ROYAL COMMISSION

ON

AGRICULTURE IN INDIA

Volume I

Part I

EVIDENCE

OF

Officers serving under the Government of India



CALCUTTA: GOVERNMENT OF INDIA
CENTRAL PUBLICATION BRANCH
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INTERIM REPORT

To

THE KING'S MOST EXCELLENT MAJESTY

May It Please Your Majesty,

We, the Commissioners appointed to examine and report on the present conditions of agricultural and rural economy in British India, and to make recommendations for the improvement of agriculture and to promote the welfare and prosperity of the rural population; in particular, to investigate:—(*a*) the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new and better crops and for improvement in agricultural practice, dairy farming and the breeding of stock; (*b*) the existing methods of transport and marketing of agricultural produce and stock; (*c*) the methods by which agricultural operations are financed and credit afforded to agriculturists; (*d*) the main factors affecting rural prosperity and the welfare of the agricultural population; and to make recommendations; availing ourselves of Your Majesty's permission to report our proceedings from time to time, desire to submit to Your Majesty the minutes of the evidence which we have taken up to the 18th of October 1926 on the subject of our Inquiry.

All of which we most humbly submit for Your Majesty's most gracious consideration.

(Signed) LINLITHGOW,
Chairman.
(„) H. S. LAWRENCE.
(„) T. H. MIDDLETON.
(„) GANGA RAM.
(„) J. MACKENNA.
(„) H. CALVERT.
(„) GAJAPATI NARAYANA DEO.
(„) N. GANGULEE.
(„) L. K. HYDER.
(„) B. S. KAMAT.

(Signed) J. A. MADAN,
(„) F. W. H. SMITH,
Joint Secretaries.

25th April 1927.

MO Y 24—*a*

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TERMS OF REFERENCE

Generally,

To examine and report on the present conditions of agriculture and rural economy in British India and to make recommendations for the improvement of agriculture and the promotion of the welfare and prosperity of the rural population ;

In particular to investigate—

(*a*) the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new and better crops and for improvement in agricultural practice, dairy farming and the breeding of stock ;

(*b*) the existing methods of transport and marketing of agricultural produce and stock ;

(*c*) the methods by which agricultural operations are financed and credit afforded to agriculturists ;

(*d*) the main factors affecting rural prosperity and the welfare of the agricultural population ;

and to make recommendations.

It will not be within the scope of the Commission's duties to make recommendations regarding the existing system of landownership and tenancy or of the assessment of land revenue and irrigation charges, or the existing division of functions between the Government of India and the local Governments. But the Commission shall be at liberty to suggest means whereby the activities of the Governments in India may best be co-ordinated and to indicate directions in which the Government of India may usefully supplement the activities of local Governments.

सत्यमेव जयते

QUESTIONNAIRE

Part I

Question.

1. Research.
2. Agricultural education.
3. Demonstration and propaganda.
4. Administration.
5. Finance.
6. Agricultural indebtedness.
7. Fragmentation of holdings.

Part II

8. Irrigation.
9. Soils.
10. Fertilisers.
11. Crops.
12. Cultivation.
13. Crop protection.
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15. Veterinary.
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17. Agricultural industries.
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20. Marketing.
21. Tariffs and sea freights.
22. Co-operation.
23. General education.
24. Attracting capital.
25. Welfare of rural population.
26. Statistics.

सत्यमेव जयते

QUESTIONNAIRE

Part I

1. Research.

(*a*) Have you suggestions to advance for the better organisation, administration and financing of—

(*i*) All research affecting the welfare of the agriculturist, including research into the scientific value of the indigenous theory and traditional methods of agriculture,

(*ii*) Veterinary research ?

(*b*) If in cases known to you progress is not being made because of the want of skilled workers, or field or laboratory facilities for study or by reason of any other handicaps, please give particulars. [Suggestions of a general kind should be made under (*a*) ; answers under this heading should relate to specific subjects. The purpose is to secure a list of the problems met with by scientific investigators in the course of their work which are being held over because of lack of resources or deficient organisation.]

(*c*) Can you suggest any particular subject for research not at present being investigated to which attention might usefully be turned ?

2. Agricultural Education.

With reference to any form of agricultural education of which you may have experience, please state your views on the following :—

(*i*) Is the supply of teachers and institutions sufficient ?

(*ii*) Is there an urgent need for extension of teaching facilities in any district or districts known to you personally ?

(*iii*) Should teachers in rural areas be drawn from the agricultural classes ?

(*iv*) Are the attendances at existing institutions as numerous as you would expect in present circumstances ; if not, state reasons. Can you suggest measures likely to stimulate the demand for instruction ?

(*v*) What are the main incentives which induce lads to study agriculture ?

(*vi*) Are pupils mainly drawn from the agricultural classes ?

(*vii*) Are there any modifications in existing courses of study which appear to be called for ; if so, what are they ?

(*viii*) What are your views upon (*a*) nature study ; (*b*) school plots ; (*c*) school farms ?

(*ix*) What are the careers of the majority of students who have studied agriculture ?

(*x*) How can agriculture be made attractive to middle class youths ?

(*xi*) Are there recent movements for improving the technical knowledge of students who have studied agriculture ?

(*xii*) How can adult education in rural tracts be popularised ?

(*xiii*) In suggesting any scheme for better educational facilities in rural areas, please give your views for (*a*) its administration and (*b*) its finance.

3. Demonstration and Propaganda.

(*a*) What are the measures which in your view have been successful in influencing and improving the practice of cultivators ?

(*b*) Can you make suggestions for increasing the effectiveness of field demonstrations ?

(*c*) Can you suggest methods whereby cultivators may be induced to adopt expert advice ?

(*d*) If you are aware of any striking instances of the success or the failure of demonstration and propaganda work, please give particulars and indicate the reasons for success or for failure.

4. Administration.

(*a*) Do you wish to suggest means towards the better co-ordination of the activities of the Governments in India or to indicate directions in which the Government of India may usefully supplement the activities of the local Governments ?

(*b*) Is it your opinion that the expert scientific knowledge required in the development of agriculture in the different Provinces could be supplied to a greater extent than is the case at present by increasing the scientific staff of the Government of India ? If so, indicate the types of work which would benefit by pooling the services of experts, and suggest how that work should be controlled.

(*c*) Are you satisfied from the agricultural standpoint with the services afforded by—

(*i*) The Agricultural and Veterinary Services,

(*ii*) Railways and steamers,

(*iii*) Roads,

(*iv*) Meteorological Department,

(*v*) Posts, and

(*vi*) Telegraphs, including wireless ?

If not, please indicate directions in which you think these Services might be improved or extended.

5. Finance.

(*a*) What are your views as to the steps that should be taken for the better financing of agricultural operations and for the provision of short and long-term credit to cultivators ?

(*b*) Do you wish to suggest means whereby cultivators may be induced to make fuller use of the Government system of *taccavi* ?

6. Agricultural Indebtedness.

(*a*) What in your opinion are :—

(*i*) the main causes of borrowing,

(*ii*) the sources of credit, and

(*iii*) the reasons preventing repayment.

(*b*) What measures in your opinion are necessary for lightening agriculture's burden of debt ? For example, should special measures be taken to deal with rural insolvency, to enforce the application of the Usurious Loans Act, or to facilitate the redemption of mortgages ?

(*c*) Should measures be taken to restrict or control the credit of cultivators such as limiting the right of mortgage and sale ? Should non-terminable mortgages be prohibited ?

7. Fragmentation of Holdings.

(*a*) Do you wish to suggest means for reducing the loss in agricultural efficiency attendant upon the excessive subdivision of holdings ?

(*b*) What are the obstacles in the way of consolidation and how can they be overcome ?

(*c*) Do you consider legislation to be necessary to deal with minors, widows with life interest, persons legally incapable, alienation and dissentients, and to keep disputes out of the courts ?

PART II

8. Irrigation.

(*a*) Name any district or districts in which you advocate the adoption of new irrigation schemes, or suggest extensions or improvements in the existing systems or methods of irrigation by—

(*i*) Perennial and non-perennial canals,
(*ii*) Tanks and ponds,
(*iii*) Wells.

What are the obstacles in your district or Province to the extension of irrigation by each of the above methods ?

(*b*) Are you satisfied with the existing methods of distributing canal water to cultivators ? Describe the methods that have been employed to prevent wastage of water by evaporation and by absorption in the soil. What form of outlet for distribution to cultivators at the tail end do you regard as the most equitable and economical ? Have these methods and devices been successful, or do you wish to suggest improvements ?

(*N.B.*—Irrigation charges are *not* within the terms of reference of the Commission, and should not be commented upon.)

9. Soils.

(*a*) Have you suggestions to make—

(*i*) for the improvement of soils, whether by drainage or other means, not dealt with under other headings in this questionnaire.
(*ii*) for the reclamation of Alkali (Usar) or other uncultivable land,
(*iii*) for the prevention of the erosion of the surface soil by flood water ?

(*b*) Can you give instances of soils known to you which, within your recollection, have—

(*i*) undergone marked improvement,
(*ii*) suffered marked deterioration ?

If so, please give full particulars.

(*c*) What measures should Government take to encourage the reclamation of areas of cultivable land which have gone out of cultivation ?

10. Fertilisers.

(*a*) In your opinion, could greater use be profitably made of natural manures or artificial fertilisers ? If so, please indicate the directions in which you think improvement possible.

(*b*) Can you suggest measures to prevent the fraudulent adulteration of fertilisers ?

(*c*) What methods would you employ to popularise new and improved fertilisers ?

(*d*) Mention any localities known to you in which a considerable increase in the use of manures has recently taken place.

(*e*) Has effect of manuring with phosphates, nitrates, sulphate of ammonia, and potash manures been sufficiently investigated ? If so, what is the result of such investigation ?

(*f*) What methods would you employ to discourage the practice of using cowdung as fuel ?

11. Crops.

(*a*) Please give your views on—

(*i*) the improvement of existing crops,

(*ii*) the introduction of new crops including fodder crops,

(*iii*) the distribution of seeds,

(*iv*) the prevention of damage by wild animals.

(*b*) Can you suggest any heavy yielding food crops in replacement of the present crops ?

(*c*) Any successful efforts in improving crops or substituting more profitable crops which have come under your own observation should be mentioned.

12. Cultivation.

Can you suggest improvements in—

(*i*) the existing system of tillage, or

(*ii*) the customary rotations or mixtures of the more important crops ?

13. Crop Protection, Internal and External.

Please give your views on—

(*i*) The efficacy and sufficiency of existing measures for protection of crops from external infection, pests and diseases.

(*ii*) The desirability of adopting internal measures against infection.

14. Implements.

(*a*) Have you any suggestion for the improvement of existing, or the introduction of new, agricultural implements and machinery ?

(*b*) What steps do you think may usefully be taken to hasten the adoption by the cultivator of improved implements ?

(*c*) Are there any difficulties which manufacturers have to contend with in the production of agricultural implements or their distribution for sale throughout the country ? If so, can you suggest means by which these difficulties may be removed ?

PART III

15. Veterinary.

(*a*) Should the Civil Veterinary Department be under the Director of Agriculture or should it be independent ?

(*b*) (*i*) Are dispensaries under the control of Local (District) Boards ? Does this system work well ?

(*ii*) Is the need for expansion being adequately met ?

(*iii*) Would you advocate the transfer of control to Provincial authority ?

(*c*) (*i*) Do agriculturists make full use of the veterinary dispensaries ? If not, can you suggest improvements to remedy this ?

(*ii*) Is full use made of touring dispensaries ?

(*d*) What are the obstacles met with in dealing with contagious diseases ? Do you advocate legislation dealing with notification, segregation, disposal of diseased carcases, compulsory inoculation of contacts and prohibition of the movement of animals exposed to infection ? Failing legislation, can you suggest other means of improving existing conditions ?

(*e*) Is there any difficulty in securing sufficient serum to meet the demand ?

(*f*) What are the obstacles in the way of popularising preventive inoculation ? Is any fee charged, and, if so, does this act as a deterrent ?

(*g*) Do you consider that the provision of further facilities for research into animal disease is desirable ?

If so, do you advocate that such further facilities should take the form of—

(*i*) an extension of the Muktesar Institute, or

(*ii*) the setting up, or extension of, Provincial Veterinary Research Institutions ?

(*h*) Do you recommend that special investigations should be conducted by—

(*i*) officers of the Muktesar Institute, or

(*ii*) research officers in the Provinces ?

(*i*) Do you recommend the appointment of a Superior Veterinary Officer with the Government of India ? What advantages do you expect would result from such an appointment ?

16. Animal Husbandry.

(*a*) Do you wish to make suggestions for—

(*i*) improving the breeds of livestock,

(*ii*) the betterment of the dairying industry,

(*iii*) improving existing practice in animal husbandry ?

(*b*) Comment on the following as causes of injury to cattle in your district—

(*i*) Overstocking of common pastures,

(*ii*) Absence of enclosed pastures, such as grass borders in tilled fields,

(*iii*) Insufficiency of dry fodder such as the straw of cereals or the stems and leaves of pulses,

(*iv*) Absence of green fodders in dry seasons,

(*v*) Absence of mineral constituents in fodder and feeding stuffs.

(*c*) Please mention the months of the year in which fodder shortage is most marked in your district. For how many weeks does scarcity of fodder usually exist ? After this period of scarcity ends how many weeks elapse before young growing cattle begin to thrive ?

(*d*) Can you suggest any practicable methods of improving or supplementing the fodder supply that would be applicable to your district ?

(*e*) How can landowners be induced to take a keener practical interest in these matters ?

PART IV

17. Agricultural Industries.

(*a*) Can you give any estimate of the number of days of work done by an average cultivator on his holding during the year ? What does he do in the slack season ?

(*b*) Can you suggest means for encouraging the adoption of subsidiary industries ? Can you suggest any new subsidiary industries to occupy the spare time of the family which could be established with Government aid ?

(*c*) What are the obstacles in the way of expansion of such industries as beekeeping, poultry rearing, fruit growing, sericulture, pisciculture, lac culture, rope making, basket making, etc. ?

(*d*) Do you think that Government should do more to establish industries connected with the preparation of agricultural produce for consumption, such as oil pressing, sugar making, cotton ginning, rice hulling, utilisation of wheat straw for card-board, utilisation of cotton seed for felt, fodder, oil and fuel, utilisation of rice straw for paper, etc. ?

(*e*) Could subsidiary employment be found by encouraging industrial concerns to move to rural areas ? Can you suggest methods ?

(*f*) Do you recommend a more intensive study of each rural industry in its technical, commercial and financial aspects, with a view to, among other things, introduction of improved tools and appliances ?

(*g*) Can you suggest any other measures which might lead to greater rural employment ?

(*h*) Can you suggest means whereby the people could be induced to devote their spare time to improving the health conditions of their own environment ?

18. Agricultural Labour.

(*a*) What measures, if any, should be taken to attract agricultural abour from areas in which there is a surplus to—

(*i*) areas under cultivation in which there is a shortage of such labour ? and

(*ii*) areas in which large tracts of cultivable land remain uncultivated ?

Please distinguish between suggestions designed to relieve seasonal unemployment and proposals for the permanent migration of agricultural population.

(*b*) If there is any shortage of agricultural labour in your Province, what are the causes thereof and how could they be removed ?

(*c*) Can you suggest measures designed to facilitate the occupation and development, by surplus agricultural labour, of areas not at present under cultivation ?

19. Forests.

(*a*) Do you consider that forest lands as such are at present being put to their fullest use for agricultural purposes ? For instance, are grazing facilities granted to the extent compatible with the proper preservation of forest areas ? If not, state the changes or developments in current practice which you consider advisable.

(*b*) Can you suggest means whereby the supply of firewood and fodder in rural areas may be increased ?

(*c*) Has deterioration of forests led to soil erosion ? What remedies would you suggest for erosion and damage from floods ?

(*d*) Can you indicate any methods by which supply of moisture in the soil, the rainfall and supply of canal water can be increased and regulated by afforestation or by the increased protection of forests so as to benefit agriculture ? Would the same methods be useful in preventing the destruction by erosion of agricultural land ?

(*e*) Is there an opening for schemes of afforestation in the neighbourhood of villages ?

(*f*) Are forests suffering deterioration from excessive grazing ? Is soil erosion being thereby facilitated ? Suggest remedies.

20. Marketing.

(*a*) Do you consider existing market facilities to be satisfactory ? Please specify and criticise the markets to which you refer, and make suggestions for their improvement.

(*b*) Are you satisfied with the existing system of marketing and distribution ? If not, please indicate the produce to which you refer and describe and criticise in detail the channels of marketing and distribution from the producer to the consumer in India (or exporter in the case of produce exported overseas). State the services rendered by each intermediary and whether such intermediary acts in the capacity of merchant or commission agent, and comment upon the efficiency of these services and the margins upon which such intermediaries operate. Please describe

the method by which each transaction is financed, or in the case of barter, by which an exchange is effected.

(*c*) Do you wish to suggest steps whereby the quality, purity, grading or packing of agricultural produce may be improved, distinguishing where possible between produce destined for—

(*i*) Indian markets ?

(*ii*) Export markets ?

(*d*) Do you think that more effective steps might be taken to place at the disposal of cultivators, merchants and traders information as to market conditions, whether Indian or overseas ; crop returns ; complaints as to Indian produce from wheresoever originating ; and agricultural and marketing news in general ?

21. Tariffs and Sea Freights.

Do existing (*a*) customs duties, both import and export, and (*b*) sea freights adversely affect the prosperity of the Indian cultivator ? If so, have you any recommendations to make ?

22. Co-operation.

(*a*) What steps do you think should be taken to encourage the growth of the co-operative movement—

(*i*) by Government,

(*ii*) by non-official agencies ?

(*b*) Have you any observations to make upon—

(*i*) Credit societies ;

(*ii*) Purchase societies ;

(*iii*) Societies formed for the sale of produce or stock ;

(*iv*) Societies for effecting improvements—*e.g.*, the digging of wells and the construction of bunds, walls and fences, or the planting of hedges ;

(*v*) Societies formed for the aggregation of fragmented holdings and their redistribution in plots of reasonable size ;

(*vi*) Societies for the co-operative use of agricultural machinery ;

(*vii*) Societies for joint farming ;

(*viii*) Cattle breeding societies ;

(*ix*) Societies formed for any purpose connected with agriculture or with the betterment of village life, but not specified above ?

(*c*) Where co-operative schemes for joint improvement, such as co-operative irrigation or co-operative fencing or a co-operative consolidation of holdings scheme, cannot be given effect to owing to the unwillingness of a small minority to join, do you think legislation should be introduced in order to compel such persons to join for the common benefit of all ?

(*d*) Do you consider that those societies of which you have personal knowledge have, in the main, achieved their object ?

23. General Education.

(*a*) Do you wish to make observations upon existing systems of education in their bearing upon the agricultural efficiency of the people ? If you make suggestions, please distinguish, as far as possible, between—

(*i*) Higher or collegiate,

(*ii*) Middle school, and

(*iii*) Elementary school education.

(*b*) (*i*) Can you suggest any methods whereby rural education may improve the ability and culture of agriculturists of all grades while retaining their interest in the land ?

(*ii*) What is your experience of compulsory education in rural areas ?

(*iii*) What is the explanation of the small proportion of boys in rural primary schools who pass through the fourth class ?

24. Attracting Capital.

(*a*) What steps are necessary in order to induce a larger number of men of capital and enterprise to take to agriculture ?

(*b*) What are the factors tending to discourage owners of agricultural land from carrying out improvements ?

25. Welfare of Rural Population.

(*a*) Outside the subjects enumerated above, have you any suggestions to offer for improving hygiene in rural areas and for the promotion of the general well-being and prosperity of the rural population ?

(*b*) Are you, for instance, in favour of Government conducting economic surveys in typical villages with a view to ascertaining the economic position of the cultivators ? If so, what, in your opinion, should be the scope and methods of such enquiries ?

(*c*) If you have carried out anything in the nature of such intensive enquiry, please state the broad conclusions which you reached.

26 Statistics.

(*a*) Do you wish to make suggestions for the extension or improvement of the existing methods of—

(*i*) ascertaining areas under cultivation and crops ;

(*ii*) estimating the yield of agricultural produce ;

(*iii*) enumerating livestock and implements ;

(*iv*) collecting information on land tenure, the incidence of land revenue and the size of the agricultural population ;

(*v*) arranging and publishing agricultural statistics ?

(*b*) Have you any other suggestions to make under this heading ?

MINUTES OF EVIDENCE

TAKEN BEFORE THE

ROYAL COMMISSION ON AGRICULTURE.

Tuesday, October 12th, 1926.

SIMLA.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Raja Sri KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries*).

Dr. D. CLOUSTON, M.A., D.Sc., C.I.E., Agricultural Adviser to the Government of India.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—The Government of India should be responsible for the co-ordination of research work in the Provinces; it should supplement, too, the work being done at present by the Agricultural and Veterinary Departments thereof. It is already co-ordinating, to a great extent, the work being done on the improvement of cotton and its efforts in that direction have been most successful. One of the objects in view in constituting the Board of Agriculture in India was to provide an agency by means of which the activities of research workers in the Provinces could be co-ordinated. I have, in one of my memoranda, explained why the Board is unfitted for such a task. It has been handicapped by the fact that it has been given no funds and no executive powers. As an advisory body, on the other hand, it has done most useful work. What is required in a Board of Agriculture consti-

tuted on the lines suggested by me in my memorandum on the Scheme for the establishment of an All-India Organisation for the Advancement of Agriculture. This Board should have an Advisory Council and an Executive Committee. The members of the Council should be appointed by the Government of India in consultation with Local Governments and Indian States, and ample funds should be placed at its disposal for expenditure on research projects and other aids to the farming industry. The Agricultural Adviser to the Government of India, the Secretary to the Board, the Director of the Imperial Institute of Veterinary Research, Muktesar, and Heads of Sections of the Imperial Department of Agriculture, should be on the Executive Council. The Agricultural Adviser should be the Chairman of both bodies: the Secretary should be an experienced agricultural officer on a grade of pay not less than that of a Director of Agriculture.

The function of the Advisory Council of the Board would be to consider ways and means of speeding up the development of India's agricultural industry and to make recommendations: the duty of the Executive Committee would be to take action on these recommendations. It would be necessary for the Imperial Department to have in the Provinces a certain number of research stations controlled by its own officers; but these officers would co-operate with the Provincial and State departments concerned and with their local Boards of Agriculture.

Veterinary research.—The Director of the Imperial Institute of Veterinary Research, Muktesar, should be a member both of the Advisory Council and of the Executive Committee of the Board. He would supervise and to some extent control the lines of veterinary research initiated and financed by the Advisory Council of the Board and carried out by the Executive Committee working in co-operation with the veterinary staff of each Province.

To give effect to this scheme it would be necessary to increase the staff of the Pusa and Muktesar Institutes, and to enable the Agricultural Adviser to give more attention to organisation and administration the post of Assistant to the Agricultural Adviser, held in abeyance at present, would have to be filled.

Scientific value of indigenous theory and traditional methods of agriculture.—As every agricultural expert studies the scientific value of indigenous theory and traditional methods of agriculture in so far as they relate to his own job, I doubt whether any further action is necessary.

Finance.—The Government of India should provide from general revenues the money required for the lines of research adumbrated in this scheme. If it cannot possibly do so, it should raise the money by imposing a small export duty on wheat, tobacco, manures, etc., as recommended by Mr. Lindsay in his memorandum and a reserve fund should be built up with a view to providing against periods of financial stringency. The cotton industry, the tea industry and the lac industry have already taxed themselves in order to raise funds for their development. Other allied industries have not done so, because they are not so well organised; it is the duty of Government to come to their rescue.

Progress in every branch of agricultural and veterinary research is being handicapped at present for want of staff and funds. If trained workers and funds were available much could be done to speed up the improvement of such crops as wheat, rice, sugar-cane, tobacco, oilseeds, vegetables, fruits, etc., and to improve our breeds of cattle and sheep. Much could be done, too, in the way of (1) designing, testing and introducing improved agricultural implements, machinery, (2) improving methods of raising water for irrigation, (3) investigating the causes of salinity in soils and methods of conserving moisture, (4) studying the technique involved in the manufacture of unrefined sugar (*gur*) of good quality, (5) improving our poultry, and (6) testing and popularising the use of manures. A certain amount of work is admittedly being done in all these directions; but there is lack of co-ordination. Moreover, the investigators employed are not always qualified to deal effectively with the problems entrusted to them and there is much duplication.

QUESTION 2.—AGRICULTURAL EDUCATION.—*Agricultural Colleges.*—In Bengal, Assam and Bihar and Orissa there is no agricultural college; this is a serious obstacle to progress in agricultural development in these three Provinces. Without a higher teaching institution a provincial department of agriculture cannot effectively bridge the gulf between the researcher and the tiller of the soil, for it cannot effectively train demonstrators for district work, and it cannot train the sons of landowners who believe in agricultural education as a factor of importance in rural development. Each of the three Provinces mentioned above should have its own agricultural college. An agricultural college in Assam might undertake the training both of agriculturists and tea planters.

The main incentives which induce lads to study agriculture at agricultural colleges are (1) the hope of getting Government employment, (2) the scholarships available, (3) the cheapness of the education given, and (4) the comparatively low standard of attainment required for admission. The students who have up to date taken agricultural courses at agricultural colleges have been mainly drawn from non-cultivating classes. The same remarks apply to the students who take post-graduate courses at Pusa and Bangalore.

The technical knowledge of students who have studied agriculture is improved by giving them short courses. At times students keen on their work take courses during the college vacation.

The study of Agricultural Economics at our agricultural colleges has in the past been somewhat neglected; much more attention should be given to this most important subject.

Post-graduate training.—In no Province has adequate provision for post-graduate training in agriculture and veterinary research been made. If adequate provision for post-graduate training cannot be made in India, men of proved ability should be selected and sent home for training at Government expense. Post-graduate courses in agriculture and the sciences allied thereto are being given at the Agricultural Research Institute, Pusa, and the Institute of Animal Husbandry and Dairying, Bangalore; but for want of staff and for other reasons these courses are not of a sufficiently high standard. Moreover, these courses have not as yet attracted students of the calibre and training required.

The standard of training given in High Schools and Arts Colleges, though it is gradually being improved is not as yet entirely satisfactory. Students admitted to agricultural colleges and to post-graduate courses at Pusa are, in consequence, handicapped to some extent from the very start. In this connection, please see Appendix 1.

Rural education.—A perusal of the recommendations of the Board of Agriculture in India will show that agricultural education has been discussed by that Board time and again. As early as 1905 a resolution was passed to the effect that for rural areas a sound system of education based on rural needs was essential. In later years resolutions were passed in which stress was laid on the importance of sympathetic co-operation between the Educational and Agricultural Departments in adapting rural education to rural needs. It must be confessed, however, that as yet little has been done to give effect to these resolutions.

Rural schools.—The village school is fundamental to any scheme of rural regeneration. The syllabus of such schools should have rural bias; it should be framed with the object of inculcating an interest in, and a love of rural life. Such schools should be supplied with suitable school readers written with the object of interesting those who use them in rural life generally; of quickening their intellectual appreciation of plant and animal life, the soil, tillage operations and the return of the seasons with their renewal of life; and with the object in particular of interesting village boys in the steps being taken by Government departments to improve economic conditions in rural areas. I believe that there is a need for the extension of teaching facilities of this kind and that they should be provided at the expense, if necessary, of

purely literary education. If they were provided, more agriculturists would send their sons to school.

Much of the education given in primary and middle schools at present is from the cultivator's point of view worse than useless. It tends to alienate the sympathy of the pupil from the land, and to unfit him for farming as a vocation. Demand for and appreciation of education of this type is, and always will be small, as far as the best cultivating classes are concerned; they want something more practical.

The teacher.—The guidance of young minds to rural ideals depends much more on the personality of the teacher than on furniture and equipment. It is with the teacher that reform of rural education should therefore start. A rural policy should aim, in short, at discovering and developing a " country sense " in teachers; they should be drawn, as far as possible, from agricultural classes and be specially trained. The number of such teachers available in India at present is admittedly small; from top to bottom the Education Department is staffed with men drawn mainly from non-cultivating classes.

Special vs. *bias agricultural school.*—I have, in a memorandum already submitted, given my opinion regarding the merits of the two systems of agricultural education now under trial in rural schools. Special agricultural schools of the " Loni " type are never likely to be popular; they are very expensive and have not as yet appealed to the people in those Provinces in which they have been tried. Any demand which at present exists for agricultural training of a vocational type could probably be met more effectively by providing special courses at agricultural colleges.

In the Punjab, agriculture has been added to the curriculum of ordinary vernacular middle schools with the object of giving the boys who attend them a bias towards farming as an occupation. This is the most one can hope to do when dealing with mere youngsters. This system has, in my opinion, great possibilities. It is described in detail in the memorandum drawn up for the Commission by the Punjab Government. From my note in Appendix 2 it will be gathered that I had recommended the introduction of a similar system in the Central Provinces 7½ years ago. This scheme was discussed at an Education Conference held at Nagpur. Please see Appendix 3.

(*a*) *School plots and* (*b*) *school farms.*—This is mainly a local question. It is desirable that the school plot should consist of an area of from 3 to 4 acres and that boys should get some training in the use of implements and in growing crops on a field scale. In Provinces where land is dear and difficult to obtain, however, it may not be possible to find the money required for the acquisition of such large areas for each school.

Adult education.—I doubt whether any appreciable demand for adult education of the literary type is likely to arise in the near future. The Department of Agriculture is within limits giving adult education of a very practical, popular and valuable kind; it could do much more but for the fact that the staff and funds at its disposal are inadequate. Its field demonstrations, its lectures illustrated by lantern slides and cinema films, its agricultural associations, agricultural shows, etc., are all of great educative value. They appeal to the bucolic mind in a way in which words can never do. Any money available for adult education could be utilised with advantage in extending and intensifying the work of educating the agriculturists on these lines. Our aim, in short, should be to show the cultivator in the most direct manner possible how to make more money and raise his standard of living: with a view to effecting this it would pay to curtail, if need be, expenditure on less practical forms of education for the time being.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—The amount of useful extension work which a department of agriculture can do depends very largely on the value of the results which it achieves by research and experiment; but it depends very largely, too, on how the demonstration and propaganda work of the department is organised. It is of importance that the Director, Deputy Directors and Extra Assistant Directors of Agriculture should be good administrators and organisers and that agricultural assistants working in the districts

should be thoroughly trained as demonstrators. For demonstration work men who have been brought up on the land are best fitted, if they possess at the same time energy, tact and imagination, for they understand the cultivator and sympathise with him in the disabilities under which he labours. I have been particularly struck by the influence gained by certain Deputy Directors of this type over the cultivators of their circles.

The popular bulletin (Appendix 4) is one of the series of bulletins which I brought out in English and the vernaculars when Director of Agriculture in the Central Provinces. It describes how the work of the Department of Agriculture in the Central Provinces was organised with a view to improving, to the greatest extent possible, the practice of the cultivators. In the proceedings of the Board of Agriculture will be found the reports of the sub-committees appointed to consider ways and means of bringing improved methods of agriculture to the notice of cultivators. I was a member of the different sub-committees appointed to go into this question; their reports read along with the bulletin I have referred to (Appendix 4), express my ideas as to how demonstration and propaganda work can be most effectively organised.

It is very important that the whole scheme of operations which come within the ambit of demonstration and propaganda should be drawn up in detail by an officer who is a good agriculturist, who is in sympathy with the cultivator, who possesses imagination and who has made a study of local conditions, including the economic problems, of his Province. Owing to paucity of staff it has not always been possible to find this type of man for the posts of Director and Deputy Director of Agriculture. This I consider has been an obstacle to progress. The various methods of demonstration and propaganda which have proved effective may be described under the following heads:—(1) Experimental, seed, demonstration and cattle-breeding farms managed by Government; (2) demonstration and seed farms managed by private individuals; (3) village to village demonstrations; (4) agricultural shows; (5) ploughing matches; (6) lectures illustrated by lantern slides and cinema films; (7) publications including popular bulletins, books and leaflets on different aspects of agriculture, agricultural education and rural sanitation; (8) circle, tahsil, district and provincial agricultural association; (9) Co-operative unions for the production and distribution of improved seed; for the purchase, sale and hire of agricultural implements, manures and fungicides, the sale of agricultural produce, the improvement of the dairy industry, etc.

The effectiveness of methods of demonstration and propaganda depends to a great extent on the qualifications of the Deputy Director whose duty it is to apply them. It is difficult to say which of the methods mentioned above have proved most successful; in a well-organised scheme of extension work demonstration, co-operation and propaganda should each play its part.

Demonstration.—Mistakes have been made in the past in recommending methods before they had been thoroughly tested; such mistakes occur only when the agricultural expert in charge of the operations fails to base his methods on the results obtained by research, experiment and a study of economic conditions. An agricultural improvement should be recommended only after it has been thoroughly tested on a Government farm or farms. It should then be demonstrated in the villages and under village conditions; to see is to believe. All the different kinds of Government farms are in a sense demonstration centres; but it is the result obtained in the village demonstration plot and seed farm which "hits the cultivator in the eye," so to speak, more especially when that demonstration plot or seed farm is controlled by an influential and intelligent landholder who shows the selected crop or other improvement alongside the *deshi* crop or practice. Agricultural shows and ploughing matches fall within the same category; they are organised by the Department assisted by local landholders and the improvement is presented in a concrete form, by men who have themselves incorporated it into their farm practice. Speaking generally mere words do not appeal to the bucolic mind of the peasant. He is slow in grasping a point and somewhat suspicious of the intentions of Government officials even. This is not surprising when

we consider the extent to which he is taken advantage of by moneylenders, merchants and others.

Co-operative organisations.—The circle of an average Deputy Director of Agriculture includes as a rule several districts, some thousands of villages and hundreds of thousands of cultivators. With his small staff and limited number of Government farms he is placed at a great disadvantage, until and unless he succeeds in gaining the hearty co-operation of the cultivator in introducing the improvements he recommends: it is, therefore, necessary to work through associations including the leading men of each district. He organises district and tahsil agricultural associations and if his staff is sufficiently large he forms also small circle associations and co-operative unions. The members of these associations and unions propagate and distribute improved seeds, sell manures, fungicides, etc.; sell and hire out agricultural implements, and otherwise co-operate with the department in the beneficent work of rural development. In this way an efficient Deputy Director can recruit thousands of willing non-official workers who practise what they preach and who help to bridge the gulf between the department and the ryot.

Propaganda.—To enthuse this class with something of his own enthusiasm he publishes in the vernaculars, leaflets, popular bulletins and books describing in simple non-technical language the improvements advocated by his department and the results obtained by those who have adopted them. He contributes articles to the Press, too, which are read both by agriculturists and non-agriculturists.

Co-operation with other officials.—The Deputy Director is only one of several officers who are trying to promote the welfare and prosperity of the rural population. He therefore co-operates in every way possible in each district of his circle with the Collector and his staff and with the officers of the Irrigation, Co-operative and Veterinary Departments. He induces the Collector to visit the Government farms in his district, to inspect private farms during his tours, to discuss with agriculturists the improvements recommended by the department, to preside over the meetings of the district agricultural association and to assist generally in developing extension work. He co-operates with the Registrar of Co-operative Credit Societies in organising non-credit societies for the propagation and distribution of seed, for the sale of implements and manures, etc. He advises the Irrigation Department with respect to the duty of water for different crops, methods of applying that water, etc., and co-operates with that department in inducing cultivators to take water from Government canals and tanks. He confers with the officers of the Veterinary Department regarding outbreaks of cattle diseases and cattle-breeding schemes.

To sum up, the measures which have been successful in improving the practice of cultivators and inducing them to accept expert advice are those I have alluded to under the headings "Demonstration, propaganda and co-operation." In the Province which I know best, namely, the Central Provinces, we had some thousands of seed farms each of which served, to some extent, the purpose of a demonstration farm. Our aim was to make each a nucleus of advanced agricultural ideas and practices. The policy laid down was to have in each tahsil (sub-division of a district) a Government farm and to make it the feeder farm for all the private seed farms of the tahsil.

The success of demonstration and propaganda work is largely dependent on the system on which it is based and the soundness of that system is dependent on the qualifications of the men who evolve it. The system evolved in the Central Provinces is, I believe, a fairly sound one; it has certainly stood the test of time. Its success has been due very largely to the fact that the department, by working through the leading landowners and well-to-do cultivators, were able to effect much in the way of introducing improvements, though the staff employed by Government was very small. The improvements introduced filtered down in course of time to the ryot.

The success achieved was due in no small measure to the interest taken by Sir Benjamin Robertson, Sir Frank Sly and Sir Reginald Craddock in the

activities of the department. I should like to lay stress on the value of the influence for good which the Head of a Province can exert in agricultural development. I should like to lay stress, too, on the importance of (1) the closest possible co-operation between the Department of Agriculture and other departments directly connected with the rural development, and (2) keeping the Collector (Head of the district) in touch with the activities of these departments.

Most officials play their several parts in rural development as a matter of duty. To sustain the interest of landholders in such work Government should in a tangible manner show how much it appreciates the services they render. In the Central Provinces, we instituted a system by which every deserving landholder was first given a beautifully designed "*sanad*" which testified to the fact that he had done useful work in his village in promoting agricultural improvements. In the event of his continuing to do good work, he was, after a period of years, given a suitably designed silver medal. But this was not all; in course of time he was presented with a gold medal and recommended for a Government title. These *sanads*, medals and titles were much appreciated for they were presented to the recipients at large public gatherings and by the Governor as a rule. The recipient invariably wore his medals at agricultural shows and on other big occasions.

QUESTION 4.—ADMINISTRATION.—(*a*) I have already outlined a scheme for the better co-ordination of the activities of the Imperial and Provincial Departments of Agriculture in my reply to question 1. The Government of India should be prepared to finance the scientific and educational work approved by the Advisory Council to be appointed under that scheme. This would include the financing of (1) research and educational work carried out by the Imperial Department of Agriculture and (2) new research schemes started by the Provinces on the advice of the Advisory Council.

(*b*) Expert scientific knowledge required in the development of agriculture in the different Provinces could be supplied to a greater extent than is being done at present by increasing the scientific staff of the Government of India. I have in replying to question 1, indicated types of work which would benefit by pooling the services of experts, and have indicated how that work should be controlled.

Agriculture is a transferred subject and the Indian Agricultural Service is to be provincialised. The recruitment of Europeans has been stopped and the tendency in some Provinces at least is to stop the recruitment of Indians from Provinces other than their own. The field of selection is thus being narrowed and the standard of efficiency lowered. Owing to financial stringency, moreover, there are many posts in the Indian Agricultural Service being kept vacant at present. All things considered the position is unsatisfactory.

If the scheme outlined in my reply to question 1 were to be given effect to, it would add considerably to the work and responsibilities of the Hon'ble Member in charge of Education, Health and Lands. He is at present responsible for all business connected with the administration of:—

(*i*) Education (except as regards Chiefs' Colleges and technical education, the various branches of which are dealt with by the departments which administer the subjects concerned);

(*ii*) Oriental languages (except as regards Pushtu, Baluchi and any other frontier language in the North-West Frontier Province);

(*iii*) Records;

(*iv*) Books and publications (except the appointment of agents for the sale of official publications in India, the United Kingdom and foreign countries);

(*v*) Reformatory schools;

} Throughout British India and in Berar.

(*vi*) Archæology and Epigraphy;
(*vii*) Arts and Museums;
(*viii*) Medical Institutions and the Civil Medical Services exclusive of officers on the political cadre;
(*ix*) Medical Research;
(*x*) Public Health;
} Throughout British India and in Berar.
(*xi*) Land Revenue (except as regards Jagirs in the North-West Frontier Province and British Baluchistan);
(*xii*) Land Surveys;
(*xiii*) Land Acquisition and Alienation;
(*xiv*) Civil Veterinary Department;
(*xv*) Agriculture;
(*xvi*) Famine;
(*xvii*) Co-operation;
(*xviii*) Forests and Arboriculture;
(*xix*) Central Agencies for Research or promotion of special studies in connection with (*i*), (*xiv*), (*xv*), (*xvi*), (*xvii*) and (*xviii*) above;
(*xx*) Botanical Survey of India;
(*xxi*) Zoological Survey;
(*xxii*) Food-stuffs;
(*xxiii*) Indians overseas and Emigration (except to Egypt, Palestine and Mesopotamia and foreign countries other than Surinam) and Haj pilgrimage;
(*xxiv*) Cinchona cultivation and the supply of Quinine;
(*xxv*) Imperial Library;
(*xxvi*) Local Self-Government in Berar and throughout British India except British Baluchistan and Ajmer-Merwara.

It would probably be desirable to relieve him of all business connected with the administration of subjects (*i*) to (*x*), (*xxi*), (*xxiii*), (*xxiv*), (*xxv*) and (*xxvi*) and to add Meteorology to his portfolio.

(*c*) To the services rendered by the Railways, the Public Works Department, Shipping Companies, the Meteorological and Posts and Telegraphs Departments, I have referred in commenting upon memoranda already submitted. For want of roads much agricultural produce has to be conveyed to markets by pack animals owned by middlemen. The producer cannot afford to maintain such animals and is therefore obliged to sell his produce at a price which compares most unfavourably with that obtained by the buyer.

For want of bridges great difficulty is experienced in some parts of India in bringing farm produce to market across rivers and streams. The lack of bridges is, in some Provinces, a more serious matter than lack of roads. Where both are good motor transport is, to some extent, taking the place of vehicles drawn by ponies and bullocks—for passenger traffic, and the place of the bullock cart for goods traffic. This is a promising innovation, releasing as it does a certain number of bullocks for farm work.

QUESTION 5.—FINANCE.—(*a*) Please see my remarks on page 16 of the volume of memoranda dealing with (1) the work being done in the different sections of the Agricultural Research Institute, Pusa, (2) agricultural education, and (3) the co-operative movement in India.

The introduction and extension of co-operative principles constitute the most useful and most hopeful means of dealing with the problem of agricultural credit.

I believe that cultivators would make fuller use of the Government system of *taccavi* if the policy of giving *taccavi* through the Departments of Agriculture and Co-operative Credit were more widely followed. In the Central Provinces, such loans are given to cultivators on a fairly large scale on the recom-

mendation of the Department of Agriculture for the purchase of improved agricultural implements, machinery and improved seed. It is not possible, however, by that means alone to provide that sound and educative system of rural credit which India so badly wants.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—The main causes of the present agricultural indebtedness are, I believe (1) the pressure of the population on the soil; (2) the existence of so many uneconomic holdings due to sub-division; (3) the lack of subsidiary means of subsistence; (4) the failure of crops in years of short rainfall and the spirit of fatalism and improvidence bred of insecurity; (5) thriftlessness and extravagance; (6) prosperity which expands credit and encourages borrowing for non-productive purposes; (7) loss of cattle from starvation and disease; (8) the failure of the cultivator to exert himself with a view to making the most of his land; (9) the ill-health of the cultivator at certain seasons of the year, and (10) the inhumanity of money-lenders and the inarticulateness of their debtors.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) It is very desirable that consolidation of holdings should be effected. In this connection, I should like to draw the attention of the Royal Commission on Agriculture to the following resolution of the Board of Agriculture in India:—"That this meeting of the Board of Agriculture recognises that in many parts of India the extreme and increasing sub-division of the land and scattered character of the holdings together form a very serious impediment to agricultural progress and to the adoption of agricultural improvements, and wishes to suggest that the attention of Local Governments be called to the matter. It recommends that the question be closely investigated and experiments made in each provincial area in consultation with the Registrar of Co-operative Societies with a view to the adoption of such measures as seem best adapted to meet the special local circumstances and to the introduction of such legislation as may be necessary."

This resolution was referred to Local Governments and the replies showed that except in Bombay, where a permissive Bill was to be introduced to enable landholders to prevent the excessive sub-division of agricultural holdings, it was considered inadvisable to take any immediate practical steps to enforce consolidation owing to divergence of opinion, religious sentiments, rigorous laws of inheritance and other circumstances peculiar to different provinces. Since then some progress has been made in the Punjab in consolidating holdings; 174 societies have been formed for this purpose and 10,411 acres have been readjusted, thereby increasing the size of blocks from 0·6 to 3·75 acres.

The difficulties in the way of consolidation are:—

(1) The cultivators are conservative and very few of them have up-to-date taken much interest in this question.

(2) In the Central Provinces, the cultivators are, I know, somewhat suspicious of the landowners (*malguzars*). When the *malguzar* tries to effect consolidation, the cultivators suspect that his object is not to benefit them but himself at their expense. There is reason to believe that the *malguzars* who have consolidated their own land including "*sir*" land have, in some cases, done so at the expense of the cultivators, so the suspicion of the latter is not entirely unjustified.

(3) Relations between different landholders in the same village are sometimes strained and this, too, is an obstacle to any amicable arrangement for the consolidation of holdings on a voluntary basis.

(4) There are also legal obstacles in the way of consolidation. In the Central Provinces, for example, the law at present does not provide for the cultivators obtaining a clear and undisputed right in the land they receive in exchange in the process of consolidation.

As pointed out by Mr. Dyer in his note on the consolidation of holdings in Chattisgarh, it is essential that the law should provide for the free transfer

of existing rights, including encumbrances, whatever they may be, which the scheme of consolidation necessitates. At present the Land Records staff has no authority to bring the land records in accordance with the facts, even when all the people concerned are completely satisfied with the transfers effected in consolidation. Mr. Dyer found that in some villages the only objection the people had to consolidation was that, having accomplished it, they had not the protection which is given to them by an authoritative Government record of their rights. It is evident, therefore, that legislation is necessary to secure the people in their rights whether consolidation is done by Government or by the people themselves.

It should be understood that complete consolidation, that is to say, the reduction of each cultivator's holding to one plot of land is not generally possible. Complete consolidation would not be desirable even if it were possible for the reason that a village generally contains soils of different classes, some of which are suitable for *kharif* and some for *rabi* crops. Some of the village area may be irrigable from existing canals, tanks or wells, while some of it may not be irrigable. Moreover, the soil of some of the village fields is comparatively fertile, while that of others is relatively poor. Where the crop-producing value of land is dependent on so many different factors complete consolidation is not therefore a practical proposition. Consolidation, if it is to be done at all, should under these circumstances be done only by blocks with a view to giving each occupier as many different kinds of land as he occupied before redistribution was effected.

In the Gangetic alluvium the soil admittedly varies much less in quality than it does in other parts of India, and the difficulty on consolidation in that tract should therefore be less. The splendid results achieved by Mr. Calvert in the Punjab indicate that the difficulty can by village co-operation be solved in that province at least.

The chief obstacle in the way of consolidation is that a keen desire for it is lacking. Government should, through the co-operative movement, encourage to the utmost voluntary efforts towards consolidation. I believe that a cinema film depicting firstly the disabilities under which the cultivator labours at present as a result of his holding being so scattered, and secondly the practical advantages enjoyed by the cultivator who has a more or less consolidated holding, would appeal very strongly to the average villager, if the picture story were told in just the right way.

Having created a desire for consolidation Government should (1) employ a special staff to work out a scheme for certain selected villages, (2) bring in the necessary legislation to empower the will of the majority to prevail over the opposition of the minority, and (3) remove legal difficulties with a view to securing for the people concerned, rights in the new plots of land allotted to them.

QUESTION 8.—IRRIGATION.—I should like to refer the Royal Commission on Agriculture to the resolutions passed in 1919 by the Board of Agriculture in India on the subject of measures for famine relief. For ready reference, these resolutions are given below:—

> "12. Each Local Government in any province, where famine conditions can be mitigated by wells, should have an efficient well-boring department under the charge of an Agricultural Engineer."
>
> "13. In connection with such a well-boring department as is recommended, the cost of unsuccessful trial borings should not fall on the individual landowners in whose land they are made."
>
> "14. A systematic survey of the supplies of underground water which can be tapped by wells or small bores should be undertaken, as soon as possible, in areas where famine conditions can be mitigated by wells. In spite of the recommendations of the Irrigation Commission (paragraph 175), this survey has not been made to anything like the extent that is desirable, and its importance has not been fully appreciated."

"5. The possibilities of strainer tube-wells should be carefully investigated where there is any likelihood of their being successful."

"16. Rivers and other sources of water which can be profitably utilised by pumping and other means, in seasons of drought (even if, at other times, their employment is not likely to be profitable) should be surveyed and mapped, and the question as to whether preparations cannot be made *in advance* to utilise these, as fully as possible, as soon as a drought occurs, should be carefully considered."

"17. The Board desires to emphasise the importance, for prevention of famine, of protective works such as embankments for regulating the run-off of water from land and the checking of erosion, combined in many instances with the afforestation of part of the area."

Paragraph 175 of the Report of the Royal Irrigation Commission referred to in Resolution 14 was as follows:—

"*Trial borings and subsoil water-survey.*—In many places, notwithstanding the aptitude and experience of the people, uncertainty exists as to the suitability of sites for wells and as to the possibility of tapping a permanent source of supply which would not be dependent on mere local percolation. To obviate the failures to find water which are not infrequent especially when, as in a famine year, wells are made in a hurry, detailed and systematic surveys should be made of the subsoil water. Over the greater part of the alluvial tract of Northern India the people have a very good local knowledge of the nature of the substrata and of the subsoil water-supply; all that seems to be required in this tract is to render assistance, where necessary, in making trial borings by providing boring tools and expert workers at a small charge; and to have mapped out, from local enquiries, all tracts in which the construction of temporary wells can be usefully pushed at an early stage of a famine. In Peninsular India also there are few Provinces in which it would not be useful to provide tools at the head-quarters of most divisions and of some districts and even sub-division as well."

I should like to draw the attention of the Commission to Resolution 14 above. Surveys have been made in the Provinces with respect to the possibility of increasing irrigation facilities by constructing canals and tanks, but a systematic survey of the supplies of under-ground which can be tapped by wells or small bores has not been carried out on a large scale in any Province as far as I know.

QUESTION 9.—SOILS.—(*a*) Much has been done on certain Government farms in India to prevent by means of embankments and drainage channels the scouring and water-logging of the soil; the Pusa system of drainage is well known. Serious loss due to soil erosion has in this way been prevented, hollows levelled up with fine silt, and the cropping power of the land greatly increased. The more enterprising cultivators construct embankments in their villages to prevent erosion; with a view to encouraging this practice *taccavi* loans should be given on a larger scale under the Land Improvement Loans Act. Government should encourage agriculturists to put up for its consideration joint schemes of land improvement. It should lend on easy terms the money required for carrying out approved schemes. The Co-operative Department should also encourage its members to carry out such schemes.

In 1916, the Board of Agriculture passed the following resolution:—"The Board recommends that the Government of India be requested to place at the disposal of the Agricultural Department of Bombay an engineer with experience and aptitude for agricultural work whose sole duties will consist in the preparation and execution of schemes of embankments and

drainage adapted to local conditions." It was pointed out "that the appointment of an engineer to advise the ryots in connection with embanking would produce a more marked improvement in the value of the produce than any other way."

No action has, so far as I know, been taken on this resolution.

(*b*) Examples of the evil consequences which result from want of control of the surface-drainage are abundant in India. They may be seen in almost every village. "Thousands of acres of valuable land on the left bank of the Jumna have been damaged by the formation of a network of ravines; and villages which were at one time surrounded by fertile fields now lie in a network of useless gullies."

(*c*) In some of the more sparsely populated parts of India, for example, the North of the Central Provinces, there are large areas of good land overrun with *kans* grass (*Saccharum spontaneum*), a persistent weed which, over considerable areas, has taken complete possession of the land. To this aspect of faulty cultivation I have referred in my remarks on pages 4 and 5 of the volume of memoranda on (1) India's Resources in Mineral Fertilisers, (2) the Manure Trade in India, and (3) the Manufacture and Sale of Agricultural Implements and Machinery in India.

QUESTION 10.—FERTILISERS.—(*a*) and (*b*) Please see my notes in the volume of memoranda dealing with (1) India's Resources in Mineral Fertilisers, (2) the Manure Trade in India, and (3) the Manufacture and Sale of Agricultural Implements and Machinery in India, and the volume dealing with Forestry and Agriculture in India, etc.

(*c*) A considerable increase in the use of manures has recently taken place in Madras, Bombay, Bihar and Central Provinces.

(*d*) and (*e*) Please see the notes in Appendix 5 and see my remarks on page 2 of the volume of memoranda dealing with Forestry and Agriculture in India, etc.

For want of funds and staff, experiments with fertilisers have not been carried out in this country on anything like the scale and the standard of scientific accuracy attained in more advanced countries. From the results obtained from the experiments already carried out, the indications are that at present prices nitrogenous fertilisers give a handsome profit when applied at the right time to sugar-cane and garden crops. Under favourable conditions they give an economic return when applied to cotton too. Nitrogen is the soil constituent which is deficient in most Indian soils, and as the tendency of late years has been for nitrogen to drop in price, the margin of profit obtained from the use of such fertilisers as sulphate of ammonia and nitrate of soda has tended to rise.

QUESTION 11.—CROPS.—(*a*) (*i*) Please see my remarks under "Economic work on Crops" on pages 9 to 12 of the volume of memoranda which deals with (1) the work being done in the different sections of the Agricultural Research Institute, Pusa, (2) agricultural education, and (3) the co-operative movement in India.

(*a*) (*ii*) Several promising fodder crops such as *berseem* (Egyptian clover) and *Rhodes* grass have been introduced. The former is now being grown on a large scale in the North-West Frontier Province.

(*b*) In tracts where facilities for irrigation have been provided, it is often possible to substitute for inferior millets crops such as wheat and rice which give much larger yields.

(*c*) In parts of India there is much scope for the introduction of new crops such as ground-nut. Good progress in this direction has already been made in Bombay, Burma and the Central Provinces.

In areas brought under irrigation heavy yielding rices have taken the place of early and less productive kinds and new crops, such as sugar-cane and ground-nut, introduced.

Seed distribution.—In plant selection the heterogeneous mixture of varieties having been sorted out by the plant breeder, selected strains of each

variety are tested first in lines, then in plots of 1/10th of an acre or so. The most promising strains are retained for further trial on a larger scale on a Government seed and demonstration farm. On this farm seed of those varieties which satisfy all requirements are propagated and supplied to private seed farms in the villages. The owners of these private farms multiply the seed and sell it to cultivators in their own and neighbouring villages. With a view to ensuring effective control over the seed produced by these private seed farms, we organised Co-operative Seed Unions in the Central Provinces. Each Union included 10 farms of which one was designated the Central Seed Farm. To the latter farm the department supplied pure seed every year, and the produce of this seed was supplied to the other farms of the Union. With a view to keeping the seed pure the Seed Unions in the cotton tract were encouraged to have their own ginning plants and to gin their own *kapas*. By this system of seed propagation and distribution one Agricultural Assistant was able to control a large number of seed farms. He was responsible only for the purity of the seed produced by the Central Seed Farm; the Union was held responsible for the purity of that produced on the branch farms. Other methods of seed propagation and distribution followed in the Central Provinces are described in some detail in the memorandum drawn up by the local Government thereof, and need not be mentioned here.

An article written for the *Agricultural Journal of India* on "Some Foes of the Farmer in the Central Provinces and how to deal with them" will be found in Appendix 6.

QUESTION 12.—CULTIVATION.—In some parts of India very little attention is paid to the rotation of crops. In the cotton tract, for example, cotton is grown year after year on the same land, so long as the price of this staple remains high. In course of time this induces wilt, a disease which takes a heavy toll on the crop. *Tur* suffers in the same way, but from a different wilt, in tracts where little attention is paid to rotation. On the light gravelly soils in some districts inferior millets are grown year after year without a break. In almost all such cases it would pay, I believe, to rotate these crops with a legume such as ground-nut. Its cultivation has been taken up in some Provinces on a large scale within the last two decades: it is grown in rotation with cotton and millets chiefly.

In parts of India, ground-nut is now being grown successfully as a *kharif* crop after which wheat is grown in tracts previously reserved entirely for *rabi*. With early varieties of ground-nut such as small Japanese and Spanish Pea-nut this system of double cropping is possible.

The tillage implements used in India at present are primitive and inefficient; the *deshi nagar* is perhaps the least efficient of all. A number of different types of improved ploughs have been introduced; some of these are not entirely suitable; those that are suitable are generally too dear.

In parts of India, a blade harrow (*bakhar*) is the tillage implement in common use. It cultivates the soil to a depth of about 3 inches only; shallow cultivation has its disadvantages in a country in which the cultivator is so dependent on the rainfall, shallow cultivation, moreover, encourages the growth of weeds. The more enterprising cultivators in some Provinces are beginning to realise this and now plough their land instead of harrowing it with the blade harrow.

Improved harrows have been introduced in some tracts with advantage and have proved most useful in breaking up (1) the clods in ploughed fields and (2) the hard crust formed after irrigation or a heavy rainfall.

The *deshi* hoes used for interculture being inefficient much money is spent on hand weeding: in some localities crops are still sown broadcast and weeding is done entirely by hand. The introduction of cheap and efficient sowing drills and hoes would go far to induce the cultivator to sow his crops in lines and to use improved hoes for weeding.

Sugar-cane and cotton often suffer as a result of water-logging more especially when grown in heavy clayey soils. Sugar-cane is generally grown

on ridges, but as the ridges are nearly always made by hand the cost is high. When not properly ridged sugar-cane suffers from water-logging which induces red rot, a disease which may, in the case of thick varieties, almost wipe out the whole crop. India needs a cheap and efficient ridging plough: such a plough could be used, too, for making surface drains in cotton fields liable to water-logging. The drainage experiments made on the Surat farm in the Bombay Presidency are promising.

The agricultural implement trade in India lacks organisation and that is one of the main obstacles to progress in this, as in other spheres of agricultural development.

Generally speaking, cultivation in India moves in a vicious circle. Inefficient tillage implements result in poor crop returns and a low margin of profit, and this low margin of profit results in the cultivator not being able to purchase the more efficient implements which he so badly requires.

QUESTION 14.—IMPLEMENTS.—(*a*) Firms interested in the manufacture of agricultural implements should be encouraged to co-operate with the Imperial and Provincial Departments of Agriculture in evolving improved types. Ransomes, Sims and Jefferies have, with the assistance of officers of the department, designed ploughs which are now being used on a large scale in India. This firm unfortunately has lost money by doing so, as the improved types of plough evolved by them are now being manufactured without let or hinderance by firms in this country and at a much lower price. There is, in consequence, but little demand for the English-made article turned out by the inventors. This English firm has, in short, sown but others have reaped.

It would be worth while encouraging enterprising firms in such cases by offering a fixed sum for the best implement of its kind designed to meet certain conditions. If this were done, engineering firms in India could probably be induced to employ specialists for the agricultural side of their business. As far as I know, they do not at present employ trained agricultural engineers.

The views of the Chief Controller of Stores on (1) the standardisation of patterns and designs, (2) the training of engineers and mechanics, (3) inspection of implements with a view to securing a high standard of quality and good workmanship, and (4) the organisation of a central purchasing agency, are worthy of consideration.

(*b*) Practical demonstrations conducted on a large scale would hasten the adoption by the cultivator of improved implements. In some Provinces short courses are already being given on Government farms in the handling of implements and machinery. These courses should be extended. The holding of large agricultural shows at which agricultural implements and machinery are exhibited and worked gives a great impetus to the demand for the same. In the Central Provinces we ploughed for landholders *kans*-infested land on contract: this, too, certainly helped to create a demand both for improved bullock-drawn ploughs and for motor tractors and motor ploughs.

Government should give *taccavi* loans for the purchase of agricultural implements and machinery on a much larger scale than is being done at present. For agricultural depôts on Government farms there should be permanent advances sanctioned and implements should be purchased and stocked there for sale. The stocking of implements belonging to private firms on consignment account does not, as a rule, work well.

Agricultural associations should be encouraged to start co-operative societies for the sale and hire of implements, and all the implements required for a Province as a whole ordered by a central body representing the different societies. Firms are prepared to give a big discount on large orders.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) Please see the recommendations of the Board of Agriculture in India as given on pages 15 to 24 of the volume of memoranda dealing with (1) the recommendations of the Board of Agriculture in India, and (2) the recommendations of the Indian Economic

Enquiry Committee and Taxation Enquiry Committee, in so far as they relate to agriculture with notes as to the action, if any, taken thereon. These recommendations express my views on the questions discussed.

(*b*) Please see also my remarks on pages 2 to 5 of the volume of memoranda dealing with the work of (1) the Imperial Institute of Veterinary Research, Muktesar, (2) the Animal Husbandry Section, Bangalore, (3) the Military Farms in India, (4) the Animal Nutrition Section of the Imperial Institute of Animal Husbandry and Dairying, Bangalore, and (5) on the quarantine arrangements for the inspection of animals imported into India. Dairying, if developed, should prove a profitable subsidiary industry for cultivators and for that reason the Imperial Department of Agriculture is concentrating on the improvement of dual-purpose breeds.

(*c*) Over the greater part of India there is great scarcity of fodder from December till July.

(*d*) The practicable methods of dealing with the fodder problem are (1) to reduce the large number of useless cattle kept at present, (2) to grow fodder crops such as *jowar* and *berseem*, (3) to stock fodder crops both in the dry state and as silage for use when grazing areas are parched and bare, and to encourage stall-feeding, (4) to introduce dual-purpose breeds with a view to reducing the number of milch animals required, and (5) to restrict, as far as possible, cattle-breeding and rearing by landless *gowalas* and other cattle owners who are to a great extent parasites on the cultivator.

(*e*) The systematic improvement of Indian cattle, by the gradual repair of the results of centuries of neglect, is a most formidable undertaking. To effect an appreciable advance in this direction will necessarily take a considerable time, but without the hearty co-operation of our large landowners the task will be well nigh impossible. Landowners are now taking a keener interest in animal husbandry in those Provinces in which an efficient system of demonstration, propaganda and co-operation has been evolved and pure-bred herds of the local breeds have been established by the Department of Agriculture.

The backwardness of animal husbandry and agriculture generally is due in no small measure to the fact that our bigger landowners have done so very little to promote the industry. Some Indian princes take an interest in, and spend much money on, horses and dogs; but to them the steps taken by the Department of Agriculture to improve cattle, crops and other aids to the farming industry have not yet appealed. In the Central Provinces, the landowners, who have co-operated with the department and done so much to develop animal husbandry and agriculture generally, are small landholders who cultivate all or part of their own lands. In the days of non-co-operation when our agricultural shows and other lines of demonstration work were boycotted by landless non-co-operators, these cultivating landowners never failed us.

The department can do much by demonstration and propaganda to stimulate a keener practical interest in animal husbandry. It can establish pedigree herds and organise cattle shows. I have, in my memorandum on the establishment of an All-India Agricultural Organisation, suggested that under the auspices of this All-India body one agricultural show should be held in India every year. At such shows lectures on cattle-breeding and dairying illustrated by lantern slides and cinema films, could be given. The slides and films should depict what is being done in India to improve cattle by better breeding and feeding. They should depict, too, how our fine English breeds have been evolved within the last two centuries. The lecturer would explain these slides and films and lay stress on the fact that these breeds were evolved by English "gentlemen" farmers at their own expense and from material which to start with was not as good as we have in India to-day.

In India we have our depressed classes; we have, too, our depressed industries, and agriculture is unfortunately one of them. How to induce land-

owners to take a keen practical interest in rural regeneration is to my mind a question to which the Royal Commission should give special attention.

It is most desirable that Government should lay more stress on the importance of the work which the Department of Agriculture is doing in India. The opinion of many of our agricultural experts is that in the welter of political controversy our premier industry has not received from Government even, the support it deserves. Many of our most experienced experts left the department during the difficult transition period which followed the advent of the Reforms. The department lost the services of these men unfortunately at the very time when their services were most required; it has lost weight in consequence. Imbued with this idea I drew up for the consideration of the Government of India last year the note which is given in Appendix 7. In forwarding that note I suggested that the Imperial Cattle-breeding Farm at Karnal should be called the Viceroy's Farm and pointed out that it would not be necessary to alter the present arrangements by which the farm is managed and financed by the Government of India. The action recommended in that note is perhaps no longer necessary, in view of the fact that His Excellency the present Viceroy has on his own initiative taken steps to impress on the minds of India's landowning classes (1) the need of developing India's agricultural industry and (2) the dignity of agriculture as a vocation. His Excellency's sincere belief in the dignity of farming as a vocation cannot fail to influence our leading Indian princes, zamindars and other landowners.

His Excellency has already visited the Cattle-breeding Farm at Karnal and is to visit it again next month. His example will, I am convinced, do more to induce our landowners to take a practical interest in animal husbandry than anything the Department of Agriculture could possibly do.

QUESTION 17.—AGRICULTURAL INDUSTRIES—.Please see my remarks in the volume of memoranda dealing with the work of (1) the United Planters' Association of Southern India, (2) the Bihar Planters' Association, (3) the Indian Indigo Association, (4) the Indian Tea Association, (5) Fruit-growing and Poultry-rearing in India, and (6) Bee-keeping, Lac-culture and other possible subsidiary industries for rural areas. I submitted proposals last year to the effect that the Government of India should appoint a Fruit-growing Expert and a Poultry Expert. The Government of India decided to await the recommendations of the Royal Commission on Agriculture before taking action in the matter. The Fruit-growing Expert would tackle also problems relating to market gardening. In the event of the steps now being taken to stimulate interest in dual-purpose breeds of cattle and dairying proving effective, dairying would become a very suitable subsidiary occupation for the cultivators in parts of India. Of all the possible subsidiary industries I consider dairying, fruit growing, market gardening and poultry keeping the most promising.

QUESTION 19.—FORESTS.—(*b*) and (*c*) Please see my remarks on page 2 of the volume of memoranda on (1) Forestry and Agriculture in India, (2) the Botanical Survey of India, (3) Irrigation Statistics, (4) Indian Meteorology in relation to Agriculture, (5) Agricultural Statistics, (6) the work of the Posts and Telegraphs Department in rural areas, and (7) Sanitation.

QUESTION 20.—MARKETING.—(*a*) and (*b*) I have drawn the attention of Local Governments and Administrations to the importance of this question and anticipate that they will, in replying to the questionnaire, give detailed information on the points raised.

The system under which agricultural produce is marketed varies to some extent from Province to Province; it varies, too, with the economic position and with the intelligence and enterprise of the cultivator. Most kinds of farm produce are delivered to the village trader who, at the same time, is a money-lender as a rule. He despatches the produce to the larger commercial centres for local consumption, or to a sea-port town for export. In recent years the cultivator has been brought into closer touch with markets for agricultural produce and is now in a better position in regard to prices obtain-

able for such produce. Some of the more enterprising landholders, moreover, follow the trend of prices very closely and hold up their produce when they have reason to believe that prices are to rise still further. Some of the larger cotton growers in Berar, for example, keep themselves informed with respect to cotton prices in Bombay and the world's available supply of raw cotton, and at times withhold their cotton from market for a whole year. They have dispensed entirely with the services of local *banias* and with great advantage to themselves.

The existing systems of marketing are on the whole bad, but there are exceptions such as the cotton markets of the Central Provinces and Berar. They are bad because there are so many intermediaries between the producer and the consumer and each intermediary makes his honest or dishonest penny. The margins upon which these intermediaries operate are not as a rule unduly high, but there are too many of them to be provided for. Markets like the cotton markets of the Central Provinces and Berar established for the disposal of agricultural produce help to keep the cultivator in touch with actual market conditions and to reduce the number of intermediaries to be supported by the trade.

In some Provinces the Co-operative Department has organised societies of cultivators to sell their produce to the wholesale dealer direct. This system of marketing has, I believe, great possibilities. It ensures a higher standard of honesty and it secures for the producer higher prices. The adoption of such a system makes it possible to improve the quality, purity, grading and packing of agricultural produce.

More effective steps might be taken to place at the disposal of cultivators, merchants and traders information as to market conditions in India and other parts of the world. It should be possible for the Department of Post and Telegraphs to co-operate with the Agricultural and Co-operative Departments in working out a scheme by which such information would be posted up at regular intervals both at important markets and telegraph offices in rural areas.

Much could be done to improve the system of marketing if the improvement of each crop and the marketing of the produce were taken up on the lines adumbrated by me in my reply to question 1. For the improvement of wheat, for example, an All-India Committee constituted on the lines of the Indian Central Cotton Committee should be appointed. That Committee should deal with every aspect of wheat improvement, from the selection and propagation of the best types of seed, to the installation of grain elevators and the improvement of markets.

As a result of the organisation set up in this country by exporting firms the quality of farm produce exported is better than that of the produce used for local consumption. Exporting firms insist on quality and they get it to some extent at least.

QUESTION 21.—TARIFFS AND SEA FREIGHTS.—Protective tariffs affect the cultivator in India, but to what extent it is difficult to tell.

Sea freights, as far as I have been able to ascertain, are not unduly high.

Some countries such as France and Belgium have imposed a protective duty on vegetable oils while they admit oil-seeds free of duty. This encourages the export of Indian oil-seeds but discourages the export of oil. If a much larger proportion of the oil-seeds produced in India could be crushed in the country there would be more cake available for use in rural areas. The cultivator has yet to be taught the value of oil-cakes. He does not realise their value at present, with the result that much of the cake made in the country is exported. This state of affairs could, we believe, be remedied by active demonstration and propaganda, and by providing the cultivator with better credit facilities. In some Provinces Government is already giving *taccavi* loans for the purchase of oil-cakes and other manures; co-operative banks are helping in the same direction, but far too little has yet been done.

QUESTION 22.—CO-OPERATION.—To encourage the growth of the co-operative movement the staff of the Co-operative Department should be considerably

strengthened; great care should be exercised in selecting the Registrars and the men selected should, in the event of proving successful, be allowed to retain their post for at least 10 years.

There should be close co-operation between the Co-operative and Agricultural Departments; the Director of Agriculture and Registrar of Co-operative Societies should be members of the Provincial Board of Agriculture.

Good work has been done in some Provinces by co-operative seed unions. In some Provinces, too, co-operative societies formed for the purchase, sale and hire of agricultural implements have done useful work. I have had some experience of co-operative cattle-breeding societies and have come to the conclusion that there is little hope of such societies being able to effect any marked improvement in the field of animal husbandry. Success in cattle-breeding depends very largely on the personal interest which the owner himself takes in his cattle. Indian cattle-owners do not as yet take much interest in their own herds and are less likely to interest themselves in herds controlled by societies.

The society for *gowalas* started at Telenkheri in Nagpur has been highly successful; but success in this case has been entirely due to the fact that the cattle of the society are housed and fed on a Government farm where breeding is controlled by the Department of Agriculture.

In the Central Provinces the Co-operative Department confined its attention very largely to co-operative credit-societies. The Department of Agriculture took the initiative in forming non-credit organisations including seed unions, co-operative shops for the sale and hire of implements, etc.

QUESTION 23.—GENERAL EDUCATION.—Educational movements in India have hardly touched the cultivator of the land. In urban areas the demand for literary education is insistent; the pity is that something more practical could not have been devised for rural areas.

Elementary Education.—My views on the subject of elementary education are given in an article on "Rural Education and Agricultural Development" which was published in Volume 12 of the Agricultural Journal of India in 1917. A copy of that article will be found in Appendix 8. A perusal of that article will show that I advocated the teaching of "Nature Study" in school gardens with a view to training intelligence.

Middle Schools.—In the case of rural middle schools I recommended as long ago as 1919 that larger plots of land should be provided and that agriculture should be combined with general education as has since been done in the Punjab.

Collegiate Education.—As very few of the sons of cultivating classes go to High schools or Arts colleges it is somewhat doubtful whether it is worth while providing agricultural courses for these institutions. It would be an advantage, however, if the preliminary training of science students at these institutions could be improved. Students admitted to provincial agricultural colleges and to the post-graduate courses at Pusa are handicapped from the beginning by the fact that their basic training has not been up to the mark. I quite realise, however, that it is gradually being improved.

QUESTION 24.—ATTRACTING CAPITAL.—In the Punjab land has been given on easy terms to men who were willing to adopt scientific methods of cultivation. Scope for raising the standard of agricultural practice by this system is necessarily limited to Provinces in which there is land which Government can allot to selected men.

Within the last 30 or 40 years a large amount of capital has been applied to agriculture in India, for Government has spent crores of rupees in constructing tanks and canals for irrigation and roads and railways for the transport of agricultural produce. The rise in the value of land, the improvement of communications, the rise in prices, the opening of new markets, the security of the Pax Britannica has enriched the land-owning classes. They have got all they wanted without having had to exert themselves. Their tenants have been less fortunate.

There is ample capital in India among the larger landowners at least. It is enterprise, lack of interest in agriculture as a vocation and a sense of duty to the community which are lacking. They can be stimulated by demonstration and propaganda and by getting high officials interested in the work of the Department of Agriculture to use their moral influence in impressing on such men the fact that they should be India's leaders in agricultural development.

With a view to creating more interest in practical agriculture and to giving our landowners a wider outlook the Imperial and Provincial Departments of Agriculture should devote more time to giving informative lectures illustrated by cinema films and lantern slides on different aspects of improved husbandry.

Much of what I have said in my reply to the last part of question 15 is equally applicable to this question.

QUESTION 25.—WELFARE OF RURAL POPULATION.—Sanitary conditions in most villages in India are bad and the death rate is high as has been pointed out in the memoranda submitted by the different local Governments. The average villager is satisfied with a low standard of living and does not try to improve the conditions under which his forefathers were content to live. The Public Health Department in each Province is doing all it can to remedy matters: hygienic publicity and propaganda work is being carried out and the number of medical dispensaries is gradually being increased. In the way of propaganda Public Health Departments are giving lectures on general health subjects, illustrated in some cases by lantern slides and cinema films. In some Provinces leaflets and pamphlets are being distributed with the same end in view.

In most Provinces particular attention is being devoted in rural areas to the necessity of improving the supply of potable water and steps have been taken, too, to popularise the use of quinine in tracts subject to malaria. In such tracts the efficiency of rural labour is greatly reduced during the busy season, owing to the prevalence of malaria.

Speaking as a layman I am inclined to think that the measures being adopted for improving hygiene in rural areas are sound as far as they go, but rural hygiene is of such enormous importance that the amount being spent on it is inadequate. Till sanitary conditions in our villages are much improved, it will be difficult to get men of brains, enterprise and capital to settle therein. For the well-being and prosperity of our rural population the absentee landowners of this country are not doing enough; they live in the towns and take but little interest in the insanitary conditions prevalent in their villages.

Rural institutes for women have become very popular in England. As an experimental measure they might be tried in India as a means of awakening an interest in rural hygiene, in which women are perhaps more directly interested than men.

The Department of Public Health to the Government will be in a position to say whether sufficient provision has been made by the Imperial and Provincial Governments for investigation into the causes and incidence of malaria, cholera, hookworm, enteric, *kala-azar* and other diseases prevalent in rural areas.

QUESTION 26.—STATISTICS.—Little has been done in India in the application of the most scientific statistical methods to the elucidation of rural and agricultural problems. The statistical work is mainly confined at present to the drawing up of simple averages and percentages. A great deal more than this would be possible if scientifically trained statisticians were employed. Such statisticians could, for example, show the correlation between the rainfall and the outturns of *kharif* and *rabi* crops dependent thereon; between the rainfall and the incidence of malaria, etc.

Excepting in permanently-settled tracts the areas under cultivation and crops are already very accurately recorded.

The yield of agricultural produce should be based on the results of crop-cutting experiments sufficiently numerous to possess a definite statistical value. A statistical assistant should be appointed to work under the Director of Agriculture as recommended by the Board of Agriculture in 1924 and he should be given an adequate staff for carrying out crop-cutting experiments on a limited scale with the object of determining how such experiments can best be conducted.

The compilation of information regarding the rail-borne trade should be revived as recommended by the Board of Agriculture in 1924. As a result of the steps taken by the Indian Central Cotton Committee this has already been done in the case of cotton.



APPENDIX 1.

Weak points in Education (from the "Statesman").

The Examination.

Ill-equipped students at Dacca.

In the annual report of the University of Dacca for 1925-26 reference is made "to the unsatisfactory preliminary education of many of the students whom it is necessary to admit to the University." The low percentages of students who passed the University examinations for the ordinary bachelors degree are, it is stated, due to this cause.

The report continues:—"It was stated in the last report that 'The work of the University is still handicapped by the backward condition of Secondary and Higher Secondary education in Bengal' and unfortunately this statement is still abundantly true. The majority of the students who pass the Intermediate Examinations of the Dacca Board and the Calcutta University are ill-equipped in the practical use of the English language and are not able to make adequate use of the instruction which they receive in the University during their first year, and in some cases, during a much longer period.

Further, it is often found that students who have passed the Intermediate Examination in such subjects as History, Logic, Politics, Economics and Mathematics, are not acquainted with the fundamental principles of these subjects. It is obvious that their study has been confined far too exclusively to the getting up of text books.

Science training.

The preliminary training of science students is still less satisfactory. The teaching of elementary science does not form a part of the curriculum of the High Schools of Bengal; the syllabuses in science subjects for the Intermediate Examinations of the Dacca Board and the Calcutta University are restricted in scope, and the science work in Intermediate Colleges is generally of a low standard. Practical work in the laboratory should form a very important feature of the training of intermediate science students, but in most of the Intermediate colleges of Bengal the laboratory accommodation is very inadequate and this side of the students' work is sadly neglected.

In the interest of students and of the public it is important that a high standard should be maintained in University examinations, and for this reason the percentages of passes in the University examinations of the session cannot be regarded as unsatisfactory. A general increase in these percentages cannot be expected until the standard of Intermediate Examinations in Bengal is decidedly improved."

APPENDIX 2.

Note on Agricultural Education in Vernacular Middle Schools written in 1919.

An earnest attempt is being made in the Central Provinces to improve rural education. The services of an officer of the Provincial Agricultural Service have been placed at the disposal of the Education Department with the view of organising Nature Study classes in rural schools and of making village school gardens a living and vital feature of primary education. Two agricultural middle schools are being opened shortly and four more will be constructed within the next 18 months. The aim of these farm schools will be to give a good general education combined with a training in the practice and principles of improved agriculture.

The aim of these measures is to adapt rural education to rural needs, but they do not go far enough. There is at present a hiatus between the primary school with its school garden and teaching of nature study and the agricultural middle schools being started on Government farms. Would it not be possible to formulate a scheme by which the teaching of Nature Study would pave the way for the teaching of the practice and principles of agriculture in middle schools. If such a scheme could be evolved, our agricultural middle schools on Government farms might then be converted into agricultural high schools. We would then have a graded system of rural education which would be carried on continuously from rural primary, to the rural agricultural high school, thus:—

(1) Rural primary schools with nature study as an essential part of the teaching, in order to give the child an interest in nature, and a bent towards agriculture.

(2) Rural middle schools with agriculture as one of the subjects of the curriculum, a definite attempt being made to teach the elementary principles and practice of agriculture.

(3) Agricultural high schools where a general education would be combined with a more advanced course of agriculture.

In primary schools the education given is, I take it, already being organised on the lines referred to above. The agricultural schools to be opened on Government farms can each have a licentiate or graduate of agriculture on its staff and can, if necessary, be converted into agricultural high schools without difficulty. We have still to make provision for the teaching of agriculture in middle schools.

How to arrange for the teaching of agriculture in middle schools is a question which has not yet been seriously considered; but we have this year gained some experience in connection with the course of instruction given to boys of the Chaurai Middle School on the Chaurai Demonstration Farm. I have inspected this farm three or four times within the last year. The general impression which I have formed is that while the principle on which we are training the boys there is perfectly sound, the scheme as a whole is not applicable over a wide area. I will give my reasons for thinking so. In the first place, the Department of Agriculture, owing to the paucity of its staff, cannot arrange to open a similar demonstration farm for each rural middle school: the *kamdar* deputed to the Chaurai Farm is, as a matter of fact, the only *kamdar* in the department who has had experience in teaching as well as in practical agriculture. In the second place, I do not consider that the teaching of agriculture in middle schools should be considered one of the legitimate functions of the Department of Agriculture.

I take it for granted, therefore, that the Education Department will, in the case of my scheme being considered feasible, be prepared to find both the

land and the teachers qualified in agriculture. I do not think this will be difficult. The area of land required need not exceed four acres; an area of even three acres would do. The training of teachers for these schools could probably be taken in hand at the Agricultural College, Nagpur. A separate training school with hostel accommodation would in the long run have to be provided on the college farm, but in order to make a start at once, it might be possible to have the first batch sent to the Agricultural College for training in June this year. The Principal, Agricultural College, would have to be consulted as regards the course and the temporary arrangements to be made for staff.

The course should, I think, cover a period of one year. The teachers selected for this course should, as far as possible, be young men of the cultivating class who have been trained in pedagogy and who have already had some experience of teaching. On completing their training they could be appointed to middle schools, one to each, and their work should be inspected at regular intervals by Deputy Inspectors who have qualified in the theory and practice of agriculture.

I do not know exactly what subjects the curriculum for middle schools includes at present, and am not, therefore, in a position to say how many hours per week could be given for agriculture. I should like to point out, however, that in my opinion the number of hours given to practical agriculture could probably be added to existing school hours without causing any dissatisfaction. Nine hours for practical work and five for theory would probably suffice. All that they need be taught as theory is included in my book of Agricultural Lessons which is being published. They would get practical instruction in the cultivation of the staple crops of the locality and in that of new ones being introduced on improved lines.

It might be possible to make agriculture a compulsory subject in vernacular middle schools at least, and the existing curriculum would in that case have to be modified no doubt. The importance of the subject would, in my opinion, amply justify such action.

Great care would have to be taken in selecting the land and in equipping these school farms. A man of Mr. Nand Kishore's type would be required for this. The cost of starting such farms would vary from district to district. In Chhattisgarh, where land is cheap, the cost would be approximately as shown below:—

	Rs.
4 acres of land at Rs. 40 per acre	160
2 pairs of bullocks at Rs. 150 per pair . . .	300
Buildings, including a cattle shed, a quarter for a *chaukidar* and a godown	1,800
One well	1,000
Implements—some sets in duplicate	300
Fencing	200
Miscellaneous	100
TOTAL .	3,860

In Berar, the land would probably cost Rs. 800 and the bullocks Rs. 400, which would increase the estimate by Rs. 740. I consider a well absolutely essential to enable the cultivation of crops to be carried on throughout the dry weather. This building would include a shed for four bullocks, a very small implement shed, one godown and one quarter for a *chaukidar* who would look after the bullocks.

The farm should be within easy reach of the school. The soil of the site selected should be suitable for the cultivation of the staple crops of the tract.

It will be noted that the capital cost of a farm school of this type would be small. The recurring cost would be approximately Rs. 700 divided under the following heads:—

Rs. 96 for pay of *chaukidar*.

Rs. 300 for feed of bullocks.

Rs. 100 for manure and seed.

Rs. 200 average miscellaneous expenditure, including cost of renewing bullocks and implements.

If properly run, the farm receipts should cover at least half the expenditure.



APPENDIX 3.

Discussion on Agricultural Education held at Education Conference on the 3rd May 1919.

It was decided not to support the Director of Agriculture's recommendation for the grant of Rs. 10,000 for the free distribution of vernacular editions of the agriculture-readers now in the press.

Mr. Mayhew's letter, to which a general note by the Director of Agriculture is attached, urging the direct teaching of agriculture in vernacular middle schools, raises the whole question of the policy to be followed in agricultural education in village schools. It was agreed that while in primary schools the present policy should be adhered to, of attempting nothing more than is being done at present, namely, the improvement of nature study and of school gardens, the experiment now being carried out at the vernacular middle school at Chaurai in the Chhindwara district, though not conclusive, was promising enough to justify further experiment on the same lines. At the suggestion of the leading men of Chaurai, practical instruction on a small plot of about four acres near the school is being given to the school boys outside the regular curriculum and outside of the school hours. The land and cattle are provided free by the villagers and the owners of the land take the profit. A *kamdar*, who was already on duty on a demonstration plot in the village and who happens also to be a trained teacher, gives the practical instruction.

The success which has attended this venture so far can be attributed to the spontaneous co-operation of the leading local cultivators, and it was felt that it would be premature to accept the results as proving that similar plots for the direct teaching of agriculture in vernacular middle schools would be equally successful elsewhere. Moreover, no theoretical instruction in agriculture is attempted at Chaurai, and it is doubtful whether any addition can be effectively made to the present vernacular middle course as a part of the curriculum without detriment to general education. Dr. Clouston dissented from this opinion and was in favour of proceeding on the lines indicated in his note, which is attached to the letter from the Director of Public Instruction, but the other members of the committee thought that the general question was one which could only be decided by a specialist who has wide practical experience both of agriculture and of education. Besides, the present staff of the Agriculture and Education Departments has neither the time nor the specialised knowledge to undertake agricultural education in vernacular middle schools on a larger scale. It was, therefore, decided to recommend that an effort should be made to obtain such a specialist, who, in addition to deciding whether the Chaurai experiment was suitable for general application and whether indoor instruction should also be given, would be of great assistance as a general adviser to the Director of Public Instruction on matters of rural education. To obtain such a man it would probably be necessary to go to Canada or the United States of America, in which countries agricultural education has been carried much further than in any other. As experience of actual work is an essential, it would be necessary to select a man of between 35 and 40 years of age. It was suggested that Sir Frank Sly, from whom the idea of obtaining such an expert first originated, should be written to and asked to find out where such a type of man could be obtained and on what terms of salary he could be engaged.

If such an expert were engaged it would probably be two or three years before he knew enough of the country and the local conditions to advance with confidence; and it was felt that in the interval it would be useful to employ one or more local men on temporary terms, who are known to be enthusiastic in the cause of agricultural education. It should be the endeavour of such men to induce the people of the tracts in which they worked to imitate the people of Chaurai, and with the minimum help from Gova[illegible]

farm plots on that model. The establishment of more such plots would give further evidence from which to judge the experiment and the temporary men could be usefully employed in awakening parents, from whom the Education Department experiences a certain degree of opposition, to the fact that nature study and work in school gardens is for the benefit of the pupils.

It was, therefore, felt that it would be premature to ask for a share of the grant in the current year for establishing agricultural plots attached to middle schools, as proposed by the Director of Agriculture. Out of the grant of Rs. 1,50,000 given by the Government of India for the improvement of vernacular education a sum of Rs. 15,000 has been assigned for the pay of Mr. Nand Kishore, who is already doing useful work under the Director of Public Instruction in improving nature study work and school gardens, and for a reserve for the pay of a more highly qualified man obtained from outside India, should such a man be obtained. As the Director of Public Instruction stated that he could usefully employ the whole of the Rs. 1,50,000 on other objects, it was recommended that the Rs. 15,000 should be no longer earmarked for agricultural education, but should be at the disposal of the Director of Public Instruction for other purposes and that out of the special grant for the current year a recurring sum of Rs. 25,000 should be asked for, to provide the pay of Mr. Nand Kishore, and that of the local men proposed to be appointed and for any expenses which may arise in connection with the work which they will do.



APPENDIX 4.

BULLETIN No. 13 of 1921.

The Organisation of the Department of Agriculture.

1. For administrative purposes the Provinces have been divided up into Circles. At present there are three circles, namely, (1) the Southern Circle comprising the Chhattisgarh Division and all the Nagpur Division except Wardha district, Sausar tahsil of Chhindwara district, and Warora tahsil of Chanda district, (2) the Western Circle comprising all Berar Division, Wardha and Nimar districts and Warora tahsil of Chanda district, and (3) the Northern Circle comprising all the Nerbudda and Jubbulpore Divisions except Nimar district and Sausar tahsil of Chhindwara district.

2. The Director of Agriculture is responsible for the administration of the Department as a whole. In consultation with his experts he decides the lines of work to be taken up by each, the staff required to do that work and the extent to which different experts can co-operate in solving any special problem. He inspects at intervals the experimental and research work being done on the experimental farms and the extension work being carried out in the districts, points out any mistakes which have been made and suggests ways and means of overcoming difficulties.

3. In charge of each circle there is a Deputy Director of Agriculture assisted by a staff of Extra Assistant Directors, Agricultural Assistants and *kamdars*. The Deputy Director controls all the experimental work of his circle, and with the assistance of his Extra-Assistant Directors organises all the extension work including the supply of seeds and implements, field demonstrations, tahsil agricultural associations, etc. Agricultural Assistants are employed on Government farms and in supervising extension work in the districts. In immediate charge of demonstration work in the villages there are trained *kamdars*.

4. The existing circles are so very large and the activities of the department have increased so much within the last ten years that the three Deputy Directors now find it very difficult to exercise proper control over the unwieldy charges allotted to them. The three existing circles are therefore to be divided into seven circles as soon as sufficient staff to run them is available. The work of the department has increased enormously during the last ten years. Within that time the number of experimental farms has increased from 4 to 9, the number of seed and demonstration farms from 1 to 11, the number of cattle-breeding farms from 2 to 12, including two dairy farms, and the number of implements and parts of implements sold annually by the depôts of the Department from 280 to 1,832. The quantity of improved seed of the selected varieties supplied by Government farms annually has, within the same time, risen from 84,246 to 405,652 pounds and the quantity of sugar-cane seed from 24,370 to 420,534 whole canes. Nearly all the seed raised on Government farms is handed over to the owners of private seed farms who propagate it and sell the produce to their neighbours and others. In this connection expansion within the last ten years has been extraordinarily rapid, as may be gathered from the fact that the quantity of seed distributed annually through these private agencies has risen within that time from a few thousand to nearly 48 lakhs of pounds, and the number of canes from a few hundreds to over 342,000.

5. This is only a small part of what has been accomplished in the last ten years, for during that period a considerable number of small demonstration plots have been started, tahsil agricultural associations have been opened in about two-thirds of the tahsils of the Provinces, and the department has gradually got into touch with a large body of cultivators. The activities of the department have, in short, grown to such an extent within the last ten years that it is becoming increasingly difficult with our present staff to control

them properly. The office work of the Director and his Deputy Directors has also increased very much; for landholders are, year by year, taking a more intelligent interest in agricultural improvements, and now appeal more often for advice and assistance.

6. The research and experimental work of the department is conducted on its experimental farms and in its laboratories in Nagpur by highly trained scientists. The object kept in view has always been to discover new knowledge on which to base improved methods. Fruitful discoveries have been made after years of patient research. Improved varieties and strains of varieties of crops have been isolated and propagated for distribution on a large scale. Our *gurmatia*, *luchai*, *chinoor*, *bhondu* and other improved rices give much larger acreage outturns than the *deshi* varieties commonly grown. Sannabille, khari and Mauritius cane have, on their merits as *gur* producers replaced the *deshi* varieties almost entirely in hundreds of villages. Roseum cotton, isolated by the department fourteen years ago, is now being grown on an area of several lakhs of acres, and *buri*, a wilt-resistant cotton discovered fourteen years ago, is being grown on wilt-infected areas in parts of Berar. Improved varieties of wheat and *juar* have been given out in large quantities, and a method of preventing the latter crop from being damaged by smut introduced. Thousands of improved agricultural implements including ploughs, hoes, winnowers, fodder cutters and cane mills, which had not been heard of in the Provinces fifteen years ago, are now being used by landholders with advantage to themselves. Of iron ploughs alone the Department has sold 5,648 since 1907. Hundreds of thousands of cultivators now realise the merits of *Saoner*, *ramkel*, and *chapti juar*, and of A088, A013, A090, Pusa 12, Pusa 4 and other wheats given out by the Department. An improved type of *gur* furnace, known as the McGlashan furnace requiring no fuel but the trash and *megass* of the crushed cane, has been evolved; by using this improved furnace the cane-grower is saved the cost of from ten to twelve cartloads of wood for every acre of cane he crushes. Manures of different kinds tested and recommended by the department are also being used on a gradually increasing scale to supplement the very inadequate supply of cattle manure available.

7. The educational work of the department, too, has been of considerable value. Enterprising cultivators have learnt to appreciate the value of the improvements introduced and now talk with authority on the relative merits of selected varieties of seeds and of manures and implements, the names of which they had never even heard a few years ago. To stimulate this growing interest in agriculture a series of books, popular bulletins and leaflets have been published by the Department; for these there is a considerable demand. Of the small book entitled "The Story of Rai Sahib Kaluram Kurmi," the number of copies sold has already risen to about 15,000; and a large number of our popular bulletins have also been disposed of. It may be rightly claimed that all the extension work of the Department is of considerable educative value; the use of an improved implement or of an improved strain of seed teaches its own lesson in a most effective way. To meet the requirements of landowners desirous of giving their sons a training in the practice and principles of agriculture after they have passed the upper primary school two agricultural vernacular middle schools have been opened—one on the Chandkhuri experimental farm near Raipur and one on the Powarkhera experimental farm near Hoshangabad. Landholders desirous of giving their boys a more advanced training after they have passed the matriculation examination can send them to the Agricultural College, Nagpur, where a much more advanced training in the science and practice of agriculture is given.

8. Of the different kinds of farms run by the department experimental farms are the most important. They are designated experimental farms because our object on these farms is to discover new knowledge by experimenting. These farms are not supposed to pay; their function is to supply knowledge which when applied by the cultivator will enable him to make his farming pay. These experimental farms are in short the fountain head from which we gain most of our knowledge of new and improved methods of agri-

culture: the cost involved in running them is small as compared with the value of the results obtained.

9. Seed and demonstration farms are farms on which improved varieties of seed are propagated for distribution, and profitable methods of cultivation practised. The seed produced is supplied to the owners of private seed farms who in turn propagate it for sale to other cultivators. Some of the Government seed and demonstration farms in these Provinces are being run at a profit. They could all be run at a profit were it not for the fact that a staff of one superintendent and one clerk has to be maintained on each farm in order to guarantee its serving its purpose as a seed depôt in the most effective way.

10. The department has opened a number of small demonstration farms or plots as they are commonly called. On these small demonstration plots the object in view generally is to demonstrate the advantage of growing a new crop such as cane, an improved variety or strain of an existing crop, or to demonstrate a new cultural method such as sowing in lines. The expenditure incurred in starting these demonstration plots is small. The land is taken on lease for five years, and only cheap *kutcha* buildings provided. The land is handed back to the owner when the lease expires. These demonstration plots are generally run at a small profit.

11. The department has eight cattle-breeding farms and has in addition two dairy farms on which milch breeds of cows and buffaloes are kept. On these breeding farms all the best breeds of cattles in the Provinces are represented. The cows and stud bulls on each farm are carefully selected and fed, and inferior animals rejected from time to time, the object being to improve the herd by better breeding and better feeding. That like begets like is a law of nature; given a good bull and a herd of good cows the offspring should also be good if properly fed and cared for. On these farms stud bulls are reared which are sold to cattle-owners for breeding purposes.

12. This brief outline of the work of the department deals mainly with the official side of its activities as carried out by a paid staff whose duty it is both to discover improved methods and to get the cultivator to apply them. The extent to which a new method is adopted by the cultivator depends very largely on the facilities provided for its introduction. One of the functions of the department is to provide these facilities. Cultivators are encouraged to form unions and to co-operate in growing the improved variety of seed recommended or to stock for sale the improved implements found suitable for the conditions which exist in their tahsil. All this so-called extension work requires a great deal of organisation and a great deal of tact, for the approval of the leading landowners has to be obtained and their assistance gained. Improvements are, in short, first introduced in the villages in consultation with and through the leading men. For this extension work a selected type of official is required who understands the principles underlying the improvement, who is thoroughly practical and who is tactful in his dealings with other men. They are recruited from the ranks of the subordinate agricultural service and are designated Extra-Assistant Directors.

13. The staff of the department thus consists of four classes of trained men, namely:—(1) Experts or Specialists, (2) Extra-Assistant Directors, (3) Agricultural Assistants, and (4) *Kamdars*. The expert staff includes Deputy Directors, the Principal of the Agricultural College, the Economic Botanist, the Agricultural Chemist, the Mycologist and the Agricultural Engineer. The Principal of the Agricultural College is responsible for the training of the students in the theory and practice of agriculture. The subjects taught include manures and manuring, crops, selection of seed, live stock, cattle foods and cattle feeding, dairying, veterinary science, horticulture, farm accountancy, the use of agricultural implements and tillage operations, etc. The students also get a thorough practical training on the College farm which is well-equipped with up-to-date appliances. On the research side the Principal is paying particular attention to the study of machinery as used on the farm, the principles of their actions, care of various parts, points to be attended to, so as to ensure economic running, etc. He is also making a

special study of dairying and of dairy breeds of cows and buffaloes. The Economic Botanist is responsible for the teaching of botany in the College, the Mycologist for mycology, and the Agricultural Chemist for chemistry, but these three experts also do a considerable amount of research work. The Botanist has taken up the improvement of the staple crops of the Provinces by selection and crossing, and has classified them into different varieties; he has under trial many exotic varieties likely to do well in this part of India, and is experimenting with different kinds of fruit trees. Chemical investigations involving the analysis of soils, manures, feeding stuffs, dairy produce, etc., to determine their composition and value are being carried out by the Agricultural Chemist. He is also studying in his laboratory problems such as the effect of fertilisers, green manures, bonemeal and cattle-dung on crops grown in different classes of soil; the effect of inoculating the poor lateritic soil known as *bhata;* the possibility of making artificial manure from grass and straw, etc. The Mycological Section of the departments is a comparatively new one, but the Mycologist has already started definite lines of research work on fungoid diseases of crops with a view to finding practical remedies. The Engineering Section of the department is also a new one. In these days of mechanical traction and operation this section will gain considerably in importance within the next year or two; for the tendency now is to utilise more machinery on the farm, and there is great need for expert advice and assistance in this connection. The Agricultural Engineer has already started a well-boring campaign with a view to assisting cultivators to obtain more water from their wells; he has carried out experiments with different types of motor tractors and tractor ploughs and is now training a class of young men to handle them. There is great need for new inventions and improvements in agricultural implements; one of his most important duties will be to effect improvements in existing types, and to invent new ones. Deputy Directors are experts in the science and practice of agriculture. Their duty is to carry out on the experimental farms under their charge experiments to test the relative varieties of improved strains of seed, of different manures and methods of cultivation, etc., to see that the results of these experiments are reliable and that correct conclusions are drawn from them. The problems investigated are complex and difficult, and to solve them requires the concentrated attention of a highly trained scientist. Unlike many forms of scientific work agricultural experiments only give results, as a rule, once a year. It is therefore all the more important to ensure that such results are worth having, and only reliable men, to whom accuracy is everything and who will place the trustworthiness of their experiments before the deductions it is hoped to make from them, should be in charge of experimental work. When a fruitful discovery is made at a station the Deputy Director in charge sees that it is handed on to the cultivators, for he is a practical scientific man who bridges the gulf between science and practice. All these different experts are always pleased to give the cultivator the benefit of their advice.

The progress that can be made in these different directions depends very largely on the qualifications of the experts employed. The type of man required is a well-trained scientist who has shown an aptitude for research.

14. The Extra-Assistant Directors of the department are doing district work, or they are employed as assistants to the experts and do research work or teaching. Those Extra-Assistant Directors who are doing district work are largely responsible for the organisation of the demonstration work in their circles. They are in charge of Government seed and demonstration farms, and co-operate with the district authorities in organising agricultural associations and in conducting the meetings thereof. They organise demonstrations to show the working of improved machinery and implements, and assisted by a staff or agricultural assistants and *kamdars* carry the teaching of our experimental stations and laboratories to the cultivator in his own village. With the assistance of officials and non-officials connected with the co-operative movement they have done much in the way of organising seed unions on a co-operative basis. Their advice is sound, practical and helpful; for they are selected men of much experience. They have done much, too, to assist managers of estates under Court of Wards to improve the cultivation

of the home-farms of these estates. They are the main connecting link between the expert staff of the department and the patient plodding tiller of the soil, for they take the results from the researches in science and reclothe them for his benefit in more simple and familiar language than that form, of necessity, used by the scientist. To make these results still more intelligible the Extra-Assistant Directors give popular lectures illustrated by magic lantern slides in which the results are explained in a graphic manner.

15. Agricultural Assistants are employed as superintendents or overseers of Government farms, as demonstrators in the districts, and as teachers and researchers. Many of them are young and inexperienced men who, if left to themselves, would be quite incapable of organising district work properly, as they lack experience and do not carry much weight with the landholders and others with whom they come in contact. The Extra-Assistant Director under whom they serve does the needful, however, in drawing up definite lines of work for each assistant and in keeping them up to the mark. The number of assistants available for district work averages only about two per district, and each has, as a rule, from four to five hundred villages in his circle. It is impossible, needless to say, for one assistant to get round so many villages, and arrangements have therefore been made whereby they are assisted by *kamdars*. These *kamdars* are in charge of demonstration plots and seed farms, and when a practical demonstration is carried out to show the cultivators how to sow in lines or how to work an improved implement or machine, for instance, there is a *kamdar* present to instruct them in the process. The agricultural assistants employed in teaching and in doing research work under the supervision of the heads of the different sections are doing useful work in training other young Indians in agriculture and the sciences allied thereto, and in learning correct methods of experiment and research.

16. Each class of workers, whether they be highly trained scientists, or organisers, or demonstrators has their own special lines of work, but all have the same goal in view, namely, the economic betterment of the cultivators of this country. Fruitful discoveries in agriculture as in other industries come as a rule after many years of patient concentrated effort: in no other way can nature be induced to reveal her secrets. To ensure progress it is all-important that our research workers should be given opportunities of carrying out their work to the best advantage: to hurry them or to worry them by unfair criticism would be fatal to that concentration of mind which is so necessary in research.

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APPENDIX 5.

A note on the proposal to restrict the export of oil-cakes, bones and fish manures.

Much has already been written on the proposal to restrict the export of oil-cakes, bones and fish manures. In the light of the findings of the Indian Fiscal Commission, the proposal to prohibit export entirely need not be seriously considered. Most of those who advocate the imposition of a small export cess do so because they believe that it is highly desirable that the manurial substances produced in this country should be used for the improvement of the soils thereof. They believe, moreover, that the lack of demand for such manures is largely due to the ignorance, prejudice and poverty of the cultivators and that to remedy this state of affairs Agricultural Departments should have funds placed at their disposal to enable them to carry on propaganda work with a view to creating a demand for such manures.

2. The work of our Agricultural Departments is at present handicapped for want of funds. They do not have enough money to enable them to demonstrate on a large scale the value of these manures. Non-credit agricultural co-operation is in its infancy and little has yet been done to provide the cultivator with money with which to purchase manures on a co-operative basis. Faced by these difficulties many of our agricultural experts have advocated the levying of a small cess and the building up of a cess fund to be used for propaganda work with a view to popularising the use of manures. I do not think a small export cess of, say Re. 1 a ton on oil-cakes, bones, bone-meal and fish manure would appreciably affect the industries connected therewith in this country. But so much has already been written on this subject and so many unsound economic theories have already been advanced by amateur economists like myself, that I think, the time has come to refer the question to a higher authority, namely, the Tariff Board, the members of which are, presumably, in a position to study the question with reference to the effect which a cess of this kind will have on trade.

3. If the question is to be referred to the Tariff Board, I do not see the object of appointing a committee. The utilisation of supplies of nitrogenous and phosphatic manures might be brought up for discussion at the next meeting of the Board of Agriculture on the strict understanding that questions of tariff policy are to be left to the Tariff Board.

4. Most Indian soils must have reached their maximum state of impoverishment hundreds of years ago and will not get any poorer even if cropped without manures for hundreds of years more. An average crop uses up about 20 lbs. of nitrogen per acre but the loss is made up annually, for the soil gets nitrogen from the air and from the decay of root matter left in the soil after the crop is harvested, with the result that most soils are not getting any poorer in nitrogen. There are, on the other hand, certain classes of soil in India which are already deficient in available phosphate and which will tend to get more so if the supply is not replenished. The area affected is, however, small as compared with the total area under cultivation. It was definitely proved at Rothamsted, the premier agricultural research station in the world, that the unmanured soil there did not reach its maximum state of impoverishment till after being cropped continuously with wheat for a period of 40 years, since when the yield from year to year has remained almost stationary, despite the fact that no manure has ever been applied to the field. We may take it, therefore, that, with the exception of the limited area in this country the soils of which are deficient in phosphates, our old cultivated land has long since reached its maximum state of impoverishment; that increased yields now depend on the rainfall, standard of tillage and manure applied; and that only new lands or lands deficient in phosphates are being impoverished by cultivation. I raise this point because

Mr. M. K. Reddy Garu, M.L.A., and some of the members of the Madras Department of Agriculture have referred to it. They refer to the impoverishment of the soils in phosphates in certain limited areas.

5. Most Indian soils respond readily when manured with nitrogenous manures such as fish and oil-cake. That the demand for these in India has risen considerably within the last eight years is a healthy sign, proving as it does that the propaganda work already carried out by Departments of Agriculture is bearing fruit. The price of these manures has risen but, even at present prices, it pays very handsomely to use them for cane and certain garden crops. The cakes exported are mostly edible kinds such as linseed, ground-nut and cotton cake, the nutritive value of which is so high that it does not ordinarily pay to use them as manures. For these cakes, too, the demand in India is steadily growing and will continue to grow, for they are now being fed extensively on Government cattle-breeding and dairy farms, and many cattle-owners also are now beginning to use them.

6. What is wanted is propaganda to break down the prejudice and ignorance of the cultivator of this country. For propaganda and the organisation of the co-operative movement money is needed. If that money can be provided in no other way, I would be in favour of placing a small cess on the export of manures on condition that this cess should not go into general revenues but should be devoted to the encouragement of the use of manures as recommended by the Indian Fiscal Commission.

Margin of profit obtainable from the use of fish manure, oil-cakes and bone-meal.

Directors of Agriculture were asked to supply information as to whether there is or is not a margin of profit obtainable from the use of oil-cakes, bone-meal and fish manure in their Provinces. The figures they have given are mainly for last year, since when the price of food grains has fallen considerably. But as the price of these manures has also dropped, we may take it that the figures given in the last column of the statement attached, convey a fairly accurate idea as to what margin of profit is obtainable at the present time by using the manures named in column one for the crops named in column 3.

In the case of the more profitable crops such as sugarcane, chillies, onions and potatoes the profit from the use of these manures at present prices is very large as a perusal of the statement attached will show. When applied to less profitable crops such as paddy, wheat, cotton and ground-nut the margin of profit obtained is much smaller on the whole. In Bombay, the application of castor cake has increased the net acreage profit on cotton cultivation by Rs. 27 in one case and Rs. 42 in the other. In the United Provinces, the same manure has increased the net profit on wheat cultivation by Rs. 24 in one case and Rs. 25 in the other; while *neem* cake has in the same Province accounted for a profit of Rs. 16 when applied to paddy land. Bonemeal has given a net profit of from Rs. 10 to Rs. 14 when applied to paddy in Assam; and when applied along with a green manure, *viz.*, *dhaincha*, it has given a profit of Rs. 16. In Burma bonemeal applied to paddy has given a profit of Rs. 7 an acre.

The quantity of these manures produced in India though considerable would be far short of requirements if a real demand for them were to spring up in the tracts in which the more profitable crops are being grown. If such a demand were to arise there would be no manure to spare for less profitable crops such as cotton, wheat and rice. These manures are, in short, being exported at present, because the cultivator is not yet prepared to pay a fair price for them. Manure is so plentiful and cheap over the greater part of India in fact that cowdung, the value of which no one knows better than the

cultivator, is commonly burnt instead of being applied to the land. The reason for this is that he has not enough capital to grow on anything but a very small scale the more profitable crops which require manuring, irrigation and intensive cultivation generally.

These manures are, on the other hand, already being used on a fairly large scale for cane and garden crops by the more substantial landholders in the Provinces. The rise in their price of late years is largely due to the growing demand for them; the most that Government can do at present is to stimulate that demand still further by demonstrating their value through the Agriculture Department.

I have not been able to get any figures from the Director of Agriculture, Madras; but I gathered from him when I met him some months ago that these manures had dropped in price of late, and that they now gave a fair margin of profits when applied to cane and other garden crops grown in the Presidency.

Manure.	Province.	Crop.	Net profit per acre due to manure.
Fish . . .	Bombay . .	Sugarcane .	Rs. 154.
Safflower cake . .	Do. . .	Do. .	„ 176.
Safflower cake *plus* sulphate of ammonia..	Do. . .	Do. .	„ 223.
Ground-nut cake . .	Do. . .	Do.	„ 176.
Ground-nut cake *plus* sulphate of ammonia.	Do. .	Do. .	„ 199.
Safflower cake . .	Do. . .	Paddy .	„ 16 at present price.
Castor cake . . .	Khandesh-Bombay	Cotton .	Rs. 27.
Castor cake . .	Jalgaon-Bombay .	Do.	„ 42.
Castor cake . . .	Nasik-Bombay .	Chillies .	„ 40.
Castor cake *plus* sodium nitrate.	Khandesh-Bombay	Do. .	„ 14.
Castor cake *plus* sulphate of ammonia.	Nasik-Bombay .	Red onions .	„ 63.
Do. . .	Do. . .	Onions .	„ 55.
Til cake . .	Central Provinces .	Cane .	Ranging from Rs. 244 to Rs. 381.
Bonemeal . . .	Do. .	Ground-nut	Rs. 8.
Til cake . . .	Do.	Wheat .	Nil at present prices.
Castor cake . . .	United Provinces .	Potatoes .	Rs. 32.

Manure.	Province.	Crop.	Net profit per acre due to manure.
Poppy cake . . .	United Provinces .	Potatoes .	Rs. 55.
Mahua cake . . .	Do. .	Do.	„ 13.
Mustard cake . .	Do. .	Wheat .	„ 24.
Castor cake . .	Do. .	Do. .	„ 25.
Castor cake . . .	Do. .	Cane .	„ 80.
Bonemeal . .	Do. .	Paddy .	„ 16.
Neem cake . .	Do. .	Do. .	„ 45.
Castor cake *plus* sulphate of ammonia.	Bihar and Orissa .	Potatoes .	„ 106 to Rs. 130.
Castor cake *plus* nitrate of soda.	Do. .	Do. .	„ 93 to Rs. 107.
Bonemeal . .	Surma Valley, Assam.	Paddy .	„ 10 to Rs. 14.
Bonemeal and dhaincha .	Do. .	Do.	„ 16.
Fish . . .	Do. .	Do. .	„ 2.
Bonemeal and oil-cake .	Do.	Do. .	„ 7.
Oil-cake and cowdung .	Do. .	Potatoes .	„ 44 to 64.
Bonemeal and cowdung .	Do. .	Do. .	„ 7.
Castor cake . . .	N. W. F. P. .	Cane .	„ 70.
Bonemeal . . .	Burma . .	Paddy .	„ 7.
Cotton seed cake . .	Do. . .	Do. .	„ 21 loss.

APPENDIX 6.

BULLETIN NO. XX.

Some foes of the farmer in the Central Provinces and how to deal with them.

Owing to the very large area which still remains under jungle in the Central Provinces there is probably more damage done to crops by wild animals in these Provinces than in any other part of India. Wild pigs abound everywhere and make nightly raids on cane, *juar*, rice and other crops on which they feed all night returning to their haunts in the jungle in the early morning. One cane-grower lately informed me that his field of thick canes of which he had obtained the seed from the Department of Agriculture was damaged to the extent of Rs. 300 by pig in one night.

2. The counter measures that one naturally suggests in this case are (*i*) to destroy as many pigs as possible, and (*ii*) to protect the fields by fences. But as the pig is a nocturnal feeder and lies hidden during the day in the jungle or grass-covered wastes which are often many miles distant from the crops on which it feeds, to reduce their number to any appreciable extent will, I believe, take many years. In some districts of the Central Provinces cultivators are granted gun licenses on condition that they shoot a certain number each year. In the north of the Provinces a system of pig hunting with dogs has been organised and some thousands have been killed this season in that way. In villages, in jungly tracts pigs are often caught and killed in pits. Otter traps have been tried by the Department of Agriculture and by means of these a few pigs have been caught: but while the number destroyed by these different methods may total to some thousands every year, the number of young produced probably amounts to many hundreds of thousands. To obtain immediate and effective results in crop protection, therefore, the use of fencing is necessary, by means of which valuable crops in pig-infested areas can be saved from their ravages. To attempt to grow the thick juicy high quality canes which are so toothsome to pig from a porcine point of view would, in districts where pigs abound, appear to be a hopeless task without some such precautions.

3. The types of fencing used locally for cane fields are all more or less inefficient and it is customary therefore to keep also a watcher at night in the fenced field. His wild yells in the silent watches of the night on the approach of "grunters" are generally sufficient to scare them away; but at times, Homer-like, he often nods, and on such occasions the owner finds next morning that thousands of his canes have been destroyed and that his farming profits have been very materially affected thereby.

Where wood is plentiful, it is usual to construct a fence of thorns or bamboos, but on the efficacy of such a fence one never can entirely rely, as both pig and jackal bore their way through it.

Where jungle is distant a mud wall about 3′ in height is constructed all round the field; this is generally effective in keeping out pigs if kept in a good state of repair; but jackals do not hesitate to jump over a wall of this height. Not only are the fences in common use at present inefficient but in the long run they are more costly than a *pucca* and permanent fence would be. To fence an acre with the branches of thorns or *garari* (*Cleistanthus collinus*) costs about Rs. 12 and lasts for one year only. In addition to this the owner has to meet the cost of retaining one watcher for 8 months and the practical certainty of a certain amount of loss. The cost per acre of the patent woven wire fencing now under trial is about Rs. 200 and it should last for at least 20 years. Barbed wire fences are quite useless.

4. As the problem of protecting cane had become a serious one, I had occasion two and a half years ago to suggest to the firm of Messrs. Burn and Company that they might design a strong woven fencing of the type of wire netting. The firm in reply sent a roll of patent wire fencing known as the Ideal woven fence which had been sent to them on trial from home. Page's fence supplied by Balmer, Lawrie and Co., is similar in construction to Ideal fencing, but the wire is of a lighter kind. Of both these patent fences there are several types varying in height and in the size of the mesh. We have tried several of these in the Central Provinces and have found that a fence about four feet high with a mesh 3 inches in depth at the foot, increasing to six inches at a height of 2 feet is, if properly fixed, quite effective in keeping out pig. For general purposes type No. 1150 of Ideal woven fencing is, as far as I have seen, the most suitable. It is supplied in rolls of 220 yards and costs 8*d.* per yard run. The fence is 50 inches high, and has eleven strands with uprights 13 inches apart. It is sufficiently strong to keep out cattle, sufficiently high to prevent *nilgai* from jumping it and the mesh is sufficiently small to debar pig. If properly stretched, jackals cannot get through it without considerable difficulty.

Patent woven fencing is being successfully used as a deer fence for a park in the Maharajbag gardens in Nagpur in which *nilgai, sambar,* antelope and *cheetal* are kept.

The chief points to be attended to in constructing a fence of this kind are (*i*) to see that the lower edge is two or three inches below the surface of the ground, (*ii*) that there is no space left between the lower edge of the fence and the ground, *e.g.*, at *nala* crossings, and (*iii*) that the wire is properly stretched. Nos. (*ii*) and (*iii*) are obvious points, but in the case of fences erected on our experimental farms I have noticed that the staff seem at first incapable of grasping their importance, and almost invariably leave an entrance somewhere. They only learn by sad experience that the habit of the pig on approaching a fenced field is to run along the wire in search of an opening. On several occasions pigs have got into our fenced areas by such openings, and their destruction when inside has given a considerable amount of sport. A large boar, which recently entered, by a *nala*, the cane area fenced with Ideal woven fencing on the Raipur Farm, after having made many attempts to find an exit, charged and knocked down several coolies and one of the farm staff, and died inside the fence fighting to the last.

No. 1150 Patent woven fencing described above costs 8 annas per yard exclusive of posts. In jungly districts where it is most required wood can be obtained at low rates and the cost of this patent fencing with wooden posts is approximately the same as that of an ordinary wire fence with iron standards. So as to obviate the necessity of having to renew these wooden posts after a period of years it will be found advisable to plant, between each pair, a cutting of *salai* (*Boswellia serrata*) or some other species which can be reproduced from cuttings. In two or three years these *salai* trees will serve the purpose of permanent posts. This method of fixing the wire is now being tried by the Department and will, I believe, prove satisfactory.

Semi-wild cattle, though of limited numbers and local occurrence, do an enormous amount of damage to crops in the vicinity of the jungles in which they live. The cattle live in herds of from 30 to 70 and there are few districts in the Central Provinces without one or two such herds. By day they are to be found resting in the jungle from which they pay nightly visits to the nearest cropped fields. These herds are no doubt the descendants of "strays" or of animals set loose as an act of religious merit by Hindus. They are generally in prime condition; are much more alert than domesticated cattle, and are often very furious when irritated.

To destroy those animals would offend the religious prejudices of the Hindus; to construct a fencing that will keep them out of a field is too expensive to be a practical proposition. The only feasible remedy left, therefore, is to capture them. Three methods of accomplishing this have been tried in these Provinces. The first was to entice these animals into a large *kheddah* strongly fenced with fencing of 8 barbed wires on posts 4 feet apart, each

supported by a stay to give it strength. The fence was interlaced, moreover, with thorny *babul* branches, and a trench 3 feet wide and 3 feet deep was dug to prevent the cattle when inside from rushing it. The cattle were enticed inside by *juar* stalks placed within. Trails of *juar*, salt and cotton seed leading up to the entrance were also put down. The area of 3 acres inside the *kheddah* proved much too large and great difficulty was experienced in approaching sufficiently near the enclosed cattle to lasso them. To throw the lasso for any considerable distance with effect was impossible owing to the number of obstructions in the form of trees. Moreover, when once enclosed, these cattle become dangerous and a man can only approach them in safety by taking shelter in a heavy cart with a hood. This was done and the lasso was thrown from the end of a long bamboo. Even after taking these precautions this method involves much danger for the lasso-thrower who is not constantly on his guard. To manipulate the bamboo properly, he has to come out of the cart and is liable to be charged at any time. While carrying out this operation for the first time two men were injured by an infuriated bull which charged and gored them. Over 30 animals were captured last hot weather in a *kheddah* of this kind, but we do not recommend it as the most suitable.

The second method that has been tried was to drive the cattle into nets placed in the more open part of the jungle. But this, too, was unsuccessful. The struggling of the animals in their efforts to escape resulted in the death of some of them from abortion in the case of cows in calf, and from what appeared to be congestion of the lungs in the case of other animals.

The third and most successful of the methods tried was to construct a very small *kheddah* 40 feet square, of strong wooden posts 3 feet apart and 7 feet high, with cross pieces 1 foot apart. To give this fence additional strength a strong stay was put in behind each post. The cattle are allured inside as described in the case of the previous method and the gate is then quietly closed by the watchmen in charge. They are then lassoed one by one by men who have taken up their positions in trees overhead. Fifteen were captured in this way recently without much trouble. This method is easily the cheapest and most expeditious that has yet been tried, and will be adopted in capturing other herds that are still at large.

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APPENDIX 7.

Leadership in Agricultural Development in India.

Writing about 300 years ago on the subject of the importance of agriculture to a country, Markham said:—"A husbandman is the master of the earth, turning barrenness into fruitfulness, whereby all common wealths are maintained and upheld. His labour giveth liberty to all vocations, arts and trades to follow their several functions with peace and industry. What can we say in this world is profitable where husbandry is wanting, it being the great nerve and sinew which holdeth together all the joints of a monarchy?"

The salient facts regarding the state of agriculture in India are, (1) that it is by far our most important industry, providing as it does 3 out of every 4 of the people with a means of livelihood; (2) that it is in a backward state and has not as a vocation attracted any considerable number of men of brains, enterprise and capital, and (3) that the amount spent in India up-to-date on research and experiment with a view to developing this industry is quite insignificant compared with the enormous value of the interests involved.

The land is largely in the hands of owners who are rent collectors rather than agriculturists. They lease their lands to semi-illiterate tenants who seldom show any initiative or enterprise: other important industries such as the textile industry, the coal industry and the tea industry would, if left to the tender mercy of a similar class, have been doomed to failure. The idea seems to prevail that the agriculturist requires but a modicum of brains, capital and enterprise and that he can be relied on to work out his own salvation on empirical lines. Empirical knowledge alone is not sufficient, especially in this country where illiteracy is prevalent and where so few agriculturists are capable of understanding the correct relationship between cause and effect. Agriculture presents a large number of highly specialised problems which can be solved only by highly trained specialists; for research is the foundation of all progress in this as in other industries.

Improvements in agricultural practices must needs be based on accurate knowledge regarding our soils and their constitution, crops, breeds of cattle, plant and animal diseases, insect pests, etc., but such knowledge can be acquired only by research and experiment. The field of investigation is so wide and varied, moreover, that many highly qualified specialists each devoting his whole time to his own particular subject are required, if we are to wrest from Nature the secrets which would make for further progress. For the last 20 years or so such specialists have been working on these problems in India and great progress has been made in different branches of agricultural science. Thousands of varieties of crops have been sorted out, classified and tested, and new varieties have been brought into being by cross breeding. Improved breeds of cattle have been evolved by selection and crossing. New and more profitable methods of cultivation have been introduced on Government farms, and thousands of improved agricultural implements and labour-saving machines supplied to landholders. Diseases of crops and animals have been investigated and remedial and preventive measures devised.

Much has already been accomplished by the small staff of research workers employed by the Imperial and Provincial Departments of Agriculture, and the results of their beneficent work are now being applied in many villages Progress in this direction would be much more rapid if the larger landowners of this country could be stimulated into taking a personal interest in the development of their own estates. Their apathy in this respect has been and still is one of the main factors clogging the wheels of progress. How to break down this apathy is a difficult problem which has, from the very beginning, confronted the Department of Agriculture in India. If a solu-

tion could be found, the tree of scientific agriculture already planted in rural India would, in a decade or two, throw out its roots far and wide and produce in season fruits in plenty.

That agriculture is an honourable vocation, worthy of the attention of the best brains in India, our landed autocracy do not realise. It is so worthy a vocation that the King of England himself worships at its shrine. The King is proud to be a farmer and takes a presonal interest in the management of his own estates. He is a Patron of the Royal Agricultural Society of England, too, and one of the most successful stock-breeders in the world. His sons are following his fine example as gentlemen farmers: His Royal Highness the Prince of Wales has extended his activities in this direction to Canada, too. If it were possible for the Viceroy of India to play the same part in this country as Royalty does in England the effect would be magical: for what our landowners stand in need of is leadership in the domain of scientific farming. No country in the world stands more in need of the driving and organising power of the State in the development of its agriculture than India; no country in the world stands more in need of leadership calculated to dispel apathy and to breathe life and imagination into the dry bones of our landed aristocracy.

If it were possible for His Excellency the Viceroy to associate himself in a practical way with the development of this great industry, the effect of his influence would be felt in every corner of rural India. If he were to establish a model farm, hundreds of our zamindars would follow his example, and that example would be handed on to thousands of smaller men, for agricultural improvements tend to filter down from the big estates to the smaller holdings.

Lord Willingdon, when Governor of the Bombay Presidency, was so convinced of the need of such leadership in the field of scientific husbandry that he opened his own model cattle-breeding farm at Ganeshkhind, and was the means of getting several Rajas in the Presidency to follow his example. In an article which he contributed to the *Agricultural Journal of India* on his herd of dairy cattle he wrote as follows:—"It is, I am convinced, largely the fact that the landowner has in England been a keen breeder of stock himself, which has produced the fine herds of cattle in that country, and which has encouraged the numerous agricultural shows, where we often find our King-Emperor, great landowners and tenant farmers all competing in friendly rivalry, and the tenant farmer not uncommonly proving successful over his Sovereign and his other august rivals. Is it too much to hope that a similar development in cattle-breeding may take place in this country?"

A concrete example of this kind repeated by His Excellency the Viceroy would strike the imagination of the landowners in a way in which nothing else could. It would stimulate their interest in farming and rural life generally, and give them a truer conception of the importance of agriculture and of the possibilities of promoting it.

APPENDIX 8.

Rural Education in its relation to Agricultural Development.

In the West the science and art of education have been much developed of late years: the science has been greatly enriched by the writings of such psychologists as Spencer, Bain, James, Adams, and others. Chairs of education have been established in some of our Universities. The great reforms in the methods of education, as now practised, owe much to the teachings of the educationists of the sixteenth, seventeenth and eighteenth centuries. In the latter half of the sixteenth century Montaigne condemned the pedantries of the schools which, he said, exaggerated memory while they depreciated the value of useful knowledge. Ratke and Comenius of the early seventeenth century also denounced the purism of the schools, in which so-called culture and scholarship were synonymous with ability to deliver elegant speeches in the dead languages. The latter was one of the first to lay it down as a principle that the teaching of words and things must go hand-in-hand. He was, moreover, one of the first advocates of the teaching of science in schools and his method of teaching a language was to teach it as the mother tongue, *viz.*, by conversation on the topics of every day life. Teaching, he said, should be made interesting by bringing the child into contact with actual things and the pupils should always be kept interested, cheerful, and happy. Locke in the end of the seventeenth century developed Montaigne's theories still further: he laid great stress on the training of the mind in order to fit a man for the duties of the world. The aim of education was, he said, to produce a sound mind in a sound body. Rousseau in the eighteenth century wrote his *Emile*: the influence of its revolutionary philosophy was enormous. The child, he said, must be a pupil of Nature. His *Emile* was taught by the real things of life, by observation and experience: he was to learn nothing from books, much by experience having read deeply in the book of Nature. Like Lock he laid great stress on the physical development of the child and on training his hand and eye. The strength and body of his *Emile* was to be fully developed: and he was to be athletic and good at handicrafts. Pestalozzi in the latter half of the eighteenth century still further developed and practised the science of education on more or less the same lines. Like Comenius, Locke, and Rousseau he followed Nature: the child's powers of observation had to be developed by training and his whole mind was to be gradually moulded by sympathetic contact with that of the teacher. Sympathy was all important in his method. Froebel, the mystic and disciple of Pestalozzi, like Comenius looked at the course of Nature for the principles of education. The duty of the pedagogue was, he said, to superintend the development of inborn faculties and to encourage self-activity of the child. Just as the farmer provides good cultivation and leaves the plant to grow naturally, so must the pedagogue give the mind of the child scope to develop. This consists in giving the child opportunities to live, act, and conceive, and at every stage of mental development the child must be cared for as the cultivator cares for his gradually developing plant. In his kindergarten (garden for children) he laid great stress on every child cultivating his own plot of ground: "to give them employment in agreement with their whole nature, to strengthen their bodies, to exercise their senses, to engage their awakening minds, and through their senses to make them acquainted with Nature and their fellow creatures," was to him the essence of true education. Of later day educationists it will suffice if I mention Spencer. To him science was the worthiest subject of study. The child should be trained in things in which it is interested, he said. The teacher's duty is largely to keep in sympathetic touch with the child and to foster its interest in natural things and to allow it to learn by the experiences of life—this being the way in which the young mind is developed.

Froebel has done perhaps more than any other for the progress of the science and of education. His kindergarten system for young children has on its own merits become almost universally popular as a method of teaching in the primary school. To the same system can be traced the origin of school gardens as a means to nature study.

At Home the study of education both as a science and an art has risen into great importance. Chairs of education have been founded in our Scotch Universities at least where the subject is included in the curriculum for the M. A. degree. Training centres, where the method of teaching is taught, have also been organised at several centres. As a result of all this, a great advance has been made of late years in raising the standard of teaching. The general trend of the new system has been to brighten school life. The system of rote-learning by which the child mastered pages of geographical names, historical dates, and rules of grammar has disappeared. New subjects have been added to the school curriculum with a view (*i*) "to train the young child to observe carefully and to reason correctly from the observations which he makes, (*ii*) to train the hand and eye to thoroughness by using them in doing things, and (*iii*) to foster such wholesale outdoor interest in the things of Nature which lie around him as will get him into the habit of approaching the unknown in a spirit of intelligent curiosity".

These new principles of education aim at the development of the child's intelligence by training him to observe and reason accurately. To give him manual skill and quickness of eye he is trained to do things for "the child must be induced to take as keen an interest as possible in his work and this is usually most easily achieved by means of exercises that lead to tangible results". The child gets his ideas from concrete objects which are familiar to him and which he can handle. In his nature knowledge lesson he no longer relies on books and pictures but on real objects. Each school has its little museum in which these are kept. He is trained to appreciate varying shades of form and colour by drawing and colouring figures with the originals in front of him. He draws from a real leaf, not from a line drawing of one. He mixes his own colours to get the shades required, and greets with unfeigned pleasure the discovery that yellow and blue when mixed give a green. The success obtained is very largely dependent on the fact that ample measures have been taken to train the teacher. At the university he studies the science and history of education; at training centres he is taught the art of teaching; and at other centres he learns his kindergarten, his nature knowledge, and art subjects for schools. A perfect system of classes for teachers has been organised, and elementary teaching has become a highly specialised profession. In towns these meet after school hours or on Saturdays. Rural teachers, on the other hand, attend central classes during their holidays.

I have briefly outlined the method of teaching which has been evolved in the West with the view of showing the enormous difficulties which have to be overcome before similar methods can be carried out here with any degree of success. I have discussed this subject with some Inspectors of Schools, more especially that part of it which refers to school gardens. Their views are pessimistic on the whole. They have not had the opportunity of specialising in teaching on the lines which I have described: their work is almost entirely administrative, and there are so few of them that they are not in a position to give any new system of education that amount of supervision which would be absolutely necessary in its initial stages. The general opinion seems to be that in the ordinary primary school the difficulty of teaching the child a little of the three R's, in the three or four years during which he attends school irregularly, is in itself a heavy task. They have not yet got qualified teachers nor the required appliances for teaching nature knowledge properly. School gardens have been established in most of the schools in the Central Provinces and in nearly half those of Berar: but they are not of much educative value: they are maintained almost entirely for ornamental purposes. The method of teaching in school which is practised is akin to that which has been con-

demned by educationists from the sixteenth century downwards. The child is taught mere words, not things: his memory is exercised, while his intelligence is left undeveloped.

I have inspected a good many of these gardens. They are on the whole fairly well kept and do undoubtedly serve a distinct purpose in so far as they help to brighten school surroundings and to give the child and his parents some idea of neatness, order, and beauty; but apart from that they are, under present management, of very little practical value as a means of education. The hardier annuals are grown with a few country and English vegetables; there is very little variety. In one school garden which I visited lately, I found English cabbages and bananas growing, the seedlings of which had been obtained from our Agricultural Assistant; but they were suffering for want of water as the boys were reported not to be willing to draw water from the village well; and the *chaukidar* who ought to have done this work had also refused to do so. In other schools, too, I have found that the question of water-supply is one that gives much difficulty in the management of school gardens. The parents are said to object to their children becoming "hewers of wood and drawers of water". The teachers are mostly of non-cultivating castes who have a natural prejudice against doing gardening or any other form of manual work, and are not therefore of the stamp likely to inculcate into the mind of the child a sense of the dignity of labour.

The equipment required for utilising the educative advantages which school gardening is supposed to supply is still very inadequate in these Provinces. This is not surprising when the facts already stated are taken into consideration; moreover, this branch of education is a comparatively new one even in the West. The subject of garden teaching in the curriculum of rural schools at Home only received official recognition within the last twenty years, and not before there was a trained staff of specialists qualified to teach this and other branches of hand-and-eye training. The value of school gardens when properly conducted can be considered under two heads: (*i*) educative, and (*ii*) utilitarian.

Under proper management their educative value is very great. Such teaching makes the school work more concrete. The child can be taught to make a line drawing showing the division of the garden and its different plots. He can be taught the elements of calculation in measuring the size and outturn of a plot, and in reckoning the outturn and profit per *bigha* or acre therefrom. Gardening can thus be correlated with other branches of school work. The child is trained in the observation of living and therefore interesting things which are changing from day to day. He makes his own observations and is trained to reason correctly from them. The responsibility of having to do things with his own hands makes him practical and resourceful. In carrying out the practical operations in the presence of the teacher and other class-fellows he is taught the dignity of labour and he gets a hand-and-eye training in the use of tools; he learns by doing things. If properly directed, an intelligent curiosity in his attitude towards Nature is created within him, and he becomes more and more anxious and able to find things out for himself. The attainment of this intelligent and sympathetic attitude towards his natural surroundings and this desire to solve their mysteries should be the main object in view in gardening as in other branches of nature study. This ideal is a high one, but I feel sure that if we are to rely on our present untrained Indian teachers to carry it out, failure is certain. Such aimless work as is being done at present, discredits the whole movement towards practical education. It is a premature attempt to graft a new and advanced system of education on to a primitive one by the help of teachers who have not yet been trained in the new system and who are therefore quite unqualified.

School gardens could not under present conditions be made of much practical value. But the great desideratum at present is to get teachers trained in the method of teaching nature study for which the school garden is only a means to an end and I am of opinion that to do this

successfully it would be necessary to employ a specialist who has fully qualified himself in the science and art of teaching at Home and could be relied upon to turn out teachers qualified in the method of teaching, for nature study is *largely a method of teaching*. It is for the Education Department to decide whether it would be better to do this or to train one of their own men. A two years' training at Home would probably suffice. He would be entirely responsible for the teaching of nature study, drawing and kindergarten in the Training Colleges. Acting teachers would come there for holiday courses. The specialist would have a model school garden and a museum at each training centre and would frequently take his students out into the fields to study the geology, the *flora* and *fauna* of the country. Manual training including kindergarten and art subjects suited to local conditions, would be taught at the same time. One of his first duties would be to prepare a set of lesson sheets suitable for the Provinces: another important task would be the preparation of a Science Reader for the use of middle schools in co-operation with members of the Scientific Departments of the Administration.

The student would learn how to manage a model school garden and how to utilise it as an object-lesson. Each student would have a separate plot of at least one-twentieth of an acre which he should cultivate with his own hands. In addition to this there would be a communal garden area used more especially for common teaching purposes. Given teachers trained in this way it would then be possible to make existing school gardens of considerable educational value. But the teacher would not depend entirely on the school garden: he would also take out his boys into the fields to study Nature on a larger and more varied scale there.

If taught in this way nature study would necessarily give the child an interest in agricultural subjects as the teaching would be in the concrete and the object-lessons would nearly all be connected with agriculture. On these lines the perceptive, reflective and reasoning faculties of the child's mind would be developed, and it would not be too much to expect that the training, acquired in this way while at school, might be of the greatest practical value in after-life.

I am well aware of the fact that any great improvement in the quantity or quality of rural education in India must be of slow growth as was the case in England, where we first developed our industries and thereby enriched the country before evolving that high standard of rural education which we enjoy to-day. Our Government first raised the economic condition of the people and then taxed them heavily for the support of education. In India there is a crying need for more and better rural education among the educated classes at least; but these same classes attach as yet but little importance to the training of the ryot in improved agricultural methods which would enable him to rise in the economic scale. They do not yet fully realise the fact that to create in him that spirit of enterprise, self-reliance, and resourcefulness which are so essential to success in agriculture, his education even in the rural school must be made more practical than it is at present.

It is a well-known fact that much of the education given in rural schools at present is compulsory in nature though not in name. But for the pressure exercised by Government officials in securing attendance, many of our village schools would stand empty. For the average ryot education has no charms because he does not see its advantages. For those of the clerical class the case is of course quite different. For this class education is absolutely essential to fit them for their life's work. The ryot does not see that agricultural prosperity is in any way dependent on education. This is, I consider, a very strong argument in favour of the steps now being taken by Government to develop Indian Agriculture. The development of this, our greatest industry, should precede the development of rural education. If we first demonstrate to the ryot that improved methods bring him prosperity, it will then be an easy matter to prove to him that to enable his boys to benefit to the full from these improvements, education is indispensable.

Oral Evidence.

1. *The Chairman:* Dr. Clouston, you are Agricultural Adviser to the Government of India?—Yes.

2. It is a post you have held for?—For about three years.

3. Before I proceed to ask you one or two questions on the proof which you have been good enough to prepare and which has been in the hands of the Commission some days, I should like to ask you whether you would care to make any statement supplementing the written matter which you have put before the Commission?—I do not think it is necessary.

4. I imagine that after the Commission has completed its tour round the Provinces most of us, and certainly I, will have a good deal more to ask you than we have to-day; but there are some questions mostly of a general nature which I should like to put to you this afternoon. I should like to know whether you would care at this stage to tell the Commission on what, in your view, the need for a Central Government Department of Agriculture is founded, having regard of course to the fact that agriculture is now a provincialised subject. Would you care to make any general statement of that sort to-day?—I have already given my reasons for thinking that we require a strong central department in my replies to question 1 and question 4. I think there is great need for co-ordination and that the tendency is for each Province to work by itself; there is no opportunity of co-ordinating the work either between the Government of India and the Provincial Governments or between the different Provincial Governments themselves.

5. Are you prepared to tell the Commission that in your view there is less co-ordination to-day than there was in the past between Province and Province?—I think there is certainly less co-ordination than there was, say, before 1920.

6. And is that to the prejudice of agricultural progress as a whole?—I certainly think so.

7. You have no doubt studied the practice in other parts of the world and particularly in States with a federal constitution; have you observed that in the United States of America, for instance, a strong central Agricultural Department is maintained?—Yes, I know that, that is the case in Australia and to some extent in Canada too.

8. In fact, it is almost universal in progressive federal organisations, is it not?—It is to a greater or less extent.

9. I will not go point by point through the reasons which you have given in support of your view that a central organisation is necessary; but I want to direct your attention to one point in particular. It is your view, I understand, that one good reason for research by a central organisation, that is to say, an Imperial Department in the case of India is that there are not enough research workers of the highest calibre to staff separate research stations in every province?—That is so.

10. Are you satisfied with the calibre of the Heads of departments at Pusa at the present time?—We used to get very good men for Pusa but within the last 5 years we have had very great difficulty in getting men to come from the Provinces when we require them because they think that their prospects in the Provinces are better than their prospects in the Imperial Department. I think we have got very good men for Pusa in the past; but I believe we shall have very great difficulty in getting equally good men in future. We have asked for the services of certain men working in the Provinces and these men have told us that they were not prepared to come to Pusa.

11. You think the conditions of service, prospects and salaries at Pusa are not to-day such as to attract the best research workers; is that the position?—Yes, that is the position.

12. Do you agree with me that the usefulness of Pusa as a central research station rests in a great measure on the prestige which the research workers in Pusa enjoy throughout India?—I quite agree.

13. Mediocrity is not wanted?—I believe that a research worker is of little or no value if he is a mediocrity. He must be a really good man, otherwise he is useless.

14. Now how about the direction and co-ordination of research at Pusa? Is that in your own hands in particular?—Yes, as Director I am responsible.

15. And you are advised, are you not, by something in the nature of a council composed of your colleagues?—Yes, we have a council.

16. Do you think that that council, in its capacity as an advisory body, is proving sufficient, with your own responsibility super-imposed, for the carrying out and co-ordination of research at Pusa?—I think it probably is, but I should be very glad to get assistance from research workers in the Provinces if we could possibly arrange it.

17. I do not quite understand?—I mean that if we had a central organisation on the lines that I have suggested we should be very pleased to get advice from the members thereof as to what lines of research we should carry on at Pusa, but at present we are not sufficiently in touch with the work being done in the Provinces. We are more or less isolated at Pusa.

18. You have not indicated the nature of the powers of central body the creation of which you advocate. Am I right in thinking that your intention is to give this body executive powers?—My proposal was to have an advisory council; it would not have executive powers but working with it I would have an executive council which would have executive powers.

19. And the funds at the disposal of that executive body would be the funds at the disposal of the Department of Agriculture supplemented, if necessary, from general revenues?—Yes.

20. Is continuity in matters of research of paramount importance?—Of the very greatest importance I should say.

21. Do you think that the method that you suggest would provide an assured future for research?—I think it would if the Provinces would agree to accept my scheme; I have discussed it with a number of Directors of Agriculture who seemed to fall in with the idea of having some such organisation.

22. So that going about India from Province to Province you have formed the view that some scheme of that sort would appeal to the Provinces?—Yes, that is my opinion. We were to have discussed the scheme and to have worked out the details at the last meeting of the Board of Agriculture, but when Government decided to appoint this Commission they gave orders to the effect that my scheme should not be discussed by the Board, as it did not go far enough.

23. It would strengthen your remarks about the lack of co-ordination between Province and Province if you could give the Commission any instances of such lack of co-operation and co-ordination?—There is I consider no co-ordination at all between the Provinces at the present time. Our heads of sections, who tour in the Provinces find that they are welcomed in some Provinces while in others they are not. Some Provinces at least do not want them to inspect work being done by their research workers.

24. With regard to the field of research, is it your experience that the research workers in one Province do not make themselves aware of the lines of research being carried on in other Provinces?—Well, only in so far as they can get such information from the reports published in other Provinces.

25. And are you satisfied that by the means they adopt to make themselves informed of the research carried on elsewhere, they do not in fact obtain all they require in the way of information?—Yes, I am quite sure that they do not. In the case of research work being done on cotton, the Central Cotton Committee is now co-ordinating the activities of different departments.

26. Now before I pass on to another question, another branch of our enquiry, do you wish to say anything about the efficiency of the officers of

the Imperial Department other than the research workers? Do you think that in their case the pay and prospects are sufficient to attract the right men?—I think it is; the pay is reasonably good. It has been increased within the last few years.

27. Are you satisfied with the service given by the staff as a whole?—As I have already pointed out in my replies to your questionnaire we lost some of our best men, and the department is not so strong as it was five years ago.

28. Now, pursuing the arrangement adopted in your memorandum, I should like to ask one or two questions about agricultural education, first about agricultural colleges. There is a great deal in your memoranda of the utmost interest, and the whole of the Commission have read with the utmost attention the very interesting series of notes attached to the provincial memoranda and the memoranda of the Central Government which were written by yourself, and we are immensely grateful to you for the trouble which you have taken in preparing those notes. I say that because I do not wish it to be thought that the points that I am bringing out are the only ones of interest. I am only concerned at this moment to ask you one or two general questions, and in this matter of agricultural colleges I should like to ask you whether you think that in principle it is sound to attempt to train officers who are to take their place in the agricultural service of the country and those who are to return to their paternal acres as practical farmers at one and the same time. Do you think that the attempt to train the official and the farmer side by side is a sound one?—I think it is, if you provide at the college a separate two years' course (for practical trainers and a four years' course for men who are being trained for the department). I think that a Province cannot afford to have several different institutions for training men in agriculture. I consider that the two years' course ordinarily given in agricultural colleges is quite suitable for prospective farmers: it is largely practical. Our colleges are well equipped, they have got their farms, they have got their herds of cattle and they have got their up-to-date implements, so that additional students can now be trained at a very small cost.

29. I should like to ask you whether working day by day with schoolmates who are to go into the official service does not tend to turn the minds of those who enter the college with a view to return to their farms, to the possibility of obtaining an official status?—Well, it might have that effect; but I think the men who make up their minds to get into Government service, or to farm their own lands as the case may be, do so from the very beginning. The men who before entering an agricultural college make up their minds to return to their own lands stick to that decision I think.

30. Reading through the series of memoranda that have been provided for the Commission I have noticed that no statistics as to after-careers have been presented. Do you follow what I mean?—Yes; in the Central Provinces I know what happened to the men. We took about ninety per cent of them into our department as assistants; the remaining ten per cent got employment with landowners or went back to their land; but the number that returned to the land was small. In the Bombay Presidency a higher percentage of the students become practical farmers we are told; the people are, however, more advanced in that Presidency.

31. *Sir Henry Lawrence:* What is the reason?—I think, agriculture is more advanced in the Bombay Presidency.

32. *The Chairman:* Do you know whether agricultural colleges in general make a practice of following the careers of their students and thereby discovering what in fact their after-careers are?—I think they know their careers fairly well for the reason that the Department of Agriculture has its assistants in every district and these assistants are in touch with the men who after having taken a college course have settled on the land or have taken up posts as managers of private estates.

33. Do you think that the principle of linking the agricultural colleges with the Universities for the purposes of degrees has proved a success?—I think it has. The Poona Agricultural College, for instance, is one of the

best in India; it was affiliated with the University a good many years ago. I think that is one reason why it has attracted so many students. The Nagpur College which was affiliated last year has in consequence attracted a larger number of students this year, I am told; moreover, students of a better class have applied for admission.

34. And that is because of the prospect of getting a degree?—Yes; a degree gives a man a better social status.

35. To what posts in the public service does an agricultural degree help a candidate's chances?—A few of the men who took the diploma of the Agricultural College in Nagpur used to get into the Revenue Department as Naib Tahsildars or Revenue Inspectors. A few were given posts as Assistant Managers of estates under Court of Wards after they had had a few years' experience in the department.

36. Do you think that the possession of an agricultural degree may well count for rather more than it does at present in a man's candidature for posts other than those in the agricultural departments?—I think it should; I think that a degree in agriculture should count as being equal to a B.A.; but I am not sure that local Governments would agree, as a matter of fact I think they are inclined not to.

37. That is a very important consideration, is it not?—The men who have taken a degree at an agricultural college have had a scientific education. From the literary point of view they are not as good as a B.A. and for that reason perhaps they are not so well fitted for certain Government services.

38. Now, I want to turn for a moment to those students of agricultural colleges who mean to return to the business of farming. It is a very important and difficult step for a young man to pass out direct from an agricultural college to his own farm, is it not?—Yes; it is always better if it can be arranged to give them practical training in the Department of Agriculture with a view to enabling them to gain some experience before they take over the sole management of their own lands.

39. Would that provide them with commercial knowledge and experience?—A good deal, for the reason that we keep records and accounts of different kinds on every farm.

40. I want to get down to the roots of this question, and I may put my point in this way. It is bad enough to lose 20 or 30 marks in an examination paper; it is a good deal worse to go to your own farm and drop half your capital; and I want to know from you whether you think that all that might be done is being done to bridge over this difficulty for these young men who go to the agricultural colleges with a view to take up farming?—As far as the Central Provinces is concerned I think we did all that we could possibly do. The trouble was that a very large number of students were men who did not belong to any agricultural class; they did not really want to go back to the land.

41. In one of the provincial memoranda before the Commission, I read of a suggestion (which was rather more in the nature of an experiment), that successful and promising students would be given an opportunity of cultivating land on very favourable terms for five years or so after they leave the college. Do you know about it?—Yes; I know the scheme; it is being considered in the Punjab; I believe it has not yet been sanctioned, but it is under consideration.

42. *Sir Ganga Ram:* It has been sanctioned; the period has been reduced from five to three years.

The witness: I think you want my opinion on it. I should say that a student after having taken a degree in agriculture is certainly not likely to be a successful farmer until he has had some years' experience. It takes years and years to make a successful farmer; and if land is given to inexperienced men the chances are that a good many of them will prove failures. If we had an experienced officer to keep an eye on them and advise them for some years, then a scheme of that kind might be quite successful.

43. *The Chairman:* In other words, a man may be a skilled technician but he might not be any good at farm management?—Students fresh from an agricultural college know very little about the practical side of agriculture for the reason that they do not find time to give much time to the practical side when they are at college, and, as you know, it takes many years' experience to make a successful farmer.

44. Now, I should like to ask you whether, in your view, teaching stimulates research? Or, in other words, whether the presence of a teaching school stimulates research when both are carried on side by side?—I have always been inclined to think that it does, but there are a great many research workers who disagree with me. They think that when they concentrate on any special piece of research work they have not enough time for teaching.

45. Is it possible to have any particular research worker left in peace; that is to say, is it possible to have an arrangement of work whereby a research worker does not do any teaching but nevertheless if such a research worker is in contact with those who are teaching from day to day, that is a valuable thing?—I think it should be.

46. Would you call Pusa a live teaching centre?—I should say it is. The men who go there for training take post-graduate courses. The Heads of sections guide them in their research work and also give lectures at times: they take a keen interest in the training of these post-graduate students in short and are always in touch with the work they are doing.

47. And you yourself would like to see the teaching side of the work in Pusa extended?—If we were to extend it, it would be necessary to increase the staff. Most of our sections contain only one Imperial Service Officer and if he were to devote all the time that is necessary to research, he would find very little time for teaching.

48. How many students are there at Pusa for the moment?—I am afraid I cannot tell you that off-hand. I think there is about a dozen at the present time.

49. Now, do you think that any of those students who are at present at Pusa are likely to develop into scientists capable of directing higher research?—I think so. Some of them are reported to be very promising.

50. Of course, the teaching at Pusa is entirely post-graduate, is it not?—Yes, we have lately given up what we called our short courses.

51. How about the scientific equipment of students, I mean of the degreemen who come up to Pusa for the courses?—This is our great difficulty. Most of them when they come to Pusa are not well equipped for taking a research course. This year, for instance, there were 16 men who applied to be admitted to the post-graduate course in chemistry, and not one of the 16 was considered qualified for that course.

52. It takes a long time to make a first class research worker, does it not?—We take them for two years only; I consider that that is too short a time really.

53. Do you think a man who, either through fault or because he has no opportunity, has not properly acquainted himself in essential sciences, can ever make up that difficulty in after-life, or do you think it is a lasting handicap to his career as a scientific worker?—I think that if a man has not got the basic education to start with, it is extraordinarily difficult to become a successful research worker; if he has not got a sound basic education in short, I do not think he is ever likely to develop into a very efficient research worker. I consider that, at the present time, the teaching of science in the Arts colleges in India is not good.

54. How do you account for that?—I think they have not been able to get first class teachers, nor have they been able to afford the cost of laboratory equipment, which is fairly high; still I quite realise that the standard of teaching is gradually being improved.

55. Do you think that it is very important for the future of agriculture in India that University teaching in pure science should reach the highest

standards?—I think so. I think that existing standards are an obstacle so far as the training of men for the highest posts in the service is concerned, graduates in science are given post-graduate courses at Pusa. It is reported that their knowledge of science is deficient and that they cannot be put on to research with advantage.

56. Then in your memorandum you turn to the question of elementary general education on page 3. You say that the village school is fundamental to any scheme of rural regeneration, and in this note you develop your ideas of the direction which elementary education ought to take in rural areas, and you are plainly of opinion that nature study should form one of the pillars of elementary education in rural areas?—In primary schools it should be. For vernacular middle schools the Punjab system of agricultural education is, I believe, suitable.

57. Do you think that, broadly speaking you are faced with this alternative, that either you will devote your resources in the main to achieving and sustaining literacy or you will make some sort of attempt to interest or even to educate a small child in agriculture? Do you think that is an alternative?—I am afraid I do not quite follow your point.

58. Let me put it in another way then. Do you yourself believe in trying to teach small children the practice of agriculture?—No, certainly not.

59. Do you believe that in the short period during which most children in India attend schools, there is time to teach them more than the essential elements of literacy? Do you believe that the time taken in attempting to educate small children in the principles of nature study is justified?—I think it is. As a matter of fact, the Education Department has, in some Provinces at least, already included nature study in the curriculum for primary schools. I know that in the Central Provinces nature study lessons were given in primary schools. What I mean by nature study lessons, are lessons on such subjects as the parts of a flower, and the uses of the different parts of a plant.

60. I used to be taught my arithmetic on such matters as wall papering and the hands of a clock and so on; you would teach arithmetic of that sort, but in terms of agriculture. You would not attempt to teach anything in the nature of practical agriculture to small children?—Not at the primary school, but in the middle school one can teach them how to handle implements, how to sow seeds, how to use hand tools, how to irrigate crops and so on. That is already being done in the vernacular middle schools in the Punjab, in which they teach agriculture.

61. Of course, literacy in itself quite apart from any agricultural bias which may be imparted would be an immense advantage from an agricultural point of view, would it not?—Yes, I quite agree.

62. Have you any grounds for supposing that the attempt to teach nature study and to interest growing boys in natural history in the life of plants and so on has in fact tended to make those boys better cultivators?—I am afraid not, for the simple reason that the first attempt to teach agriculture in a school in the Punjab was not made till about 1920, and there has not been time to test the system. At Home there is a great deal more attention now being paid to the teaching of nature study in our schools, and the general opinion is that it has had an effect both in making the pupil more intelligent and in making him take more interest in agriculture.

63. You think that is the general opinion at Home?—I think so.

64. Of course this problem of keeping the rural population on the soil is not merely an Indian problem, is it?—I think the problem is world-wide.

65. Would you agree with me that the two main impediments to the movement of the rural population towards the towns are bad communications and lack of education?—Yes, I should think so.

66. So we are really faced with this difficulty, that, while both communications and education must be improved for the sake of agriculture, that very improvement is going to increase the tendency to leave the rural areas and

go towards the towns?—On the other hand, I think it is possible to raise at the same time both the standard of education and the standard of living in the villages; that would tend to prevent the villager from deserting his village.

67. So as to increase the attractions of a rural life?—Yes, by improving sanitation for example.

68. Would the bettering of the economic prospects of the cultivator not do more to stop the drift towards the towns than even an agricultural bias in elementary education? Is it not really a question of economic opportunity? —I think it is largely that, perhaps; but on the other hand, land-owners, who have land in the villages, prefer to live in idleness in the towns. They are not doing any work and are not earning any money there: they live in towns for the reason that they know they can enjoy there a higher standard of living.

69. It is not merely a question of rupees; it is a matter too of amenities, of amusements, is it not?—Yes, the amenities of life are very much better in the towns than in the villages.

70. There is one passage in the paper which you have provided for the Commission, in which you say on page 22 that there is at present a hiatus between the primary schools and the agricultural middle schools being started on Government farms. I do not quite understand those words?—What I meant was this; nature study is taught in primary schools to boys of from 6 to 10 years of age. These boys were not allowed to join our special vocational schools in the Central Provinces till they were 14 or 15 years of age. From the ages of 10 to 14 there was thus a break in our scheme of rural education.

71. I understand, thank you. Now as regards secondary education: And here again I shall have many questions to ask you when you come before us again, as I hope you may, after our provincial tours. I should like to know from you whether you think that the cultivator to-day is more inclined to encourage his son to undertake agricultural education than he was when you first knew him?—I think he is. When our agricultural colleges were opened, we had much more difficulty in getting suitable students than we have at the present time. I think that applies to most of the agricultural colleges in India. There are more applications for admission now-a-days than there used to be, which seems to indicate that the course of training given is becoming more popular.

72. And as another test of the movements of public opinion, do you think that landholders are more apt to appreciate the value of engaging a manager who has had sufficient agricultural training than they used to be?—Not to any great extent. I do not think the land-owners have as yet wakened up very much to the importance of having trained men as managers.

73. May not that be due to the fact that candidates for such employment lack experience in management?—Yes, it is partly that. A landowner sometimes employs a man fresh from the college who has had no practical experience; in many cases such men though they may have taken a degree or a diploma in agriculture have not, owing to lack of experience, proved satisfactory as farm or estate managers.

74. Are the after-careers of boys who have passed through the secondary schools charted? Are they recorded by way of discovering what proportion of those boys have turned to farming?—You mean by the Education Department?

75. Or by the institutions themselves? Are the figures available?— I notice that in the report on the working of the Bombay Department of Agriculture, the Director states how many of his students have returned to the land.

76. Well, that is as regards a particular institution. But I think you will agree that an exact test by means of after-careers is very important. An exact test of what the future of those boys who undertake agricultural edu-

cation proves to be is very important?—We know fairly well what has happened to all the men we have trained at Pusa: they have nearly all gone to the Provinces and hold appointments in the Agricultural Departments thereof.

77. That is a very different thing from knowing from what has happened to boys who have passed through the middle schools and so on?—In his annual report on the working of the Department of Agriculture, the Director of Agriculture in the Bombay Presidency states how many of the students trained at the Loni and other vocational agricultural schools have gone back to the land.

78. How about the proportion of the total funds available for education which is being expended on the attainment of literacy as compared with that which is being spent on secondary education and higher education? Do you follow my point?—Well, I am not sure whether you mean by secondary education, secondary education in agriculture or education of a purely literary type.

79. I should say general?—The amount spent on agricultural education is quite insignificant. There has been no attempt to teach agriculture in schools, except on a very very small scale. They have about 60 schools in the Punjab, over 40 in the Bombay Presidency, and a few in the United Provinces. They have 6 special vocational agricultural schools in the Bombay Presidency. The total cost of running these schools is very small. The percentage of the total expenditure on education spent on these different forms of agricultural education is probably a fraction of one per cent.

80. As regards the question of general education, the percentage of literates in the total population is very low, is it not?—The percentage of the population which is literate is very low. It varies from Province to Province. Over 90 per cent. are illiterate, I believe.

81. I will not take you further in that matter because it is of course the concern immediately of another department. But as you have touched on the question, I wanted to know whether in your view the best possible was being done to teach the three R's to school children in rural areas. Apparently your view is that the best is being done, considering the difficulties?—Yes, I think so. But I think we should provide more money for nature study in primary schools and for the teaching of agriculture in vernacular middle schools in rural areas.

82. Then you turn to demonstration and propaganda. Without demonstration and propaganda, the results achieved by research workers cannot be placed at the disposal of the cultivator?—That is so.

83. Do demonstrators, as such, suggest to research workers lines which might prove profitable for investigation?—Yes, they do so. The Deputy Director very often makes suggestions to the Chemist, to the Plant Breeder, to the Entomologist and other specialists.

84. Do you think full use is made by research workers of the opportunity of getting into touch with actual problems through demonstrators, getting into touch with problems that require attention?—I think so. Research workers visit Government experimental farms in their Province and come to know what agricultural problems there are in the different tracts. They sometimes tour in the districts too, when they find time.

85. So you think there is sufficient touch between workers who are concerned with research and those who are concerned with demonstration?—I think so. It is the duty of the Director to see that they work together.

86. You say that agricultural improvement should only be recommended after it has been thoroughly tested on the Government farm or farms. Is it your experience that the cultivator of India is a very cautious person? Do you think him over-conservative?—I do not think so. A good many landowners are quite willing to try experiments. If you once mislead them they are disheartened. You have got to be very careful not to make the mistake of giving them wrong advice.

87. The man of very small resources is inevitably disinclined to make risky experiments?—As a rule we do not expect them to do so. We get the bigger men to try out the improved seed. Then the bigger man, having satisfied himself that it is superior to the local varieties, propagates it and hands it on to smaller men. In the early days of the Department officers who were anxious to produce rapid results, sometimes gave out seed of strains or varieties which had not been very thoroughly tested. In the year in which I came out to the Central Provinces a very large quantity of seed of a variety of cotton called *bani*, a fine stapled cotton, was given out by the department to cultivators. It gave a very much smaller yield than the varieties commonly grown and gave the cultivator a very much smaller profit, but these facts were not seriously considered before the seed was distributed.

88. To the cultivator deeply in debt, the possibility of a slight increase in returns is not, I suppose, a great attraction when you are endeavouring to persuade him to sow an improved seed?—That is so. If he does not get an increase of at least 10 per cent. he does not even notice it.

89. It really means nothing to him?—It does not mean anything, because he is probably paying 20 per cent. or even 30 per cent. interest on borrowed money. On the other hand, approved seed does not cost him anything more than ordinary seed, as a rule.

90. So that still less would he be inclined to make experiments when he has to pay rather extra for the material?—Yes, if he has to pay more, but I think the Departments of Agriculture charge as a rule only a very very small premium, if any, for improved seeds.

91. What form of demonstration do you think most effective in persuading the cultivators to adopt an improved seed?—The most effective form is that by which you get the cultivator to adopt the improvement in his own village and on his own land. In the case of an improved strain of seed, for example, he cultivates the land with his own implements, and grows the improved seed under ordinary village conditions. He sees that when it is grown under ordinary conditions even, it produces an increased yield.

92. On what terms is that class of demonstration carried out? On what arrangement between the department and the cultivator in question is demonstration on that plan carried out? Do I understand that there is something in the nature of a partnership between the department and the cultivator during the period of demonstration?—Only in so far as the seed is supplied by the Department. The Department gives out the quantity of improved seed required to sow a definite number of acres. The cultivator propagates the seed and distributes it among other cultivators in the village.

93. If it happens that he has suffered loss as a consequence of sowing the seed recommended by the department, the cultivator himself would have to bear the loss?—In the Central Provinces, we guaranteed our seed growers against loss when we first gave out improved cotton seed, but we never had to compensate them as they never suffered any loss.

94. You point out the importance of co-operation by the department with the District Officer, with the officials of the Irrigation, Co-operative and Veterinary Departments and no doubt you would also add the Forest Department? Would that arise in this context?—I think I would, but we do not find it quite so necessary to co-operate with the Forest Department. We do not seem to have so much in common with that department as with the other three mentioned.

95. I should like to pursue that matter at this stage a little further. Do you mean that the lack of touch with the Forest Department is general?—No. I think not. The Chief Conservator of Forests was a member of our Board of Agriculture in the Central Provinces. At our meetings forest management in its relation to agriculture was sometimes discussed, but the two departments have, as yet, relatively few interests which are common to both.

96. Do you ever make representations as a department to other departments on behalf of cultivators in any particular district?—Very often to the Irrigation Department with regard to irrigation questions.

97. No doubt that obtains between departments in the Provinces as well?—I think so.

98. What is your opinion as an officer of the Agricultural Service on this point? Do you think that there is a sufficient knowledge amongst officers of the Forest Department of the opportunities which their Service has in assisting the agriculturist and cultivator?—I think the Forest Department is assisting the cultivator as far as it can. I have always found the officers of the Forest Department very reasonable in their attitude towards the cultivator.

99. You do not suggest that there is any aloofness or lack of, shall I say, combination or co-ordination between the departments?—I think that there may be in some Provinces, probably, but, where they have what they call a Provincial Board of Agriculture, there is a good deal of co-ordination.

100. Is it your experience that landlords generally in India play their part in advancing the cause of progressive agriculture?—I do not think they play their part well. In the Central Provinces, the smaller land-owners who are men owning anything from 40 to 200 acres co-operated with us a great deal in measures for helping the smaller cultivators. The bigger land-owners take very little interest in the practical side of agriculture.

101. Among European countries the landlords have done a great deal?—I have stated that in one of my replies, that the great development in farming in England in the 18th Century was largely due to men like Bates, Bakewell and Townshend, who were gentlemen farmers.

102. In ryotwari districts there are no landlords, strictly speaking? Who stands as landlord in the ryotwari districts?—The *patel* who is the headman of the village, corresponds to the landlord.

103. You do not think Government stands as the landowner?—The *patel* represents the Government, in a way. He collects the rents for Government and gets a certain rate of commission. He has, as a rule, a fairly big area of land in the village.

104. Do you think that in what Government has done for cultivators in ryotwari districts it has shown an example to landlords in other districts?—I have not had sufficient experience but I know that in Berar, where we have the ryotwari system, the standard of cultivation is very much higher than it is in the Central Provinces where we have the *malguzari* system.

105. I was interested in your statement that the publication of leaflets, bulletins and books, describing in simple non-technical language improvements advocated by the department, have in some Provinces stimulated interest in agricultural improvements. Remembering the extraordinarily small percentage of literacy amongst the rural population, I was a little surprised that you put so much emphasis on the value of leaflets?—It is a fact that in a village sometimes you find the schoolmaster or other literate person reading these bulletins to quite a crowd of cultivators who are illiterate.

106. Under the heading Administration, you say that the recruitment of Europeans has been stopped and the tendency in some Provinces at least is to stop recruitment of Indians from Provinces other than their own and that the field of selection is thus being narrowed, and the standard of efficiency lowered. Is it possible to support that view by any facts?—I think so. Quite a number of posts which were held in the past by very able and experienced officers are now held by men who have been promoted from the Provincial Service. The latter have not had anything like the training that the men who previously held these posts had had. You will find that quite a number of posts in the Imperial Service are held by such men who have been promoted from the Provincial Service.

107. And you think that this tendency that the Provinces are showing to limit recruitment for their Services to the inhabitants of the Province is likely seriously to affect the efficiency of the services?—I certainly think it is likely to do so.

108. I suppose that the position is, for instance, as regards the higher research positions, that there are very few first-class men available, and you

have to pick them where you find them?—Yes. If we have a wide field to draw from, we are likely to get good men. If we have to recruit the men from the Province to which they belong we are restricted to a very narrow field of selection.

109. Then you make the proposal, in order to strengthen the Agricultural Department and in order to give the Hon'ble Member in charge of the portfolio of Education, Health and Lands more time for the administration of the Department of Agriculture, that it is desirable to relieve him of some of the subjects for which he is held responsible at present. You do not say how you propose that the subjects which will be discarded if your suggestion is accepted should be administered. What do you think should be done with them?—They might be attached to the portfolios of existing Members.

110. You do not think your proposal necessarily involves the creation of a new portfolio?—I did not have that in my mind. I wanted to relieve the present Member of some of the subjects for which he is at present responsible. I know he is a very hard-worked man; and if we are going to advance agriculture and give more attention to its development from the top, that is from the Government of India point of view, the Hon'ble Member and Secretary concerned should have more time to devote to agriculture.

111. Then you turn to the Meteorological Department and you point out the possibilities of development for that department. I should like to know whether it is your view, remembering the stringency of the times, that that is a direction in which further expenditure would be immediately justifiable?—I think, it would. If money can be found, I think we should make a start. The Head of Meteorological Department has suggested that one Imperial Service Officer and a certain number of assistants should be appointed for agri-meteorological work; the cost would be very small.

112. Do you think anything more could be done than is being done at present to place the material provided by the department at present before cultivators?—I think something could be done, but at the present he has got no staff for looking at problems relating to agriculture.

113. Then you turn to finance, and you say that some of the best authorities hold that banking in rural areas should be expanded by the development of co-operative credit and by the recognition of the indigenous banking system in India, and its adaptation so far as possible to modern banking conditions, rather than by its supersession by joint-stock banks manged on Western lines. I am not sure exactly what you mean by the words "the recognition of the indigenous banking system in India and its adaptation so far as possible."?—I mean that instead of introducing joint-stock banks as we understand them, we should base the system on the existing Indian system of banking.

114. I thought that was what you meant. Have you tried to work out a scheme?—No, I have not given it sufficient consideration.

115. I was interested to see that you attach importance to the cinema (page 10 under the heading of Fragmentation of Holdings) for purpose of persuading cultivators of the disabilities from which they suffer as a result of excessive fragmentation. Have you had a good deal of experience of propaganda by means of films?—I have had a little. We have got a cinema camera at Pusa and we have been preparing films for some time.

116. It is not an easy matter to prepare films, is it?—It is very difficult. We have not got trained people to do the acting. The G. I. P. Railway Company have prepared some very good films, and they are getting a special man out from Home for cinematograph work.

117. Have you ever yourself been present when the films were being shown to a purely rural audience?—Yes.

118. Did they appear to follow the points?—I think so, or at least they seemed to laugh heartily at certain pictures.

119. At the right places?—Yes, and I believe the G. I. P. Railway Company have had audiences of 30,000.

120. Such a thing had never entered my mind before, but it was suggested to me by someone who ought to know that some of the backward peoples found great difficulty in appreciating cinema films because of their inability to understand an illustration presented in two dimensions, that is to say that they are so unaccustomed to seeing photographs or pictures that a good many of them did not grasp what was being put on to the screen. Do you think that is likely?—Not likely in the case of a moving picture. When they see the movements, then they cannot help understanding.

121. The suggestion was made to me by someone who knew India so well that I paid attention to it. Do you not think that the cinema offers a wonderful opportunity of bringing home certain facts to a population largely illiterate?—I think it does. For that reason I am very keen on making full use of it.

122. I am sure the present staff at Pusa does its best to fill the bill, but may it not be that the moment has come when you might consider the desirability of initiating a small branch concerned with the preparation of cinema films for demonstration and propaganda purposes?—We have been considering that, but I think that the Railway Company I have mentioned is prepared to do the work. As we experience great difficulty in getting money out of Government for such purposes, I think we had better leave our film work to this Railway Company. They propose getting a special man out from Home for this class of work.

123. If the cinema is going to prove one of the most important engines of education in agricultural matters, do you really suggest that you should leave a job like that to the railways?—I am very much against it, but it is very very difficult at present to get money for such objects.

The Commission then adjourned till 10-30 a.m. on Wednesday, the 13th October, 1926.

सत्यमेव जयते

Wednesday, October 13th, 1926.

SIMLA.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Raja Sri KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Dr. D. CLOUSTON, M.A., D.Sc., C.I.E., Agricultural Adviser to the Government of India.

Further Oral Evidence.

124. *The Chairman:* I will now turn to Question 9, under the heading Soils. Has there been a systematic soil survey of British India?—Soil surveys have been carried out in certain Provinces, but not in all.

125. Do you advocate a systematic soil survey of the whole of the area?—I think it would be useful. At present we have not got the men to carry it out.

126. Is it a very expensive operation?—It would probably mean that each Province would require a chemist for that special piece of work.

127. How long do you think it would take to carry out a soil survey of the whole of British India?—I am afraid I could not tell you. A chemist would be in a better position to do so. I think it would take some years to carry out such a survey in a single Province.

128. A word about your proof under the heading of fertilisers: Are the results of experiments carried out in Europe a reliable indication of what may be expected to be the results of the employment of manures under Indian conditions?—I think not, for the reason that soils in Europe are more deficient in phosphates than soils in India. A good deal of the manure applied in Europe is manure containing phosphate in some form or other The manure we require for India is manure containing nitrogen principally

129. And as regards nitrogen, is the sunlight factor in India very important as compared with the sunlight factor in Europe?—I think not.

130. You do not think the natural regeneration is more active in tropical countries than in Europe?—I think that in India the nitrates are washed out of the soil to a greater extent than in Europe. You have the optimum conditions for nitrification and there is a greater loss of nitrates.

131. So that, water apart, in your view, the absence of nitrogen is the principal limiting factor in India?—I think so. There are certain soils that are deficient in phosphates, but the area is comparatively small as compared with the area that is deficient in nitrates.

132. Has the short season available for ripening an important bearing on manurial questions in India?—It has a very important bearing; the

manure is wasted in the case of crops grown in the monsoon if they do not get the manure at the right time. It is washed down into the subsoil, beyond reach of the roots of the plant.

133. And how about the tendency of nitrogenous fertilisers to delay ripening? Has that been found by experience to be an important factor?—I do not think it is very important in India. It does delay ripening slightly, but not to any appreciable extent.

134. You have no hesitation on that account in recommending nitrogenous fertilisers to cultivators?—None.

135. Do you think sufficient basis of experiment exists for firm recommendations to cultivators in the matter of fertilisers?—I think so. In certain Provinces they have been carrying out experiments with fertilisers for several years and they have got results on which they can rely. In Bombay they have been using sulphate of ammonia for many years as a manure for cane They are now using it on a fairly large scale there; I believe that over two thousand tons of sulphate of ammonia were sold to the cultivators last year in that Presidency. The planters in North Bihar have been experimenting with nitrate of soda and sulphate of ammonia for many years too, and are now using much more than formerly. In Madras also they are using fish manure, and oil-cakes, etc., on a much larger scale than formerly.

136. It is not your view that there is a large field of inquiry open to research institutions in the matter of fertilisers?—I think that more experiments should have been carried out in the Provinces; the excuse is that they have not had an adequate staff, nor the money required for experiment on a large scale.

137. Are you carrying out important experiments at Pusa in this matter at the present moment?—We are conducting series of manurial experiments both on wheat and sugarcane.

138. Are you satisfied with the scope of the experiments being carried on at Pusa on this question?—I think we might have done more; but we have started some new provincial experiments within the last year.

139. Is night-soil a very important potential source of fertilising material?—I do not think it is very important for the reason that the quantity available is very small and always will be small.

140. Prejudice apart, need it be small?—In the bigger towns, they are using incinerators and there is little or no poudrette made; but I think they could conserve a much larger quantity of it than they do in smaller towns.

141. Are you familiar with the work being carried on by Mr. Fowler at the present time?—No, I am afraid I have not seen the work he is doing.

142. Do you agree that this question might assume very important proportions if large quantities of treated night-soil were at the disposal of cultivators?—You mean in the villages?

143. Yes?—I do not really know that there is much scope for extending its use.

144. Is it not possible that export of prepared material from the large areas of population to rural areas might take place?—Yes, but the quantity would be very small.

145. The argument as to whether there is a progressive decline in the fertility of the soil in India is one which is perennial. You express the view that there is no progressive decline, speaking in general terms, taking place at this moment, except possibly in phosphates in certain areas?—Yes, and except in areas where the soil is of a virgin nature, the fertility is gradually decreasing. But most of the area under cultivation in India has been under cultivation for hundreds of years and had reached its maximum state of impoverishment many years ago.

146. I notice that in several of the papers placed before the Commission it is deplored that there are no body of persons trading in India in the position of seed merchants such as we have in Europe. Is that the case,

that there are no seed merchants?—I think that is the case. The owners of the seed farms which we have in the Provinces are seed merchants in a sense; for they propagate and sell seed. The difference between them and seedsmen at home is that they do nothing to improve the seed. They merely propagate on their farms improved seed supplied by Government.

147. Do you think it might be possible to encourage the starting in business of seedsmen in India?—I think it would certainly be advisable to encourage it and I think the time will come when some of our students who have been trained at our agricultural colleges will set up as seedsmen like Garton and Sutton at Home.

148. Now I will turn to your answer on the question of damage by wild animals. Has this question received a great deal of attention in your department?—No, I think it has not. It is very important. We discussed it last year at our meeting of the Board of Agriculture and made certain recommendations which are now before the Government of India.

149. Is a very important proportion of the total damage done by wild animals brought about by wild pigs?—I think the wild pig probably does more damage than any other animal.

150. Are domestic pigs kept in rural areas to any important extent?—They are kept in the villages where there is a fairly large population of low caste people; they do not do much damage, because they are under control.

151. That was not in my mind. What I was going to ask you was whether (I am fully aware of the dangerous nature of the suggestion) the possibility of introducing some disease specific to the pig had been considered?—That has been considered and at our meeting of the Board, one of the recommendations was to the effect that an officer should be put on special duty to study the habits of the pig and to find out, if possible, some disease which, if introduced, would kill them off.

152. Was that a recommendation or has an appointment actually been made?—A recommendation was made at the last meeting of the Board of Agriculture that a man should be put on special duty to study the habits of the pig with a view to finding out ways and means for reducing their number.

153. The pig is a hardy animal and is not likely to be killed by resolutions. Do you think that active steps are likely to be taken?—Certain diseases have killed off a great many of our wild animals. The wild buffalo, for instance, suffers from rinderpest.

154. Plainly, the practicability of such a suggestion rests upon the assumption that the domestic animals of the same kind and liable to the same disease are not present in important numbers?—Yes.

155. Now, on page 13 of your note you refer to cultivation. You say that scant attention is paid in many parts to rotation of crops. Is that through ignorance or improvidence, in the main?—You may call it improvidence, but it is due to the fact that the cultivator thinks that by growing the same crop year after year he can make more money than he can by rotating it with another crop that brings in less return.

156. You see the point of my question: Does he at the back of his mind know as well as you know the value of rotation?—I think he does.

157. So that it is due to improvidence?—He does not foresee the fact that by growing the same crop in a certain field year after year he may bring on disease. He learns that by experience.

158. Might not heavy indebtedness have an influence on his mind in this matter?—It may but I had in mind the cultivators in Berar where the well-to-do people grow cotton year after year without rotating it with another crop.

159. In many of the memoranda before the Commission the importance of an improved system of dry cultivation has been emphasised. Do you think that an ideal system of dry cultivation may solve the problem of the

seasonal unemployment in rural areas? In other words, do you think that the increased amount of work required to meet the needs of an ideal dry cultivation might afford a substantial increase in the amount of labour required in what is at present the slack season?—It would add considerably to the amount of labour required, but at the present time the difficulty is that there are no implements suitable for dry cultivation.

160. A great deal of material has been put before the Commission in the matter of tillage implements. I should like to ask you one question. Do you think that any important improvement is possible without improved bullock-power?—Yes, I think improvement is possible; a good many of our improved ploughs are really lighter in draught than the *deshi* ploughs. An efficient plough is light in draught. If we could introduce on a large scale an efficient plough like the *sabul*, it would be very advantageous because it goes to a greater depth than the heavier *deshi* ploughs used in the Deccan and it can be drawn by a pair of good bullocks as a rule, whereas the heavy *deshi* plough capable of doing the same class of work requires two pairs.

161. I suppose turning of the sod is not necessary in India to kill the weeds?—The great thing is to expose the roots of the weeds to the sun.

162. Is it, then, the price which in the main prevents the cultivator from purchasing and using a better implement?—I think it is partly the price and partly the fact that most of the improved implements recommended are not entirely suitable for Indian conditions.

163. How do you account for the fact that someone in India does not come forward and supply this demand? Does it not offer an immense opportunity commercially?—We have the firm of Kirloskar Brothers in Bombay, who have manufactured and sold about 150,000 agricultural implements including over 100,000 ploughs since they started their business.

164. How long ago was that?—They started, I believe, about 1890, so they have been working for a long time. Other firms say that there is no big demand at present for agricultural implements and it does not pay them to manufacture them on a large scale, as they cannot rely on finding a market for them. In other words, there is no proper organisation for the sale of agricultural implements in India at present.

165. Do you think that improved communications will expedite the change to better implements?—I think so, and we might get Railways to reduce the freight on implements too.

166. You agree, I see, that the improvement of cattle in India is one of the most important questions on the agricultural horizon?—I think it is.

167. I now turn to page 15 of your memorandum, Animal Husbandry. Do you believe in the soundness of the present arrangement according to which cattle improvement and dairying come under the Department of Agriculture while veterinary matters alone come under the Veterinary Service?—Yes, I do believe in it; you cannot with advantage divorce cattle breeding from arable cultivation and the production of fodder crops. The raising of foodstuffs is very much more important than the disease side in cattle breeding in India.

168. Having regard to the generally accepted importance of an improvement in the breeds of cattle in India, is it your view that sufficient stimulus is likely to be imparted to the attempt to improve cattle in India under the present arrangement? Do you think that the matter is to-day receiving the attention it deserves?—I think it is not. We have, as a Board of Agriculture, put up recommendations time after time with respect to cattle improvement, but some of these recommendations have not yet been given effect to. For instance, some of the Provinces have not as yet got cattle experts, and until a Province employs an expert, I do not think that it can do justice to this big question.

169. Would you have this expert under the Department of Agriculture?—Yes.

170. Would you not have the Veterinary Service under that officer?—I do not think it really matters much. I think the present arrangement by which the Veterinary Adviser deals direct with his Government in the Province is probably all right.

171. Do you think that the lessening of the incidence of disease is likely to prove one of the most important factors in the improvement of the breeds of cattle in India because of its effect upon the minds of those who may be considering expenditure in an attempt to improve breeds?—I do not think it is so very important.

172. Do you think a man is prepared to invest his money to improve the breeds of cattle in India as readily when he knows that the whole of his cattle may be swept away by disease as he would if reasonable immunity and security were provided?—I think reasonable immunity is already provided. The disease which carries away most of the cattle in India is rinderpest, and by the simultaneous method of inoculation we can give permanent immunity. On Government farms where cattle are immunised against rinderpest we lose very few cattle from disease.

173. No doubt this simultaneous method of inoculation is proving extraordinarily satisfactory, but is its administration satisfactory?—It has proved satisfactory, as far as I know, in the Provinces in which it has been tried. They tried it in Madras and Mysore State.

174. It is a question of degree?—But you have not got the staff in the Provinces to carry it out on a large scale. That is the obstacle to progress.

175. At the moment, the breeding problem is in the hands of the Agricultural Department?—Not in all Provinces. In the Punjab it is in the hands of the Veterinary Department.

176. I mean as regards Imperial centres?—We get our cattle on Imperial cattle-breeding farms inoculated by our Muktesar staff.

177. What I am going to ask you is this. Do you agree that heredity is one of the most important factors in resistance to disease?—Yes, I believe it has a good deal to do with it.

178. I see that you are of opinion that further attention might well be given to fruit growing and horticultural matters generally?—Yes.

179. Do you think that is likely to grow into something important in India?—I think there is great scope for developing the fruit industry, but very, very little has been done up to date in that direction.

180. And yet expenditure in this direction would appear from the material placed before the Commission to be a good investment?—I think so. After seeing the Tarnab farm in the North-West Frontier Province, I think you will agree that under expert supervision a great deal could be done to promote fruit-growing in this country.

181. Now I come to a very different subject. You have referred the Commission to another note in which you have given your views as to forestry and agriculture in India. I want to ask you this question. Do you recommend the uniform enforcement of the higher scale of grazing rate as a means of eliminating from the grazing in the forests the poorer beasts who are not in a position physically to get advantage from the grazing in the forests?—I would rather not offer an opinion on that point.

182. Then we come to the section of your memorandum on Marketing, and I think you will agree with me that it is idle to proceed to attempt an analysis of the marketing system at present in vogue in India until facts and figures are before us?—Yes.

183. Apparently those facts and figures have never yet been ascertained; is that the position?—I believe it is the position, but I have written to the Local Governments on the subject and have asked them to give special attention to the points raised by you in your questionnaire; they are, I take it, collecting the information now and will have it ready by the time they get the questionnaire.

184. When we get those materials we may find it possible, I do not say we shall find it possible, to build up and analyse the price structure and make some appreciation of the cash aspect of marketing?—Yes.

185. Do you think the producer of the raw material is getting his fair share of the good things of the world, not only in India but all over the world to-day?—I think not.

186. Compared with industrial organisations, farming in the nature of things is an industry carried on by small units?—Yes, it is.

187. And in these days you find the purchasers of raw material acting in large combinations, highly efficient and highly organised. It is extremely difficult, is it not, to get cultivators to combine adequately and sufficiently for the purpose of protecting their interests when they are selling their produce?—It is very difficult, and the middlemen put difficulties in the way of Government starting any such organisation.

188. And it is no use combining the more efficient units, the larger farmers, the more wealthy cultivators, if the smaller man remains unorganised, because the produce placed on the market by the small man breaks the market in spite of the organisation of the more important farmers?—Yes, quite; but Government can establish markets and the smaller man as well as the bigger man can take advantage of these markets. I refer to markets such as the open cotton markets in Berar.

189. But to turn again to the general aspect of things, it remains true that the producer of the essential raw materials, if he realised his power and could be brought to combine, is in a very strong position, does it not? If he could be brought into adequate combination to protect his interest he would be in a very strong position. Do you think his failure to get his fair share of the wealth of the world to-day may be one of the factors tending to rural depopulation, to the drift of population from rural centres to industrial and urban areas?—I do not think we have reason to complain of rural depopulation in India or of any great drift of population from rural to urban areas.

190. But you are at an earlier stage, if I may say so. Do you not think the difficulty of keeping the educated sons of cultivators in their villages is the first sign of what is likely to be a growing tendency to move from the rural area and from the business of cultivation towards the towns and towards industrial employment?—No, I think it is due rather to the fact that agriculture as an industry is not looked on as an industry suitable for educated men in India.

191. You do not think the movement is due to economic causes?—I do not think so.

191A. Where combination between cultivators has not been achieved by co-operation, is an alternative market an important consideration?—I think so.

192. Does the provision of alternative markets in India depend very largely upon the improvement of communications?—Yes; it does, I think.

193. On Question 24, Attracting Capital, advertisement goes for a good deal in these matters. Do you think there has been a quickening of interest in agricultural matters since the Reforms of 1919?—I do not think so. There has been a quickening of interest within the last five or six months.

194. Are you paying us a compliment?—This interest is partly due to the fact that we have this Royal Commission no doubt, but it is due to a greater extent to the fact that our new Viceroy is taking a personal interest in agriculture. That, I think, is the main cause.

195. I want to ask you whether you think that discussions in the legislative bodies have quickened public interest?—Not in the Central Provinces most certainly, where I was Director. Discussions relating to agriculture generally took place when our annual Budget was under consideration; the members of the Council sometimes cut it down despite the fact that Government was quite prepared to sanction it. They were only interested, in other words, in keeping down expenditure.

196. I was concerned not with the attitude of members but rather with the effect of their words on persons outside?—I do not think our Legislative Councils have as yet taken much interest in agriculture. In our Councils we have very few members who do.

197. Now on your answer to the question about the welfare of the rural population, does much remain of the indigenous village organisation which must, I suppose, have existed in India as in other Oriental countries?—I think something still remains, but there have been great changes.

198. Would it be advisable to strengthen the village organisation or the village unit?—You mean, to have panchayets?

199. I do?—They have done a good deal in some Provinces, I think, to resuscitate the panchayet system. They have put a man on special duty I notice in the Central Provinces to organise such panchayets.

200. Do you think that is a wise endeavour?—I think it is very wise.

201. Now on quite a different matter, statistics show that the population of British India has tended to rise at least as rapidly as the productivity of the soil and the total wealth produced by cultivators has tended to increase?—Yes, that is so.

202. And if every increase in fertility and in the output of agricultural produce is met by an increase in the population is there likely to be any raising of the standard of living?—I do not think there really can be much, unless some form of birth control is practised.

203. Very early marriage of course is another cause, is it not?—Yes, that is the main cause.

204. Do you think that the spread of education is likely to have any effect in checking the rising birth rate?—I think it should.

205. Am I right in thinking that the Imperial Department is responsible for agricultural questions and for the administration of agricultural matters in the small isolated administrative units such as Coorg and Ajmer-Merwara?—I am afraid they seldom ask us for assistance. We have given a good deal of assistance to the Department in the North-West Frontier Province.

206. They have no provincial organisation, naturally?—No, but in the North-West Frontier Province they do have a small department.

207. Do you suggest that you should wait till they ask before you give?—We are not supposed to offer our services except through the Political Department.

208. I do not suggest any lapse of duty of course, but I was wondering whether in your view the cultivators in these areas were receiving the same attention as the cultivators in other areas?—No, I do not think they are.

209. Do you feel yourself that you and your department are having placed before you the results of research work in other countries, particularly in the Empire outside British India?—We get all their publications. We have a very large library at Pusa and we get publications from all parts of the Empire as well as from countries outside the Empire.

210. You do not think that anything more has to be done in the way of inter-communication?—I do not think so.

211. If I might take you back for one moment, I forgot to ask you, but it strikes me very forcibly that there is no Department of Agricultural Economy at Pusa. Why is that?—We have not felt the need of it up to date; but we have this year appointed an Agronomist.

212. Do you attempt to carry out systems of costings?—I am afraid we have not given much attention to costings up to date.

213. Do you agree with me that costings are coming to be regarded as one of the most important factors in progressive agriculture?—Yes; it should be very important in the Provinces, but Pusa is a research station. The receipts there are very, very small, needless to say; we are spending money on research but are getting very little back.

214. That is an explanation of why you cannot afford another department?—There is less material, I mean, at Pusa, than in the Provinces for the study of rural economics.

215. Is it your view that there is no scope for a department of this nature, a department of agricultural economy at Pusa?—If the Provinces desired it there would be room. I should like to point out however that the Provinces do not come to the Imperial Department for help to the same extent as they used to do.

216. Is that in part due to the fact that the central department does not provide them with that which they require?—No. It is largely due to the fact that provincial departments are now more or less self-contained, and require less assistance from Pusa.

217. One last question on a rather different matter: Do you think it would be to the advantage of agriculture if factories could be established in rural areas rather than that new factories should all be congregated in the present industrial districts?—I think it would. It would supply labour for the surplus population. We already have a certain number of factories in rural areas which provide labour for a good many thousands of people.

218. Have you ever considered the possibility of the development of hydro-electrical schemes on a large scale in relation to this question?—I think that little has been done in that direction in India. They are considering it, I believe, in the United Provinces. There has been nothing done up to date, as far as I know.

219. Do you happen to know who in the Government of India could tell us about hydro-electric possibilities?—The man who would be able to tell you is Mr. Harris who will be giving evidence this week.

220. There used to be an officer responsible for hydro-electric schemes, at any rate for hydro-electric surveys: I understand that has been discontinued?—Yes, I think Mr. Harris is responsible at the present time.

221. But you feel that future developments of this sort might have a most important bearing on agriculture generally?—It might well be.

222. *Dr. Hyder:* In regard to this question of research and co-ordination of agricultural activity, I ask you whether there is any research at present being carried on in the Provinces?—There is a good deal of research being carried on in the Provinces at present.

223. So there are research institutes under the Central Government and also in the Provinces?—Yes, that is so.

224. You think you require co-ordination between these different institutes?—I do.

225. What is your agency? How do you propose to give effect to this idea?—I propose to have an Advisory Council, the members of which would be appointed by the Government of India acting in consultation with Provincial Governments. This Advisory Council would make recommendations regarding schemes of work to be taken up. The Council would get these schemes of work carried out through committees appointed *ad hoc* as we have appointed a Cotton Committee to carry out work in the improvement of cotton; separate Committees would have to be appointed for the improvement of different crops, such as tobacco, wheat, sugarcane, etc., and the Government of India would have to find all the money required. The money would be spent in this way; the Advisory Council would make certain recommendations regarding research work to be done by its own staffs; it would probably advise that additional staff should be recruited. The Advisory Council would also give grants to provincial agricultural departments working on similar problems. As the Central Cotton Committee finances its own farms and finances as well the research work being done on cotton by provincial departments so would each committee of the Advisory Council allot grants both for the work done by its own men and for the work done by research workers in the Provinces.

226. And these workers would be under the control of the Provincial Governments or of the Central Government?—In some cases they would be

under the Central Government; in cases where the Central Government had its own station in a Province, the research workers of that station would be under the Central Government. On the other hand when, on the advice of the council, a man in a Province was deputed to work on a certain problem, he should remain under his Director of Agriculture, I think.

227. You do not think any conflicts will arise between the present provincial autonomy in certain transferred subjects and the idea of central control?—I do not think so, for the reason that we have had a good deal of experience in administering the Central Cotton Committee; there has been no friction. If the Council provided the money there would be no objection to its carrying on research work in the Provinces.

228. With regard to this Pusa Institute, it is a purely research institute, is it not?—Largely research.

229. It does no teaching?—We provide post-graduate courses and up to the present time we have been giving what we call short courses on special subjects.

230. With regard to the results obtained in this institute, how do you make it certain that these results are actually for the benefit of the cultivator? How do they get down, filter down?—What we do is this: when we evolve a wheat, for example, which we consider to be very good, we first test it at Pusa and then we supply seed to those Departments of Agriculture which are interested in wheat-growing. They test this wheat on their experimental farms. When they find that it is superior to their own they multiply it on their seed farms; and then from their seed farms it is given out to the cultivators. Pusa 4 and Pusa 12 wheat were given out in the first place to the Department of Agriculture in the United Provinces, the Punjab and Bihar and Orissa. The area under these two wheats is reckoned to be about 2 million acres; the Director of Agriculture in the United Provinces states that the area under Pusa wheat in that Province alone is between 600,000 and 700,000 acres.

231. Is it your view then that the organisation by means of which the results tested in the laboratories or in the fields at Pusa are actually brought down to the fields of the cultivators is adequate and complete?—No; I do not think it is quite satisfactory. If you have read over the memorandum submitted by the Cane-growing Expert at Coimbatore, you will have noticed that he states that the arrangement by which he gets his canes tested in the Provinces is not satisfactory. He says that in some Provinces they mix up the names and they cannot tell after a year whether the cane they have got is say Coimbatore 210 or Coimbatore 250; they lose the labels in short.

232. The point I have in mind is this: whether there is any gap between the cultivator and the provincial farm: that is, whether the results handed on by the central institute, say, at the provincial farm, do not filter down quite easily to the cultivators?—I think when they test the seed they hand it on to their private seed farmers.

233. Is there any return flow of information from the fields up to your experimental farms and then on to your central institute, so as to keep your research workers also alive to the needs of the cultivators?—Yes, there is; we get reports from the officers in the Provinces who try our improved seed.

234. But you have no agency of your own?—No.

235. Would you like to have some kind of agency, of the kind they have in America for instance; "extension service" or agents or county agents as they have in South Africa and other countries, people who are constantly travelling from the research institute right down to the fields and then come back with their ideas from the fields and hand them on to the research people?—You mean government officials?

236. Government officials or private agency?—Yes; we do want a staff, I think, to work in the Provinces. We cannot rely on getting our improvements introduced as fast as we would like them to be introduced so long as we have to rely entirely on provincial departments. They have their own

work to do; as it is they have far too much work and there is always a certain amount of jealousy, needless to say, between the Provinces and Pusa as pointed out by the gentleman who wrote the memorandum on the work being done at Coimbatore.

237. So that there is scope for co-ordination and extension there?—Great scope, I should say. You can see for yourself what progress we have made in that direction through the Indian Central Cotton Committee; since we started we have done a great deal for the improvement of cotton in the Provinces.

238. Now, coming to the question of education, why do you think that agricultural education does not make any headway in British India? I would ask you to confine your remarks to agricultural education in the primary stage?—You must remember that, though there has been much talk about agricultural education of late, there is no system of agricultural education widely adopted in India at present. They have done a little in the Punjab, and something has also been done in the United Provinces and Bombay; but very little has been attempted in the other Provinces.

239. Is there no demand for it?—The reason why little importance is attached to the teaching of nature study in primary schools is that many officers in the Education Department hold that the child is at school for a very few years only, and that there is no time to teach him anything but 3 R's. Agricultural education as given in vernacular middle schools is in its infancy.

240. Do you think that if an agricultural boy were given a certain bias in primary education, the agriculturists would like it or would they think that they know agriculture far better than any teacher teaching their boys in the primary schools?—That is my view, but I know there are a great many people who hold an opposite view. They say that you cannot give a boy a rural bias at this stage except by sacrificing the teaching of the 3 R's.

241. With regard to secondary education, where do you think these boys would be absorbed?—Do you mean the vernacular primary education? My idea of course is to get them back to the land.

242. You know that the unit of operation in India is small, say two or three or five or ten acres. Therefore, if a boy equipped with agricultural knowledge goes back to the land, do you think he will be satisfied with the life of his father, or do you think there will be scope enough for his work?—When trained, he is more likely to adopt a higher standard of cultivation. We should train him with a view to enabling him to make more money and to raise his standard of living.

243. With regard to your agricultural colleges, what do you think could be done with the boys who come out of these colleges?—As far as I know the men who have passed through our agricultural colleges have almost all got suitable employment.

244. What I mean is this. In the Agricultural Services, the number of officers who retire or die is much smaller than the number of men turned out by the various agricultural schools and colleges. Where do you think room could be found for these boys?—I think that big landowners could find employment for hundreds or even thousands of them. They are employing a certain number as it is, but in future, I believe, they will employ more men who have been trained at our colleges.

245. With regard to the question of drift from rural areas to towns, do you think this problem in India is the same as in England?—I do not think there is much drift.

246. At present people do come into the towns from rural areas, and the reason is chiefly economic?—Yes, they do go there to get work.

247. So that there is not enough work for all the people in rural areas?—Quite so.

248. There was a question put by the Chairman with regard to the lessening of disease. Do you think that if you lessen the disease it will improve

the breed or that it will simply preserve the number of the existing inefficient cattle?—I think what the Chairman meant was that there is no encouragement for a man to breed very valuable cattle when they are swept off by rinderpest or some such disease; I think that disease carries away the good as well as the bad. I do not think, however, that disease is a very serious problem on well-managed farms, for the reason that we can give our cattle immunity against the most virulent of all the diseases, namely rinderpest.

249. You will have to do something more to raise the quality of your cattle besides inoculation?—The percentage of mortality in Government farms is very, very small; it is only about one or two per cent. a year.

250. What are the difficulties in the way of raisers of agricultural produce in regard to combination? Why can they not combine when they market their produce? The purchasers have got their own organisations. Why cannot the producers combine in marketing their produce?—The difficulty is that you have got hundreds of thousands of isolated units who are more or less illiterate; they do not combine in marketing their produce. It is the duty of the Government, therefore, to get them to do it.

251. In order to perform that duty, the first essential then is there must be general education among such people, otherwise they will not be able to combine?—I think they will combine to a certain extent even without education. Education will tend to make them see the advantages of combination, but if you are going to wait for education, you may have to wait for ten or twenty years or for even a longer period.

252. Now, with regard to the business side of farming, you said in reply to the Chairman that there was no Department of Agricultural Economy. The prejudice against Pusa and against all researches carried on on Government farms is that they have got a very long purse, but what we want to see is whether their ideas are sound from a business point of view. Do you think there is need for some such department?—There is certainly need for some such department for India as a whole, but we have got the Auditors coming along every year, and there is very little chance of exceeding our expenditure.

253. That is not in my mind. What I have in mind is this, whether a certain idea which you have worked out in your laboratory and tested on your fields, appeals to the cultivator from the business point of view?—We have no means of testing our improvements. We have to rely on the Provinces to do that.

254. *Sir Thomas Middleton:* In reply to Dr. Hyder you outlined the type of organisation which you had in mind for securing co-ordination in scientific research in India. Now, I think it is obvious that at first some such organisation would be most useful. It follows closely the type of organisation that we have found useful in Great Britain. But I was going to ask you this question. Have you thought whether this type of organisation is likely to be permanently useful in India. Is it as a beginning or is it the permanent type of the organisation which you have in view for co-ordinating the Services?—I think it should be a permanent structure.

255. That is to say, the Government of India should be responsible for research and for financing research, leaving to the Provincial Governments mainly the duty of education. That is the general outline, is it not?—Yes, but the Provinces would also continue to do research as they are doing at present.

256. You have in view the strengthening of the research work in the Provinces just as much as in the stations directly under the Government of India?—We would supplement the work they are doing at present by giving them grants for work on special problems.

257. You refer in the précis of your evidence to the need for the establishment by the Government of India of certain additional research stations controlled by its own officers. I should like to have some more information as to the types of stations you have in view?—You must have noticed that

in the memorandum submitted by the Indian Sugar Producers' Association, they have pointed out that the Government of India should have its own stations for testing the canes evolved at Coimbatore. The Cane-breeding Expert at that station has pointed out the same thing. He says that he cannot always get his new canes tested properly in the Provinces, so what I have in mind is, in cane-growing Provinces such as the United Provinces, we might have at least one small station of say 10 to 20 acres where we could have our canes tested by our own men. We would hand on the cane seed to the local Department of Agriculture, the staff of which would arrange for its distribution.

258. I quite follow that the type of station you have in view is a station for a special crop or a special subject. In advocating these extensions had you in view another type of station, a station which instead of studying a particular crop or a particular subject, would deal with the problems of a locality, for example, the problems that arise in some new canal area? Did it occur to you that additional stations for the study of groups of problems might be required?—Do you mean irrigation problems?

259. The group of problems that might arise in, for example, a newly canalised area. One might instance the question of alkali, the need for studying the rotations suited for, and the crop pests in, the area, that is to say, the provision of a station serving a locality rather than a subject?—I think that stations of that kind would probably be very useful. The Board of Agriculture recommended in 1918, I think it was, that the Government of India should have stations for investigating irrigation problems. But the proposal was turned down: the Government of India held that the Provinces were now getting all the revenue from irrigation, and that the Government of India should not, therefore, find the money. The proposal was strongly supported by the Inspector General of Irrigation with the Government of India.

260. You agree with me that stations of that kind might be required?—I think so.

261. In reply to the Chairman yesterday, you indicated that research might benefit by being associated with education?—That is my own opinion, but a great many men in our department think quite differently.

262. You may agree with me that education would benefit to an even greater degree if associated with research?—Yes, I agree.

263. Is there any difference of opinion on that subject among those engaged in agricultural education?—I think not.

264. All are agreed that education benefits by association with research?—Yes.

265. Now, I am going to ask you this question. You have throughout the Provinces a number of higher institutions doing, as you indicate, in some cases, a certain amount of research. I am going to ask you if it would not be possible to associate with these teaching institutions the groups of problems of the second kind which I have just referred, namely those groups which apply to areas, leaving for the Government of India those special subjects which one might describe as All-India problems. You are probably familiar with the method by which this work is organised in Great Britain. We have our research stations or institutes as we call them there. We have also our provincial colleges which form advisory centres. You may know that the second group of problems to which I have referred are the questions which specially interest our provincial colleges in England. Have you been giving any thought in India to the possibility of directing the researches within the college areas to these general questions?—I do not think much has been done in that direction.

266. You have not reached that stage of organisation?—I do not think so.

267. You agree that a development in that direction would probably be useful for the college?—I think it probably would. If we had an All-India Advisory Council we might get it to allot funds for work to be done by the Provinces on these problems.

268. That brings me to another point. You say that the Government of India should allot the funds. Are you satisfied that the Government of India could always provide funds. May not the position arise in which a Province is better able to afford a special piece of work, which your Advisory Council might think it advisable to undertake, than the Central Government?—The Advisory Council would have to take all that into consideration of course. The Indian Central Cotton Committee refuses to give a grant to a Province for work on cotton, when that grant is required for work for which the Province itself should ordinarily provide funds.

269. That is your present method of dealing with grants. Is that method likely to lead to what we all desire, namely co-operation?—I think it is likely to do so.

270. Do you not agree that the thinking out of the financial relations between the Government of India and the Provinces on this particular subject of the allocation of research wants a good deal of attention?—We would have representatives of the Provinces on this All-India Advisory Council; they would have to be consulted.

271. You would deal with each question as it arises?—Yes, just as we do on the Indian Central Cotton Committee.

272. You would satisfy the representatives of the Provinces that your reason for refusal was simply that the Province was in a better position than you, as a central body, were, to supply the funds?—The Provinces would have to accept the decision of the majority of the Council as they already have to do in the case of similar questions brought before the Indian Central Cotton Committee.

273. There is one very small matter on quite a different subject on which I wanted to ask you a question. You said in reply to the Chairman that you thought that, generally speaking, the results of your fertiliser experiments were reliable and satisfactory. I wanted for my own information to ascertain whether the usual practice is to carry out these tests in duplicate or triplicate. You sent in a tabulated statement, I think it is in the Memorandum on Fertilisers, summarising the results of a large number of experiments. Am I right in supposing that the figures were results of experiments carried out on duplicated plots?—I do not think there has been much duplication, but they are carried on for a period of years and then we strike the averages.

274. It serves much the same purpose?—Yes. I do not mean to say that the results are altogether reliable: in some cases I believe they are not as the land was not standardised before the experiment was started. Taken as a whole, the experiments are fairly reliable.

275. If we allow for a pretty big margin of error in examining these figures you think that they are not likely to mislead us?—Exactly.

276. *Sir Ganga Ram:* On the subject of nitrogen, are you prepared to accept the statement which is made in the book which I read from, the American book, that each acre of wheat land deprives the soil of 180 lbs. of nitrogen, 31 lbs. of potash and 90 lbs. of phosphoric material?—No. I have read the book and have come to the conclusion that the writer added an "0" to it by mistake.

277. You accept those figures?—No, I do not.

278. What modifications would you suggest?—He states on page 21 that the crop of wheat removes from the soil 20 lbs. of nitrogen. Then on page 22 he states that it removes 180 lbs. There must be a mistake in his figures.

279. Robertson puts it down as 90 lbs.?—I have got the figures here. I may tell you that the average crop of wheat in India is 845 lbs. The grain actually removes about 13·7 lbs. of nitrogen per acre and the straw removes about 5·3 lbs., so altogether just about 19 lbs. of nitrogen is removed. This is for a small crop of 845 or 850 lbs. In the Punjab you get twice that yield: a crop there may remove 40 lbs. of nitrogen.

280. I am coming to that. If so much of nitrogen is lost every year, and as we know very little manure is put in, how is the nitrogen brought back

into the soil? If so much nitrogen is removed every year there would be nothing left in the soil. What remedy have you thought out? What is the natural remedy for this?—The natural remedy is to apply organic manure.

281. Where the manure is not supplied, there would be nothing to produce?—A certain amount is being supplied.

282. There are many places where they employ no manure at all?—In that case you have got down to what I call a state of maximum impoverishment.

283. I will tell you what remedy I have found for this. In the Punjab we have found it. I have made experiments on it. Did you read my book on the Punjab Proverbs?—Yes.

284. I learnt it from an ordinary farmer that the more you open the soil, you bring in more nitrogen from the air in the form of nitrifying bacteria. In the Punjab the least average yield is 15 maunds per acre. I have made experiments and found out that by ploughing 20 times I can get 25 maunds and by ploughing 25 times I can get 35 maunds per acre. Do you accept that statement that by constantly ploughing the land you abstract nitrogen from the air into the soil in the form of nitrifying bacteria?—The amount of nitrogen obtained from the air is about 3¼ lbs. per acre only. That comes down in the rain and the dew. The reason why you get a much larger crop by better cultivation is that you produce optimum conditions for nitrification. The organic matter is acted upon by the nitrifying bacteria in the soil, which build up a large quantity of nitrate. By experiments carried out in India it has been proved that in five months the amount of nitrogen in the soil can be increased by 50 per cent.; in other words, that you can increase the amount of nitrogen per acre in the first nine inches of soil by something like 3,000 lbs., which is about 100 times as much as the crop removes. The quantity of nitrogen in the soil is increasing and decreasing from season to season.

285. You accept this natural method which we have found out in the Punjab? I have made inquiries from other Provinces. They plough only five times and they only got 6 maunds per acre?—I understand your line of reasoning; but the reason why you get more is not due to the fact that the nitrogen comes from the air. You get a bigger yield because in the soil aerated by much ploughing you have produced optimum conditions for the nitrifying bacteria.

286. You accept the natural method?—Yes, I accept it.

287. On page 1, you say that your research work has been handicapped by the fact that the Board is given no funds and no executive powers. Will you define what executive powers you want?—I mean that we would require funds to enable us to carry out localised research in the Provinces.

288. You say that you are handicapped for want of executive powers?—As a Board we have no executive powers in the Provinces. The Board as such is only an advisory body. It advises Government to adopt schemes of improvement, but having no money placed at its disposal it cannot give effect to its own recommendations.

289. I only want the word "executive" to be defined?—By "executive powers" I mean power to give effect to its own recommendations, to start its own stations and to employ its own research workers if need be.

290. In what way would the Board control matters in the Province?—If it had its own stations, it would control them, in the same way as the Cottton Committee is controlling the Indore Institute.

291. In Provinces how would you control?—We would have our own men in charge of any station we opened.

292. In each Province?—Only in Provinces in which we opened stations.

293. Do you also wish to have central control over the Services?—No, I did not anticipate that.

294. Could you give any indication of the funds you would require?—For all purposes, we would probably require about a crore of rupees at least.

295. Will a crore satisfy you?—Yes, I think it would.

296. And also the Provinces?—The Provinces would provide their own money in their several budgets.

297. You require this money for your central research?—For central research and for supplementing such research as is already being done by the Provinces.

298. Out of that money you would give a slice to the Provinces?—Yes.

299. In that case, would you allow the constitution of the Board to remain as it is, or would you want to have any modification?—We would have to change the constitution. We would require an Advisory Body with committees working under that Advisory Body. So, the constitution would be very fundamentally changed.

300. In what way would the provincial research be differentiated from the Imperial? Would their work in some cases not be overlapping?—In many cases it is very desirable that we should have overlapping. We would duplicate, at the commencement, in some cases, but the Advisory Council would have to see that there was no undue overlapping.

301. Do you attach any value to the wisdom inculcated in the proverbs of the people?—I attach a good deal of importance to them, but I think that an expert who takes up the study of a question like this does consider indigenous theories such as those incorporated in proverbs.

302. Would you use these proverbs in any shape in the syllabus of rural schools?—No, I do not think I would go as far as that. We sometimes publish articles in the Agricultural Journal giving such proverbs and thus bring them to the notice of the people.

303. Do you give salt to cows?—Always.

304. How much?—We do not as a rule measure it out because we have what we call salt licks and the cows are allowed to lick as much as they want.

305. And horses?—We do not keep any horses.

306. You think it is necessary to give salt to cattle?—I think so. We do it on all Government farms.

307. We should devise some method of making it available to zamindars?—You can get salt in the villages in a solid form.

308. At page 3 you say that the education given in agricultural colleges is very cheap. Is it cheaper than the education in the Arts and Science and Medical Colleges?—I think it is, but I cannot give you figures. I know that in the Central Provinces we used to charge a fee of Rs. 3 a month, and that I consider cheap.

309. Do you think if the cost of agricultural education was higher that it would deter people from adopting the agricultural profession?—It would not deter fairly well-to-do people.

310. I understand that the present standard of admission into agricultural colleges is the matriculation. Would you propose any higher standard?—The standard varies from Province to Province.

311. Do you think if the standard was raised to the F. A. the students would be better able to follow the lectures?—Yes, I think they would, but if we were to raise the standard, fewer students would apply for admission.

312. You say that education in rural areas should be made practical. Can you explain the present deficiency of it?—At the present time, agriculture is not included in the curriculum of vernacular middle schools except in the case of some 60 schools in the Punjab, some 30 in Bombay and about the same number in the Central Provinces.

313. To what extent is agriculture financed by (1) co-operative societies, (2) the Government *taccavi* loans, and (3) village money-lenders? I understand that the co-operative societies have been pushed forward in this country

for the last 20 years and yet we find that this method had not reached far enough and agriculture is as a whole being financed very largely by the money-lenders? What is the cause? Is it that our co-operative movement has not become so popular as we should have desired? Why do the cultivators in most cases still prefer the money-lenders, although the interest charged by them is greater than that charged by the co-operative societies? Is it not due to the fact that the village money-lender is more accommodating and less rigid in his attitude than the co-operative society?—I think that is a leading question. I am inclined to agree with you.

314. Then in that case do you know that 90 per cent. of the money advanced to the agriculturist is given by money-lenders? Would you not in these circumstances improve the indigenous banking system and utilise that agency for the promotion and development of agriculture?—Yes. I have suggested that in my reply to one of the questionnaire on the improvement of the indigenous banking system.

315. Could not the Imperial Bank, for instance, advance money on very favourable terms to the co-operative societies and thereby enable the latter to reduce the interest to the agricultural people? Would that not be a method? —It may be, but I do not profess to know very much about these questions.

316. You say that one of the causes of the present agricultural indebtedness is the great pressure of the population on the soil. Can you tell us in which particular parts of the country that is so?—Mainly in the Provinces in which the holdings are very small such as Bengal, Bihar and Orissa, and the United Provinces, where there are many holdings of only 2 or 3 acres or less.

317. As far as that goes, in the Punjab, according to Mr. Calvert's figures, there are 17,000 people holding one acre each?—I think the holdings are still smaller in Bihar and Orissa and Bengal.

318. And in Bombay?—No, I do not think they are smaller there than in the Punjab.

319. Do you think that that means that we should frame some rules or law to prohibit further fragmentation? Have you any ideas on the subject?—I do not think it would be advisable to frame any such rule. I think it is a good thing to have in rural areas small cultivators who put in a certain amount of their time as labourers.

320. But it does not give them a living wage?—Well, in that case they try to get work outside.

321. What do you think is the proper size of an agricultural holding in three kinds of land, irrigated area, well-irrigated and unirrigated area, which should give a man a living wage for himself and his family?—It is very difficult to answer that question, but I should put it at 10 to 12 acres in the case of irrigated land and at 19 to 20 in the case of unirrigated land.

322. And you would make no difference between " irrigated by canal " and " irrigated by well "?—No.

323. In regard to the question which the Chairman asked you about soil survey, would you include also a survey of the section of the land, I mean, the spring level of the land? While you are doing the survey, would you also include the survey of the spring level of the land, the water level, the spring level at which by digging a well you get water?—Well, I have, in replying to a certain question in the questionnaire, suggested that a survey of the subsoil water should be made in the Provinces as recommended by the Board of Agriculture.

324. I mean a general survey of the country showing the water level?—I think that survey should be carried out as an entirely separate piece of work, and not as part of a soil survey.

325. But it is very necessary?—I think so.

326. You think that the spring level generally follows the contour of the country, or is it parallel to the contour of the country, the general lie of the

country?—It might be parallel in the Gangetic alluvium but it certainly is not so in Peninsular India.

327. Because that is not parallel to the country: are you aware of any rule about it?—No.

328. Otherwise it would give rise to something like the *kaerez* system as in Baluchistan, that is, they generally go on digging a well until the water comes to the level of the country?—That is what they generally do.

329. *Dr. Hyder:* It has got to be lifted up.

Sir Ganga Ram: No. It is the *kaerez* system; generally, the spring level is not parallel to the country; it follows different lines altogether. I will be able to explain that better afterwards; that is the reason why I wanted the evidence of Mr. Wilsdon who has got some knowledge on that question.

330. You know that in certain parts of America and in certain parts of Europe also, the double size of the economical holding is made inalienable by law?—Yes.

331. Would you, for the purpose of keeping model farms for the instruction of the general masses of the country, introduce the English law of entail on big estates which are self-acquired if the proprietors of such estates want this law to be applied?—I am afraid I have not considered the question.

332. Perhaps you are aware of the fact that this option is already given to *jagirdars* of the Punjab, I do not know about other Provinces?—Yes.

333. *Jagirdars* in the Punjab are given the option of entailing their property and make it inalienable?—Yes.

334. Is it a fact that in some parts of the country irrigation canals are not remunerative except in cases of drought?—Yes.

335. Have you thought of any scheme such as tube wells on a co-operative basis? It is stated in the Irrigation Commission's report that in the United Provinces the Canals Department always pray for drought to make the canals pay. The great demand for water is in the months of April, May and June. When the rains start, there is no demand for water, and in the hope of getting rain, they do not take canal water in the beginning; but when drought comes there is too much pressure on the Canal Department for water. Do you think a system of tube wells for three months working on a co-operative basis and giving water for three months would be available to stimulate sugarcane cultivation?—It may be. It would depend on the cost of lifting the water.

336. You say in your statement that the erosion of soil in many parts of the country should be prevented by embankment. Have you thought of any scheme for the purpose? Have you seen my article on the subject?—Yes, I have read your article.

337. What is your opinion regarding the suggestion made in that article, that is to say, to make it compulsory on the part of every proprietor not to leave the land unploughed?—The suggestion may be sound enough, but I do not like the idea of forcing the cultivator to adopt improvements.

338. Could you suggest any practical schemes for construction of embankments, drainage of water-logged areas and reclamation of soils, destruction of weeds and prevention of soil erosion? Have you thought of these very important questions?—These are all questions which would naturally be taken up by the Advisory Council which I propose to constitute. Each question would be discussed by men who understand it, such as Engineers and Agriculturists. We had, as a Board of Agriculture, advised Government to appoint an Engineer to go into the question of embanking and draining land, but this Engineer has never been appointed.

339. Have you any idea of any mineral deposits in the country which could by some chemical process be converted into fertilizers in British India as well as in Indian States?—You will find that Dr. Pascoe's memorandum gives a great deal of information regarding the deposits of mineral phosphates and saltpetre available in India.

340. You know that sulphur plays a very important part in converting bones into superphosphates and also in other agricultural matters. Are you aware of any raw material from which we could get sulphur in this country?—At present we import our sulphur from Japan.

Professor Gangulee: And from Sicily.

341. *Sir Ganga Ram:* What about iron pyrites?—I think that in his memorandum Dr. Pascoe refers to the possibility of getting sulphur in Burma.

342. I am told that there is iron pyrites in Gwalior?—I am afraid I do not know.

343. Would you be in favour of levying an export duty on bones?—I would put on a small duty on the understanding that the money was to be utilised in demonstrating improved methods of cultivation involving the use of manures.

344. The money to be spent on factories to convert obnes into superphosphates?—Not with the idea of prohibiting the export of manures.

345. In reply to the Chairman you said that night-soil is not very important. Are you aware of the fact that in the Punjab land which is within 25 acres of the village always carried 25 to 50 per cent. more price?—I know that. The same applies more or less to every village in India.

346. Within 20 acres of the village habitation the price is certainly 25 per cent. more than elsewhere?—Yes. What I think the Chairman meant, however, was that it might be possible to convey large quantities of poudrette from the bigger towns to the villages.

347. That is made by burning night-soil?—No, it is the name applied to night-soil when dried and decomposed. The night-soil is put into pits and left for a year or so and by bacterial action it is converted into dry earthy matter known as poudrette.

348. In regard to cheap fuel to be used in the place of cow dung, the Forest Department claim that an increase of forestry is the proper substitution and therefore there should be increase of forest. I am going to ask the Forest Department if they know of any tree which will not cast any injurious shadow on the crops when planted round the fields. That is the only way to substitute cheap fuel for cow dung and I have tried it. When the Commission come to my village I will show them. I do not remember the name of the tree, but I have got 4 trees. I planted the whole square of 25 acres with that and they prove very good. In three years they gave 1 maund and 29 seers of fuel. It is a kind of Eucalyptus. It was suggested to me by the late Mr. Booth Tucker. Are you aware of any tree of that kind?—I think you mean the Australian Blue Gum or Eucalyptus which they have in the Nilgiris

349. Is it not injurious to the crops growing underneath?—To a certain extent; but it is not so injurious as some trees.

350. If the tree is very tall, even if it is injurious the shadow would be only for a short period?—It has less foliage than most trees, and the shadow is not large.

351. Have you any other suggestions to make in regard to providing cheap fuel to the cultivators?—I have made some suggestions in my replies to the questionnaire. I have suggested that we should get fuel reserves established wherever possible near the villages.

352. No zamindar will buy. He will not spend a pice if he can help it. Unless he can get something very cheap, or without paying for it, he will revert to cow dung. The only remedy is to plant that kind of Eucalyptus on the edge of the holdings. Have you analysed the soil of Bombay? Is it owing to the nature of the soil that the yield of Bombay for sugarcane is three times that of the United Provinces?—The soil of the Bombay Presidency is not so rich as that of the United Provinces, but in Bombay cane-growers supply

an enormous quantity of manure to their cane. They spend up to Rs. 300 or even Rs. 400 an acre on manure.

353. Is that increase only due to manure?—Entirely.

354. It is not due to any superiority of soil?—It is partly due to the fact that they grow thick canes, and thick canes when heavily manured give bigger yields than thin varieties.

355. *Dr. Hyder:* They pay the highest water rate?—Yes, up to Rs. 60 per acre.

356. *Sir Ganga Ram :* In order to stimulate the use of seeds, do you not think the agency of *patwaris* might be invited?—We have never had any trouble in getting rid of all the good seed we produced. The demand is great already; there is no need to stimulate that demand.

357. Do you admit one statement which is made in the book I lent you? Do you think if the soil does not suit the seed, the seed must be altered to suit the soil? Is that true?—Yes, but you must remember that that book was not written by a scientist. It was written by a propagandist.

358. I wanted to know whether you were prepared to admit that?—That only means that in a soil that is not suitable for a crop which is late in maturing, an early variety should be sown which will mature before the soil loses its moisture.

359. They have very little wheat in Bombay. They have not even sufficient for the people. They import wheat from other Provinces. Cannot you invent some seed to suit that soil?—There is a Pusa wheat known as Pusa No. 4, which matures about a month earlier than most wheats grown in Northern India.

360. To prevent the destruction of crops by wild animals, would you advise Government to put up Canadian fencing round large areas? It would be impossible to fence each field because the cost would be prohibitive?—It should be quite possible to get all the village cultivators to combine in putting up a fence round the whole village.

361. Could not Government do it and charge them something?—They are fencing villages now in the Bombay Presidency, I understand; the people themselves are, I gather, meeting the cost.

362. Do you recognize the fact that in order to grow valuable crops, all the land available has come under cultivation and very little is left for the purpose of cattle grazing? Since there is a recognised need for a larger supply of other dairying produce, what is your opinion with regard to the suggestion that in the case of landholders owning more than 25 acres of land they should by law be prohibited from cultivating more than 75 per cent. and the remaining 25 per cent. should be left for grazing? In the Punjab they have passed rules to that effect?—I think it would be quite a mistake to do so; the grass obtained from an acre does not weigh out to more than 600 or 700 pounds when dried, whereas wheat will give a yield of straw weighing at least 1,000 pounds, and *juar* much more.

363. But in the Punjab they have reduced the irrigation water. They only give water just enough for 75 per cent. On the advice of the Agricultural Department they have made the rule that people should not do 100 per cent. of cultivation?—Still, I do not think it pays to put land under grass in this country.

364. I am not talking about grass. If they only plough the land, herbs and other things will grow, which will be enough for grazing?—It gives you very little in the way of return.

365. What is your opinion about stimulating the oil crops in order to keep the cake here for the purpose of manuring and to set up the practice of hydrogenation by which you could use this oil for the purpose of railway grease or for any other use of oil that you can think of?—I do not think that is a question that the Royal Commission on Agriculture should take up; the Industrial Commission dealt with it.

366. Could not the Commission recommend that such a practice should be established so that it will stimulate the growth of oil-seeds and therefore keep the cake in the country for purposes of manures? It will come within the purview of the Commission from that point of view?—I doubt whether this Commission is qualified to deal with a question of that kind.

367. In the Punjab we find that the donkey is a very useful animal for the purpose of marketing. Do you not think some effort should be made to improve the breed of donkeys? By castration, and so on?—I am very sorry, but I do not know very much about donkeys.

368. What are at present the subsidiary occupations in rural areas? Have you thought of any schemes? You know that in the unirrigated parts of the Bombay Presidency there is no occupation for the people for about 4 months in the year?—I believe that is correct.

369. Could you suggest some occupations like dairy farming, poultry keeping, bee-keeping, etc.?—I have said in replying to the questionnaire that poultry keeping and dairying are suitable subsidiary industries for the cultivator.

370. You recognise that in the time of famine, the dearth of fodder creates more havoc than the dearth of grain. What scheme have you thought of to keep one year's reserve of fodder? Is it by pressing or by keeping in silos?—By storing fodder in silos and stacks.

371. By pressing fodder or keeping it in silage?—In both ways.

372. Could the grass that grows on the banks of canals be rendered fit for cattle by any process of keeping it in silage?—It makes a fairly good silage. I do not know what kind of grass you mean, but we have made silage of the ordinary coarse grasses.

373. At present the products of our schools and colleges mostly adopt literary and clerical professions which are non-productive. As far as the economics of the country are concerned, it also adds to the problem of unemployment. Do you not think agriculture should be introduced in schools from very early stages whether the students take to the agricultural profession or not?—It should be introduced in rural schools only; not in urban schools.

374. Would there be any harm if you introduce agriculture as an optional subject in urban schools also? There are many subjects which are never made use of, such as zoology and a good many other subjects?—I think it would be advisable to do much more than has been done in this direction for rural schools before starting in urban schools.

375. Have you any definite opinion about the cash rent versus *batai*, which means participation in kind?—I do not think that *batai* is a suitable system; it offers to the *batai* cultivator no great incentive to produce a big crop. He only gets one-half of the crop whether it is big or small.

376. On the other hand, when the landlord takes only cash, there is no incentive for him to improve his estate?—When the landlord takes cash, he knows that the cash rent is fixed, whether he produces a big crop or not.

377. Therefore, it makes him lazy. I can tell you that in the Punjab colonies there is nothing but the *batai* system and people have become very very rich in a very short time.—Perhaps they are all good tenants.

378. You say the average villager is satisfied with a low standard of living and does not try to improve the conditions under which his forefathers were content to live. Here again, do you not think that the elimination of educated and well-to-do people from rural areas has deprived the country of leaders of thought who could set an example in public health, sanitation and hygienic living?—I agree with you that if we had educated men in the villages they would help to raise the standard of living.

379. Really the standard of living depends upon means. I may tell you that since the war in Lahore we are producing now 100 tons of ice whereas before the war only six or seven tons of ice used to suffice. No coolie will drink water now without ice in it. The wages of coolies have gone up from

3 annas within 10 years to 12 annas and 14 annas. I do not know what is the case in other Provinces?—The cost of labour has risen all over India, though probably not to that extent.

380. *Sir Henry Lawrence:* You told us just now that you would like to have a sum of about a crore of rupees at the disposal of the Imperial Department. What is your present budget?—The present budget is between 9 and 10 lakhs.

381. Has that been reduced? Was it bigger in recent years?—It has not been reduced within the last two or three years, but it has not grown, either.

382. Would you like to have a progressive increase up to something like a crore?—Yes. We had proposed to add considerably to the staff of the Imperial Department, but the Inchcape Committee made recommendations to the effect that we should curtail our expenditure and we have not filled some of the posts which were sanctioned.

383. You have been forced to curtail your expenditure?—We have been prevented from expanding the department. That is probably the better way of putting it.

384. Can you tell me roughly the expenditure in provincial departments all over India?—I think the total net expenditure on agriculture last year was 82 lakhs. That is for all-India, including the Imperial Department.

385. If you are to go up ten-fold, would you ask the Provinces to go up in similar proportion?—The idea would be to utilise part of the crore in the Provinces. The Advisory Council would make grants to the Provinces for certain lines of research which they would carry out.

386. Then you wish to centralise the work more than it is at present?—Yes.

387. How do you reconcile this with the devolution to Provinces of financial autonomy and also with the fact that agriculture is a transferred subject?—We would not interfere with the working of the departments in the Provinces. It would be a case of making grants to provincial departments and of the Government of India carrying on certain lines of research work as they do at present but on a larger scale. At the present time the Cotton Committee is giving grants to the Provinces and is to some extent controlling the work being done on cotton in the Provinces.

388. You do not suggest that your scheme would require any alteration of the system established under the Government of India Act?—I do not think so. The Provinces would only object in the case of our interfering with their staff or if we were to ask them to undertake research work without our finding the money for it.

389. You do not think that any alteration of the Devolution Rules would be necessary?—No, I do not think that any alteration would be necessary.

390. And under the Devolution Rules research in agriculture is definitely assigned to the Provinces?—Yes, but the Central Government is also supposed to carry out research.

391. You see no obstacle?—It has not been definitely laid down that the Central Government should carry out only certain lines of research and that other lines should be left to the Provinces. In my opinion the Imperial Department of Agriculture should expand and intensify its research work and also help the Provinces to intensify and expand theirs.

392. And that system would be accepted, so far as you know, by the Ministers of Agriculture in the Provinces?—I think it would be. I have discussed the proposal with some Directors of Agriculture who agreed that it would work all right.

393. Have you discussed it with any Ministers of Agriculture?—I have, informally. We were to have discussed this whole question at the last meeting of the Board of Agriculture; the Government of India, however, issued orders about 3 weeks before the Board met to the effect that the subject should be removed from the agenda of the Board, as it would be considered by this Royal Commission.

394. I understood you to suggest that there is not so much co-ordination as existed say five or six years ago between the different Provinces and the Imperial Department.—Yes, that is so.

395. To what do you attribute that?—I think it is due to the fact that agriculture is now a transferred subject.

396. But is that any reason why they should not accept or invite your assistance and advice?—If you read the Devolution Rules you will find that they do not imply that the Central Government should co-ordinate the work in the Provinces. The Agricultural Adviser to the Central Government is no longer responsible for the work done in the Provinces. The Provinces seldom consult him. If you have read Mr. Ware's memorandum you will have noticed that he states that in veterinary matters too there is no co-ordination of work between Muktesar and the Provinces. This is what he says:—

"There is very little correspondence or connection between the Muktesar Institute and the provincial Veterinary Departments. Pieces of research work have been carried out at this Institute at the instigation of provincial Veterinary Departments and occasionally advice is sought by them, but in nearly every case this can be traced to some personal arrangement. There is no other means of co-ordinating the work of this Institute and that of the Provinces with the result that there is little co-ordination or co-operation. In at least one case there was distinct friction as a result of what a Province considered intrusion by this Institute in the matter of investigating a disease."

397. Yes; I see that was the experience at Muktesar, but I wanted to know if your experience at Pusa was similar?—Our experience at Pusa is similar to some extent, though some Provinces do get all the assistance they can from us, for instance, Bengal, North-West Frontier Province, Bihar and Orissa, and to a less extent the Punjab.

398. Then I understand, owing to this lack of power of co-ordination vesting in your hands, there has been some overlapping of research work in the different Provinces. Is that your view?—Yes, I think so.

399. Could you give us any instances of what kind of work is being duplicated without good reason or good results?—Take the work now being done on a disease such as wilt in cotton, they are working on it in Bombay and they are working on it in the Central Provinces.

400. Cannot those two work together and check one another? Is it not useful or is it something that you want to stop?—No, a certain amount of duplication is necessary, but there is no means of finding out what these two different Provinces are really doing or how they are tackling such problems. We get their reports, but the work they are doing is not fully described in these reports. We used to meet together once a year as a Board of Agriculture and discuss the research work being done in the Provinces, but these meetings are now being held only once in two years. Moreover, there is very little touring between one Province and another: it is very, very seldom that an officer is allowed to go to other Provinces to see what is being done there. The tendency, as you perhaps know, has been to cut down expenditure on touring. The Provinces have been passing through a period of financial stringency and so has the Government of India.

401. I would like to have that clearer. Do you suggest that the Provinces refuse to pay the touring expenses of an Imperial officer; is that it?—A Province would refuse to pay the touring expenses of its own officers who wanted to go to other Provinces: Provincial Governments refuse also to pay the touring expenses of Imperial officers who have occasion to visit their Provinces.

402. Would that not be a proper charge on your own budget?—Well, there again the Government of India think that a Province should in certain cases at least pay the touring expenses of Imperial Service officers. For instance, when we send down an officer from Pusa to examine the students of an agricultural college, say, the Agricultural College at Nagpur, we expect the Central Provinces to pay his travelling allowances.

first cross and you stop there; if you produce a three-quarter cross then the animal loses constitution.

433. It cannot stand the heat?—It cannot stand the heat.

434. So do you not think cross-breeding between selected varieties of Indian cattle would prove better?—I think there is probably room for both systems; where you want to produce large quantities of milk very cheaply for the towns, cross-breeding with English breeds is feasible. The Military Department has been breeding dairy cows for over thirty years, and they have stuck to their system of cross-breeding with the Ayrshire and Holstein breeds. They find that by crossing they can produce a cow that gives twice as much milk as a good Indian cow.

435. What are the commercial crops on which research is being undertaken in Pusa? I mean to say the crops having a commercial value?—Tobacco, sugar-cane, wheat, chillies and several others.

436. Have these research varieties of tobacco been tried in Southern India? —Yes; the Pusa varieties are being tried at Guntur in Madras where the Imperial Tobacco Company are growing tobaccos.

437. Is it a drought-resisting variety?—No; it requires about the same amount of moisture as the ordinary *deshi* kinds, I understand.

438. But I suppose the variety of leaf produced is a much better type?— Yes; the variety evolved by Mr. Howard at Pusa and known as No. 28 gives a much better leaf than the ordinary country tobaccos.

439. Is it by experimenting, as with, say the seeds of sugar-cane, by a sort of inter-fertilisation with flowers that you get a better variety?—Both ways; No. 28 Pusa was a straight selection; but we have produced quite a number of cross-bred varieties at Pusa by crossing *deshi* tobaccos with improved American varieties.

440. Which is most suitable?—The crosses that we have under observation are promising but we have not had time to test them thoroughly. It takes quite a number of years to fix such crosses; still they are very promising. The Manager of the Imperial Tobacco Company says that the leaf is very good.

441. They are better than the selections, are they?—Better to this extent that you can sell the tobacco at about eight annas a pound, while the ordinary country tobacco fetches about three or four annas.

442. *Sir James MacKenna:* Yesterday in reply to the Chairman and this afternoon in answer to Sir Henry Lawrence you have given what I may call the material considerations which prevent officers in the Provinces coming on to the Imperial staff at Pusa. Are there any other reasons with which you may be acquainted which make it difficult to attract probably your best men to Pusa?—Another difficulty of course is that officers in the Provinces have opportunities for touring; they have a freer life; at Pusa they are tied down to one place; they are very isolated there.

443. That is a semi-material consideration. Have you considered cases which came to your notice as Agricultural Adviser where one either failed to get, or with great difficulty persuaded a man working at a particular problem in a Province to go to Pusa because that man was sacrificing his work?— There is something in that no doubt; but I do not think that is very important, for after all they know quite well that they will get work of great importance to do at Pusa. We did try to get a Botanist from the Provinces two years ago, but he refused to come to us; he said his prospects were much better in Bengal.

444. Therefore there is a risk that on the grounds of material considerations and the higher consideration which I have suggested, you may have some difficulty in getting the best men?—Yes; we tried but failed to get a man from the Central Provinces quite lately.

445. There is a serious risk that the Pusa staff might become somewhat second rate?—Undoubtedly it will.

446. Does that tend to strengthen the position of Pusa as a centre for Imperial research?—No.

447. What other reasons can you mention as preventing officers going to Pusa?—I have mentioned them; there is the question of pay and there is the question of being very isolated; and there is the question of not having opportunities for touring and seeing what other workers are doing. I may add also that the climate from July till about the middle of October is not at all good; it is not so good as it is in most Provinces.

448. Do you think there is room for duplication of an institute similar to Pusa in Southern India to deal with wet crops and rice crops to which it is not possible to devote so much attention at Pusa?—You mean, a station that would be run by the central Government?

449. Yes?—Under my scheme, we would have such stations scattered all over India. We already have a cane-breeding station in Southern India. We would require to have a rice station either in Madras or Bengal I suppose; and we would probably require to have a wheat station either in Jubbulpore or Northern India.

450. Yes, that would meet the case. There was a good deal of talk about lack of co-ordination and failure to co-operate and co-ordinate between Pusa and the Provinces. Do you not think that this is probably largely due to the fact that provincial departments are so much better-manned and that therefore references are not as numerous as they used to be when Provinces did not have their own entomologists and mycologists and bacteriologists?—Yes; I think it is very largely due to that. Some of them now have very good chemical and botanical sections. The provincial departments which do apply to us most frequently for assistance are those which have not got entomologists and mycologists.

451. In view of all these circumstances it seems that if Pusa is to maintain its position as head of our agricultural research, it must be manned by men of the very highest calibre who have made their reputation in agricultural research?—I agree entirely.

452. The staff must be very carefully selected and trained?—Yes, I think it is a mistake to insist on Indianising Pusa; it is quite a mistake.

453. Coming to that question of Indianisation on another line: the policy, of course, of the Government of India is that the Services should be completely Indianised and there should be no recruitment from Europe at all. Have any steps been taken to provide the necessary higher agricultural education to train these future research workers and teachers?—We have made provision at Pusa, but our staff there is not sufficiently strong to give really good courses.

454. Do you think that the imposition of teaching work of the higher grade upon the heads of sections would handicap research?—It would; we would require two good men for each section, so that one of the two could devote part of his time to teaching.

455. That is the point I wanted to get. Then, I presume that, if this Central Advisory Board, or whatever you call it, comes into being, you contemplate that the Pusa Institution should be under that Board?—I think so.

456. Also the one at Muktesar?—All the work we are doing there should also come under it.

457. What about the Central Cotton Committee?—It is a going concern. It is doing very well. I do not quite see how we could bring this under the Central Advisory Board.

458. Then there is a general question about agricultural organisation. You have been in the Agricultural Department practically since its inception, and, as you know, the principle adopted there was to divide the country by administrative areas; that is to say, a large area was placed under Deputy Directors of Agriculture, corresponding roughly to a Commissioner's Division. But do you not think it would have been a better policy from the beginning if we had divided up by crops rather than dividing the country by geographical area, and got men to work on one crop?—In the Central Provinces we divided our Province for administrative purposes into what we called the wheat tract, the rice tract and the cotton tract, and we did follow

that system more or less. We had men for work on definite crops. One worked on wheat, another worked on cotton, and a third worked on rice.

459. You think that is a better system?—I think so. It encourages some measure of specialisation and concentration.

460. I have one or two general questions. You are strongly in favour of an agricultural bias in education?—Yes, but I may be wrong.

461. Was there any agricultural bias in your education?—I was brought up on the land. I worked on the land for a time.

462. Then another question. I am just trying to pick up what has been left out in the exhaustive examination. You are very enthusiastic about simultaneous inoculation against rinderpest?—I think it should be introduced on a large scale as soon as we can find the staff in the Provinces to carry it into effect.

463. You admit that it is a very ticklish job?—Yes, but the percentages of deaths now are something below one per cent., about a half per cent.

464. Very good. Just another subsidiary matter with reference to agricultural economics which was mentioned. Do you know whether provincial colleges include in their courses a training in farm accounts, book-keeping, the Civil Service Regulations and that sort of thing?—Some of our colleges teach these subjects.

465. Do you think it is a very desirable subject?—Yes. Our colleges should give instructions in costings, and the activities of the co-operative movement in India.

466. *Professor Gangulee:* You are Agricultural Adviser to the Government of India, and you are also the Director of Research Stations?—Yes, I am.

467. What are your duties as Agricultural Adviser to the Government of India?—As Agricultural Adviser, I give the Government advice on questions referred to me, and when the Provinces ask for advice, I advise them. I am in charge of the Coimbatore cane-breeding institution, of the Institute of Animal Husbandry and Dairying at Bangalore and of the Wellington, Bangalore and Karnal farms. I am also in administrative charge of the Muktesar Research Institute, and I am *ex-officio* President of the Indian Central Cotton Committee. I am also responsible for the editing of all the publications emanating from Pusa, including all the Memoirs and Bulletins and the Agricultural Journal.

468. And you are also the Director of Research Stations?—Yes.

469. Do you conduct any field experiments yourself or any research work?—No, I have no time for research.

470. Do you chart out a plan of research for others?—No, we have a definite plan that was drawn up several years ago by the Pusa Council.

471. Do you have time to make inquiries as to what extent researches are being developed and what progress is being made?—It is being done in consultation with the heads of sections from time to time.

472. Have you visited any central research stations in Europe?—I am afraid I have not.

473. Have you visited the famous Rothamsted experimental station of England?—No. I have visited some in Scotland.

474. Have you visited the Rowett Research Institute at Aberdeen?—Yes.

475. What do you think of the laboratory equipment of the Pusa Institute as compared with the equipment of the institutions you have visited in Great Britain?—I think that of the Pusa Institute is quite as good as that of those at Home.

476. Have you any information about the salaries of research workers in different parts of England in comparison with what you propose to give your research workers in Pusa?—I have a fair idea. I know we pay them a great deal more out here than we do at Home, because the men will not come out unless they get at least twice as much in India as they get at Home.

Even when we pay them twice as much, they do not always care to stay out here.

477. What problems of fundamental importance have been tackled during the last five years in Pusa?—If you take the trouble to read through our reports, you will find that all the problems tackled are described therein in great detail.

478. I am referring to this. We have an excellent result out of Dr. Howard's work, Pusa No. 12. Since then what problems of fundamental importance with reference to animal nutrition or plant nutrition, animal protection or plant protection, have been tackled?—We have lately evolved wheats which are probably as good as Pusa 4 and 12. We have, for example, Nos. 54 and 55 which have been evolved within the last few years; these are being given out to the Provinces. As regards animal nutrition, if you will take the trouble to read through Mr. Warth's reports, you will see what work is being done by him at Bangalore.

479. I am referring to problems of fundamental importance, for instance, with regard to manuring problems which are not merely of local importance, but are likely to be of all-India importance?—Do you not consider nutrition problems as being of fundamental importance?

480. Do the provincial research workers visit Pusa?—At the time of the Board meetings. They come, that is, once in two years. Men from Bengal and Bihar and Orissa very often come at other times.

481. They come even now?—Yes, we had the Director of Agriculture from Bengal there only last week.

482. Do you visit experimental stations?—I do at times.

483. What is the object of your visit? Do you direct their work or make inquiries?—I am not supposed to do that. I visit the stations when they ask me to.

484. Now, please tell us something about the meetings of the Board of Agriculture. You discuss there all-India Agricultural problems, do you?—Yes, on consultation with the Provinces I decide on the subjects that are to be discussed. I think we have sent you copies of the proceedings for the last year, and also copies of the resolutions passed by the Board since 1905. If you will take the trouble to read through the resolutions, you will get a fair idea of the work done at our meetings.

485. I was impressed with various suggestions made at the Board of Agriculture meetings, and therefore I am asking you as to what extent the suggestions made by the Board of Agriculture have been followed either by the Provinces or by the Imperial Department?—I have tried, as far as possible, to explain in a memorandum submitted what action has been taken on the different resolutions. In a good many cases we have not been able to take action for want of money.

486. What reasons, then, have you to expect that an all-India organisation which you suggest would furnish provincial departments with added stimulus to agricultural and veterinary researches. You have suggested the Advisory Council. What reasons have you to expect that this organisation which you propose would furnish additional stimulus to agriculture?—We already have one central body, namely, the Indian Central Cotton Committee, which has been a great success; we should have other committees for work on other all-India problems. The Cotton Committee has been a great success. It has been tried and tested and has proved a success.

487. You go on the precedent of the Cotton Committee? Do you realise that cotton is a special subject, has specific vested interests behind it?—Yes, it has to a great extent, but there are other crops, for instance, sugarcane, tobacco, and wheat, the improvement of which might well be treated in the same way.

488. Perhaps I am repeating a question which was already put to you by Sir James MacKenna. What specific agricultural research problems have been investigated by the Central Department at Pusa to which the provincial departments have not paid attention?—The provincial departments have not

given much attention to crop diseases, for instance; very few of them have mycologists. They have given very little attention to the study of insect pests for the same reason. They have given little or no attention to bacteriology; they have not got bacteriologists.

489. Are there any handicaps to agricultural research being conducted by the provincial departments? You have just said that they have not got bacteriologists or mycologists?—They have been suffering from want of funds in the same way as the central department. That is the main difficulty.

490. You agree that Provinces have made certain progress during the last decade?—Very good progress.

491. In view of these developments in the Provinces, what changes do you think are necessary in the policy pursued by the Imperial Department? —I have tried to explain in my replies to questions Nos. 1 and 4.

492. I want to be quite clear on the point. Supposing to-day good sense prevails on the Bengal Government and they get a mycologist and carry on research work on mycology. They then perhaps would not feel the necessity of asking your advice on any specific question of mycology? Or supposing in time to come the deficiencies which now exist in the provincial research departments are remedied, then what would be the position of the Imperial Department?—I think you will find in the United States of America, where they have been devoting attention to agriculture for many years, the State departments still have to come to the Federal department for assistance. Is that not so? Then take the International Institute of Agriculture in Rome; experts from all parts of the world attend its conferences to discuss problems in which they are interested. Individual workers do not rely entirely on their own unaided efforts. They are seekers after truth, and as such get valuable information at these conferences from other scientists. They get each others' publications relating to agricultural research too. If you were to get a mycologist for Bengal, after three, four or five years' work, he would still have a lot to learn from Pusa.

493. Therefore I suggest that changes may be necessary in the policy of Pusa as a central research institution as the departments in Provinces develop?—Quite.

494. Sir Henry Lawrence has already asked you several questions on co-ordination. We are all anxious to have that co-ordination. You have said that the Devolution Rules under the Government of India have greatly jeopardised that co-ordination. It is not quite clear to me how these political re-adjustments may affect the scientific work. I find that co-ordination exists between the French scientific workers and workers in Scotland, for instance. Can you explain to us how these actually affect co-ordination? Take, for instance, men engaged in plant breeding experiments. Why do they not come to you and why do you not go to them? How do these Devolution Rules stand in the way?—The Provinces are supposed to be independent of the Government of India. Agriculture is a transferred subject. The Government of India is no longer responsible for the development of agriculture in the Provinces.

495. Supposing that the Province of Bengal were handed over to the French Government to-day, even then I suppose there would be co-ordination between the workers in Bengal and workers in the British Indian territory so far as scientific work is concerned?—I have just pointed out that there is always the risk of the Provinces being asked now to pay all the travelling expenses of a man sent from Pusa to help them in carrying out an investigation. They object to that. Under the old regime there was no such difficulty. We sent the men here and there; our aim was to help the Provinces. We were to some extent at least held responsible for the work in the Provinces.

496. In the last week I received an invitation from the International Soil-Science Conference. They are having a meeting at Harpenden in Hertfordshire. Men from all parts of the world are coming there to discuss the problem of soils. Do you organise in India any such conference of workers,

for instance of plant breeders of the different Provinces?—Yes, we do. We hold meetings of specialists, of chemists and mycologists, for example, and we invite the men from the Provinces to attend these meetings. But some of the Provinces think that it costs too much to send their men to Pusa; they are not prepared to pay their travelling allowances.

497. If any provisions are made to satisfy that requirement and to provide funds for such conferences, then you will be satisfied?—Yes. We would like the Provinces to allow their men to attend such conferences.

498. Let me please turn to other questions. Do you propose to develop Pusa as the centre of higher education in agriculture?—I think it should be developed as a centre for post-graduate research courses.

499. Already it is a success? You find the applications more than you can entertain?—Yes. I just mentioned a case yesterday in which we had 16 applications for a post in the chemical section for post-graduate training.

500. What is the standard that you specify?—M.Sc.

501. You find that they have not enough fundamental training in science? —Well, a few of them have, but very few. I do not think there was any M.Sc. in Chemistry who applied this year. They were nearly all B.Sc.'s.

502. Have you been able to develop what we call a research atmosphere in Pusa?—I think so. Our men in the Provincial Service are quite keen on research; I mean our class II or Provincial Service men.

503. You entertain great hopes for Pusa as an agricultural training institution?—I think so. But it will take a long time to establish in India what we may call a scientific atmosphere. There is no real scientific atmosphere in India at present except in Government institutions and Universities. It does not exist in rural areas; in towns it exists to some extent, perhaps.

504. Do you think that higher agricultural training should be in the hands of the Universities?—No.

505. You do not think so?—Not at the present time. It may after a time be placed in the hands of the Universities, but not at present for the reason that we are training men mainly for Government Service and the Department of Agriculture can train them much better than the Universities.

506. The reason for my suggesting that is this. The University having facilities for the teaching of fundamental sciences like chemistry, physics, botany and so forth may supply necessary pre-requisites to agricultural training. Would you not therefore link up the University with a scheme for an advanced agricultural training?—As the Universities happen to be in the bigger towns that divorces their outlook from the practical side of agricultural training.

507. Just as they have developed, for instance, a School of Agriculture at Cambridge University or Oxford University. Practically all the Universities at Home have Faculties of Agriculture?—Conditions are rather different at Home. A very large number of men who take degrees in agriculture at Home are men from the farms. They have acquired all the practical training required before they come to the University.

508. That brings me to the practical question of training young men in agriculture. Do you believe that agricultural pursuits may be raised to the status of a profession in India?—I think so, if the bigger landowners will take an interest in it.

508A. You think you can interest the landowners?—Yes.

509. Turning to the question of State-aid, do you think that the people of this country as a whole obtain sufficient help from the Government in agriculture?—Government has done a great deal for agriculture. They have constructed canals, roads and railways. They have thus spent crores and crores of rupees, whereas the bigger landowners have failed to play their part.

510. Since when have you devoted some attention to the question of cattle-breeding? Do you agree that this is of vital importance to Indian agriculture?—Yes. The Military Department started their cattle-breeding dairies

about 35 years ago; Departments of Agriculture have devoted a certain amount of attention to cattle-breeding for the last 25 years, but they have devoted special attention to it during the last 12 years.

511. When did you appoint your Imperial Dairy Expert?—In 1919.

512. Before that did you carry on any fundamental work?—We had before that our big cattle-breeding farm at Pusa.

513. Was there an expert in charge of that farm?—We had an Imperial Agriculturist in charge.

514. Not a specialist?—Yes, a specialist.

515. What method do you suggest for conserving fodder and forage?—Stacking outside can be done to a certain extent: it can be stacked in barns where they can be put up economically. It can also be conserved as silage in silo pits: the making of silage has great possibilities in India, more especially if made in an ordinary *kutcha* silo pit which costs very little.

516. Are you conducting any experiment in silage to determine its keeping quality?—Yes. We make a very large quantity at Pusa. Our cattle are fed for about half the year on a diet of silage combined with other bulky fodders.

517. You consider that soil survey is of very great importance?—I am afraid I do not attach very much importance to soil surveys, but when we get an adequate staff we should take up such work.

518. Do you think that a beginning could be made in this direction with some co-operation with the Geological Survey of India?—I am not sure how far they have studied the question; but I do not think they devote much attention to soils.

519. Could we have some sort of co-operative method of doing that work with them?—Could you suggest how it could be done?

520. Do you think it could be done?—I do not know that it could be done. They are interested more in rocks and minerals of economic value.

521. How do you carry on your manurial experiments without sufficient knowledge of the soils of the Province?—We possess fairly accurate knowledge of the soils in the Provinces. They have all been carefully analysed mechanically and chemically. Before manures are tried, the land selected for experiment is cropped with one crop; we ascertain whether the land is uniform by weighing that crop. We only carry out our experiments as a rule on land that has been standardized; in other words, on land that we know to be uniform as regards fertility. I do not think that there is any information lacking regarding the soils on Government farms. We know exactly what their chemical and mechanical composition is.

522. The reason why I ask you this question is this. Supposing you recommend the use of sulphate of ammonia. You may not be quite sure whether that soil is likely to benefit?—We have got our chemical analyses of soils which are published with the annual farm reports as a rule.

523. *Mr. Calvert:* I should like to clear up one question by Professor Gangulee. There is no objection from your point of view to an M.Sc. passed student, who wants to appear for his D.Sc., coming to Pusa? How long would it take?—About two years' research work. I think we could arrange that.

524. Is it possible in Provinces to obtain any help in the solution of your specialised problems by co-ordinating work with the post-graduate course and professorships in Universities in subjects like botany, zoology, chemistry, physics, etc.?—We sometimes allow Professors of Universities to take courses at Pusa: they come as a rule during the holidays and for short periods of two or three months.

525. Is the University post-graduate research work helping agriculture at present?—Yes, in so far as they are able to build up our knowledge regarding certain sciences allied to agriculture. That knowledge may be of use to agriculture.

526. I have got a few questions to put you on your note. Under research you do not make any mention of economic research. I presume you do not mean to exclude it?—No, but I think that it should be taken up by the Provinces rather than by Pusa.

527. You say that students who have up to date taken agricultural courses in Agricultural Colleges have been mainly drawn from non-cultivating classes. Would you advocate a restriction in favour of the agricultural students?—I would be in favour of a restriction when the number of agriculturists who apply for admission is greater than the number we can admit. But so long as the supply is not equal to the demand you cannot very well restrict admission only to agriculturists.

528. Then you say that much more attention should be given to the study of agricultural economics at the Agricultural Colleges. Is it not rather a question of over-loading the curriculum?—That may be so, but I think agricultural economics is more important than some of the subjects they teach at present. I would give it the preference: I would leave out, or devote less time to less important subjects with a view to finding time for instruction in rural economics. I have great difficulty in framing questions which I think students can answer for the B.Sc., even though I think they are very elementary. They complain that the curriculum is already so overloaded that they cannot give time to agricultural economics. It is only recently that they have paid much attention to agricultural economics even at Home.

529. In discussing rural schools you say there is a need for the extension of teaching facilities for agricultural subjects and they should be provided at the expense, if necessary, of a purely literary education. I presume you mean literary subjects beyond the three "R's"?—What I really meant was that instead of increasing the number of rural primary schools it might be well to utilise some of the material available for teaching agriculture in vernacular middle schools.

530. But later on in discussing adult education you say it would pay to curtail, if need be, expenditure on less practical forms of education for the time being. You mean in teaching colleges or in the high schools?—In the vernacular middle schools more especially.

531. Would you try to find funds for teaching agriculture in middle schools?—On a large scale and if need be restrict the number of other subjects taught therein. You need not increase the number of primary schools. A great deal of money is being spent on elementary education in the Provinces; the amount spent is increasing every year. I would, if possible, reduce the amount spent on purely literary education and utilise some of it in providing agricultural instruction for vernacular middle schools.

532. You were not referring to the higher Arts courses? It takes about Rs. 200 a year to educate a boy in a technical or arts college and only about Rs. 14 a year in a middle school. You could easily find money for promoting agricultural teaching in middle schools if you curtail the number of arts colleges?—I think there would be a great cry against that, though it is quite a sound idea I admit.

533. Then you say "I doubt whether any appreciable demand for adult education of the literary type is likely to arise in the near future." I think our Punjab figures at present show about 80,000 pupils in rural schools. You were not thinking of that?—I was thinking rather of what had happened in Bombay. Mr. Kamat will be able to tell us what happened there. Although you have got 80,000 pupils it does not necessarily follow that the scheme is intrinsically sound. The temporary success of such a scheme depends too often on the man who initiates it. It is easy, in short, to run a scheme of that kind successfully for a number of years, but when the man who supplies the driving force disappears the whole scheme sometimes collapses.

534. That is, the personal touch?—Yes.

535. I started this movement in the Punjab and so far it has been very successful?—Quite. I have read the account of it given in the Punjab memorandum; the scheme promises very well.

536. I should like to be clear in my mind what exactly you mean by the teaching of agriculture in middle schools. Do you mean the barest elements or something higher?—What they are teaching in the Punjab is some elementary facts regarding soils, improved agricultural implements, crops and so on. You have perhaps seen that little book "Agricultural Lessons on Indian Agriculture." I think something of that nature is necessary.

537. The Punjab scheme definitely avoids a vocational training?—Yes.

538. It deals with the elementary principles of agriculture?—The idea is to give them a bias; but the special agricultural schools in the Bombay Presidency are definitely vocational.

539. In your note about demonstration and propaganda, you say you would work through the leading landowners and well-to-do cultivators. I gather that in the Central Provinces there are about 2 million cultivators of whom about 1,300,000 would be below the 8·5 acres average. How would you get at these poorer people? Do you think the leading landowner is the right medium?—I think he is the best medium in the Central Provinces. You see the smaller cultivators get their seed from the landowner.

540. Did you try to get at the poorer cultivator direct by any means?—No. We got at them to some extent in this way; we gave out improved seed to the co-operative society of the village; the smaller cultivator, instead of getting a loan in cash, got the loan in seed. When he wanted, say, Rs. 10 worth of cotton seed we supplied that seed and his society paid for it. He got his loan in kind instead of cash, in short.

541. On the question of consolidation of holdings you write rather definitely that complete consolidation would not be desirable even if it were possible. Are you thinking of special conditions?—Yes. I was thinking of the conditions in the Central Provinces. In the villages in the Central Provinces there are very distinct types of soil. For instance, in Chhattisgarh where there are three distinct types, the cultivator would want to have a block in each.

542. Then you would not give that to us as a direction in the Punjab where the Gangetic plain type is very much the same?—I noticed that you were not able to effect complete consolidation. The land quite near the village is much richer than that half a mile away.

543. But the practical advantages of consolidation exceed any advantages of soil?—Yes, but in any one village have you got holdings each in one block?

544. Oh yes, a large number?—I think I pointed out in my note that the difficulties would be much less in the alluvial plains (stretching from the Punjab right down to Bengal) where the soil is more or less uniform in type; but in rolling country with light and heavy soil it is altogether different.

545. Then you say Government should encourage agriculturists to put up joint schemes of land improvement. Have you any suggestions to make? What do you mean by "encourage"?—Government should get co-operative societies to undertake such work.

546. How should Government encourage?—By giving them *taccavi* loans through the central banks.

547. They are doing that now?—To a certain extent, not on a big scale.

548. You were not thinking of any special form of encouragement?—Another form of encouragement would be to place an engineer at their disposal to show them how their enbankments, drainage channels, etc., could best be made.

549. Give free technical advice?—Yes.

550. As regards this question of marketing, would you agree that one of the difficulties in trying to work better marketing systems is that the small cultivator has such small amounts of grain to sell that an improved marketing system would make very little difference to him?—Probably.

551. Encouragement is really insufficient for the small cultivator?—I suppose there is a good deal in that.

552. As regards implements, you say that firms interested in the manufacture of agricultural implements should be encouraged to co-operate with the Imperial and Provincial Departments of Agriculture in evolving improved types. What form of encouragement would you suggest?—I think I have suggested later on that in the event of a firm turning out a very good agricultural implement Government should give a bonus. At present if a firm turns out a very good implement which catches on, it is manufactured by other firms who have not spent a pie in designing or evolving it.

553. You recommend a bonus by Government for evolving implements?—Yes.

554. Further on you say Government should give *taccavi* loans for the purchase of agricultural implements and machinery on a much larger scale than at present. I do not quite understand what the obstacle is?—The obstacle in the Central Provinces was that Government could not provide enough money. We got Government to set aside one lakh of rupees for the purchase of agricultural implements and machinery: they considered that that was quite a big sum; but it was not enough.

555. I suppose there are so many other demands on the money? Later on you propose to encourage stall-feeding; what was the idea there?—To encourage stall-feeding in the villages.

556. Have you got them to store fodder, to encourage them, to show them, to demonstrate the method?—It is just a bit of demonstration. In some Provinces they send round a motor lorry and a fodder cutter and demonstrate in the villages how to make silage. They are actually demonstrating in the villages how fodder can be conserved in the green state as silage, and how dry fodder such as *juar* stalks should be chaffed.

557. Encouragement by demonstration?—Yes.

558. In reply to the Chairman you expressed your opinion in favour of cattle-breeding being under the Director of Agriculture. In the Punjab cattle-breeding is under the Veterinary Department. I think it is the biggest cattle-breeding scheme in India?—Yes.

559. Do you not think it has been very successful?—I think it has been fairly successful though the farm is not run at a profit. In the Punjab you started your Veterinary Department years and years before your Department of Agriculture came into being. But there is not the least doubt but that the agriculturist has far more to do with cattle-breeding than the veterinary man. When in charge of cattle-breeding farms I did not require the help of a veterinary man oftener than once or twice per farm per year. The veterinary man is interested mainly in the diseases of cattle, outbreaks of which occur only after long intervals as a rule; while the agriculturist has to produce the fodder required daily for his herds. On a cattle-breeding farm we do not require the services of the veterinary man oftener than say once or twice in the whole year. In short, the services of the agriculturist are required daily.

560. Would your stock-breeding expert be a veterinary man or an agricultural man?—If he knew something about agriculture, and the growing of crops, and if he knew veterinary science as well, I would prefer the veterinary man.

561. That is a contentious point between the two Departments?—I think every Province except the Punjab has definitely decided that the Director of Agriculture should run cattle-breeding.

Sir James MacKenna: Not Burma.

562. *Mr. Calvert:* A little further on you say it is important to induce landowners to take a keen practical interest in rural matters and you say that to your mind is a question to which the Royal Commission should give special attention. Can you help us with any suggestions?—I think the Royal Commission should recommend that our highest officials in the Provinces should take more interest in agriculture, and that those officials should

use their influence in getting the larger landowners to take more interest in its development. I believe the present Viceroy will be a power for good in the land in that respect; that a great many of our Maharajas, Rajas and Zamindars will, within the next year or two, start home farms, that it is within their power to do a great deal to build up pedigree herds of cattle to produce improved strains of seed and to introduce improved implements, and that their influence and material help would be of great benefit to the cultivator.

563. In your subsidiary industries, you mention fruit-growing, market gardening and poultry-rearing: are there not questions of caste involved in connection with those particular industries?—Poultry-rearing of course might be difficult, but not dairying, I think.

564. You say that the Registrar of Co-operative Societies should be allowed to retain his post for ten years: would you not rather say "encouraged"?—I think that is a better word. It is a mistake to change him every five years or so as often happens.

565. I think you will admit that it is very very important that great care should be taken in selecting the best possible man for the post of Registrar and that he should be kept on as Registrar for a good many years, in the event of his proving a success?—His success would depend very largely on his enthusiasm, I should think.

566. You rather cast some doubts on co-operative cattle-breeding societies? —There are a great many of them in the Punjab.

567. Were you thinking of the Punjab?—No. We had a society in the Central Provinces and we had to close it down. I have not much faith in co-operative cattle-breeding societies. I believe that if we are going to improve cattle in India we must get the owner of the cattle to give them his personal attention. He must take a personal interest in his animals. They have now in some villages premium bulls, each of which is looked after by a certain man in the villages, though its services are given free to all the people of the village. Is that what you mean by co-operative cattle-breeding societies?

568. I mean a co-operative system to organise local public opinion in favour of carrying out the advice of the Department; you are not casting discredit on that?—No.

The Commission then adjourned till 10-30 a.m. on Thursday, the 14th October, 1926.

Thursday, October 14th, 1926.

SIMLA.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.

Sir THOMAS MIDDLETON, K.B.E., C.B.

Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.

Sir JAMES MACKENNA, KT., C.I.E., I.C.S.

Mr. H. CALVERT, C.I.E., I.C.S.

Raja Sri KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.

Professor N. GANGULEE.

Dr. L. K. HYDER.

Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Dr. D. CLOUSTON, M.A., D.Sc., C.I.E., Agricultural Adviser to the Government of India.

Further Oral Evidence.

569. *Mr. Kamat:* I have to revert to the question as to the lack of co-ordination between the Provinces and the Imperial Department here about which you spoke yesterday, because I feel it is a matter of some importance with reference to the relations, which must be definite, between the Imperial Department and the Provincial Agricultural Departments. Would you, therefore, kindly tell me whether we are to take certain statements which you made yesterday as being symptoms of apathy on the part of the Provincial Departments towards the Imperial Department with regard to co-operation?—To what statements do you refer?

570. You said, for instance, that officers of the Imperial Department were not wanted by the Provinces?—Yes, that applies to certain Provinces.

571. You take that to be a symptom of apathy on the part of the Provincial Departments towards the Imperial Agricultural Department?—Yes, I do.

572. Now this tendency you have noticed during the last 5 years, and you think it was due to, or consequent upon, the introduction of the Reforms?—I think so. It has been due to the fact that the Central Government has now lost all control over the Provincial Departments of Agriculture: we have no strong central body to co-ordinate the activities of the Provincial Departments.

573. I know, but then I am trying to find out whether there are other possible explanations of this lack of co-ordination, because I think it should be the duty of this Commission to take cognisance of any other possible explanations or any other under-currents, and also to ascertain whether the Imperial Agricultural Department is inspiring that confidence and trust which it should deserve. Now you have told me that you have lost control owing to the Reforms. You have read the Devolution Rules and do you not think the Provincial Departments are within their rights in developing their research on their own lines, if they can?—Yes, quite; I agree.

574. Now so far as your personnel is concerned, at any rate in those Provinces where the Director of Agriculture, for instance, is a technical and scientific man, a man of experience, and if he has also in his department men with English qualifications and also Indian qualifications who are able to undertake research, should not they really go on self-contained and on independent lines?—In no part of the world have they been able to make much progress on those lines: you will find that in the United States of America they have found it necessary to have a strong central department to co-ordinate the work of the departments of the different States. You will find the same policy adopted in Australia, and in South Africa: wherever they have a federal system of government they have a strong central Department of Agriculture to co-ordinate the work of their smaller departments.

575. I quite see that you are quoting the analogy of other countries, but, so far as the Devolution Rules go, what has been now provided for, as far as I can see, is that the control which the Central Government can exercise is intended for two things only, namely, if there are differences between two Provinces, if they are unable to settle those differences the Central Government can exercise that control; and, secondly, the Central Government can exercise that control to safeguard its own interests. Otherwise whatever co-ordination there is to be should be on a purely voluntary basis; I mean the Central Government has no right to interfere. Do you agree?—I quite agree. All the same, I think it is wrong. I think that the Central Department should itself do as much for research as possible and at the same time help the Provinces to intensify and expand their research work.

576. Quite so. When you complain of this lack of co-ordination, I want to ask you whether you initiated or laid down any lines along which co-ordination might be made possible between Provinces and yourselves. Did you suggest any lines? I will make my question plainer by means of an example: for instance, did you classify certain subjects which the Provinces could take up for research entirely by their own staff: was any such attempt made to lay down lines along which co-ordination should proceed?—I drew up a scheme which I called a scheme for an All-India organisation for the development of agriculture. I had intended to discuss that scheme at the last meeting of the Board of Agriculture, but, as a result of the decision to appoint a Royal Commission on agriculture, the subject was not discussed.

577. You will have noticed that your scheme does not pertain to research alone, and, secondly, whatever you laid down in this scheme was laid down recently. I am talking about the last 5 years, of which you complain. Have you initiated any lines of co-ordination for the consideration of the Provinces during the last 5 years or since you have been in charge? The Royal Commission only came in at the beginning of this year?—That scheme was drawn up over a year ago, and submitted to the Government of India. We had before that another scheme under consideration; that scheme was to provide for India something corresponding to the Royal Society of Agriculture in England. The Provinces were consulted: some Provinces were in favour of this scheme but others were opposed to it.

578. Beyond the suggestion of this analogy of a Royal Society, there was no effort made by the Government of India to indicate to the Provinces on which lines co-ordination should go?—The Government of India brought into being the Indian Cotton Committee which made very definite recommendations as to how co-ordination could be effected. The Government of India appointed a Sugar Committee too, which made very definite recommendations. All the recommendations of the latter Committee have not been given effect to; it is true, but action has been taken on most of the recommendations of the Cotton Committee. The Government of India has thus made some effort to secure co-ordination.

579. Have you got in your own Department here a list of the problems which the Provincial Departments are trying to solve by research?—The list is a very very large one; you will find them all described in some detail in the reports. I can give you a list if you care to have it.

580. I have got before me at least the list of the Bombay Government. My question was: do you keep the Provinces informed of what the Pusa Research Institute is doing for the time being, and do they keep you informed of the problems they are trying to solve? Is there an interchange in the interests of co-ordination of such problems, so that there should not be overlapping?—Pusa publishes its annual report in which the research work done by the heads of sections is described in considerable detail. The Provinces publish their reports in which their research work is described. Pusa gets reports from the Provinces and the Provinces get the Pusa reports.

581. That is not what I mean. They get the reports after the work is started. I want to know whether before the publication of these reports you are in possession of facts as to what investigations are being carried on in the Provinces and are the Provinces in possession of facts as to what Pusa is doing?—We do not know until the work has actually been taken in hand and until a report on that work has actually been issued.

582. If the Provinces are not kept informed when you take up a particular problem for investigation, how is co-ordination to proceed?—When the Board of Agriculture met annually the programmes of work in the Provinces were discussed. It meets only once in two years now, so it is not possible to keep in touch with the work that is being done in the different Provinces.

583. As the Board does not meet for two years, the respective plans and programmes of research of different Provinces are not known to each other and you have taken no means to ensure that such prgorammes are made known to the different Provinces. Is that correct?—That is correct, but for that very reason we propose that we should have an All-India organisation to keep the Provinces in touch with Pusa and Pusa with the Provinces. We are trying to remedy the defect.

584. Till that organisation comes into existence, if it does at all, I think this sort of information should be supplied to the Provinces, and if they have not been receiving it, you agree that it is not their fault that there has been lack of co-ordination during the last 5 years? I shall just ask you one question in order to illustrate still further what I indicated. Rice, you know, has various varieties in India. Rice research is circumscribed by conditions of climate and soil. The Bombay Government is carrying on research in one variety of rice. Pusa or other Provinces may be carrying on research about rice. Did you enquire what the Bombay Government was trying to solve and did you inform the Bombay Government what you or the other Provinces were trying to do?—You are pointing out the defects in the present system. As these defects exist I put up a scheme for the better co-ordination of agricultural education and research, but you want to know, evidently, why I did not put up that scheme earlier.

585. I shall now come to another point. Yesterday you told us that it was the shortness of funds for touring and travelling that was perhaps one of the causes of lack of co-ordination?—That is so, to some extent at least.

586. In almost all Provinces the expenditure on agriculture has during the last 10 years, or during the last 5 years, been on the increase?—The increase has been very small: that you will find if you study the budgets.

587. In any case, if there is an outstanding problem which Pusa has solved to the knowledge of the Provincial Governments, they would not grudge the small expenditure to send up their officers to Pusa. They would not be so unwise, would they?—I think it is very possible that they would.

588. If therefore there is unwillingness to spend on travelling, is it due to an under-current of feeling that there is nothing outstanding at Pusa which their officers can learn?—We have been taking on officers from the Provinces for short courses of training and we have repeatedly had as visitors officers from Bengal, Bihar and Orissa and other Provinces.

589. That is not what I meant. Take occasional visits to see what Pusa is doing for tobacco or for sugarcane. Such visits are not encouraged by the Provincial Departments not only owing to the lack of funds but even because

of their feeling perhaps that there is nothing new that they can learn at Pusa? Is that the feeling?—I do not think that that feeling exists.

590. You said something about the calibre of men coming up to Pusa. May I know how many men you have finally selected for the post-graduate course?—You mean this year?

591. This year?—The applications have only come in within the last two or three weeks, but we ordinarily have about 60 applicants, out of which we probably select about 4 or 5.

592. How many post-graduate people have you now working?—We have about a dozen at the present time, I think.

593. Who makes the selection?—We have a selection committee consisting of the Agricultural Adviser and heads of sections at Pusa.

594. Are there any rules for the guidance of this committee, or is the selection purely arbitrary?—Purely arbitrary. We select the best men.

595. You said the other day that there were 16 applicants for the chemistry course out of which none was suitable?—Yes.

596. You know there are other institutions in India for post-graduate courses, such as in Bangalore and the Hindu University at Benares. Do you know that more people go for post-graduate courses to these institutions than to Pusa?—You may be correct. I am not sure.

597. Have you noticed any lack of confidence on the part of candidates going to Pusa rather than to these other institutions where a post-graduate course is provided for?—We have many candidates, but, as I have already said, they have not got the qualifications required.

598. Most of these graduates come from Government colleges, do they not? —From Government colleges.

599. Now, to take one instance, the Royal College of Science in Bombay. If a graduate is trained in a well-equipped college like that, do you think he has not had good training?—His training would probably be all right. We obtain a number of men who have had the necessary training, and whose qualifications are up to our standard. But, as I have already said, a great many of those who apply for admission have not got the qualifications.

600. Is it the fault of the calibre of the boys or is it the equipment or the curriculum?—It is due to the equipment and to the teaching staff provided for these colleges not being up to the standard required.

601. Even in the Government colleges?—Yes.

602. You have nothing to grumble at about the curriculum provided by the Universities, I suppose?—I submitted a note which was a report on the results obtained at Dacca University. Perhaps you have read that. It pointed out the defects in the system. It pointed out that the students were not properly trained in science at the High Schools. The equipment was not good and the staff was not up to the standard required.

603. But men from these Universities, from the very same Government institutions, are accepted in other countries and they turn out to be very good men either in the matter of research or in the matter of general qualifications. Do you know that?—That is so, but at Pusa we also admit a certain number and some of them turn out very well indeed.

604. Then your complaint about the calibre or about the equipment is not shared by other Universities or other educational bodies. Is that correct?—No. It is not correct. The number of Indian students who go home, I suppose, may be a fraction of a per cent. per million of the population. The number is very very small.

605. But no complaint has been received. At least, have you heard any complaint about the calibre or about the bad equipment of the Indian colleges from English Universities?—At Edinburgh University, I know, some Indian students do very well, but quite a number do not. We have the very same experience at Pusa.

606. The English Universities also share your view?—I think so.

607. At least I have not heard of any complaint. You said the other day that you lost very good men in research at Pusa after the introduction of the Reforms?—I did not refer especially to Pusa; I referred to the Provinces.

608. And you told us that it is more or less due to public criticism?—It was partly due to public criticism.

609. Do you mean that these officers who resigned were intolerant of criticism?—It may have been that, because scientific men are intent on their own work and they like to be left alone to do their own work in their own way. They do not like to be criticised by people who do not understand what they are trying to do and who do not understand the time that it takes to produce results by research.

610. By criticism you meant criticism in the Legislative Bodies?—Yes, and in the newspapers.

611. You also told us that members of the Legislative Bodies take very little interest in agriculture?—I was referring in that case to my experience in the Central Provinces. I had a good deal of experience there and I can say without hesitation that they took very little interest in agriculture or agricultural development.

612. How do you reconcile the fact that these officers were intolerant of criticism and therefore had to resign and yet there was very little criticism in the Legislative Bodies of the Agricultural Department or their work?—I think I pointed out that the criticism took place when the budget was being considered and the criticism was destructive criticism. The members did not take much interest in schemes for developing agriculture, constructive proposals, in other words.

613. Take my own Province, which I know fairly well. If members have not been taking interest in agriculture, how would you account for the fact that the budget for the Agricultural Department has gone up during the last 10 years from Rs. 8 to Rs. 15 lakhs?—I am afraid I could not answer your question as I do not know the conditions sufficiently well in the Bombay Presidency.

614. The same phenomenon is to be observed in other Provinces. How is it to be accounted for?—I do know that in the Central Provinces we had our budget reduced by Rs. 1,80,000 in one year by the vote of the Legislative Council and I also know that the reason why they reduced the grant was not their lack of confidence in the Department. It had absolutely nothing to do with the work of the Department. Some of the members of the Council were opposed to a certain measure brought forward by the Minister and to show that they resented this measure they reduced his budget.

615. They might have rejected a particular measure or scheme on its merits. You suggest that generally the members of the Council do not take interest in their own constituencies, which they do not correctly represent?—As far as the Central Provinces are concerned my statement is absolutely correct for the very good reason that the members who represented rural areas were not directly interested in agriculture.

616. As long as they are returned by the rural constituencies, do they not really represent them?—They are representatives in name.

617. Do you know that in certain Provinces rural representatives do not even know English and are allowed to speak in the vernacular and that they are really the representatives of the rural constituencies?—That may be so.

618. You said something yesterday about your views on Indianisation and if I understood you correctly you said that Indianisation was a mistake. Am I correct in saying that?—That is not correct. I may point out here that I am expressing my own personal views. I believe that it is our duty to Indianise as quickly as we can but I also believe that the development of agriculture is of such enormous importance to India that we should recruit for the Central Department of Agriculture the very best men we can get. If necessary we should get our research men from other countries. If, however, we had an appointment vacant for which an Indian and a European had

applied, I would, in the event of their qualifications being equally good, invariably on principle give the appointment to the Indian. But I think it would be a mistake to decide that we shall recruit no more Europeans to the Central Department of Agriculture; we have not yet got a sufficient number of Indians trained to do justice to the research work waiting to be done. Moreover unless we recruit more Europeans of very high calibre, I am afraid we shall not be able to train Indians as they ought to be trained.

619. Then your remarks about Indianisation refer not to the Indianisation in other Departments but only to the Central Department of Agriculture?—I am referring to the Central Department of Agriculture. We cannot interfere with the Provinces.

620. And is it only with reference to research work or with reference to other agricultural work also?—Research and teaching.

621. Now, with regard to the idea that research cannot be done by Indians, is this due to your idea that they have not the genius for research?—I have never made that statement. I have had to train a great many Indians, some of whom have been absolutely first class officers. I have never once cast a slur on Indians or on their ability to do research work. What I said was that they have not yet had an opportunity of learning research methods. The Department of Agriculture is after all only about 20 years old. In some of the Provinces you have not even got the agricultural college at which men can be trained.

622. You recognize, then, that in research Indians have the aptitude for doing good work if they are given the opportunity?—Most certainly they have the aptitude.

623. So far as the research work done in the Provinces is concerned, there have been striking results in certain problems, say, for instance, cotton in Surat and tobacco in Nadia, which have been conducted only by Indian officers of the Agricultural Department?—I should not say that the research work was being conducted entirely by Indian officers, because it is the Director of Agriculture who really controls the research work. With regard to cotton in Surat, I happen to know that the cotton seed that is being given out on a large scale there was evolved over 20 years ago by Professor Gammie.

624. From the annual report of the Director of Agriculture, Bombay. I see that they have evolved locally certain strains of their own. You do not give them the credit for that?—I certainly give them the credit for that, but the improved seed of the Surat cotton to which you have referred was evolved by Gammie.

625. You agree that research in other directions has been done independently by Indian research workers?—They work under the Director of Agriculture, who controls research.

626. You think that without the help of the Director of Agriculture they will not be able to do any work?—I would not make any such statement but I do say that at present they are working under the Director who does control the research work.

627. The Lee Commission has referred to this question and has laid down that so far as the Department of Agriculture is concerned further recruitment as far as possible should be Indian and that there should be Indianisation of the Agricultural Department?—They have made that recommendation, and I quite agree with that. But I say that we should not insist on it for the Imperial Department at least. If we cannot get fully qualified Indians we should not hesitate to get suitable men from Great Britain or from America or from wherever they can be had.

628. If there are Indians capable of being trained in England, you would not send them there and bring them eventually to Pusa?—As a matter of fact, we are already adopting that procedure. We appointed an agronomist quite lately. As he has not got the qualifications required, we propose to send him Home after three years, for training at Cambridge in his special line of work, namely agronomy.

629. If you stretch your eye to the next 15 years, you will be prepared to admit that a certain amount of Indianisation even in the higher appointments at Pusa must be arranged for and the posts must not be reserved only for the European element?—We have made four appointments within the last year and they have all been Indians.

630. As a matter of principle, then, you are not in conflict with the idea of the Lee Commission?—Our goal should be to Indianise the service completely, but I say the time for that has not come yet. We should recruit the very best men available.

631. As a matter of policy, would you not bring that time of Indianisation nearer by taking certain steps?—I think you can bring that time nearer by getting from more advanced countries the most highly trained scientists that they can produce.

632. Would you still carry on that policy of bringing in men from foreign countries instead of sending Indians from here to foreign countries for training?—I would do both simultaneously. If you send a man home, it takes a considerable time to train him there; in the meantime, we should be training Indians out here.

633. Therefore, if you would carry out the policy laid down by the Lee Commission to which the Government of India are also committed, that is not a wrong policy?—It is not a wrong policy, but I think you will find that the Lee Commission did not recommend that the recruitment of Europeans should be stopped; at least, they did not recommend this as far as the Central Department is concerned. It has worked out in practice, however, that European recruitment has been entirely stopped.

634. Would you modify your views, then, that Indianisation is a mistake to that extent?—Complete Indianisation is a mistake. I am not modifying my views. They were my views yesterday.

635. Would you modify your views to the extent that the simultaneous process should go on?—Yes. As a matter of fact, we are already training Indians at Home. For instance, we sent Home men about four years ago to be trained in veterinary science.

636. How many years would you take to accomplish by this simultaneous process the Indianisation of the Pusa Institute; say 20 or 25 years?—I am afraid I cannot tell you that.

637. Would you not attempt it either?—I would not attempt to make a guess as to the time it will take.

638. Gradually?—Yes, gradually, but we are now doing it gradually; we have decided once for all to Indianise the services.

639. You recognize the good work in research which is done by some of the Indian graduates in the Provinces?—Certainly. I have had a great many Indian graduates working under me and some of them have done excellent work.

640. If the visits of the officers from the Pusa Institute were not welcome, is it due to any want of confidence in the work that is carried on there?—No. There are a great many reasons. When we had civilian Directors of Agriculture, they took broader views on the whole, but I do not desire to cast a slur on the work of the expert Director. The expert Director is sometimes inclined to be a little jealous. He wants to get all the credit for the work done in his Province.

641. But this feeling is not confined to Bombay or Madras. You said that it was prevalent in all Provinces?—I said it was prevalent in some other Provinces. I think I stated that some Provinces came to us for assistance. I quoted Bengal and Bihar and Orissa.

642. If there is this feeling it is localised in the Provinces?—Yes, it depends very largely on the personality of the Director.

643. Have any distinctive results been achieved by your workers which have obtained recognition in International journals and International Institutes?—Yes. The work done by the Howards is recognised as most valuable;

it is recognised in every part of the world. You will find that Pusa wheat is now grown on a fairly large scale in Australia even.

644. I am talking of the last few years, since the departure of Howard?—He left Pusa only last year.

645. Then such work has been recognised by International Institutes?—Yes. Our work is often referred to in research journals published in other parts of the world.

646. I now wish to refer to your scheme of an All-India organisation, the rough outline of which you have placed before this Commission. You told Sir Henry Lawrence yesterday that you would accomplish co-ordination by an Advisory Council and also for this All-India organisation I find that you are proposing to have another Advisory Council?—That is correct.

647. Would there not be too much of a multiplication of Advisory Councils in this way?—My proposal was to have one Advisory Council only and have one Executive Committee to carry out the work in the Provinces.

648. But your Advisory Council for co-ordination would be separate from your Advisory Council for this All-India organisation?—No, it is the same thing.

649. It will be within the functions of this All-India organisation to carry out research also?—The Advisory Council would be responsible for that.

650. Would there be no duplication in this way if you leave research within the functions of this body as well?—The Advisory Council would give advice regarding the research work to be done in the Provinces.

651. Now what would be the composition of your Advisory Council, the total composition? Would it run to a hundred members?—No. I have not really thought out the number we should have on the Advisory Council; it might be 30 or 40.

652. You are going to provide for all the Ministers of Agriculture, the Directors and also non-official gentlemen?—No, you are mixing up the two schemes. We were to have in the first place one very big All-India organisation which would include such leading agriculturists as desired to join this organisation. It would also include Ministers of Agriculture, Maharajas, Rajas, and Zemindars interested in agriculture. The aim of this body would be to stimulate a general interest in agriculture, and to get our Legislative Councils to take more interest in agriculture. That body would only meet once a year and would have no advisory functions at all. At its meetings we would have lectures illustrated by slides and cinema films given on different aspects of agricultural development. It would hold an All-India agricultural show once a year; it would have a publication branch and all the members would get the publications issued by the same. In other words, its main aim would be to interest a very large body of people connected with the land in agricultural improvement. It would not have advisory powers. The Advisory Council would be a body within this larger body.

653. Then this larger body would be more or less for propaganda work?—Yes, that is the word.

654. And within that body you wish to have an advisory body?—Yes.

655. I want to know this. When that advisory body tenders advice to the Government, would that advice be binding or would the final word be with the official Adviser to Government?—I think their advice would not be binding, but as the Agricultural Adviser would be chairman of this Advisory Council the chances are that all their recommendations would be accepted by the Government of India.

656. It comes to this, that the recommendations or the resolutions of that Advisory Council will have very little value, as the Agricultural Adviser to the Government has the power to override them?—I am afraid I do not quite follow that. I said the Agricultural Adviser would be chairman of this body, just as he is at present chairman of the Indian Central Cotton Committee. All the recommendations of the Indian Central Cotton Committee, as you know, are sent up to the Government of India and the Government of India

invariably accept them for the reason that their own Agricultural Adviser is President of the Committee.

657. I think you did not catch my point. If the chairman does not agree with the resolutions passed by this Advisory Council, and if he tenders different advice from the resolutions, whose word is to be final?—I do not think that that difficulty is likely to arise in the event of our having such a body.

658. You think it will be a workable body?—Yes, I think so.

659. Have you thought of the funds that might be available for such an organisation as this, without which it cannot be effective?—Yes, I have suggested that the money should be provided either by the Government of India from general revenues, or that a cess should be imposed on certain exports as recommended by Mr. Lindsay, our Trade Commissioner in London.

660. You would derive your resources from a fund that would be created in that way?—Either in the one way or the other. If the Government of India were not in a position to provide the money from general revenues, they could provide it by imposing a cess, and building up a Cess Fund.

661. Earmarked for your All-India organisation?—Yes.

662. You have told us about the federal system existing in the United States of America. There are different bureaux for different kinds of agricultural work attached to the Department at Washington at the headquarters of the Government. I believe in the Union there are something like 35 or 40 States?—I believe there are.

663. These bureaux guide the co-ordination work of these different States. Now is there not some constitutional difference in the arrangements the analogy of which you have given to us, inasmuch as the President of the United States has vast powers and is not dependent on a Cabinet and there is no portfolio for Agriculture there?—I did not recommend that what we may call the federal system of the United States should be followed here in India. I think you are probably referring to a memorandum submitted by Dr. Landor; I did not say that I approved of his suggestions.

664. I take it, then, you would not have a similar arrangement here? You would not approve of it?—Not necessarily.

665. You keep your mind open on that question?—Quite.

666. You would be content with your All-India organisation?—Yes.

667. And no bureaux for investigation?—Well, the committee which has to deal with each crop and each line of research work would really take the place of the bureaux in the federal system in America.

668. *Dr. Hyder:* Did I understand you to say that there was no Secretary for Agriculture in the United States?

Mr. Kamat: I never said that.

669. *Dr. Hyder:* A portfolio, I think you said.

Mr. Kamat: I said a Cabinet system with a portfolio of Agriculture.

670. *Dr. Hyder:* My impression is that these Secretaries correspond to Ministers

Mr. Kamat: I referred to a Cabinet system with a Minister in charge of a particular portfolio.

671. *Dr. Hyder:* The Secretaries do form part of the Cabinet.

Mr. Kamat: There is a difference: it is not identical with the system in England.

672. Now, Dr. Clouston, I have to ask you a few questions about agricultural education. We have heard a great deal about these middle schools and also agricultural bias schools, but let me ask you one question, whether you have during the last few years mapped out a general plan, a general design, of the whole structure, of the whole edifice, if I may call it so, of agricultural education as it should be in each Province? Could you give me a general design of your edifice with an agricultural college for each Province, for instance, as the apex of your edifice and going down to the bottom to the

village?—If you will read over the recommendations of the Board of Agriculture you will find that we have made very definite recommendations.

673. That is precisely the reason I ask the question. I have gone through the recommendations of the Board of Agriculture, but they have not prepared a regular scheme, a whole scheme, of agricultural education beginning from the village right up to the top, the agricultural college, with all the intermediate steps, and a scheme which could be fitted in or dovetailed or combined with the other school systems in the country. That is precisely the point I am driving at. You are aware that in all the Provinces compulsory primary education is being pushed and Acts have been passed. You are also aware that strenuous efforts are being made both by financial and other means to have a large number of schools opened in the villages. We here on this Commission are stressing the point about agricultural education while primary education will also be promoted side by side with it. My point is this: How are the two things to be co-ordinated? Have you thought out a scheme for that?—I think all the co-ordination that is necessary is the co-ordination that has now been adopted in the Punjab, where you add agriculture to the vernacular middle school curriculum. In the primary schools nature study lessons are already being given. I do not think it is really the duty of the Department of Agriculture to undertake to give agricultural education either in primary schools or middle schools. It is the duty of the Education Department. We should act as advisers only.

674. Well then, you agree that according to your scheme in the ordinary rural schools where the three R's are taught, except for nature study you have nothing to do with agricultural education as such?—Nature study in the primary schools.

675. That will be your first step. Then on the top of that you will have middle schools and middle agricultural schools. That will be your second step in the scheme? Is that right?—That is right.

676. Now have you noticed that except in the Punjab, in other Provinces these middle schools have not yet taken root. I mean they have not been a pronounced success?—They have not been started, that is the reason; they have not been tried, except in Bombay and the United Provinces.

677. I was just coming to that. The only other Provinces which have started them are Bombay and the United Provinces. Now in Bombay these have been in existence for something like 12 years?—I think you are mixing up two types of school. You are talking of special schools of the Loni type.

678. Certainly?—But those schools have been tried in Bombay, Bengal, the Central Provinces and Madras. They have not been successful in these provinces.

679. The Loni type of school is only a difference in name. According to your scheme what is the difference?—I think you are probably mixing up the type of education given in the ordinary vernacular middle school in the Punjab schools with that of the special vocational schools of Bombay Presidency.

680. You are therefore in favour of the Punjab type and not of the Loni type. You are not in favour of the policy of separation of purely agricultural schools from others?—I am not in favour of what are called vocational schools. I am in favour of bias schools, as they are called in Bombay.

681. That is altogether different. In the Punjab you are talking of the grafting of these schools on the ordinary school system?—Quite.

682. Do I take your view to be that other Provinces should stop having these separate agricultural schools of the Loni type?—They have been tried in Madras, the Central Provinces and Bengal and they have not done well, and I think I am justified in saying that they have not taken on in the Bombay Presidency, where the first Loni school was started 15 years ago. I think you have at the present time only 6 schools in that very big Presidency.

683. The school at Loni has 42 boys, and another school of the same type at Dhulia has got 22; a total of 64 boys being taught for a population of six millions?—Yes.

684. So you think it would not be workable?—It would not be workable for the reason that you would never be able to find the money required for the extension of this system of education; it costs, I believe, from Rs. 250 to Rs. 300 per pupil per annum.

685. Similarly in Bengal there is one school which has got about 10 or 12 pupils?—Yes. In the Central Provinces we had to close down one of our two vocational schools, and to convert the other into an ordinary vernacular middle school with agriculture as one of the subjects of the curriculum.

686. May I know if during the course of your deliberations in the Board of Agriculture or otherwise you have advised the Provinces to curtail the extension of these special schools and to adopt the Punjab type of school?—We have advised them to adopt the Punjab type, I think.

687. According to your opinion the Provinces are going in the wrong direction spending money over the special schools?—No, I have not said that. We decided at the meeting of the Board of Agriculture held at Poona in 1918 that a certain number of these special schools of the Loni type, *i.e.*, vocational schools, should be opened in each Province. We actually recommended that one or two should be opened in each Province as an experimental measure. Very little money has been wasted on these schools, for after all two only have been opened in Madras, two in the Central Provinces, and one in Bengal. If money has been wasted it has been in Bombay, where there are six such schools.

688. I am just asking you to give the benefit of your views to this Commission with reference to the extension of such schools in the Provinces?—In the light of experience I do not think they should be extended.

689. I want a definite opinion from you as to whether this special type of school should in future or should not be encouraged by the Provinces?—I do not think they should be encouraged.

690. You are definitely of opinion that that type should be given up?—I am definitely of that opinion; if there are many sons of big landowners desirous of getting a scientific training in agriculture, we should provide special courses for such men at our agricultural colleges, where we have all the equipment and staff required.

691. Will you just elaborate to me the kind of instruction given in the Punjab type of school in the middle stage?—They have drawn up a definite syllabus; I have not got a copy of it with me.

692. In all other schools where agriculture is taught, is it an optional subject or a compulsory subject?—I believe it is optional; but all the boys ordinarily take it. I am open to correction and Mr. Calvert will be able to tell us; I believe it is optional, but that all the boys take it.

693. Have you visited these schools in the Punjab yourself?—No, I have not.

694. You have not seen actually the results of the working of these schools? —I have seen the reports on their working.

695. And you are asking us to adopt the Punjab system purely from these reports?—From the reports of men who have had to work these schools.

696. Have you visited the Loni type of schools in Bombay?—I have.

697. *Mr. Kamat:* Till we have better and first hand knowledge of this Punjab type of school, should we not suspend our opinion about the superiority of the Punjab type over the Loni type?

Sir Ganga Ram: Mr. Richey, who started these schools, is coming before you: he will be able to give you information regarding them.

698. *Mr. Kamat:* Until you have satisfied yourself about the superiority of that system of agricultural training, should we not withhold our opinion on it?—I have seen the system as practised in a school in the Central Provinces and I know fairly well how the system is applied in the Punjab.

699. What is your opinion about the agricultural bias schools which we have started for instance in Bombay?—They are exactly the same as the schools in the Punjab; you merely copied the Punjab model.

700. Then why do you recommend the Punjab type as superior?—I merely call it the Punjab type because the system was started in the Punjab before it was started in the Bombay Presidency.

701. Do you recognise that the agricultural schools in the Bombay Presidency are extremely popular and they are said to be a success?—You mean the vocational schools?

702. The agricultural bias schools?—I quite agree; and that is the reason why I am recommending that a similar system of agricultural education should be introduced in other Provinces.

703. Therefore you would not be quite prepared at this stage to prepare a scheme giving prominence to the Punjab type of school?—I am afraid we do not quite understand each other. The types are not different; they are exactly the same.

704. We can therefore go on with our bias schools as we are going?—Yes.

705. Talking about implement manufacture, did certain manufacturers bring to your notice their difficulties chiefly about railway freights and classification of railway rates?—No; but I had a letter within the last two months from Kirloskar Brothers pointing out that the one great obstacle to any great extension of the trade in agricultural implements was high freights on the railways.

706. Did you take any action about it in advising Government to take up this point with the railway authorities?—I am not supposed to; I was Liaison Officer to this Commission at the time; these questions are now being brought before the Commission.

707. Do you know how many Indian factories for the manufacture of agricultural implements are in existence in India?—I could not tell you the exact number; I suppose there must be hundreds; there is in each Province a large number of small concerns manufacturing winnowers, ploughs, etc.

708. You say there are hundreds; you mean of the small type?—Yes, of a very small type.

709. I am talking of those on a fairly large scale?—There are very few, the only one I know of is Kirloskar Brothers.

710. You have in the Provinces agricultural engineers who design implements for Indian conditions?—We have.

711. Do you know whether they are trying to introduce modifications of new designs to suit Indian conditions?—Yes; they are trying to.

712. Have you got any specific types in which our agricultural engineers have improved upon the foreign implements to suit Indian conditions and if possible to cheapen them here?—Yes.

713. In which particular Province do you mean?—They have done so in the Central Provinces and in the Bombay Presidency for example.

714. In Bombay which is the particular type evolved by the agricultural engineer?—A seed-drill.

715. The seed-drill was the result of a competitive prize given by the Department, I think?—It is the agricultural engineer who is really trying to produce this new design. In the Punjab they have evolved an improved machine for boring for water; and in the United Provinces they have improved certain types of water-lifts.

716. On the whole you are satisfied with the results of the adaptation of western types of implements to Indian conditions?—The Departments of Agriculture have not had their engineers for any length of time; in the Central Provinces their engineer joined in the year 1920, for instance, so he has only been at work for 5½ years. Our agricultural engineers have not as yet had time to do very much.

717. Are these agricultural engineers men brought up in the country or are they men with foreign qualifications?—Most of them are men with foreign qualifications; in Bihar & Orissa on the other hand their engineer was trained in this country.

718. So far, therefore, nothing very outstanding in the way of the adaptation of western implements has been done; nothing very outstanding, I mean, in creating new designs and new types?—Yes; quite a lot has been done.

719. The seed-drill is the only thing you can think of in Bombay?—So far as I know.

720. Now, with reference to marketing, you have had some experience about the new cotton marketing system in Berar?—Yes, I have.

721. Will you just tell the Commission whether by this new system of marketing of cotton the producer gets the fullest value he ought to get for the quality and quantity of his cotton, without any filtering of his legitimate dues owing to middlemen or other causes?—There are certain defects even in the Berar system. Cotton, when it is brought into the market, is sold through a commission agent and when it is weighed there are complaints to the effect that the weighments are not always very accurate. There are small defects of that kind, but it is certain that in establishing such open markets Government has thereby provided a place at which cotton can be sold at the market price of the day.

722. Who fixes the market price of the day?—The buyers; they get telegrams from Bombay and then the cotton is auctioned and sold to the highest bidder: there are several buyers in each market and there is a good deal of competition.

723. You think that the cultivator is not defrauded either by the grading, or the quality that is fixed without his consent, when the consignment is brought to the market?—There is a certain amount of fraud practised even yet. When a cartload of cotton is sold, and unloaded, for example, the buyer at times finds there is a little dirty cotton in the cartload and refuses to pay the price at which he had bought it. On the other hand there is no doubt but that the cultivator gets a better price for his cotton in an established market than he can in his village.

724. So there has been some improvement?—Great improvement; so great an improvement as a matter of fact that the Indian Cotton Committee after studying the marketing system in Berar, recommended that the same system should be adopted in other Provinces.

725. *The Chairman:* Have you ever heard it suggested that the sale in the controlled market of Berar is sometimes a dummy sale that the cotton passes through the market and that the actual sale is effected outside the market afterwards?—No; I have not heard that.

726. *Mr. Kamat:* I want to ask you something about veterinary research and cattle improvement. Do you not think that the Central Veterinary Research Institute at Muktesar is too isolated for the purposes of the country?—It is isolated. If I were to select a site for a Veterinary Research Institution, I would not select a site which is so far away from a railway station. Muktesar is about 24½ miles from the railway station. On the other hand it has certain advantages. I do not think that the orthodox Hindu would like to have a research station of that kind in a centre near a big urban population.

727. Is that the only reason why it has been located there, or are there other grounds; suitability of climate and so on?—The climate is one of the considerations. The vaccines and the sera produced tend to go bad if they are kept at a temperature much above 40 or 50 degs. c.

728. Is the Director in charge of that Institute able to go round the country, and are there any means for similar research on a smaller scale in the Provinces?—There is little or no veterinary research being done in the Provinces: the Provinces have not yet provided laboratory accommodation and the staff required.

729. So you think that so far as cattle improvement or the prevention of disease is concerned, the fact that there are no facilities in the Provinces in this respect is a great handicap?—I think so, and for that reason I have recommended an All-India organisation to be called an Advisory Council, and that we should have in the Provinces research laboratories working in co-operation with Muktesar and investigating the different cattle diseases and their causes.

730. In whatever little veterinary work that is being done in the Provinces, either at the colleges or by the Indian Veterinary Superintendents, is there any co-ordination between the Muktesar Institute and the local institutions in the Provinces?—I think there is very very little research being done in the Provinces except in the Punjab. In the Punjab they are co-operating with Muktesar, but there is not much co-operation because there is no considerable amount of research work being done.

731. You are aware of the present system of cattle-breeding that is carried on in the Provinces, and you have cattle farms in different districts but no far-reaching system of supplying premium bulls to different villages. Is that right?—They have introduced the premium bull system in Bombay and in the Central Provinces already: it is very desirable that they should have the same system in other Provinces as well.

732. But even this premium bull system is so inadequate compared to the large number of villages that you would not call it a very satisfactory system, would you?—It is a very satisfactory system, in my opinion, if you can increase the number of bulls very largely, but at the present time there is a very small number of good bulls available.

733. Whatever prize cattle you show, are the bulls you exhibit confined only to a very few small centres and not even seen by the villagers?—Do you mean that we have not got a large number of cattle shows?

734. I mean cattle shows?—That is so, I believe.

735. Do you know that in ancient India there was a system of keeping a premium bull in each village which was maintained on charitable or religious grounds and which served very well for the purposes of breeding?—Do you refer to the Brahmani bull system?

736. It was a bad system in some respects, but could you adapt or modify that system if Government undertook to regulate it?—I do not think it is a good system. I studied the whole system fairly carefully last year in Bihar and Orissa when I was chairman of a Cattle Committee that went round, and I found that the objections to the Brahmani bull were that he was allowed to roam about without let or hindrance and that he did a lot of damage to the crops.

737. That is why I say is it not possible to adopt that system by bringing the work under Government control?—Another objection was that the bulls which are now dedicated by certain religious Hindus as Brahmani bulls are often of very poor quality. Instead of dedicating the best calf, they dedicate the worst. That was the complaint among the villagers.

738. Now, speaking about the welfare of the cultivators, I think you told the Chairman something about birth control?—I did not mean to lay much stress on that, but I notice that in a memorandum sent by Mr. Knight he refers to it. He is the Collector in Khandesh.

739. Was that idea due to any feeling that the rural population is increasing?—It is increasing. I believe the population of India has increased by about a hundred millions in the last fifty years.

740. Taking only the last decade, do you think that the rural population has definitely increased?—It has definitely increased within the last decade.

741. I wonder whether you have seen the memorandum issued by your department and supplied to the Commissioners about economic progress in the Bombay Presidency.* There, I think, figures are quoted showing that the

*The Economic Progress of the Rural Areas of the Bombay Presidency, 1911-22, by Dr. Mann.

population has not increased on the whole in the last decade?—I think the tendency generally is for the rural population to increase all over India.

742. In the Economic Progress Report issued by Dr. Mann for the period ending 1922, he gives a table showing the increase or decrease in the rural population district by district, and he definitely says that in East Khandesh, for instance, there is an increase by 2 per cent., in West Khandesh there is an increase by 6 per cent., but in Nasik it has gone down by 10 per cent., in Ahmednagar by 23 per cent., in Poona it has gone down by 10 per cent., either due to migration or other causes?—Taking India as a whole, I think the rural population is increasing.

743. Would you be surprised that so far as the smaller villages below a population of one thousand are concerned, the population is not increasing; it is stationary?—I can quite understand that in certain localities where the textile industry is being expanded very fast, the villages are losing a large number of their labourers.

744. What I mean is that this question requires very careful investigation and we need not assume that the population is increasing so as to disturb the welfare of the village community?—I think you must take a fairly long period. Taking a period of fifty years, you would not question my statement to the effect that the population has increased by about a hundred million in fifty years.

745. *The Chairman:*—Was there influenza during the period of ten years referred to in that book you quoted?

Mr. Kamat: These are figures for 1911-1922 during the influenza period.

746. *Sir Thomas Middleton:*—It has occurred to me that in directing a searchlight on the Indian Agricultural Department, we are in some slight danger of losing our sense of perspective, and I want to ask you this question. Are you, or are you not, aware that many of these problems which have been facing you, are problems which are common to developing Agricultural Departments?—Yes, I am aware of that.

747. If you had not been aware of it, I was going to say that in my experience such problems have been quite common in the development of Agricultural Departments in Great Britain in the last ten or fifteen years. Now, I want to ask you one or two questions on points on which you have been questioned. We all desire to secure the greatest possible amount of co-ordination between the central and provincial departments, but from my point of view I was disposed to think it was rather a healthy sign to find that the provincial departments have not been applying to you for advice so much in recent years as they did originally. Do you agree?—I entirely agree with it; some of them have developed their own research sections and do not find it necessary to come to Pusa for assistance to the same extent as they used to. It is only the departments who have not got special expert officers such as mycologists and entomologists who come to us freely for assistance. They now have their own chemists to do soil analyses; they have their own plant breeders too who are doing plant breeding, and do not in consequence find it so necessary to come to Pusa now for assistance.

748. It is a stage through which any developing department must be expected to pass?—I quite agree.

749. Now, one of your chief difficulties has been due to changes of staff, and in this connection there has been a reference to the influence of the Reforms. May not the effect of these Reforms in a sense be regarded as incidental in this way, that opportunities have been given to men to retire, good posts were available elsewhere, and it was not unnatural that the opportunity being there and the posts being offered elsewhere, a certain number of men should have retired at the time?—Yes.

750. There is no reason to suppose that this state of affairs will continue?—No, I think the men in the service at present are quite satisfied, despite the fact that they are working under a reformed Government.

751. It was a purely transitional and incidental effect of the change?—It was partly due to the fact that in the days of non-co-operation dating from 1921 there was a certain amount of racial feeling.

752. You refer, in connection with the training of men at Pusa, to the absence of instincts and traditions. Would you agree with me that in developing work of this sort instincts and traditions are not, after all, very difficult to create?—I agree with you.

753. You are of course aware that our "instincts and traditions" in Great Britain, for example, have been the product of the last 30 or 40 years. Further you may agree with me that although at the present moment Pusa may not have the instincts and traditions which you would desire, there is no reason to suppose that these cannot be acquired within a comparatively short period?—There is no reason; none whatever.

754. In listening to the account which you gave yesterday of the work at Pusa, I got the impression, I may have been mistaken, that the work at Pusa was regarded as consisting almost wholly of the production of the Pusa wheats. Now, quite recently I happened to look through one of the latest volumes of the Agricultural Journal, and there I found at least one paper which was of fundamental importance on another subject, and it was the work of persons working at Pusa. Do you agree with me that in addition to the production of wheats there has been quite a substantial amount of fundamental work done at Pusa?—Yes. We have done a great deal of fundamental research which does not bring in any profits, and which we probably cannot apply at the present time. It has, however, added to our knowledge of scientific agriculture, as for example, our work on soils, etc.

755. I am thinking of work on the root range of fruit trees?—Yes, that was by Mr. Howard.

756. That seemed to me a piece of work of quite fundamental importance?—It may not bring in any rupees, annas and pies immediately, but it has added to the sum total of our knowledge of plant life.

Then, to touch on this difficult question of the Indianisation of the Services: The policy which you stated seemed to me to be not solely an Indian policy but a policy which is common among all the nations whose agricultural progress I have studied. Mr. Chairman, you and I come from a country which has sometimes been accused, rightly or wrongly, of attempting to keep its posts for its natives. Just before I left home I was asked to agree to an appointment by a Scottish institution and I noticed with some interest and some degree of satisfaction that it was an Englishman who was proposed for the post. In England we have been trying for quite a number of years to train men in the country to fill the posts which require filling. Quite recently however it has been necessary for us to go to the United States of America and bring a man from that country because we could not find one suitable in England. So that, in listening to Dr. Clouston's exposition of his policy in this matter, it seemed to me that the policy advocated by him for adoption in India closely resembles the policy on which other countries are now working. At this stage I do not wish to put any further questions to Dr. Clouston, but I do wish to emphasise the need, in examining these Indian problems, of maintaining a due sense of perspective.

757. *Sir Ganga Ram:* When you are giving appointments, when you are selecting boys for the Pusa work, are you governed in any way by communal considerations, or are you only governed by merit? Supposing there are two candidates, one a Hindu and one a Mahommedan, and the Hindu is superior, but if there are already many Hindus at Pusa, would you give the appointment to the Mahommedan?—Certainly not: we would give the appointment to the best man.

758. So your selection is entirely governed by merit and not by communal considerations?—Yes.

759. Now, boys go to England for agricultural training on their own account and come back after three years, and there are the boys who are the output of the colleges here. Do you find these boys who get their training

in England in any way superior to the output of your colleges? I am not now referring to the boys who are sent by Government for some special training but to the boys who wish to see England and can afford to go there and get a training on their own account. Do you find, in your experience, that such boys are superior to the output of your colleges?—It is very difficult to answer that question; but I may say that a great many of the Indian students who have gone home for training in agriculture are students whom I would not have selected for such training. They go Home because they can afford to do so and they very often study both law and agriculture at the same time. They have not got any special bent for agriculture and, I think, that men of that type are not likely to make good when they come back to this country.

760. Have you made any research on drying vegetables? Howard did a lot in Pusa. Do you make any?—We have done nothing since the Howards left Quetta.

761. *Sir Henry Lawrence:* There was one question to which I could not quite grasp your answer. It was in regard to the selection of applicants for the post of chemist, I think. Was it a post of chemist?—No, it was for post-graduate training in chemistry at Pusa.

762. And out of 16 applicants you could find nobody qualified?—Nobody was qualified.

763. Do you mean they were not qualified by reason of the previous examination that they had passed or did you apply any particular test of your own?—It is like this. When they come to Pusa, they are supposed to start off with research. They are not really qualified to begin research unless they have passed the M. Sc. examination. In other words, the men referred to had not got the basic training necessary to qualify them for research work.

764. So that you have laid down that for this post-graduate course no boy who has only taken the B. Sc. degree is qualified. He must take the M. Sc.? —Yes, for the reason that very few of the men who have taken the B. Sc. have covered the ground that should be covered preparatory to their starting research.

765. Then, of these 16, none had taken the M. Sc.?—That was so. I did not see the students myself but the Head of the Chemical Section, who is the Joint Director at Pusa, had gone through their applications very carefully and gave it as his opinion that not one of them was qualified for post-graduate training in research.

766. Then your answer does not imply that the Universities do not teach up to the standard that you require?—Oh no, it does not imply that.

767. But at the same time, the standard of teaching at the Arts colleges is not high in science. Are there not other institutions of which the standard is sufficiently high?—In the Punjab it is fairly high: in Bombay too it is fairly high; at the Arts colleges in Bengal and Bihar and Orissa, it is not.

768. But would you accept the product of the Arts colleges of the Punjab and of Bombay?—Yes, when the student has taken his M. Sc.

769. What about the Institution of Science in Bombay? Have you had any applicants from there?—I do not think we have ever had an applicant from there up to date.

770. Is their teaching sufficiently good?—I think so.

771. *The Chairman:* Do you think that any University in India is capable of providing an education in pure science equal to that of the Universities in Great Britain?—Well, I should not like to give an opinion, for the reason that I do not know enough about the standards.

772. How would you account for the fact that there were no men who had passed their M. Sc. anxious to come forward for these appointments?—One of the reasons is that the very best science students go in for medicine because it pays them better. A post in the Medical Department is worth more to them than a post in the Department of Agriculture.

773. *Dr. Hyder:* That is to say, after they have taken the B. Sc. degree? —Yes.

774. But do you not know that in order to get into the Medical Department you must first pass the F. Sc. and go straight on to a Medical college? Otherwise, it would be a waste of four years?—What I mean is that they make up their minds from the time they have taken their First Arts to go in for medicine and very few of the really good students study up to the B. Sc. standard with the view of specialising in agriculture later. They make up their minds to go in for medicine and they take medicine.

Sir Ganga Ram: Let me tell you that in the Punjab you have got a medical group which you take up after passing the Matriculation. It is only those boys who are admitted into the Medical College.

775. *The Chairman:* Assuming that there were opportunities for the training of higher research workers in India, do you think it would be to the advantage of a man preparing himself for the higher posts to go to England or to go abroad at some stage in his learning life?—I think it would be. It would be advisable to let him take study leave, because it would widen his outlook, and bring him into touch with other great minds.

776. At what stage of a man's learning career do you suggest that he should go abroad?—I would first take him into the department and let him take study leave after four or five years. I would send home only selected men, *i.e.*, men likely to benefit from a course of training abroad.

777. By that time he would be 22 or 23?—No, he would be 26 or 27.

778. *The Raja of Parlakimedi:* Just a little more information about sugar-cane. As India has to import a lot of sugar, is the Department paying attention to getting a type of sugarcane to produce the maximum quantity of sugar in India?—I consider that we have not done enough in the way of carrying out the recommendations of the Sugar Committee. The reason for that is that the Government of India have found it very difficult to provide the money required, and the Provinces are in the same position, I daresay. But we have within the last two years spent a good deal at Coimbatore. We have acquired a new area of 38 acres; we are now taking up the breeding of thick canes on that new area. We have appointed a second cane-breeding expert and added some more men to our subordinate staff too. We have also decided to devote more time to the improvement of cane at Pusa; there is a great deal more work being done there now than used to be.

779. What are the methods of demonstration carried on by the Department so that these improved varieties can reach the ryots?—In most Provinces we have demonstration farms where the improved variety is grown alongside the ordinary country cane; seed of the improved variety is afterwards given out to the cultivator.

780. Have you got sufficient hands to go among the ryots and teach them the benefits of growing these improved varieties?—No. The staff employed is certainly most inadequate. In some Provinces in India one Assistant is responsible for an area of nearly a million acres scattered over 300 or 400 villages. Generally speaking the staff is much too small, but in the more advanced Provinces they are adding to it every year.

781. Do you not think that to meet that difficulty and to work on practical lines, Indian labourers can be trained to go about and explain to these ryots practical methods of growing sugarcane on an economic basis also?—Yes, I think so. About 12 years ago I started a system in the Central Provinces by which we trained ploughmen to demonstrate the improvements which we had tested. These ploughmen were called *kamdars*. We employed a large number of them. We put them in charge of the demonstration work we were carrying out in the village and they with their own hands actually demonstrated to the cultivator the new processes that were involved in carrying out the improvement.

782. It was effective, was it not?—Very effective.

783. Has it been carried out in other Provinces also?—It has been taken up since in certain Provinces. They probably give them different names. We called them *Kamdars* and *Jemadars*. In other Provinces they give other names now.

784. It is not very costly, is it?—The men were started on Rs. 12 a month and they rose to Rs. 40. Rs. 40 was the maximum pay.

785. They are called *Maistris* in our Province.—Probably, yes.

786. What is the manure that you suggest for sugarcane to increase the sucrose?—I do not think that the manure has much effect on the sucrose percentage, but the manures recommended in Madras are oil-cakes and fish manure. In Bombay the Department recommends the use of oil-cakes and sulphate of ammonia mainly. In the Central Provinces, too, oil-cakes are being used; the manures in favour vary from Province to Province.

787. Has gingelley cake (*til* cake) been experimented upon?—Is it better than ground-nut cake?—It is much cheaper and for that reason it is a more economical cake to apply.

788. Which is cheaper?—The *til* cake.

789. I do not think it is cheaper, at least in our Presidency?—We used to buy *til* cake at Rs. 40 a ton in the Central Provinces before the war. It is now about Rs. 75 or Rs. 80 per ton, I believe.

790. Is ground-nut taking its place?—In the parts of India which I know well, ground-nut is an expensive cake; it is used more as a cattle food than as a manure. It is considered too expensive to use as a manure.

791. Actual experiments have not been conducted to find out which is the better of the two, ground-nut or *til* cake?—Ordinarily one does not experiment with edible cakes such as linseed and ground-nut cake as manures for the reason which I have given, namely, that they are more valuable as cattle foods.

792. Another point about buffaloes, which are so helpful for paddy cultivation in Southern India. Is the Department paying enough attention to improvement of these or to maintaining good varieties of buffalo in the country?—I think that the Department is not giving enough attention to buffalo breeding; but the same statement applies to cattle-breeding generally. They have a buffalo farm in Madras and they have buffaloes, too, on some of the cattle-breeding farms in other Provinces. The buffalo breed which they are trying to improve is the Murra-breed, which gives a big yield of milk. It is being improved with a view to increasing its milk supply.

793. It is not carried on on the lines of combining both draught and milk supply?—The Murra buffalo is as good a draught buffalo as the ordinary non-milch buffalo and when you improve it for milk you do not reduce its value as a draught animal.

794. Is it attracting the attention of the Department that the Kolahandi breed is one of the best breeds for draught buffalo?—That may be so in Madras, but I do not know whether they have the same breed in other Provinces.

795. It is considered a happy mean to cross breed between the Delhi and the Kolahandi breeds. It will then produce both draught and milch buffaloes?—The Delhi is another name for the Murra breed; it is being used in some Provinces for cross-breeding.

796. *Sir James MacKenna:* With reference to the location of the Imperial Bacteriological Laboratory at Muktesar, primarily as a manufacturing institute for vaccines and sera, one of the reasons for selecting that site is that the hill bull, which is the best material for the manufacture of the vaccines and sera, is available there in large quantity and at moderate prices?—Yes, that is so. But we might have had the station nearer Kathgodam, *i.e.*, nearer the Railway.

797. Pusa has come in for a good deal of criticism, and I am putting you a sort of leading question. Taking your experience into account would you say that the work of the late Mr. Maxwell-Lefroy on Indian insect pests and

the work that is being done now by Mr. Fletcher in the same field, Dr. Butler's work on Mycology, Hutchinson's work on diseases of the silk worms, Harrison's work on soils combined with Howard's work on various crops, *plus* Henderson's work on cattle-breeding, is enough to justify the reputation of Pusa as a Research Institute during the short period it has existed?—Most certainly. I believe the research work done at Pusa is equal to that done in any part of the world. That is my opinion.

798. *Professor Gangulee:* Following up the question which you have just answered, I should like to ask you whether these researches of Maxwell-Lefroy, Fletcher, Butler, Howard, Hutchinson and Harrison are being followed up now?—Yes.

799. For instance, Butler's fundamental work on Mycology: in what direction has that work been followed up?—Dr. McRae has, within the last year, given a great deal of attention to mosaic disease in sugar-cane.

800. I am referring to fundamental work, work such as that done by Dr. Butler?—It is very fundamental for the reason that this mosaic disease was only discovered in India about two years ago. It was supposed that Indian canes did not suffer from this disease. Now we find that it is fairly wide-spread, and Dr. McRae can claim credit for having discovered it. At the present time he is studying a fungus disease of the betel vine. That is fundamental enough. It had never been previously studied in India.

801. Dr. McRae has got two fundamental diseases under consideration at the present time, the mosaic disease in sugarcane and this other disease?—I only mentioned two. He has quite a number in addition to that.

802. Do you think that it would lead to efficiency for a man to embark on so many lines of research work?—We have asked for a second mycologist. I provided for the post in the budget last year but the money was not voted. I have again made provision for the post in the budget for this year.

803. Do you not consider that these bulletins that I had occasion to read and that are published by the Pusa Institutes are more or less of a descriptive nature? For instance, you have just referred to the mosaic disease in sugar-cane. I may be quite wrong, but so far as I can see, the published bulletins are more or less of a descriptive nature. When I refer to fundamental research, I mean research into the question such as, why a particular variety of sugar-cane is more immune from mosaic disease than another? There is the problem of immunity and the problem of susceptibility. These are questions of a fundamental nature. I should like to know whether any researches are being conducted in these directions?—Yes, but I think you have read only the bulletins. The bulletins are written in non-technical language for men who are not capable of understanding scientific reasoning; the relation between cause and effect is discussed in a separate series of publications known as memoirs.

804. In answer to Sir Thomas Middleton you referred to some fundamental researches on soils. Would you give us some indication of the nature of the work?—You mean as done now by the physical chemist or by the bacteriologist?

805. In answer to Sir Thomas Middleton you said that you were carrying on some researches on soils and I should like to get an idea of the nature of the work?—There is a lot of work being done on the movement of water in the soil, and the movement of the moisture from the sub-soil to the surface. Quite a lot of work has been done on these lines within the last two or three years.

806. In interpreting the result do you attempt to correlate the various factors that may be at work, such as season, rainfall, and other factors that may influence crop growth?—Yes. You must take for granted that the men we have at Pusa are very highly skilled research workers. They are first class scientists and know exactly how to tackle their scientific problems.

807. The reason why I am asking you this question is this. You may carry on an experiment for a couple of years and then jump to certain conclusions, whereas at Rothamsted experiments have been carried on for 80 years and

are still being carried on, and they have not yet come to any definite conclusions. When you are interpreting the results of experiments you have to correlate the various factors and find out by statistical examination the accuracy of the results before you arrive at definite conclusions. The importance of that work is so much that the Rothamsted station has felt the necessity of appointing a statistician solely for the purpose of weighing the results of these experiments. Do you have anything of that sort in Pusa?—We have appointed an agronomist who will in course of time be our statistician. We got him only within the last 7 or 8 months. Dr. Harrison, who visited the Rothamsted station last year, when he was on leave, has given it as his opinion that the work done at Pusa on soils is as good as that done at Rothamsted. When you have him before you, you can find out exactly what he thinks of the work at Rothamsted.

808. You naturally put a great deal of emphasis on better seeds?—Yes.

809. Do you have testing experiments such as are done, for instance, in the National Institute of Agriculture in Cambridge?—No, but I hope the time will come when we will have a man for that purpose. We have done nothing in the matter of seed testing so far.

810. You have said a great deal about co-ordination. Are you aware of the steps taken at the Rothamsted experimental station towards co-ordinating all researches?—I know what has been done by the Ministry of Agriculture at home.

811. I am referring, for instance, to the series of experiments conducted in regard to barley in different parts of Great Britain?—I know they are having tests carried out by farmers scattered all over the place.

812. When they carry on experiments on barley, they try even to co-operate with the malting and brewers' associations so that they can find out the percentage of malt in relation to manure and so on?—Yes.

813. Do you not think that that sort of co-ordination is possible at the central station at Pusa?—Barley and malt are not very important in India. There is co-ordination of that kind: each head of a section sees to that.

814. There is nothing to prevent you carrying on that sort of co-ordination, from instituting that method of carrying on research all over the country, testing your results under various conditions and so on?—You mean, to get it done through the Departments of Agriculture in the Provinces?

815. Yes?—That is being done to a certain extent at present, but we have not gone far enough.

816. Co-ordination of that sort does exist?—Yes, to a certain extent.

817. *Mr. Calvert:* So far as the botanical work that has been done is concerned, it has been directed to crops of direct economic importance?—Yes.

818. But it seems to me that there is further scope for botanical work on such subjects as grasses or shrubs for stopping soil erosion or for training rivers. At present you have not done that?—We have not done it at present for the reason that we have much more important work still remaining to be tackled, work which we consider more urgent.

819. As far as the study of the question of stopping soil erosion by trees is concerned, it is a matter of forest economy; but as to using shrubs and grasses to prevent soil erosion or for river training, that is nobody's business?—It has not been done at Pusa. A certain amount has been done in the United Provinces by the Forest Department.

820. Not in grasses and shrubs?—Not as far as I know. We certainly do nothing at Pusa. We test fodder grasses of direct economic importance at Pusa.

821. I am talking about botanical work of indirect importance. There is scope for further botanical work which has not yet been covered?—There is any amount of scope, I should say.

822. There is scope for further botanical staff for such work as I have suggested, which does not come under your sphere?—Yes. My Advisory Council will when it comes into existence go into these problems.

823. These are hardly agricultural matters, are they?—We would have to have experienced members of the Forest Department on our Advisory Council.

824. *Mr. Kamat:* One little point was left over in my questions to you just now about subsidiary industries. Do you know whether any Provincial Government has attempted to find out the actual economic value of such industries as are usually mentioned, such as bee-keeping, poultry-keeping, or sericulture in the list of subsidiary industries and to demonstrate that particular industries are suitable for adoption by the cultivators in this country?—They have done a good deal of work in sericulture in Bengal; they have done very little work I think in poultry-breeding in any part of India, except in the United Provinces.

825. And it has been definitely proved that it would be an economic asset to the ordinary cultivator?—I think there are reasons that led us to believe that these industries could be introduced with advantage to the cultivator.

826. In order to introduce them and to convince the cultivator, has any attempt been made to your knowledge in the Provinces to establish any such model industry, so that people could go and see how bee-keeping or sericulture or poultry-keeping helps people?—I think so. In Bihar and Orissa the Department of Industries has done a lot to encourage sericulture and the manufacture of silks as a cottage industry.

827. In your opinion Provincial Governments are establishing some such model subsidiary industries in certain suitable places for the benefit of cultivators?—I think so.

828. Have you advised Provincial Governments to carry on such model industries in certain places, for instance in Madras and Bombay, and has it been taken up?—You must remember that the Agricultural Adviser is not supposed to interfere with or to give advice to the Provinces unless he is asked to. If I were to advise the Local Governments, they would probably resent my offering advice.

829. It would be desirable to advise them?—Yes, it would.

(The witness withdrew.)

सत्यमेव जयते

Mr. J. A. RICHEY, M.A., C.I.E., Educational Commissioner with the Government of India.

Memorandum on Agricultural Education in India.

The following statement shows the number of institutions in India devoted to the teaching of agriculture together with attendance and cost during 1924-1925.

Agricultural Education, 1924-25.

Government Institutions.		Average attendance.	Annual cost.
(a) *Agricultural Colleges*—			Rs.
1. Poona		179	1,37,659
2. Coimbatore		46	86,354
3. Nagpur		82	54,840
4. Cawnpore		88	74,247
5. Lyallpur		129	1,07,480
6. Mandalay		(Not available.)	
	TOTAL	524	4,60,580
(b) *Agricultural Middle Schools*—			
Province.	No. of schools.		
Madras	2	50	15,885
Bombay	6	156	53,289
Bengal	1	16	6,573
United Provinces	1	35	14,286
Central Provinces	2	(Not available.)	
	TOTAL	257	90,033
	GRAND TOTAL	781	5,50,613

N.B.—Figures have been taken from the General Educational Tables for 1924-25.

In this table are not included the Agricultural Research Institute at Pusa and the Imperial Institute of Animal Husbandry and Dairying at Bangalore. The former of these is, as its name implies, primarily a research institute but it has recently opened classes for post-graduate teaching. There are five research students at Pusa and five at Bangalore; there are also thirteen students of the Agricultural Institution taking a two years' course for a diploma in dairying. At both institutions also short special courses are held

(*a*) *Agricultural Colleges.*—The need for agricultural colleges to train the future personnel of the Agricultural Department as well as to provide education in scientific agriculture for those engaged or intending to be engaged in farming was recognised as soon as the Agricultural Department was reconstituted in 1905. Colleges were founded at Poona in the Bombay Presi-

dency, Coimbatore in Madras, Sabour in Bengal, Lyallpur in the Punjab, and Nagpur in the Central Provinces. There was at first some confusion in the organisation of these institutions owing to the dual nature of the functions they were intended to perform. In 1913 each Province was given a free hand to work out its own scheme with reference to the stage of general education and agricultural research that had been reached. Actually the lines on which the colleges have been developed have been influenced by developments in general education. The widening of the sphere of University work in India so as to include professional and technical education, by the affiliation for example of medical and engineering colleges, has been followed by the gradual incorporation of the agricultural colleges in the Provincial Universities. This development has been due not so much to the desire of the Universities to teach an all round curriculum as to the desire of the college students to obtain degrees. Peculiar importance is attached in India to the possession of a degree, which is not only a passport to higher appointments in public and private service but also carries with it a certain social *cachet*. The affiliation of the agricultural colleges to the universities, thereby qualifying successful students for degrees, has had a marked effect in increasing the number of applications for admission. The Sabour College which did not take this step in time proved a failure and had to be closed in 1924.

At present, the Poona, Coimbatore, Lyallpur and Nagpur colleges are attached to the Provincial Universities. The Lyallpur College has also a post-graduate course teaching up to M.Sc. in Agriculture. Two more recent institutions—the Cawnpore Agricultural College and the Mandalay College opened in July 1924—have not yet qualified for affiliation. In the former case, however, the examination at the conclusion of the first two years has now been recognised by the Intermediate Education Board of the United Provinces and the conversion of its final two-year diploma course into a degree course is only a question of time. At Mandalay it has not yet been possible to raise sufficiently the standard of admission to qualify the students for recognition as University students. The Universities of Madras, Punjab and Nagpur have faculties of Agriculture. In Bombay Agriculture is a branch of the Science Faculty. The full college courses are of four years except at Poona where, as in the Engineering College, the course is one of three years only, and at Mandalay, which has also as yet only a three years' course.

In addition to the full degree course the college also provide short courses of one (in the case of Poona) or two years (elsewhere), distinct in character leading upto a diploma or certificate in agriculture. These courses are intended primarily for practical agriculturists but they also serve to train men for employment in the subordinate ranks of the agricultural services. These courses have met with very varied success. The certificate course at Madras has failed completely with the cessation of recruitment from it to the agricultural service. It is proposed now to substitute a special intermediate course leading up to a University Intermediate examination.

Agricultural colleges perform three functions—

(*i*) They are the Provincial centres for scientific research in agriculture.

(*ii*) They train officers for Government service.

(*iii*) They give instruction in modern agricultural methods to those who either farm for themselves or act as agents to land-holders.

(*i*) As centres for agricultural research the colleges with their well-found laboratories and staffs of specialists fulfil an indispensable function in the agricultural development of the Provinces.

(*ii*) The colleges also provide the main source of recruitment for the ordinary ranks of the agricultural department. In addition, at some of the colleges, *e.g.*, Lyallpur, courses are held for revenue officers as also for the training of teachers for agricultural work in schools. It is open to question whether their utility as a training ground for Government servants has been fully recognised. A graduate of an agricultural college who has subsequently

been through a course of education at a training college should make quite as efficient an inspecting officer for rural schools as the graduate of an arts college. He should in fact be in many ways more suitable for employment as an assistant district or deputy inspector in rural areas, in that he would be in closer touch with the lives led by the parents of the school boys. The standard reached by agricultural college graduates in English, mathematics, etc., is as high as that demanded of graduates of arts colleges. In making appointments to certain services employed on rural areas, *e.g.*, irrigation, co-operation and education, a certain preference might be given to graduates of agricultural colleges.

(*iii*) A few practical farmers take the diploma and certificate courses. Of the students taking the degree courses the very great majority have in the past aimed at public employment. They have in fact been would-be Government servants and not would-be agriculturists. Any diminution in recruitment to the agricultural services in a Province is at once reflected in a decline in the number of candidates for admission to the agricultural colleges. The question of increasing the number of practical farmers under training is primarily economic and not educational. So long as the graduate of the agricultural college has not, and through lack of capital he very rarely has, any opportunity for turning his scientific knowledge to account it is useless to expect any large increase in the number of such students. The Punjab Government have under consideration a system of leasing farms on very favourable terms with Government assistance to selected students of the Lyallpur Agricultural College. The experiment appears promising. It must be remembered that men of education in India do not as a rule make their homes in the country owing to the lack of amenities; the products of the medical colleges all congregate in the towns. This leads to considerations which are outside the scope of this note.

(*b*) *Agricultural Middle Schools.*—The first agricultural middle school for the special training of the sons of farmers was opened in the Bombay Presidency in 1910. At a conference on agricultural education held in Simla in 1916 under the presidentship of Sir Claude Hill it was resolved that similar schools should be started in other Provinces, the aim being to have at least one such school in every district. This proposal was more fully and carefully considered at a meeting of the Board of Agriculture held in December 1917 at Pusa. The Board recommended that, until there was an effective demand for such schools arising from the appreciation by farmers of the advantages of improved methods of agriculture, only a few agricultural middle schools should be started in each Province as an experimental measure. This policy which had already been adopted by Bombay was followed in Madras, Bengal and the Central Provinces. There are now six agricultural middle schools in Bombay with an attendance of 156 students. Of two such schools started in Bengal one has been closed and the other is being altered in character. Exactly the same is the history of the two schools in the Central Provinces as also of the two schools in Madras. The Government of the United Provinces maintains one such school at Bulandshahr.

Agricultural middle schools are strictly technical or craft schools providing a course in agriculture of a practical character for boys who have received a general education up to about the age of thirteen. The object is to send the pupils back to their own land to cultivate it better. Bombay alone maintains that these schools have proved a success. But in Bombay the students are not only provided with free lodging and tuition but receive stipends. Even these inducements have proved insufficient in Bengal where the students are provided with free lodging and tuition and Rs. 10 per mensem towards their board. In Madras the students are required to pay fees of Rs. 15 per term for which they are lodged, fed and taught for three months, the fee providing only one-third of the cost of maintenance. If with all these inducements the schools have been unable to attract students, it is obvious that so far from their meeting a felt want they are actually unpopular. Moreover the schools have failed in the particular object for which they were provided. The two

schools in Madras have cost during the three years they have been open, Rs. 98,000 and of the students admitted only 38 have at any time completed the course. Of these only ten have returned to the land. Bengal reports that there were at first thousands of applicants for admission who expected to obtain Government employment after their two years at the school. Since this hope has been disappointed the number of applicants last year declined to 22. No figures are available as to the occupations followed by the Bombay *ex*-students but each boy at an agricultural middle school there costs Government Rs. 200 per annum.

It is clear that the caution displayed by the Board of Agriculture in 1917 was amply justified. It is not until the farmer is convinced that there is any economic benefit to be derived from sending his boy to an agricultural middle school that the demand for such schools will arise.

The failure of these schools is not a cause for surprise. The ordinary agriculturist in India either does not send his boy to school at all or sends him for a few years only while he is too young to be of use to his parents, or sends him in the hope that he may find some other opening than agriculture. The intelligent boy who passes the primary standard does not wish to enter the blind alley of the agricultural middle school. Even if he has a liking for agriculture, his natural ambition would be to matriculate and enter an agricultural college. But as a matter of fact the ordinary Indian boy is very reluctant to make up his mind as to the choice of a career until the choice is forced upon him. He goes on passing through different school stages, studying subjects which may or may not have any relation to his future education or occupation, until failure at some examination drives him out of the world of school and college to earn his living. If his failure occurs at an early stage he may be obliged to return to his hereditary occupation, if an agriculturist by birth to agriculture, but " agriculture without capital, agriculture as he has seen it carried on by his father, offers few attractions to an intelligent school boy ".

There does not appear to be any future for the agricultural middle school until the standard of agriculture amongst the parents has been so raised by demonstration and the work of the agricultural department that the value of agricultural education is recognised.

(*c*) *Agriculture as a subject in the general curriculum.*—It is now generally accepted that agriculture, as apart from simple nature lessons, is not a subject which can be taught in a primary school and no attempt to do so is authorised by Education Departments. Agriculture is recognised as an optional subject for the Matriculation or School Leaving Certificate examination of the Universities. It is taught in a few places, *e.g.*, at the Durgapur High School, Chittagong, and the Khalsa High School, Amritsar, on practical lines. Elsewhere Matriculation agriculture is little more than a text-book subject. It is taken by boys in preference to other options only if for any reason it is considered an easier subject in which to obtain a pass. A boy successful in this among other subjects at the Matriculation examination will proceed to college with a view to study for law or any other profession.

The Punjab did not follow the lead of other Provinces in starting agricultural middle schools. It recognised that no student of ability would turn aside from the ordinary educational course to enter such schools. On the other hand it recognised that there were a very large number of boys in rural districts who though ambitious of proceeding to the high school or college stage would be prevented by lack of ability or financial circumstances from proceeding so far. It was decided to introduce the teaching of practical agriculture in the vernacular middle schools of the countryside, in such a way as not to debar the students taking agriculture from proceeding to a higher stage of education if they were able to do so. The scheme adopted was shortly as follows:—

(*a*) Selected trained teachers who are agriculturists by birth are sent to the Lyallpur Agricultural College for a one year's course in agriculture. At the conclusion of this course they are attached

to vernacular middle schools to give instruction in agriculture, receiving an allowance of Rs. 10 per mensem as special pay for this work.

(*b*) Farms of three acres are attached to the schools at which agriculture is taught. These farms are purchased by Government or by means of Government grants and are equipped with store house, two pairs of bullocks, agricultural implements, etc., in order that the work may be of a thoroughly practical nature.

(*c*) Every boy in the middle department passes through a four years' course in agriculture. Four periods a week are assigned to agriculture during the first two years of the course and six periods a week during the last two years. Extra work on the farm is done out of school hours.

(*d*) Agriculture is included in the ordinary subjects of the middle school course, after passing which a boy is eligible for admission to a high school and so through Matriculation to the University.

(*e*) The initial cost is estimated at Rs. 3,000 for land, buildings, water supply, bullocks and implements. The recurring cost is only the pay of the teacher and the loss, if any, on the working of the farm.

There are now 27 school farms in working and the scheme has generally met with success, so much so indeed that it has been recommended by the Board of Agriculture for adoption in other Provinces. Bombay and the United Provinces have already started working on the same lines. Bengal sent a committee to the Punjab last year to report on the scheme; the report was favourable and would have led to practical results this year had it not been for political changes. Unfortunately the Punjab for financial reasons has recently modified the scheme by substituting half-acre gardens for the three-acre farms. This modification cuts at the whole root of the scheme. It was introduced from motives of economy, though as a matter of fact half the school farms pay their way and a few even make a profit.

The objects of the original scheme were—

(*a*) to influence as many boys as possible without diverting them from the path to higher education.

(*b*) to keep alive in the sons of agriculturists their interest in the land so that if they were obliged to return to it instead of proceeding to a higher education they would return even better equipped to make successful farmers. Although improved methods of agriculture are of course introduced in the school farms these institutions are not intended to turn out skilled farmers, as are the agricultural middle schools. Actually it is very rare that the product of any technical school can compete at once successfully in the open market, because the commercial element is lacking in school work. This fact is commonly overlooked by the advocates of technical education who speak and write as if the product of the technical school should at once obtain a livelihood as a highly trained craftsman. Attempts to introduce the commercial element by making the school farms pay, though it is a matter of local pride, are educationally unsound. The student who makes no mistakes learns nothing.

The Punjab Government, at the same time, proposed to establish a number of agricultural centres of five-acre farms near towns which could be attended by the boys of local high schools. For financial reasons, however, this scheme was never carried out.

The success which has attended the Punjab scheme appears to justify its adoption on a much wider scale than any contemplated hitherto. It is only by some such alteration in the character of our rural schools that they can be prevented from draining the countryside of its brighter students and increasing indefinitely the ranks of the educated unemployed. Rural schools should aim at sending the rural boy back to the land equipped to be a better farmer; their whole orientation is at present wrong.*

*See question 895.

Oral Evidence.

830. *The Chairman :* Mr. Richey, you are Educational Commissioner with the Government of India?—Yes.

831. And you have been good enough to lay before the Commission a memorandum which my colleagues and I were greatly interested in reading and for which we are much obliged to you. May I ask you whether you care to make a statement in amplification of this memorandum that you have put in?—I prefer to answer any questions put to me.

832. Following the memorandum I should like to ask you whether it is your view that the training at agricultural colleges of men for Government positions and at the same time the training of young men or boys whose ambition and intention is to return to the farm is a sound one. You say at page 115 of the memorandum before the Commission :—" There was at first some confusion in the organisation of these institutions owing to the dual nature of the functions they were intended to perform "?—Yes.

833. Do you think it is a sound principle to train boys or young men who are going to be officials alongside of boys who it is hoped may return to the farm?—I think the number of boys who go through the colleges with the intention of returning to the farm will always be very small. I imagine if there are developments in agriculture, as there must be as a result of this Commission's labours, the demand for officials will probably absorb the output of the colleges in the near future. Besides, the experience of other countries is that a very small percentage of graduates of agricultural colleges actually go on the land. I took the trouble to look up some statistics even from America, where they have 52 agricultural colleges and I understand that nearly all the graduates are employed in educational work or as demonstrators in the Agricultural Department. I find the same thing in other countries. For instance, in Sweden, where they have only two colleges, they do not even attempt to send their students back to the land. There may be a certain number employed in responsible positions. But I do not think that is the primary function of an agricultural college. It is for research and for the provision of experts.

834. You are familiar with the working of the agricultural colleges?—I have seen them all in India. I have seen one or two of them more than once. I am not an agricultural expert; I have seen them from the point of view of education. When I say I have seen all, I mean I have seen four of them.

835. Do you think yourself that there is sufficient touch between the Departments of Agriculture and Education?—My own experience is that the co-operation as far as the colleges go has been fairly close, and certainly as regards the relation between the two Departments, they have never been anything but satisfactory. I have made a suggestion here, which I would like to amplify, namely, that the Educational Department should draw more on the colleges for its inspecting and supervising staff. It has not ever been, as far as I know, suggested, even, by any Province that they should earmark a certain number of the vacancies in their training colleges for graduates of agricultural colleges. I should like to see that done.

836. Agricultural colleges are on the budgets of the Agricultural Departments in every case, are they not?—Yes.

837. I wonder whether you would clear up a little difficulty in my own mind. Would you tell me what in your view are the outstanding differences between the system which you describe on page 116 in the fourth paragraph as being one which Bombay alone maintains as having been a success, and the system in the Punjab which you advocate?—One is a purely vocational system, an attempt at vocational training, and the other is a pre-vocational system. That is to say, one definitely aims at taking the agricultural boy

and training him to be a better farmer. The other aims merely at fitting him to be a better farmer, keeping his interest in the land and seeing that he does not during his course of schooling lose touch with the land or get soft-handed. At the same time, by giving him general culture as well, fitting him to become a better farmer in the end.

838. How about the position of a boy at the Bombay vocational school who halfway through the period of his attendance there changes his mind and thinks he would rather not go in for agriculture at all but go in for something else?—Then he has to start again where he left off. Supposing he had passed the primary course before he entered, he would have to go on from the class where he left off. As far as I know, there is no provision at all for taking into account the time he spent at the agricultural middle school towards his general education.

839. How about the position of the same boy who changed his mind in the same way half way through his school time under the Punjab system?—There agriculture is merely a subject in the general school curriculum. He need not leave that school at all; he could still go on. I mean to say, the course leads straight on. At the end of his middle school course, he is free to enter the high school classes.

840. Can he take English?—Well, that is at present a difficulty. Some of the schools teach English; others do not. Some of the vernacular middle schools who teach agriculture also teach English. The difficulty is to fit all the subjects in the curriculum.

841. Do you think that is a good plan?—I think it is bound to come into force everywhere because the tendency is for English to be introduced into secondary classes in all rural schools. I know that Bengal, who recently sent a deputation to inspect the Punjab plan, in their recommendations definitely proposed to introduce it in middle English schools. They have got few vernacular schools. The deputation proposed that they should introduce the same system only in their Anglo-Vernacular middle schools.

842. Could you give the Commission the figures of expenditure per boy under both systems?—I am sorry to say I cannot. The only tables I have brought here are All-India tables.

843. Perhaps you could let us have that?—Certainly.

844. Then on page 117, paragraph (*c*), 'Agriculture as a subject in the general curriculum,' you say, "It is now generally accepted that agriculture, as apart from simple nature lessons, is not a subject which can be taught in a primary school and no attempt to do so is authorised by Education Departments." Is that view generally accepted in India to-day?—I think so. I am not quite sure whether the public generally does. One reads all sorts of articles by people who are not very expert, but I think this view is generally accepted in India to-day. Certainly it is generally accepted elsewhere.

845. Even simple nature lessons are not easy things to give?—I quite agree with you there and that is our difficulty at the present moment. Even where nature study is a prescribed subject, the teachers are very weak, and apt to teach it from the book.

846. Do you think the spread of literacy is of great importance to the future of Indian agriculture?—I think it is of enormous importance not only from the point of view of agricultural education but also from the economic point of view. This is really not my subject at all, but I have no doubt that education brings new wants and natural incentives to greater or better work.

847. New wants and new efforts?—Yes, that is it.

848. And also, of course, on the technical side it is useful to be able to get information in print, is it not?—Yes; and also from the point of safeguarding the rights of the agriculturists if they can read and write.

849. He can look after his own interests in the market?—Yes.

850. Whether he is buying or whether he is selling?—Yes.

851. What are the main obstacles to a substantial spread of literacy in rural areas in India?—I should say, first of all, that the agriculturists have yet to be convinced of the pecuniary value of education. That is to say, not only in this country, but everywhere I think, the immediate value of reading, writing and arithmetic to the agriculturist is not so apparent as it is in practically every other occupation. It means giving up certain amount of his time and it means also a certain amount of expenditure. However cheap the education may be, it costs him something. We have nc free books here and in many cases we even have fees, so that it always costs something, and is there sufficient return if the boy simply returns after his primary school to do exactly the same work as his father did before him? The parent has yet, I think, to be convinced of the value of education.

852. So you think that the disinclination of the cultivator in rural areas in India to send his children to school is the principal obstacle to a substantial increase in literacy?—I feel sure of it. Of course, they do send a certain number of their children to the school. Another factor, which is perhaps a subsidiary one, is that the schools themselves in rural areas are not efficient and consequently there is a great deal of waste of time. When those two causes are combined, the ordinary parent does not see that he is getting much value for what little money he does spend on education.

853. Could you hazard an estimate, the roughest estimate, of the proportion of parents who are cultivators in India who have the opportunity of sending their children to school if they so will?—I am afraid I could not give you even an idea.

854. *Mr. Calvert:* Would you say an opportunity within a 3 miles area?—Yes. Speaking of the Provinces I know I should say that such parents are about 75 per cent., but it is very difficult to say. There are hilly tracts where I know it is very little. It may be 60 per cent. On the other hand, in Bengal the villages are very close to each other and the population is very dense. There are 35,000 primary schools besides others. I should say that the opportunity is open to certainly more than 75 per cent of the cultivators.

855. *The Chairman:* I am not familiar with Indian conditions. What is a reasonable radius?—We count on two-mile as a rule, if it is without natural obstruction, 2 miles by the normal road.

856. So much about the disinclination of the parents to send their children to the school. What is the next most important factor?—I am afraid the inefficiency of the schools. In India, I suppose more than anywhere else, we have the single teacher school, where the teacher has to take at least four classes at once. Suppose he has four classes to teach, then it means that out of 4 hours teaching he can devote only one hour to one class and the result is that the progress made is very slow and the amount of wastage is enormous. A very large number of people do send their children to school just for a year or two and then the children drop off. They very often do not get very much beyond the alphabet.

857. Am I right in thinking that in primary schools three to four years is the average attendance per child?—Yes, just under four years.

858. And four out of five of such children remain in the lowest class?—Taking boys only, out of 8¼ million boys in school including college and post-graduate students, 4 million are in the first primary class. That is to say, half are.

859. And a very considerable proportion of children who go to school and who reach the beginnings of literacy relapse into illiteracy, do they not?—An enormous number.

860. Do you think that is a criticism of the school?—Partly a criticism of the school and partly of their surroundings. You should remember that there is nothing in an ordinary Indian village for a boy to see in the way of reading. There are no posters, no advertisements, nothing of the kind at all.

There is no opportunity for him to read anything. Sometimes, of course, he sees *patwari* papers, but otherwise he sees nothing to read.

861. But if his mother could read, it would probably make a difference?—Yes.

862. Probably all the difference?—Yes, he would read in his own home.

863. How about the teaching of female children at primary schools?—You see they marry so young. Even in villages where the *purdah* system is not so important, the children marry very young and there is no tradition really for teaching the females. As the United Provinces Government said you can multiply girls' schools indefinitely and get millions of girls in them, but they would only come up to the age of 5 or 6 or 8 at the most. The teaching too is very inefficient because the teacher is a *purdah* woman. To get women teachers is extraordinarily difficult and the progress made in the girl schools is accordingly very slow.

864. How long have you known India? How long have you yourself been here in India?—I have been 18 years in India.

865. Have you noticed any change in the direction of the education of the women of the rural classes?—Not in the rural classes. I cannot say there has been very much movement there though in the urban classes there is distinctly.

866. You have no doubt heard that certain well-informed persons are in favour of putting what I may call a certain agricultural flavour into primary education. Is there time or opportunity to do that, do you think?—We shall have to start with our normal schools I think and we shall also have to limit it to the better class schools. I cannot see much hope in the ordinary aided schools. Certain Provinces of India depend almost entirely on aided schools, that is to say, private schools started by people for their own gain. We just aid them. Those teachers are very largely untrained and in the case of those who are trained their training consists of little more than adding to their geneal education. I do not think we can do much with these schools; but you could with the better class schools, properly housed and properly managed schools. With what we would call board schools something could be done if you start with the teacher.

867. Are financial conditions another bar to the extension of the educational system?—They are most decidedly. You have constant competition, as a matter of fact, between the demands of secondary education, higher education and primary education. But the primary school itself is a very cheap thing. Even the most expensive primary schools, to start with, at the beginning, does not run to more than Rs. 400 or Rs. 500 a year. In many Provinces it runs to Rs. 80 or Rs. 100 a year. It is about the cost of educating a single boy in a high school.

868. Have you ever heard it said that the educational system of India is top-heavy?—It is constantly said.

869. What view do you take on that point?—Well, it is partly historical. Naturally we have to provide education and must provide education under a voluntary system first for those who ask for it, and if the people in the towns want to get further education in colleges it is our business to see that it is not too bad. That is the difficulty.

870. Is the suggestion at the back of your mind that persons who make the criticism we have been talking about feel that if you were to cut something off the top you could add it to the lower grades?—I suppose that is the suggestion.

871. I do not ask you to agree with that suggestion of cutting at the top, but suppose you had the extra amount of financial resources, the maximum amount of financial resources which you could hope to get by any cut at the top at your disposal, do you think you could substantially increase primary education and literary in rural areas?—I think we could do a good deal more with more money; I feel sure we could. I do not mean in every Province but

in certain Provinces. In Bengal, for example, they are at present proposing a cess for that very purpose.

872. Of ourse if there is to be progress, opportunities for education will have to be offered a little before they are asked for in rural districts?—Certainly. It has to be done by propaganda, and as a matter of fact there is a certain amount of almost fashion in education. If a school is started in a certain area a crop of enquiries very often comes for new schools. It is quite common, at least not uncommon, for a district officer to say there is no demand for schools, but after a school is opened other demands do come in from the neighbourhood.

873. Now in the rural areas in which there has been some concentration of educational effort, do you see any dynamic tendency beginning to show, do you notice an important proportion of the rural population calling for education and for better education?—I think it is very marked indeed where any intensive propaganda has taken place, where for example compulsory education has been introduced in any rural area, as it has been in a few places, or even where it has not but where you have worked on a programme of opening so many schools a year. There is no doubt whatever that the supply creates the demand.

874. Is there anything to show that these areas where particular efforts have been made are areas different from many other districts in India? Do you not think if the same efforts were applied to many other districts where no effort is being applied at present the same result might be expected to ensue?—I feel sure of it. I cannot vouch for every area but there are many areas of which that is true.

875. So that to a very important extent the spread of literacy in India is being limited to-day by financial consideration, by a lack of financial resources?—That is quite true.

876. Now about adult education, is that going ahead?—There is very little movement as yet, I am sorry to say. There again it responds at once. If schools are opened they are well attended, in certain areas at any rate, but the number of institutions is very small. There are 2,800 in India altogether, of which 1,500 are in the Punjab and 1,000 in Bengal. I beg your pardon; those are last year's figures. This year there are 3,984 of which 2,300 are in the Punjab and 1,300 in Bengal. So that that does not alter the position in the rest of India.

877. Do you not think that the demand for adult education could be stimulated?—I feel sure it is almost entirely a question of money, organisation and propaganda.

878. Has much been done in that direction?—I do not think the thing has been taken up at all except I think, Bombay had a small voluntary system run partly by the co-operative society; they have some adult schools in Bengal; they have a great many in the Punjab; but elsewhere not. I believe there has been some effort made in the Central Provinces but not attended with particular success. There may have been some defect in the management. An adult school is after all a very cheap thing. You move it from one place to another. You just keep it in a village till the local adults have been educated and then you move it on.

879. You agree that illiteracy on the part of parents is one of the principal reasons for the relapse of the child into illiteracy. If then by adult education you could render an important proportion of the parents in any one district literate you would in one stroke have removed one of the most important reasons for the relapse of the children into illiteracy?—Yes, you would.

880. Now is it not the case that that expenditure need not be altogether a recurring expenditure because I seem to see that in the next generation you would not have to face the same, as it were, capital expenditure in overcoming this inertia?—Quite true.

881. Is that not a very important possibility?—Yes it is.

882. Does it not suggest to your mind that it might be worth taking even financial risks in forcing adult education?—Yes.

883. In recommending and propaganding adult education?—Yes, I think there is a great deal to be said for that; it would prepare the way for the ordinary primary education.

884. How about the education of adult females?—There again you are up against a further difficutly.

885. I want you to instruct me on that point. I am ignorant. How far, taking rural India as whole, is the *purdah* question an obstacle?—In rural India?

886. Yes?—I should say very little. It is gradually filtering through even at present. There are at present a good many girls in primary schools for boys, in some parts of India, for instance, in Madras. One-third of the school girls are actually in boys' schools; and in other parts of the country, for instance the Punjab, where it has been very slow, I believe they are beginning to filter into boys' schools; but there is still a good deal of prejudice.

887. So that with sufficient propaganda it might be possible to do a certain amount of adult education among females in rural areas?—I am afraid I do not know enough about the domestic duties of Indian women in these areas and whether they have enough time.

888. I am thinking of the importance to the child of having a literate mother?—The mother, I presume, has a good deal to do in the house besides looking after the children.

889. I shall no doubt have my perspective corrected during the next few months but from what you have been saying it does appear to me that you are spending a considerable amount of money and effort in trying to overcome the inertia of the masses of the rural population in the matter of education. You are moving that mass a little but you are not applying sufficient energy to produce any really dynamic tendency in the mass. If you could find the means and methods on the lines perhaps which we have been discussing to, in the ordinary language, get a move on, the next 25 years might show developments in rural education which to-day seem hardly possible?—Yes.

890. Do you think that is a reasonable view of the situation?—It means a concerted effort everywhere.

891. At every point and together?—Yes.

892. With regard to rural schools, you say on page 118 (at the bottom): "They should aim at sending the rural boy back to the land equipped to be a better farmer. Their whole orientation is at present wrong." Would you develop that a little?—I admit that is a rather strong expression, but I was thinking of it not only from the point of view of agriculture but also from the point of view of the schools. I will take it first from the point of view of the school. It is, as you know, an axiom of education that you should start from the known to the unknown. Well, the ordinary boy when he enters a village school enters an almost alien atmosphere as far as the subjects that he studies and the work he does are concerned. The books are the same for town boys and for country boys. The arithmetical problems are probably written by town teachers. The geography, as far as I know, in fact, I know, has very little relation to, say, the products of the neighbourhood. The nature study is almost negligible. I should doubt if they ever talk about jute in Eastern Bengal primary schools or about cotton in Lyallpur primary schools.

893. You mean you want something instead of arguments in arithmetic about wall-paper or about the hands of clocks and the lining of cisterns, and so on?—Quite so. From that point of view the education seems to be fundamentally wrong. It is no more difficult to study arithmetic through problems of practical application than through problems set by town teachers. That is from the point of view of education, primarily. From the point of view of the rural population I think we shall have to face the fact

that the great majority of boys attending primary schools will live all their lives on the land, and therefore it seems to me, although I do not propose in any sense to introduce vocational or even pre-vocational education in primary schools, that the atmosphere of the school and particularly the atmosphere of the rural secondary school should be with reference to the surroundings.

894. *The Chairman:* With regard to the publication of your memorandum, I do not know whether you have any objection to its publication, or would wish to modify it in any way?—Yes. I think the statement about a wrong orientation is perhaps rather too strong an expression.

895. We will bear that in mind.—Thank you.

896. How many so-called intermediate colleges as recommended, I think, by the Calcutta University Commission, have been founded?—There are no intermediate colleges exactly in the form suggested by the Calcutta University Commission actually in existence. They anticipated a separate institution with a somewhat vocational bias after the high school. Actually intermediate colleges have been opened in the United Provinces simply by the addition of the intermediate classes to the high schools, and in the Punjab by taking off two of the high school classes and adding two of the intermediate classes from the colleges, making four-class institutions of that kind; but none of these institutions can be said to have the vocational options which the Calcutta University Commission recommended.

897. What is the essential purposes which these classes fulfil?—One view of the Calcutta University Commission which has been accepted by those who started intermediate colleges is that intermediate education is really of a secondary school character and should not be attached to degree colleges. The other, which is more expensive and which would develop these intermediate institutions into vocational educational institutions leading to various professions, has not been accepted, I believe, except in so far as there are a certain number of teachers' classes in the intermediate colleges.

898. Do any boys who pass through these intermediate courses go in for degrees?—As a rule they go in for degrees; the only change has been to separate the management and staff and also to treat the teaching of those classes more as school education than as college education.

899. The Calcutta University Commission, if I understand the matter aright, rather had in mind the idea that these intermediate colleges would fill a want, in that they would provide a completing course for boys not going in for University degrees?—That is clearly what they intended; they clearly intended that they should be of a vocational character.

900. So that the recommendation of that Commission has not been given effect to in regard to this matter?—It has not been carried out in that way.

901. Now, on a very different question, do you think that all is being done that should be done to teach hygiene in schools?—At present it is an optional subject in the high-school departments, and as such I think it depends for its popularity a great deal on whether it is or is not considered an easy subject for the matriculation examination.

902. You are speaking of hygiene?—Yes; it is not taught in the middle schools except in girls' schools. It is not taught as a regular part of the course except, I believe, in a somewhat desultory manner in some Provinces; but it is not a regular compulsory subject.

903. Is any attempt being made to inculcate the rules of health in primary schools?—I cannot say. I am not sure. A certain number of maxims are hung up on walls, but whether they have any effect on the boys or not I do not know.

904. That is as far as the matter goes?—In primary schools, I think, there is nothing more done, Sir.

905. It has been suggested in some quarters that the teaching in pure science which is open to an Indian boy in India falls short of the ideal standard. Would you care to say anything on that point?—The standard differs very much, I think, in different Provinces. In Bengal there is practically no science teaching in schools at all owing to the expense. It has not been traditional; a boy who takes science there starts it when he goes up to college, not before. Some Provinces, on the other hand, have very well-equipped science laboratories; as to the actual curriculum itself, I am not a scientist and so I cannot say; but I know that we had a specialist out from England in the Punjab who did a great deal towards modifying the science course in high schools and making it more practical, not quite so much merely experiments with test tubes but a little more adapted to every-day life.

906. In view of the policy of Indianisation of the Agricultural Department, you will probably agree with me that teaching in pure science in India is of great importance for the future of Indian agriculture?—Yes, certainly.

907. Now, I would like to ask you a question on a subject of more general application, as to the relations between the Imperial Department and the Provincial Departments of Education. Are you satisfied that they are as close as they ought to be?—There is no Imperial Department of Education at the present moment.

908. Between yourself in your capacity as adviser and the provincial organisations?—There used to be a Central Advisory Board on which we had representatives from the different Provinces, which met together twice a year at least and considered general educational problems and published their results. I understand they were of great value, at least we were so informed by the Directors; but the Board was abolished as a measure of retrenchment in 1923.

909. What is your own staff?—I have no staff, except that I am part of the Education Department and I simply use the particular branch of the Education Department concerned; they abolished the Board and all my own staff.

910. I will make plain to you what I have in mind. It may be that if a progressive policy were to be adopted in education, it would be considered necessary to correlate very closely the activities of two more Provinces. How would you bring that about?—At present there is no machinery, of course, and there would be a certain amount of difficulty owing to the fact that education is a transferred subject and the Ministers of two Provinces might not see eye to eye. In the old days it was quite possible to correlate a great deal, because the Government of India gave out money and by giving out money naturally encouraged lines of development which it wished to see adopted. For instance, it gave very large sums one year for the training of teachers on condition, of course, that the Provinces also did something towards it. Now a-days the Government of India gives nothing towards education in the Provinces and therefore it has no power or influence.

911. You will understand that I have formed no view as to the possible necessity of such correlation. I merely wanted to know whether in your mind it was a possible need in future?—I have always thought there was a great deal of wasted effort. We have experiments going on in contiguous Provinces; one fails completely and it is started in the next Province which probably knows nothing about why it has failed; in fact they do not even know that it has been tried in the adjoining Province. The only documents that we get are the Directors' Reports, which are sometimes, naturally, rather dull, statistical documents and they do not deal at length with any experiments that have been undertaken. As a matter of fact the knowledge of this Punjab scheme for agricultural education was really spread, I think, by the Board of Agriculture (which is not a provincial body) which met at Pusa and they recommended it to Directors; otherwise I do not suppose it would be known in other Provinces.

912. Do you have anything in the nature of a conference for all India on educational matters?—We have not had a conference since the Reforms.

913. There again I have formed no view, because I am not familiar with the facts, but it strikes one, coming into the country for the first time, as very extraordinary that you do not have a conference?—I may say that the Government of India have, as a matter of fact, actully issued a letter to local Governments only last week suggesting that there should be a conference of the Directors of Public Instruction next January, not to discuss policies, but to discuss their common difficulties and problems and their own experiences. We do not know, of course, what replies we shall get from the Local Governments.

914. You think that annual or biennial conferences might prove useful?—Very useful indeed, and I am sure the Directors of Public Instruction would welcome it. Of course, I meet Directors, because I tour all round India. I have just been to three Provinces, and I found them very anxious to hear what was being done elsewhere.

915. There is great unevenness in view and classifications and practice between Province and Province at the moment, is there not?—Very great indeed.

916. And that is to be deplored, is it not?—Not in every way, because we do not want too much rigidity. In some ways of course there might be a good deal of mutual help.

917. Do not you think that India has been passing through an experimental stage in this matter?—If there is any sign of it uniting on points where it might unite with advantage, I should say so, but it seems to me there is a tendency, possibly, to widen the differences in educational details and administration unnecesarily.

918. You not do think that the present position is an experimental stage and is now reaching its conclusion, and that there is sufficient material on some of the main issues, at any rate, to come to a firm decision?—The difficulty is, who is going to enforce that decision? We used to discuss at the Central Advisory Board certain problems such as the stage at which English teaching should be commenced in vernacular schools. We perhaps arrived at a unanimous decision, but all we could do was to circulate a record of our discussions and the results, which might not commend themselves to the authorities of the Provinces. That is the whole difficulty.

919. It is easier to spread words in any country than ' actions ', is it not?—Yes.

920. *Dr. Hyder:* Before I begin my questions, I should just like to be quite clear on a question which was put by the Chairman, and it is this. When the Advisory Board was abolished, you called a conference of the Universities?—I had forgotten that. I was thinking more of the subject under discussion, *viz.*, schools. There was a conference of the Universities held two years ago.

921. Since the Universities are independent in the Provinces, and are also independent more or less of the Directors of Public Instruction, I think it would be better to have at the headquarters of the Government a Board of High School and Secondary Education. Would that satisfy you?—I should like to have a simple Advisory Board. It need not necessarily be confined to high schools or primary schools, but it might discuss questions like agricultural education, the education of defectives and so on.

922. So that it will be useful to have inter-University conferences and something like a Board composed of Directors of Public Instruction from the different Provinces?—Or such representatives as the Provinces might choose to nominate, yes.

923. Now I want to ask you a few questions relating to education and agriculture in their relation to unemployment generally. We have here purely literary education, and then in the Provinces and at some central institutes specialised education in agriculture is given. What I want to know is, whether there is any opening for boys who come out of these agricultural colleges apart from Government service?—Unless they come of wealthy families (the sons of landowners, for instance), I should say none.

924. Taking up the educational system, apart from agricultural education, I believe you would agree with me that it is really like a bamboo tree. There are so many joints. It has very many different examinations and at the top people congregate with degrees. So that there arises out of this educational system the question of unemployment of the educated people. Now, apart from Government service, there is very little opening in the country for the educated graduates of agricultural colleges?—I should say there is very little opening for them. I understand from the United Provinces Report that there is some employment for them amongst the talukdars, but they are not graduates; they are people who come from the college at Cawnpore which goes up to the Intermediate stage.

925. Has that got something to do with the fact that the educational system does not fit in with the economic system, and the economic system does not fit in with the educational system? This is a country of small peasant cultivators and peasant proprietors. You turn out graduates from your agricultural colleges. They cannot go back to agriculture because the holdings are small. The only way open to them, therefore, is Government service. Is that so?—Yes.

926. They cannot act as estate agents or estate managers, because the landowners require men of a different kind; they require men who know the art of collecting rents and so on?—I should say that the chief reason why the big landowners do not employ agricultural graduates is because they would come with ideas of spending money and launching out into expensive schemes. That is probably why the ordinary landowners do not want to employ agricultural graduates. The landowners do not want to put more money into their land. There are of course a few educated landowners who do employ agricultural graduates, but their number is very small indeed.

927. What I was referring to is this. Take a Province like Bengal. There they have large estates and small holdings. There your agricultural graduates cannot find employment as estate managers or as cultivators of small holdings?—I do not understand why the large landowners should not put more money into their land, instead of living in Calcutta, and improve their estates both for the sake of their tenant holders as well as for their own ultimate benefit.

928. Now, in Bengal you have tenants either on produce rent or tenants paying a fixed rent. If the tenant is on produce rent, he has got to share the produce with the landlord, and he does not want any agricultural improvement because he will have to part with a portion of the extra produce. If he is on fixed rent, then of course there arises the question what agricultural improvements can be effected. If they relate to crops, if they relate to prevention of disease, if they relate to agricutural improvement, then it is in the interests of the peasant to adopt these improvements. But the landlord cares very little about these matters because the extra benefit is not going to him. Would you agree with that?—That is rather condemning the landlords. What I mean is, landlords in other countries do not necessarily look at the question entirely from a pecuniary point of view. If they are moved entirely by mercenary considerations, that would be the case.

929. I am trying to find out why it is that the educational system does not produce more useful results in agriculture?—Your statement would be perfectly correct granted the assumption, of which you will probably be able to

know the truth better than I can, that the landlord in Bengal cares little for his peasantry.

930. There is only one class of improvement in which the landlord can be interested and that relates to improvements in agricultural engineering, and if land is reclaimed or afforested, permanent improvements might be effected, and then of course the landlord can enhance his rent; otherwise not. But what I want to ask you is whether any instruction is given in agricultural engineering in your agricultural colleges?—I am afraid I am not sufficiently conversant with it, but as far as I know, there is no special course in our colleges in agricultural engineering, but whether it is included in the general course, I cannot say off-hand.

931. There is no instruction given at these agricultural colleges on rent and revenue matters?—I should say that it is one of the greatest weaknesses; agricultural economics should be taught.

932. So that we come to this really, that your agricultural colleges give specialised training, but they do not equip the boys to go out into the world and get employment somewhere, because agricultural engineering does not form part of their training, and also training in legal, rent and revenue matters is not given in your agricultural colleges?—As I said, I do not consider that it is the function of the agricultural colleges to turn out people so as to enable them to learn a living as farmers. I do not think that has been a success, as far as I know, anywhere. I think the function of the agricultural colleges is to turn out men who can work as teachers in agricultural schools, and also to provide experts. A lower grade of education is needed for the training of actual agriculturists.

933. I was referring to people who either go out into the world as teachers or are absorbed in the Government departments or who go out into agricultural industry itself and who might be absorbed as estate managers of big landowners. I was referring to the case of such people?—I do not know how far the colleges turn out such people elsewhere. But I think in India the agricultural colleges turn out people to work as experts and demonstrators. But, as I said before, there is not sufficient outlet for agricultural experts in other departments, though they might be quite useful. There is really no reason why agricultural graduates should not be introduced into the Revenue Department or the Irrigation Department or the Co-operative Department.

934. They might be absorbed by the Court of Wards as Tahsildars or Naib Tahsildars?—There is no special merit, as far as I know, about the Arts degree in preference to a degree in agriculture.

935. Now, there is one more matter. Denmark is a very great country as regards agriculture, and it is very curious that Denmark does not possess agricultural colleges, but it possesses an excellent system of high schools which impart instruction of a purely literary character. So that if we could increase literacy and also the culture imparted in our secondary schools, you would be on surer foundation as regards the improvement in education and agriculture?—As you probably know, the Folk high school is only a short term school. It lasts for four to nine months in the year. Owing to climatic advantages (I say advantages, but they would probably call them disadvantages), countries like Denmark, Canada, Sweden, and the United States are able to keep their high schools open at a period of the year when there is no farming going on, but we unfortunately have no season like that as far as I know.

936. For instance, the hot weather?—I do not know. The solution in Ireland and Scotland is as far as possible to work in the winter season. The Glasgow degree is taken in three winters only; there is no summer work at all.

937. With regard to the staffing of these primary schools and secondary schools of a literary kind, would you agree with me that the *personnel* should come from agricultural people and not from townspeople?—For agricultural

schools, as far as possible, they should come from the agricultural people, but I would not hold up education till you have agriculturists educated enough to teach. That is the difficulty.

938. *Sir Thomas Middleton:* I have only one or two questions of detail. On page 114 of your memorandum you refer to the college founded at Poona, in the Bombay Presidency, and indicate that the date was after 1905. Was any substantial change made in the course at Poona when the college was transferred from the College of Science to a new separate building? Was not the college at Poona founded about 1893 or 1894? I think the building was altered but I do not think there was any other substantial change?—Yes, perhaps I generalised too much there.

939. Now, on page 118 in the sub-paragraph (c) you say: "Every boy in the middle department passes through a four years' course in agriculture." Would you indicate roughly the ages of the boys when they enter that course? —Yes. I happened to look it up just now; I thought the question might be asked me and I verified it. The average age of entering the middle school is 11, and the average age of leaving would therefore be 15.

940. On the same page, you say that unfortunately for financial reasons the Punjab scheme has been modified. I would like you to explain your views on the sentence in which these words occur?—Yes. There has been a great deal of experiment in the past with school gardens and the half-acre farm, I consider, will probably degenerate sooner or later into the school garden and be little more. The object of the scheme of three-acre farms is to make it as far as possible similar to the actual holding which the boy will have afterwards. One obvious difference between the farm and the school half-acre plot is that in the one you have the use of cattle in ploughing and in the other not. That brings in animal husbandry; to a small extent; still, it is something, at any rate. And again, the half-acre plot would be very likely to degenerate into small gardens more like market gardens. The only one I have seen recently was very much of the type of a market garden with little bits of cabbages here and little bits of other vegetables there, whereas the three-acre farm allows you to put a really appreciable amount of ground under corn, and so on.

941. The intention was to introduce the economic idea?—Yes, to try as far as possible to make the holding correspond to what the boy would have afterwards, not so much with the idea of teaching him agriculture as of making the thing real.

942. I quite understand. The boy grasps a lesson much more easily when he sees it on the real scale than when he has it illustrated in miniature?—Yes.

943. It is the educational object which you have in mind?—Quite so. If I may make a parallel, it is the difference between kindergarten work with cardboard and paper and manual training with wood when you really make boxes.

944. Then, I am glad to see that you yourself are of opinion that the Punjab scheme might be widely extended throughout India?—Yes, I am naturally in favour of it. I organised it and have a natural prejudice in its favour.

945. *Sir Ganga Ram:* I want to ask you whether you have thought of all the avenues of employment for the output of the agricultural colleges?—Unless you are going to extend and enlarge them very much I still think that there will be a good demand in the near future, especially if we go in for an extension of agricultural education, for the output of these colleges.

946. Well, allow me to tell you that my experience is that a landholder will never look at the output of the agricultural colleges if he comes straight from the college?—I feel sure of that.

947. He must have some practical experience before he is any good to the landholder. For that reason I got the Punjab Government to give 2,000 acres on a three years' lease to the boys; but that is not enough, because that only

will accommodate two or three. We hope that with the extension of agricultural education our output will be very much greater. But I may tell you that that idea ought to be knocked on the head that landholders will ever take boys fresh from the colleges unless they have had some practical experience where they have worked for themselves and to their own profit and loss. So allow me to tell you that that scheme has been sanctioned which I have mentioned. It is good for three years, but that is not enough. The new scheme I have suggested to the Punjab Government is that they should, instead of selling crown lands wholesale, reserve, say, a thousand acres a year for ten students every year (or say more; that is a question of detail) and lease it to them at the rate of 4 per cent on the market price. What do you think of this idea?—It is rather difficult for me to say off-hand. It depends on the economic implications.

948. I have submitted it to the Punjab Government and they are considering it. But what I want to ask you is: in the Punjab you have got a lot of crown land which can be disposed of in that way, but are there such lands in other Provinces?—I cannot say. I am afraid I do not know enough about land.

949. But I go still further and say that, if you have not got crown lands, Government might take a large area on lease or something like that and then parcel it out to these boys in small plots of say 3 acres each?—It sounds to me very promising.

950. The next question is: Is the qualification for admission the Matriculation in all the colleges?—Yes, I think it is.

951. Do you not think that if we raise the qualification it might help to resolution? Nowadays I hear from professors that they send boys up for the Matric, at a very tender age, the age of 15 in the Punjab. That is a very raw age. So, do you not think if the qualification of admission was raised from Matriculation to F.A., it would be a good thing?—Yes. I would not say F.A. I should suggest F.Sc. the Science Intermediate.

952. And then in the F.A. class they could take away certain subjects which are more or less general in character?—Yes, I think there is a great deal to be said for that. After all, the engineering colleges' admission qualification is the F.Sc., and the medical colleges' admission qualification is the F.Sc. It might be the F.Sc. in this case as well.

953. Just as in the Arts colleges we have a medical group we will have an agricutural group. And for this reason I want your support for this proposal which I have sent to the Universities, that agriculture may be considered as a compulsory elective subject in the F.A. Do you agree to that?—No, I am afraid I would not agree to that at all.

954. I mean, just as in the case of Biology, so they might accept agriculture also as a compulsory elective subject?—I once was on the committee appointed to deal with a question raised by the Khalsa College as to whether an ordinary Arts college should or should not be allowed to teach agriculture. It is a very thorny subject and there was a good deal of debate about it because they thought it was likely to degenerate into book teaching. The Khalsa College were able to produce evidence that they were doing it on a proper scale by taking up a very large acreage, and employing agricultural graduates. The tendency, if you once allow agriculture to become an optional subject. . . . .

955. *Sir Ganga Ram:* Not optional, compulsory?—Well, either. A subject in an Arts college tends to be reduced to mere book work, and you turn out a certain number of intermediates in agriculture who really are not qualified by practical work.

956. I only mean to introduce that subject as an elective subject on a par with Zoology and Botany and so on?—I do not think I could agree to that. I think it is a professional subject.

957. Is the syllabus in all agricultural colleges the same?—No, it is not. The course is laid down in every case by the local University. In Bombay it is only a three years' course.

958. The text books are the same?—All the text books are not the same.

959. Is there any truth in the remark made in the Census Report that the boys who go to a rural primary school forget everything two years later?—I think it is probably true. In fact, I am pretty sure it is true, because on visiting schools lately where compulsory education has been introduced I found quite a number of boys who had come back to school and quite a surprising number who had been in school for a year or two years had, I am afraid, to go down to the bottom and begin all over again.

960. Do you feel the necessity of revising your present text books with an agricultural bias?—I am very strongly in favour of it for the rural districts, for use in rural schools.

961. With arithmetic dealing with agricultural standards, and pictures of ploughs, etc.?—There are any number of problems that can be set on agriculture.

962. Would you be in favour of introducing some sort of easy mechanical training in rural schools? For instance, instruction in how to do necessary little repairs to a plough, etc.?—Where agriculture is taught I suppose it ought naturally to come in.

963. A little mechanics of that kind?—Yes, simple mechanics.

964. Do you do that now?—I suppose ordinary repairs to ploughs must be done.

965. In the colleges (I know a little of what is done in the Punjab but not in the other Provinces) do you teach them a little of ordinary mechanics, *i.e.*, the ordinary rules of finding out what power is required to lift so much water to such a height? I mean lift irrigation?—I cannot say.

966. Do you also teach them in the agricultural colleges what depth of water is required for each crop?—I have not the curricula before me.

967. You are in favour of that sort of education in agricultural colleges?—Naturally.

968. At present they know nothing about it. All that can be done in six months' training. You can begin with oil engines to start with and the principle of pulleys, how to reduce the velocity of a pulley from one to the other. That is simple mechanism. You are in favour of introducing that sort of training?—Yes, naturally. I am in favour of anything which could be done without overloading the course and which will be of practical value.

969. *Sir Henry Lawrence:* When the Poona College of Agriculture was established in 1905 was not the course changed from the course for a diploma of two years to a University course of Bachelor of Agriculture?—I read something of the history of it when I was writing this note, but I cannot remember now the date when it changed.

970. About that time. Sir Thomas Middleton asked you if the course was not the same but I think the course was lengthened and the University made it a condition for recommending it as a Degree course in Agriculture?—Yes. I think that in Poona the course is still only 3 years. I am very sorry that both in Engineering and in Agriculture they have not lengthened their course to 4 years. It is the only college in India in which Agriculture and Engineering have a three years' course. In Engineering I am glad to say they have postponed their entrance and made it a year later now. If you want to get at the absolute standard of the degree, the Poona degree must be considered one year shorter at any rate than the others; whether it is lower in standard I do not know.

971. Do you think it ought to be increased?—I should think so. I do not know sufficient about Agriculture, but I know that there is a feeling about Engineering. The difficulty is that the University has a say in a matter like that. The University is content with a three years' course.

972. Has the Poona College got an Agricultural Engineer on its staff?—It is 3 years since I have been there. I cannot say at the moment.

973. Is there a Professor of Agricultural Economy?—I have not got the prospectus here with me. I do not know.

974. *The Raja of Parlakimedi:* There is a large percentage of boys who do not take up higher education after their School Finals?—A great many fail at the School Final or Matriculation. A good percentage of course cannot afford to go on.

975. Do you not think that if you made agriculture a compulsory study in that class, it will be helping these boys to take to agriculture as a vocation?—My experience hitherto of agricultural teaching in high schools has not been very encouraging. It has nearly always been difficult to get it beyond the level of book-teaching. The difficulty is the examination. If you are going to make this a compulsory subject for the Matriculation or the School Final, it must be a paper examination only. It will be impossible to employ a large body of men to go round and inspect the practical agricultural training of a large number of boys. Therefore, it becomes purely a literary subject, which it should not be.

976. It is now being insisted on that secondary schools should have their gardens close by. They can be made use of for practical study?—I would rather have that than have it made a subject for examination. The instant you introduce examinations, you introduce also text books and cramming.

977. In the lower forms, nature study is practically a compulsory subject?—Yes.

978. There are now several subjects such as book-keeping and so on in the School Final. If private institutions can afford to have gardens near by and there are qualified teachers, I think there would be no difficulty if it was made a compulsory subject?—When I was in the Punjab 50 high schools took agriculture for matriculation. I made inquiries and found out the reason for that. It happened to be a particularly easy subject. Only a limited number of books had to be studied on the subject for that standard and it was impossible to prescribe a practical test. It was to avoid that that I suggested introducing this form of practical agriculture in high schools, but it fell through for lack of funds, and I am doubtful whether it would have been a success. I think that every boy who gets up to the high school stage has more or less definitely made up his mind that he is not going to go in for agriculture. Of course the matter is quite different if he is going into an agricultural college.

979. You have just said that there are not books enough on geography to give you an idea of the produces of countries and Presidencies. May I bring to your notice that there is one book on agriculture written by Mr. Morrison which has also been translated into the different vernaculars? This book gives you an idea of the different products, monsoon and so on. I think it should be recognised by the Imperial Government as a sort of book which can be taken into the different Universities. After going through it, would you make a suggestion to the Government of India to that effect?—I should like to see it. I have not yet seen it.

It is Mr. Cameron Morrison's book; Macmillan and Co. publish it.

980. *Sir James Mackenna:* What are the steps preliminary to the affiliation of an agricultural college to a University?—The application to the University informing them of the qualifications of the staff and the course which it is proposed to follow. Then the University would send down a board of inspection. But the college has to be opened before it is affiliated. That is the difficulty about all these institutions. Before they are recognised they have to start as unrecognised institutions.

981. I suppose that in certain cases, if the University Committee found that any section of the teaching staff was not up to the standard or the teaching staff was inadequate, they would ask the college to fill up the gap before they considered the application?—They would lay down so many requirements. As a matter of fact, I have served on several committees. What they look into is the library, the buildings and the qualifications of the

members of the staff. They often say, if such and such a scientist with such and such qualifications is appointed, if the library is increased by so much, etc., they will be prepared to affiliate.

982. I may take it that the standard required for affiliation of an agricultural college to the University is as high as that required of any other college seeking affiliation?—You have a case in point from your own Province. The University will not take in the Agricultural College there. They do not consider the standard of admission high enough.

983. Therefore, your graduate of an agricultural college is really as good for employment in any department as a B.Sc. or a B.A.?—Yes.

984. *Mr. Calvert:* What is the explanation of the small proportion of boys in rural primary schools who pass through the fourth class?—The explanation is the inefficiency of the school largely and partly the boys being withdrawn by the parents owing to this inefficiency after a very short time. The boys can never be got to stay on until compulsion is introduced. The effect of compulsion will be to raise the number of school-going boys which means you will have to increase the staff. The schools will become more efficient in that way.

985. Has the demand for child labour any thing to do with it?—Very little, I think. It is constantly stated that you must at least have the holidays during the harvest season and that the boys are taken away for herding cattle. I have inspected a very large number of primary schools and I found that only very few of the boys are herding cattle. The others are crowding round the door or looking through the windows (of the school). The actual number employed on herding cattle, etc., is not very many, certainly not of boys of school-going age.

986. Do you agree that all subjects should be taught in relation to rural life?—I have already stated that this should be done as far as possible.

987. In the school at Moga would you say that the secret there was the extraordinary correlation between the tuition and actual rural life?—I should say it is. It is more in the nature of a community centre. They have all sorts of activities centred round the school, like they do in America.

988. Everything is really taken from the village?—Yes.

989. Do you consider that the spread of rural education must wait upon the attainment of a higher standard of living?—I should say that we should wait indefinitely if that were to be the case. The two must go together.

990. Should the Education Department recruit members of the district inspecting staff from the rural or agricultural population?—I would say that the fact that the man is an agriculturist should be a qualification in his favour, but I would not make it a *sine qua non*. In fact, you would never fill your inspecting staff sufficiently if you waited for agriculturists.

991. Is there a scarcity of vernacular books suitable for village reading? What has been the result of offering rewards? Can you suggest remedies?—There is a very great dearth of those. That is one of the difficulties of the village libraries, that there is at present little or no output of books for boys or even for peasants to read. It is a very serious drawback. The only thing possible is to subsidise production as far as I can see.

992. Is practical instruction in agriculture in elementary (primary) schools optional, compulsory, or not yet introduced? What is your experience of its value?—There is no practical instruction in agriculture in elementary schools. I think I did mention it and I have no belief in it at all.

993. Do you accept the dictum that agriculture as such cannot be taught in schools?—I do not quite know what you mean.

994. That apart from the mental discipline and cultural value of such training, agriculture cannot be taught?—I think it is much more than that. I think that agriculture as taught in the vernacular middle schools is a good deal more than that. It must be of practical value. I should like the boy who leaves at the end of the middle school to be no worse a farmer than the

boy who has not been to school. I do not say he will be better but he should be no worse.

995. *The Chairman:* In his knowledge of practical agriculture?—Yes. At the same time he should possess arithmetical and general knowledge which will make him capable of going further.

996. On the other hand, his mental alertness and capacity should be higher than the boy who has been to no school at all?—It should be very much higher.

The Chairman: That is really Mr. Calvert's point.

997. *Mr. Calvert:* Do you consider that the elements of agriculture can be taught to sons of cultivators in the vernacular?—It must be in the vernacular, certainly.

998. The point raised in one Province was that you cannot teach agriculture in the vernacular?—I should say more probably the difficulty is you cannot inspect it in the vernacular. I find that when they object to it, very likely inspectors are not used to following the local language. It is much more likely to be that. It is very difficult to tell whether the education given in the vernacular is efficient or not.

999. *Mr. Calvert:* That is a curious statement made in one of the memoranda, that you cannot teach agriculture in the vernacular?—That is quite absurd.

1000. *Dr. Hyder:* Are not Dr. Clouston's books translated into Marathi and other languages?—Yes.

1001. *Mr. Calvert:* Does the inclusion of agriculture in the middle school curriculum place any obstacles in the way of the attainment of a certificate qualifying for public service? Or in the way of proceeding to higher education?—It does not in the Punjab; but you mean if this system is adopted elsewhere there will be a certain amount of opposition to it. That is a difficulty. It has been made clear that agriculture must take the place of a classical language. There are certain Provinces which insist on a classical language. If you are going to insist on a classical language, you have to give up agriculture.

1002. It does also compete with English?—Very little; it does a little.

1003. In your scheme did you propose to apply your agriculture only to vernacular middle schools or to Anglo-vernacular schools as well?—No, I think all differentiation will soon disappear. English is being taught more and more in vernacular middle schools.

1004. Is there any local interest aroused in the school garden? Can you suggest means to increase such interest?—All reports about school gardens, I am afraid, are very disheartening. It is only when you have a real enthusiast in charge of a district, like Mr. Fremantle at Allahabad, that the school garden succeeds.

1005. Should rural teachers be specially trained? Should there be separate training schools for this purpose? Should these be situated in rural areas? Should they be staffed throughout with teachers from the agricultural classes?—To the last part I should say No, because we could not get teachers. The other part is very important. At present the normal training school course for the elementary teacher is the same for towns and country, and the elementary training schools are very largely planted in large towns. The rural boy coming out from the vernacular middle school where we hope he has gone through his agricultural course then becomes a teacher. He is transplanted to a city area where he has to dress as he would not dress in the country, where he has to live an altogether different kind of life; and apart from that he has to go through exactly the same course as a boy who is going to teach in the primary department of the town high school. If you are going to ruralise, to agriculturise your rural schools, you really would have to go in for a separate course of training for teachers for the rural schools. I think that is quite essential. All the books will have to be different.

1006. It is quite easy to convert some of the schools into purely rural schools?—Yes.

1007. Is there in your Province a text book on nature study, or school gardening or rural science? Do you consider them satisfactory or can you suggest improvements?—There is a very great lack of decent books on nature study and in fact there is very little indeed done in the way of nature study. Most of the nature study is of a more or less perfunctory character.

1008. In your scheme where agriculture is going to be taught in middle schools, would you send your teachers to the agricultural college for a short training?—Yes.

1009. Is a specialist in nature study required? Should teachers of nature study in training schools be graduates in natural science or in agriculture?—I presume you mean teachers of agriculture. At present they are taught for one year in Lyallpur and my own impression is they ought to be taught for two years or brought up for periodical courses.

1010. Your scheme is for a teacher trained in pedagogy with a short course in agriculture?—A one year course in agriculture. Of course he is an agriculturist by birth but I think it would be quite as well to put in two years. The subject of rural economics, for instance, is not taught at all. I do not believe any attempt is made to teach this subject, which seems to me to be a very important one.

1011. What is your experience of adult schools or night schools for (*a*) spreading literacy and (*b*) preventing the literate from lapsing back? Have you found lantern lectures, cinema lectures, etc., valuable? Can you suggest developments and improvements?—It is very difficult to say at present that the present schools are entirely devoted to spreading literacy or to preventing the literate from lapsing back. Of the ones I know, the Punjab ones, it is too early to say anything yet; they have only been in existence for two or three years. We cannot tell how far they are going to keep the man literate unless they are followed up by libraries. You must provide something for your reader to feed on.

1012. What is your experience of village libraries?—I know very little about them. I understand you are doing something in the Punjab. We have had a very unfortunate experience in the United Provinces where it was left to the District Boards and they are gradually petering out. We have no explanation except that the District Boards take no interest in the matter which is a great pity.

1013. Do you think that the cause of rural education would be promoted if on the administrative side you had complete separation between rural education and urban education with separate inspectors right down the line?—I don't think it would be practicable. It is very difficult to say but I should think it would be quite impracticable. Secondary schools start with the ordinary middle school course and go on into the high school. The high school is more or less urban in character.

1014. The present combination leads to peculiar results. In the Punjab an adult school run by an urban inspector was entirely devoid of rural pupils but when run by an inspector from an agricultural tribe it became entirely a rural thing?—All you can do is to transfer the men backwards and forwards to get both sides. That is the difficulty indeed. We have to keep on moving our inspectors.

1015. You do not think it is practicable to separate the two?—I do not think so.

1016. *Mr. Kamat:* You said that in other countries the function of agricultural colleges was mainly to train students for research or for Government departments?—Yes. I think I must qualify that. I have recently heard about Germany, and I understand the German colleges are now restricting admission to men who have had at least 2 years farming experience. That was only communicated as a warning to Indian students, so that I do not know much about it.

1017. But as this country is predominantly an agricultural country should we be satisfied with that sort of ideal?—The standard of agriculture is so high in countries like Denmark that if they are content and if they think their best men will be turned out after a very much lower standard of training, I do not think we can do better than follow their example. Why try to turn out an expensive article if a thoroughly practical agriculturist can be turned out for very much less?

1018. You would not take into special consideration the fact that as this is an agricultural country we require more agricultural graduates than the foreign countries you refer to. You would not give any weight to that fact?—I think the agricultural graduate is very useful but I do not think he is primarily the article that you want for farm work.

1019. In the Poona Agricultural College, agricultural economics is being taught; I think there is a Professor teaching it. Do you think in the other agricultural colleges of India agricultural economics could be taught with advantage?—I should not like to generalise as to whether it is taught or not, but my own conception is that it is not taught to any great extent.

1020. Would you not consider that an essential subject for an agricultural graduate?—I should.

1021. It has been remarked that in most of the Provinces where there are agricultural colleges, about 10 per cent (or somewhere near that figure) of the graduates go back to farming. Taking things as they are in this country, can you suggest any remedy to get over that difficulty?—I still do not think that the agricultural graduate is intended to be a farmer, except perhaps when he is the manager of a large estate.

1022. Then about this question of men who have taken primary education lapsing into illiteracy, regarding the schools in Bengal and the Punjab, are they necessarily night schools?—It is the most cheap and most convenient form. As far as I know they are all night schools. People go there after their day's work. The idea of an adult school is to capture a man who is actually on the land or in business. There are also two other conveniences: They are generally held in the public school building in the evening and they are generally taught by the day school teacher for a small allowance.

1023. As far as my recollection goes, about the remarks in the annual reports, as regards night schools in the Bombay Presidency, I think with very very few exceptions, these night schools have been said to be a failure in Bombay. Have you any special feature in your mind which has made the Bengal or the Punjab adult schools a success?—I do not know anything about the Bengal schools. When you refer to your night schools in Bombay, you refer to these rural schools in the Poona district. They have been a failure.

1024. Yes, except a few schools near the factory which attract the factory labour?—When I was in Poona some years ago, they were supposed to be a promising success. I cannot tell you about the Punjab schools which are in existence for the last two years or so. It is too early to say whether they are going to be a success or not.

1025. I am asking whether you have in mind any special feature of these Punjab schools which has made them a success?—As far as I know they follow very much the lines of the Bombay schools, conducted by the teachers in the school houses and moved on from time to time.

1026. Except these adult schools, have you any remedy in view to prevent people lapsing into illiteracy?—As I have said before, compulsory education When you can introduce it, you can make quite sure that at least the boys will finish their four-year courses and will not waste two years in school and go away. The other is the provision of village libraries and encouragement of local reading.

1027. In order to speed up literacy, is there any form of encouragement which could be given to these aided schools?—I am very sceptical about encouraging aided schools. I have lived in Provinces with both systems. Aided schools mean less efficiency, a very much larger number of schools for the

same number of boys, and poorly paid teachers. For a special community, for instance the Mahommedans in Sind, there are advantages; otherwise I am very decidedly in favour of the school under public management.

1028. As most of the Provinces are finding it very difficult to find the finance for opening primary schools according to regulations, would you not sacrifice a little bit of efficiency and give some special facilities to these aided schools in order to speed up literacy?—I went into that question very fairly deeply when I was Director of Public Instruction and I found as a matter of fact that aided schools are generally started in centres where there are already schools. The test for education is there. What you are merely doing in many of these cases is simply aiding a school which takes away pupils from other existing schools or at any rate increases numbers very slightly. I think you will find that most aided schools, except perhaps in Bengal where villages are very close, are founded in centres which already have educational institutions. I am quite sure that the aided school never touches the outside rural district. Who is going to start a school in a remote village in the hope of inducing boys to go to school? It is not a paying proposition. You must remember that the master of the aided school is out to make money. That is his job.

1029. But as he cannot make enough money would you not supplement his earnings in the village by some special grant?—I do not think he will go to a village, unless it is a purely religious school.

1030. *Sir Henry Lawrence:* What was your reference to the Mahommedans in Sind?—Aided schools may be suitable for special communities, for instance, to meet the particular desire of the Mahommedans in Sind it may be advisable to aid *mulla* schools rather than to start other schools. That, I say, is a justification for the aided school.

1031. *Dr. Hyder:* In reply to the Chairman, you said you did not know much about the *purdah* system. I ask you whether you can say from your experience of eighteen years in India whether, if the conditions of life were improved and education were introduced generally into rural areas, these people would not take on the manners and customs of the people they consider more respectable; that is to say, they are at present without *purdah*, but they would walk into the *purdah* if their conditions of life were better?—I think that is very probably true.

1032. *The Chairman:* I think we should have on the notes your view as to the advisability of applying compulsory education?—It is a very difficult subject. I think myself that it can be introduced much more widely than it is introduced if there is a little more course shown about it. I do not like always that the means for introducing compulsion are made easy. I do not like always to quote the Punjab. I started the present system there. They have made the means of introducing compulsion in individual village areas so easy that it has caught on decidedly. In a village one or two advantages are seen. As soon as you get compulsion you get a certain number of children in the schools. You may have a school with twenty children spasmodically attending. If you introduce compulsion perhaps there will be fifty or perhaps the number would not rise to more than thirty-five. As soon as you get thirty-five children, you get your second teacher. The school then becomes more efficient. You have to do intensive propaganda more than anything else. Hitherto most Provinces have been afraid to undertake intensive propaganda from the point of view of money. They have said what always used to be said by the Government of India, *viz.*, there is such a lot of voluntary education and such a lot of demands on our educational budget that we had better not undertake an unknown liability such as compulsory education. I am very strongly of the belief that it would be advisable at any rate to bring compulsory education into a certain number of areas if it is only to prevent the terrible amount of illiteracy.

1033. Is it the District Board with whom the final decision lies?—Yes, District Boards have to vote the money.

1034. You direct your propaganda to the public?—Yes.

1035. Is public opinion faithfully reflected in the vote of the District Board?—I do not think the District Board would be averse to introducing compulsory education as long as the financial liability is not too great.

1036. I think you do agree that improved communications have an important bearing on education?—Yes, very important.

1037. Can you tell the Commission whether the Universities are entirely autonomous?—They are in a very curious position here. I do not think there is any parallel anywhere else. They are not completely autonomous. Most of the Universities in India are provincial Universities, that is to say, Government started them and incorporated them by law, Government financed them and the only other source of revenue they had was fees. Gradually the fees became so large that many of them have independent sources of income: But Government has a good deal of power over them, because they nominate a certain number of their members, they used to be called Fellows. Some of the members of these bodies are *ex-officio* members; and in nearly all cases the regulations have ultimately to be confirmed by Government or some person in authority.

1038. I think we must just have on the notes that you handed in an estimate of the difference between the cost per boy per annum in an agricultural middle school, such as in Bombay, for instance, and in a middle school in the Punjab. The information you have given us is that in the Bombay type it costs Rs. 371 per annum and in the middle school in the Punjab the estimate is Rs. 31. Is that correct?—That is quite correct. That includes every expenditure. I did not take Government expenditure only. It includes fees and what they call other sources; that is the total expenditure per boy.

The Chairman: Do you wish to ask anything on this, Mr. Kamat? It was really on a question of yours that it was raised.

1039. *Mr. Kamat:* In the Bombay type I think the pupils are allowed a stipend?—Yes, they are allowed a stipend and are provided with board and lodging free.

1040. They are provided with free boarding and lodging because they are especially vocational schools?—Yes.

1041. In the Punjab I do not think they are allowed any stipend?—No.

1042. That makes all the difference?—Not all the difference. The cost of boarding and lodging for a boy ordinarily is about Rs. 25 a month.

1043. *Sir Thomas Middleton:* Have there been any studies made in India of what might be called lapses into illiteracy, that is to say, of boys who have been at school and who are afterwards discovered to have forgotten all that they learnt?—None at all. In fact the whole question of lapsing into illiteracy has only been taken up and considered by the Government of India in recent years after the last Census Report in 1921. But there has been nothing statistical done about it.

1044. We can take your gross numbers of attendance at schools and form what estimates we like as to the probable number of illiterates?—Quite so.

(The witness withdrew.)

[Questions 1045—1198 relate to the evidence of Mr. W. P. Sangster, C.S.I., C.I.E., Chief Engineer, Irrigation Works, Punjab. This evidence has been transferred to the Punjab Volume of Evidence and re-numbered.]

Friday, October 15th, 1926.

SIMLA.

PRESENT:

The MARQUESS OF LINLITHGOW, D. L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Raja Sri KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Lieut.-Colonel J. D. GRAHAM, C.I.E., I.M.S., Public Health Commissioner with the Government of India.

Replies to the Questionnaire.

Owing to my recent return from deputation in England I have not been able to give this note the time or attention which it deserves or requires.

QUESTION 25.—WELFARE OF RURAL POPULATION.—To any one conversant with rural conditions in India the close inter-relationship between health and agriculture does not require elaboration. For the past two years at the Annual Medical Research Workers' Conference in Calcutta a resolution has been passed, a copy of which is attached as Appendix III for the information of the Commission. It called attention to the vast wastage of life and energy resulting from preventible disease and recommended the formation of a Commission to enquire into this wastage. It was realised, however, that the Royal Commission on Agriculture might cover part of the same ground as the Commission asked for, as it was expected that this Commission would find preventible disease to be one of the most important factors in the causation of poverty and that an enquiry into the condition of the agriculturist must necessarily take cognisance of the public health aspect of his life.

Any discussion on the welfare of the rural population falls naturally under several main headings. These are:—

I. The influence of disease.
II. The influence of nutrition.
III. The rôle played by crop cultivation.
IV. The rôle played by research.
V. The rôle played by education.

The general effect of disease, and especially of such diseases as malaria, which reduce the vitality and efficiency, both physical and mental, of the ryot, must be felt in agriculture, as must also be the lowered physique and mentality due to nutritional influences which are so closely bound up with crop cultivation. The close connection between research and agriculture is exemplified by the food value of crops from a deficiency disease point of view, by the connection between rice cultivation, irrigation and malaria, by tuberculosis and anthrax in cattle, by grain storage in its relation to plague, etc. Agriculture affects diet, which if deficient or badly balanced will produce disease, whilst disease begets inefficiency, mental apathy and loss of virility. Much

of this, which affects medical research intimately, is new ground awaiting investigation.

I. Disease.—Most public health officials have in their recent reports laboured to bring home to the public the physical and economic effects of disease as it is seen in India.

Such major diseases as malaria, plague, cholera, dysentery, tuberculosis and in some areas *kala-azar*, relapsing fever, filariasis, hookworm disease and deficiency diseases, together with such so-called minor diseases as eye diseases, skin diseases and leprosy bulk largely in maiming the community and in accentuating conditions of depression and poverty. In the immediate past our attention has been largely directed towards making local or general geographical surveys of these diseases, and we have now reached a point where our information regarding many of them is considerable while that regarding others is increasing daily.

From time to time India is swept by colossal epidemics which have no parallel in any other country except perhaps China. Apart from the enormous mortality produced by these there is an appalling morbidity and maiming of the community which must have its effect on its labour productivity. It may be asked what is being done to stem the tide of such visitations. Perhaps Government of India has not received its share of credit for the work that has been done during the last eighty years in medical education and medical relief; but Government does not advertise. It is doubtful whether any Government in the world could show a better record of State aid for the promotion of these subjects. In the matter of public health, however, we are at once up against the rooted prejudices of a highly conservative congeries of peoples in whom, in many instances, religious practices enter largely into domestic affairs, specially in regard to illness and nutrition. It will therefore be readily understood why the deliberate policy of Government in public health matters should have been to lead rather than to compel, and to propagand with a view to creating in time a public health conscience. It is well at this stage to recognise that such a conscience has not yet developed, though signs are not wanting of glimmerings of it in the larger cities. I mention this in order to convey a proper appreciation of some of our difficulties both in regard to immediate measures and to proposals for the future. Again and again our workers have felt that apathy towards and want of enthusiasm in putting into practice much that has been scientifically proved as preventive of the onset of disease. As the trained medical *personnel* necessary to leaven the rural population with modern hygienic ideas can only be created with much expenditure, it has been the aim of the Government of India to provide the basic structure on which this organisation can rest and develop. Whether under devolution the general plan will develop on the lines anticipated remains to be seen; but, if so, we must expect to see different Provinces developing with different degrees of rapidity.

With a general death rate in 1923 of 25 per mille and an infantile rate of 176, over 6 million people died (England and Wales 11·6 per mille and 69 respectively). Comparatively recent actuarial tables show that the expectation of life at 5 is 35 years and at 20 is 27 years as against about 54 and 41 respectively in Great Britain, or to put it in another way, that of 1,000 persons born in England 530 reach 50 years while in India only 186 do. In other words disease has reduced expectation of life in India to less than half of what it is in countries like Great Britain.

In 1923 the deaths recorded were divisible as follows:—

Cholera	73,002
Smallpox	44,084
Plague	229,149
Fevers	3,706,298
Dysentery and diarrhœa	186,458
Respiratory diseases	297,365
All other causes	1,500,575
	6,036,931

The application of an arbitrary correction figure of ¼ for fever mortality figures still shows over a million deaths from malaria, the morbidity of which is very great. As we have a record of nearly 8 million people being treated for it at our dispensaries and hospitals, we can surmise how appalling is the maiming due to it. Further its relation to agriculture is very close through methods of cultivation and canal irrigation which may lead to final depopulation. It is of primary importance in opening up jungle tracts to tea, coffee and rubber, whilst its connection with rice cultivation is a very complex one which occupied the attention of the recent International Malarial Conference at Rome. * Christophers in estimating the morbidity says that for one million deaths in adult males between 15-50 years of age there should be at least 2 millions constantly sick and the equivalent of 50 million admissions to hospitals.

The 1908 epidemic of malaria in the Punjab passed like a cyclone over 20 million people and resulted in a quarter of a million deaths in three months. The great epidemic of influenza which swept round the world in 1918 affected the whole of India between June 1918 and June 1919. It was estimated that over 7,000,000 deaths occurred from it in 1918, and over 400,000 in 1919. How this affected agriculture can easily be imagined. Similar epidemics of malaria, of cholera and of relapsing fever have occurred from time to time, whilst plague has been epidemic for the last 30 years.

Plague was introduced to India from Hong Kong about March 1896 and still continues its ravages. During the 20 years period 1898 to 1918 in a population of over 304 millions (average of 1901 and 1911 census) it caused over 1,000,000 deaths, the mortality per mille of population being greatest in the Punjab and Bombay (122·27 and 87·35, respectively) and least in Burma, Madras and Bengal (8·03, 3·45 and 1·49, respectively). It affects agriculture by its high adult mortality which disorganises labour and domestic economy. Its connection with the rat and with grain brings it into still closer relations with agriculture.

Cholera is now essentially a rural disease and is endemic in certain areas as are also *kala-azar* and hookworm. In regard to the last Clayton Lane furnishes us with extraordinary figures for India. He says that a conservative estimate shows probably 45 millions of wage earners infected who, at an average annual wage rate of Rs. 100 each man, would earn Rs. 4,50,00,00,000; but our tea garden experts reckon on a 10, 25 or 50 per cent increase in labour efficiency under hookworm control. This gives us a minimum increase of Rs. 45,00,00,000 or £30,000,000. Lane thinks that what has been done in Darjeeling can be done for India. In the case of cholera and hookworm prevention of soil pollution, by or with the provision of a pure water-supply, must be a sound investment, and, if to this we add anti-malarial measures, the investment becomes sounder still.

Famines and epidemics reduce fertility and produce a temporary fall in the birth rate but this is usually rapidly recovered from, though provincial investigations show that such a recovery does not take place equally or even in all Provinces and that there are instances where population has actually decreased.

With such facts before us we are now in a position to form a clearer estimate of the economic and financial effects of disease on the country. Excessive death rate, decrease in population, and excessive morbidity all contribute to interference with the agricultural development and vocations on which the welfare of the country population depends. In their train must follow loss of revenue, scarcity of money, loss of producing power, physical deterioration, in fact the establishment of a vicious circle.

In a country like England and Wales with its vast State resources for national insurance against sickness and invalidity, it was estimated that during the year 1923 there was lost to the nation, among the insured population only, and excluding the loss due to sickness for which sickness or dis-

* Presidential address, 11th Indian Science Congress (Medical Research Section).

ablement benefit was not payable, the equivalent of the work of 394,230 persons or 20½ million weeks' work. Maynard calculated that the economic loss in the Transvaal from preventible disease amounted to £2,600,000 per annum. It is almost impossible to realise what the loss must mean in a country like India; but we may rest assured that the productivity of the country will be enormously increased by an effective control of such causes as have been enumerated.

II. Nutrition (Diet).—The relationship between diet and disease has only within recent times even in Europe and America received the attention that it merits. The development of biochemical work, and the inauguration of nutritional researches, owing to the necessities of the Great War, have given an impetus to this study which is already resulting in a great increase of our knowledge and in the shattering of many time-honoured beliefs.

At the recent meeting of the British Medical Association at Nottingham in July 1926 in the section of public health a discussion took place on food deficiency conditions in relation to preventible illness (*vide* British Medical Journal, July 31, 1926, page 185), and four very instructive papers were delivered dealing with the scientific, the clinical, the tropical medicine and the public health points of view. The British Medical Association lecture was delivered by Mellanby of Sheffield on Diet and Disease with special reference to the teeth, lungs and pre-natal feeding (*vide* British Medical Journal, March 20, 1926). I would further call attention to two important and very recent papers published under the auspices of the Medical Research Council, details of which I have given in Appendix I. These all point to the importance with which this subject in Great Britain is now being regarded.

In India these studies are in their infancy. From time to time odd workers have made a special study of Indian dietaries and of their effects on health, and in this connection the work of McCay and of McCarrison must claim our attention. McCay's work which was done over 15 years ago is recorded in our Scientific Memoirs (Nos. 37 and 48). It dealt with an investigation into the jail dietaries of Bengal and the United Provinces, and incidentally with the influence of dietary on the physical development and well-being of the people. Though McCay's work is very convincing some specialists such as the Danish expert Hindhede refuse to accept many of his deductions. McCay explains that his aim was to determine experimentally the nutritive values of the diets at present in use in the Bengal and the United Provinces jails and to work out interchangeable diets. He states that from the facts he assembled with regard to the inhabitants of the United Provinces and the martial races of the plains there would appear to be abundant evidence that, other things being equal, diet is the all important factor in determining the degree of physical development and general well-being of the people, and that, with a low level of nitrogenous interchange, deficient stamina, morally and physically, must be expected. With very precise data he concluded that the general lack of physique and vigour in Bengal is most probably due to deficiency of protein in the diet; whilst the inclusion in the diet of wheat in gradually increasing proportions as we pass up through Bihar and Orissa and the United Provinces to the Punjab coincides with our gradual introduction into the areas inhabited by the martial races. He shows that with a full rice diet such as that of the Bengali, insufficient protein is ingested, this being made up by the use of pulses; but, owing to the bulk of the diet, only about 50 per cent of the protein can be absorbed as against 90 per cent. in European diets and this even if the quantity of pulses be increased beyond the jail dietaries' allowance of 6 ounces. With the addition of wheat, however, protein assimilation is increased, thus indicating the value of a well-balanced diet of rice, *dals* and wheat which is further improved by the addition of small quantities of meat and fish. Protein deficiency is perhaps the most characteristic feature of Indian diets even though they may be generous. The Bengalee diet has a very low protein metabolism, less than half of the home standards, whilst the highest is encountered in certain hill peoples who eat rich meat dietary such as Bhutias and Nepalese. A rough indication would seem to be that the food of the population of India and the agriculture

producing this are modelled closely, in so far as concerns quantity, on the actual dietetic needs of the population.

In a recent essay* on the relationship of diet to the physical efficiency of Indian races McCarrison calls attention to the great differences in Physical efficiency of the Indian races and the contrast between those of the North, and those of the South and East. His argument is that as rice, wheat, barley, millet, maize, vegetables and fruit represent most of the food eaten throughout the country, and as milk, eggs and meat are not eaten to any extent by the masses, the diet is deficient in at least three factors:—

(*a*) it contains relatively poor quality protein,

(*b*) it contains too little of certain mineral elements such as calcium, sodium and chlorine,

(*c*) it is deficient in fat soluble vitamin A.

He argues further that the consumption of such supplementary foods as meat, milk and its products, fruit and leafy vegetables is the determining factor in the variations of physical efficiency, and he quotes the Sikhs, the Pathans and the people of Hunza to exemplify this. In the same way as physique is affected so also are disease and immunity to disease. McCarrison is still continuing his researches at Coonoor and has put in a special note to the Commission. In the same publication Hallilay, dealing specially with the Punjab, and quoting his experience of over 22 years as a Surgeon there, comments on the *chapati* and *dal* diet, with abundance of raw fruit, and meat only as a luxury, as being associated with freedom from certain intestinal surgical diseases, stone and cancer.

Little recent work has been done on dietaries in the Physiological Laboratories of the Medical Colleges of Lahore, Calcutta, Lucknow, Madras and Bombay. I have added a note on it as Appendix V.

In so far as concerns the mental effect of a monotonous diet I quote Professor Starling regarding Germany during the War. "Three years on a diet insufficient as to quantity and quality, indigestible, tasteless and monotonous had a marked influence on the vitality and efficiency of the great bulk of the urban population, which finally resulted in the changed mentality which rendered impossible any further efforts of attack or even of resistance. In the condition of dull apathy and mental prostration resulting from the deprivation of food the course of the War no longer seemed of importance. Food filled their thoughts by day and their dreams by night, and the only desire was to end the War by any possible means that might lead to a slackening of the blockade and the free entry of food into the country. No means could have been more effective in breaking the spirit of a nation by effects which were likely to last for some time." This is not without its lesson in regard to the influence of badly-balanced and monotonous diets on a population in peace times.

I have added in Appendix II a note by Lieutenant-Colonel Christophers, Director of the Central Research Institute, Kasauli, regarding the composition of dietary as shown by cropped areas. His calculations which are from the Imperial Gazetteer figures have been rapidly done and must be considered as only very approximate; but the results are interesting and suggest that further useful results might be obtained by more accurate estimates made on such a plan.

Undoubtedly the necessity for bulky carbohydrate meals in the absence of a high protein diet all makes for multiplication of digestive troubles and for such diseases as diabetes, these disorders appearing much less frequently as one passes northwards. The basic cereal diet of the north-west and of the Punjab, *e.g.*, that of the Sikhs, which includes meat perhaps three or four times in a month, would seem to be a well-balanced diet making for physical efficiency. The influence of so-called dangerous pulses such as *Lathyrus*

* Practitioner, January 1925, Vol. 114, No. 1.

sativus has been blamed by McCay for illness; but our recent investigations* under the Indian Research Fund Association where we were able to arrange for the co-operation of a botanist, of a chemist, and of a doctor on the enquiry seem to point to an opposite conclusion. Hindhede challenges McCay's conclusions in regard to the need for more protein, he himself being an ardent vegetarian.

Under normal conditions the diet of an indigenous population is largely influenced by the crops which are raised in the area in which they live, and so long as the agriculture of an area is diversified the diet is likely to be diversified and competent. If agriculture is one-sided the diet tends to be unbalanced. Transportation, shortage and marketing all help to diversify the diet and represent an insurance against deficiency disease. The conditions producing dietetic deficiency diseases need not therefore obtain to any extent in normal times in India in so far as scurvy, rickets and beriberi are concerned as the three vitamins supposed to be concerned in the production of these diseases are usually supplied. Whether the absence of the water soluble B. vitamin (*i.e.*, the anti-neuritic or anti-beriberi factor) is the cause of this disease is now open to serious question in view of the recent work being done on the fungoid changes in rice as a result of imperfect storage. On this we may reserve our opinion; but, in so far as the anti-scorbutic and anti-rachitic factors are concerned, we are on strong ground; these diseases, generally speaking, in non-famine times are largely absent. The partiality of the lower orders towards eating quantities of raw vegetables and fruit would ordinarily prevent this.

The economic side of the labour wage in so far as it affects malaria has been worked out in a very interesting way in regard to the sea gardens in the Duars by Christophers and Bentley in a report† now fifteen years old which deals, *inter alia*, with the questions of food, housing, social conditions and standards of comfort of labour in this intensely malarious area.

III. Crop Cultivation.—My own experiences in 1909-10 in an enquiry instigated by a former Lieutenant-Governor of the United Provinces (Sir John Hewett) and undertaken by the late Major Robertson and myself in the Government Estate in the United Provinces, Terai, with a view to determining the conditions influencing depopulation led to certain interesting conclusions. We demonstrated that, under conditions when cultivation was easy and food of all kinds plentiful, but when malaria was present in malignant form, depopulation, from diminished fertility and huge infantile mortality, led to the necessity of constant immigration from the plains to replace the losses. Though there were degrees of relative immunity in the different aboriginal tribes the domestic fate of the plains immigrants was deplorable and only a very few of the second generation survived to adult age.

This leads up to a consideration of the influence of irrigation on health. The story is a sad one but points a lesson. Our earliest cannalisation schemes took little cognisance of drainage and, as a result, the subsoil water level rose and land which had been cultivated became water-logged, soured, incrusted with alkali, and eventually passed into jungle. Meantime the conditions for the perpetuation of malaria were established and these in time led, not only to a heavy morbidity of the ryot and his inability to cultivate, but eventually to the other evils usually associated with endemic malaria, *i.e.*, to want of fertility and to depopulation. This can be seen in certain areas of the western Jumna canal, more especially in the Karnal area, and so striking was the chain of events even so far back as 80 years ago that a special Committee‡ was then formed and traversed this canal to investigate the conditions obtaining. This Committee incidentally discovered and described the spleen test for malaria, a discovery which had apparently remained forgotten until within the last 30 years.

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* Enquiry by Major Anderson, Dr. Simonsen and Mr. Howard under the Indian Research Fund Association and still in progress.

† Malaria in the Duars by Christophers and Bentley, 1911, page 51, Chapter VI.

‡ The Dempster Committee. (Baker, Dempster and Yule).

In our developmental projects in the new canal colonies and wherever irrigation is being introduced the necessity for expert public health advice hardly requires to be laboured at this stage, and I believe that our irrigation engineers are fully alive to the need for drainage projects going hand in hand with those for irrigation. The conditions in some parts of lower Egypt and more recently in certain areas of Iraq should serve as a warning if this were needed. The correct use of irrigation water still requires much study. It is not, as so many people think, simply a method of supplying the rainfall shortage. Mr. Howard in a recent address* remarked on the deterioration of cultivation under irrigation, the loss of producing power of the soil, the appearance of " alkali " land and the tendency to malaria, and he adduced instances where the process had gone wrong and canalisation had produced " alkali " soil. It has long been known that dried crops under irrigation are liable to cause intense malaria and the reasons annexed require further study as do also many of our malarial problems in different parts of India which are bound up with irrigation. With the reorganisation of our Central Malarial Bureau we hope to be able soon to give more attention to such problems than we have been able to do since 1914. Mr. Howard fears an extension of the formation of " alkali " land in the Punjab canal colonies which might lead to depopulation. I am in accord with him in his statement that the addition of water to compensate for deficient rainfall does not lie entirely within the province of the engineer. The solution of such problems can only be accomplished by investigators of great experience capable of bringing several sciences simultaneously to bear on them.

One other point I would wish to draw attention to. I have already described the position as regards malaria, our greatest morbidity scourge in India. Intimately associated with this and with agriculture is the production of cinchona bark wherewith to prophylax the healthy, treat the sick and diminish infection risks. Several decades ago Sir David Prain, a distinguished member of my service, who was Director of the Botanical Survey of India and later of Kew Gardens, put the position frankly to the Government of India and advised that the cultivation of cinchona bark be embarked on by the Central Government on a large scale. It is not necessary to go into the history of what happened regarding the cultivation; but the fact remains that to-day, more than 30 years afterwards, the Central Government is not much further on in regard to the cultivation and control of this essential product. Opportunities have been missed which Java has seized, and the Dutch-German ring which now controls the bark and its refined products has forced up the price of quinine to a point at which its distribution to the general population on a scale commensurate with their needs is impossible. Fortunately the League of Nations has convened a committee on the subject; but the cheapening of this product in the open market or its substitution by the cheaper febrifuge on a scale sufficient for the prophylactic and therapeutic needs of India is one deserving of every attention and encouragement by the Agricultural and Forestry Departments.

IV. Research.—Organised research into the causes and prevention of disease, as well as the spread of effective sanitation, are important both to agriculture and to medical science. The application of research has elucidated many of the modes of transmission, and the practical application of such discoveries is being carried out in the various preventive measures that are in progress throughout the country. The future health developments of the Provinces on a scale adequate to the requirements of India must take time and cost money, but the foundations have been laid.

Medical research in India has evolved largely on medical lines, and, at present, arrangements exist for its co-ordination through the Medical Scientific Advisory Board. In the case of enquiries involving other departments such as the deficiency disease inquiry of Lieutenant-Colonel McCarrison and the lathyrism inquiry already referred to, such co-ordination as was possible has been attempted by the Secretary of the Scientific Advisory Board (myself)

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* 12th Indian Science Congress, 1925. Presidential address.

in correspondence with the Agricultural Adviser and others. This is all right so far as it goes; but it is insufficient.

The deeper we probe into this study the more we are compelled to admit the necessity not only for further research work but for its organisation and co-ordination on a scale commensurate with its importance. So far our essays into this region have been largely by individual workers; but team work in which doctors, agriculturists, chemists, botanists and others are co-ordinated will be essential in India in the future if this study is to be carried out as it ought to be. The Japanese with their usual foresight and push have arranged for this study by the establishment of a Nutritional Institute under their Home Department, particulars of which will be found in Appendix IV.

We must visualise a more scientific and representative control than that which now exists. The ultimate control at the moment is essentially a financial one, more often than not exercised without any reference to the merits, demerits or necessities of the particular schemes under consideration. The recent Inchcape retrenchment of the medical research grant and its gradual restoration illustrate my point as it is only now that the Medical Research Department is returning to the financial position which it had in 1920-21. If research problems in all departments of research are to be properly represented to the Legislative Assembly which has the money voting power, one question for consideration is the need for a representative central scientific board with direct representation on the Assembly. The organisation of the Medical Research Council in Great Britain has no counterpart in this country, but there is no reason why something similar on a smaller scale should not be attempted for India. The material exists for the formation of sub-committees on many of the problems that require attack, and, in my opinion, for the constitution also of a thoroughly representative Research Council. It is only thus that we can hope to have that co-ordination of effort which is so essential for economy in research, for guidance in priority of work, and for pressing claims for the necessary financial grants.

V. Educational propaganda.—Propaganda work in connection with health has come very much to the front within the last decade. Health Publicity Bureaux are being established in all countries, and a serious and systematic attempt is being made to bring the great principles of hygiene and the cardinal facts in connection with disease prevention to the intellectual level of the great masses of the population. The development of preventive medicine in Western countries has allowed of this being done in regard to a large number of diseases, more especially the slow infectious diseases like tuberculosis and the social diseases. Though India has not progressed so far on this road as have European countries she is now making a serious attempt to do so through the Education Department, the Provincial Health Publicity Bureaux, Voluntary Agencies, Co-operative Anti-malarial Societies, Child Welfare and Maternity Leagues, Baby Weeks, Red Cross, etc. How far it is possible to utilise the Education Department still more for this purpose is a question requiring further investigation; but those of us who know India believe that is one of the surest methods of awakening the so-called public health conscience. In matters concerning the inter-relationship of health and agriculture, co-ordination for propaganda purposes is equally essential. It is, therefore, with pleasure that we see the recent development of the agricultural film to take its place with the health film. The organiser of any future plans or proposals for this activity should attempt to co-ordinate medical, public health, medical and agricultural research, and the educational departments in this connection.

The cry used to be " Does hygiene pay," but it is now " Why does hygiene pay "? Most will agree with this proposition but there is still much indifference. In a recent address Dr. Andrew Balfour says that colonies sapped by malaria, hookworm, typhoid and dysentery and who refuse to bestir themselves must go to the wall. He adds that we have only to look at Central America, Federated Malay States and Java to see the economical aspects of efficient control of yellow fever and malaria, respectively. Similarly, Porto

Rico work under American direction, mosquito reduction work in Queensland, and anti-tick measures in Jamaica which added 25 per cent to cattle production all demonstrate the truth of the proposition, and at the same time all are helping towards benefiting the public health.

VI. Personnel.—In so far as public health and research are concerned good men are essential to initiate and to control such health reforms; but niggardly salaries will never attract them. Well-paid men with an active progressive but non-extravagant policy are essential if the foundations are to be truly laid where new ground is being broken. Research has no use for mediocrity and any research department filled with mediocrities ceases to remain one. Careful and severe selection of *personnel* on merits irrespective of race or proportion of race is essential. Last but not least heavy expenditure must be budgeted for; but, as has been shown above, it is a sound investment.



APPENDIX I.

Two very recent and highly instructive publications by the Medical Research Council have thrown some light on the value of diet. The first of these is "Diet for Boys during the School Age" (No. 105), the second is "Poverty, Nutrition and Growth being Studies of Child Life in cities and rural districts of Scotland" (No. 101). Briefly the former deals with the results of certain increases to a basic school diet in a school with houses accommodating 30 to 35 boys on the villa system and over a period of four years. By varying the diet for different groups for periods over 1 to 3 years by adding fresh milk or castor sugar or butter or vegetable margarine or edible casein or water-cress definite varying improvements in weight and height increments were able to be recorded.

In the latter case the low weight and height of slum children were investigated and many prevalent ideas were upset. The chief points noted were that after 18 months the growth curves for urban and rural children run fairly parallel, that small parents beget small children, that there is no clear indication of nutrition of the child being directly associated with the income of the family, that there was a failure to establish correlation with overcrowding, that a family diet of 2,500—2,700 calories per day shows as little growth retardation as does that of 3,000 for country children, that correlation between breast and artificial feeding and child weight though manifest below 8 or 9 months is absent after that, and that maternal health is not revealed as a factor of prime importance. To summarise, this pioneer work which is the first extensive attempt to estimate the influence of various environmental conditions on growth and nutrition of slum children, shows that heredity and inherited growth play a large part in determining the child's growth which proceeds like that of its parents despite prejudicial environmental factors. Again material efficiency is more closely associated with child variations than are poverty, underfeeding or overcrowding. It has *not* been shown that a plentiful income is followed by improved condition of the children. The slum problem is therefore more complex than we think. We must, therefore, seek a middle position between these who look on plenty of money as the solution and the eugenist on the other.

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APPENDIX II.

Note by Lieutenant-Colonel S. R. Christophers, C.I.E., O.B.E., F.R.S., I.M.S., Director, Central Research Institute, Kasauli, on the composition of dietary as shown by cropped areas and calculation of diet from food crop areas.

It is of interest to see what the diet of Indian populations appears to be (as regards its cereal basis) when estimated on crop area, yield per acre and population.

The general nature of the diet in different parts of India so far as cereal basis is concerned is clearly shown by the amount of different crops grown. The following statement taken from the Imperial Gazetteer of areas in square miles of rice, wheat, millets, etc., is given in Table A.

In Table B this is given as the calculated amount per person of different food grains per diem. The calculation is made on figures for 1903-04 in the Imperial Gazetteer and must be considered only as very approximate. The results given by the method are, however, interesting and suggest that useful results might be obtained by more accurate estimates made on such a plan The way in which the figures have been arrived at is shown in Table F.

TABLE A.

Area.	AREA UNDER CULTIVATION IN SQUARE MILES.			
	Rice.	Wheat.	Millet.	Gram.
Punjab	1,100	13,600	11,000	3,100
United Provinces	11,000	12,200	9,000	8,600
Central Provinces	7,000	5,300	8,000	1,500
Bombay	4,000	3,400	20,000	5,000
Bengal	54,690	2,300	12,413	...
Madras	13,000	...	25,000	...
Burma	14,542	...	2,500	...

TABLE B.

Estimated consumption of cereals and pulses in various parts of India per adult person per diem in ounces.

Area.	Rice.	Wheat.	Millet.	Gram.	Other.	TOTAL.
Punjab	1·3	11·7	4·2	2·7	5·8	25·7
United Provinces	7·7	8·0	3·5	5·4	8·5	33·1
Central Provinces	17·4	6·1	9·3	1·9	4·6	39·3
Bombay	6·7	3·7	13·4	5·4	1·6	30·8
Bengal	25·9	1·1	...	·3	3·0	30·3
Madras	10·9	...	13·4	...	...	24·3
Burma	35·5	...	4·0	...	...	39·5
India	11·7	3·0	4·6	1·0	2·9	23·2

TABLE C.

——	Punjab.	United Provinces.	Bengal.
Rice	1·3	7·7	25·9
Wheat	11·7	8·0	1·1
Gram	2·7	5·4	·3
Other cereals	10·0	12·0	3·0
TOTAL	25·7	33·1	30·3

Taking the Punjab as the example of a wheat area, Bengal as a rice area and the United Provinces as an intermediate form of dietary we should get in ounces as a rough approximation the above figures.

TABLE D.

Indian Army ration scale is the same for all areas with the option of *atta* or rice (22 ozs. of either). The cereal basis of the ration is:—

	Oz.
Atta or rice	22
Dal	3
Potatoes	2
TOTAL	27

TABLE E.

Examples of Jail diets are the following:—

——	Lower Bengal.	Bihar.
Rice	26	16
Wheat (atta)	...	10
Dals	6	6
TOTAL	32	32

The jail diets are fixed at something approaching the maximum quantity of the cereal basis which is capable of being eaten.

TABLE F.

Calculation of diet from food crop area.

Square miles are reduced to acres and this multiplied by average yield per acre giving total food in pounds. After subtracting where necessary an amount for export the proportion per individual per diem is estimated. This figure is further converted to the adult diet by multiplying by a factor arrived at by consideration of the proportion of children and adults in the community. In the last column this is expressed in ounces. The data refer to 1903-04 and are taken from the Imperial Gazetteer of India.

Crop.	Total yield in lbs.	Amount per person per diem lbs.	Adult diet lbs.	Adult diet ozs.
Whole of India (population 294 million).				
Rice	109,000 640 1,000 69,860,000,000 exported 4,480,000,000 consumed 65,380,000,000	·61	·73	11·7
Wheat	36,800 640 800 18,842,000,000 exported 1,680,000,000 consumed 17,162,000,000	·16	·19	3·0
Millet	59,000 640 700 26,432,000,000 exported 224,000,000 consumed 26,208,000,000	·24	·29	4·6
Gram	15,000 640 550 5,280,000,000 exported 280,000,000 consumed 5,000,000,000	·05	·06	1·0
Other grains	51,000 640 500 16,320,000,000 exported consumed say 16,000,000,000	·15	·18	2·9
	Total cereals and pulses consumed per adult person per diem		23·2 oz.	
Punjab (population 27 million)				
Rice	1,100 640 1,000 704,000,000	·07	·08	1·3
Wheat	13,600 640 800 6,960,000,000 exported say 1,000,000,000 consumed 5,960,000,000	·61	·73	11·7
Millet	5,800 640 600 2,221,000,000	·22	·26	4·2
Gram	3,100 640 700 1,389,000,000	·14	·17	2·7
Other grains	7,800 640 600 2,995,000,000	·30	·36	5·8
	Total cereals and pulses consumed per adult person per diem		25·7 oz.	

Crop.	Total yield in lbs.				Amount per person per diem. lbs.	Adult diet lbs.	Adult diet ozs.
United Provinces (population 48 million).							
Rice . .	11,000	640	1,000	7,040,000,000	·40	·48	7·7
Wheat .	12,200	640	1,000	7,808,000,000			
	exported		say	500,000,000			
	consumed			7,308,000,000	·42	·50	8·0
Millets .	9,000	640	560	3,225,000,000	·18	·22	3·5
Gram . .	8,500	640	900	4,896,000,000	·28	·34	5·4
Other grains	20,000	640	600	7,680,000,000	·44	·53	8·5
	Total cereals and pulses consumed per adult person per diem					33·1 oz.	
Central Provinces (population 12 million).							
Rice . .	7,000	640	1,100	4,928,000,000			
	exported			100,000,000			
	consumed			4,828,000,000	1·10	1·32	21·1
Wheat .	5,300	640	600	2,035,000,000			
	exported			300,000,000			
	consumed			1,735,000,000	·40	·48	7·7
Millets .	8,000	640	500	2,560,000,000	·58	·69	11·0
Gram . .	1,500	640	550	528,000,000	·12	·14	2·2
Other grains	4,000	640	500	1,280,000,000	·29	·35	5·6
	Total cereals and pulses consumed per adult person per diem					47·6 oz.	
Bombay (population 25 million).							
Rice . .	4,000	640	1,250	3,200,000,000	·35	·42	6·7
Wheat .	3,400	640	800	1,740,000,000	·19	·23	3·7
Millets .	20,000	640	500	6,400,000,000	·70	·84	13·4
Gram . .	5,000	640	800	2,560,000,000	·28	·34	5·4
Other grains	2,300	640	500	736,000,000	·08	·10	1·6
	Total cereals and pulses consumed per adult person per diem.					30·8	

Crop.	Total yield in lbs.				Amount per person per diem lbs.	Adult diet lbs.	Adult diet ozs.
Bengal (population 83 million).							
Rice . .	42,970	640	1,200	33,000,000,000			
	11,720	640	800	6,000,000,000			
	6,300	640	1,000	4,000,000,000			
				43,000,000,000			
	exported		say	2,000,000,000			
	consumed			41,000,000,000	1·35	1·62	25·9
Wheat .	2,300	640	700	1,030,000,000	·06	·07	1·1
Gram . .	1,560	640	700	722,000,000	·02	·02	·3
Other grains	11,000	640	600	4,224,000,000	·16	·19	3·0
	Total cereals and pulses consumed per adult person per diem					30·3 oz.	
Madras (population 38 million).							
Rice . .	13,000	640	950	7,904,000,000	·57	·68	10·9
Other grains	25,000	640	600	9,600,000,000	·70	·84	13·4
	Total cereals and pulses consumed per adult person per diem					24·3 oz.	
Burma (population 10·5 million).							
Rice . .	14,500	640	1,230	11,400,000,000			
	exported		say	4,300,000,000			
	consumed			7,100,000,000	1·85	2·22	35·4
Other grains	2,500	640	500	800,000,000	·21	·25	4·0
	Total cereals and pulses consumed per adult person per diem					39·5 oz.	

APPENDIX III.

Copy of a Resolution of the All-India Conference of Medical Research Workers held at Calcutta on 27th to 29th October, 1924 and on 15th to 17th December, 1925.

In 1924 proposed by Lieutenant-Colonel J. W. D. Megaw, C.I.E., I.M.S., Director, School of Tropical Medicine and Hygiene, Calcutta, and seconded by Dr. C. A. Bentley, Director of Public Health, Bengal.

In 1925 proposed by Lieutenant-Colonel J. W. D. Megaw, C.I.E., I.M.S., and seconded by Lieutenant-Colonel C. A. Gill, I.M.S., Officiating Director of Public Health, Punjab.

RESOLUTION:

That this Conference believes that the average number of deaths resulting every year from preventible disease is about five to six millions, that the average number of days lost to labour by each person in India from preventible disease is not less than a fortnight to three weeks in each year, that the percentage loss of efficiency of the average person in India from preventible malnutrition and disease is not less than twenty per cent, and that the percentage of infants born in India, who reach a wage earning age is about 50 per cent whereas it is quite possible to raise this percentage to 80 to 90 per cent.

The Conference believes that these estimates are under-statements rather than exaggerations, but, allowing for the greatest possible margin of error, it is absolutely certain that the wastage of life and efficiency which result from preventible disease costs India several hundreds of crores of rupees each year. Added to this is the great suffering which affects many millions of people every year.

This Conference believes that it is possible to prevent a great proportion of this waste at a cost which is small in comparison with the expenditure.

The recent census shows that the position in India is one of grave emergency. The Conference recognises that the problem is very complicated and involves not merely medical research, but also questions of public health, medical relief, medical education, propaganda, and social and economic considerations.

The Conference strongly urges on Government the immediate necessity for appointing a strong Commission, chiefly non-technical, for the purpose of making a thorough enquiry into the wastage of life and the economic depression in India which result from causes which are capable of being remedied.

The Conference believes that the greatest cause of poverty and financial stringency in India is loss of efficiency resulting from preventible disease and therefore considers that lack of funds far from being a reason for postponing the enquiry is a strong reason for immediate investigation of the question.

APPENDIX IV.

The Japanese Government has shown its wisdom by establishing by a special ordinance in 1920 an Imperial Government Institute for Nutrition. In doing so the Japanese were laying foundations for alterations in the national diet which appeared necessary but proof of the necessity for which was demanded, and they realised the urgent need of the study of national nutritional problems. The necessity for such a study was based on several reasons, the principal of which were:—

(1) Biological reasons,
(2) Reasons of social policy,
(3) Reasons of food supply,
(4) Reasons of physical improvement.

The staff of this Institute is said to consist of 1 Head, 7 experts, 15 assistant experts, 2 secretaries, and 10 volunteer assistants, the whole being under the control of the Ministry of Home Affairs. It is divided into four departments with 14 divisions. The departments deal with the investigation of the science of nutrition and its application together with statistics and propaganda concerning it, while the divisions represent the study of food chemistry, of metabolism, of physiology and pathology, of micrology and physics, and in respect of the application of the Applied Science, they deal with the investigation of food materials, economical nutrition, preservation and distribution, cookery, infantile nutrition, utilisation of waste products. The whole is run under the Home Department on a budget of £15,000 per annum (150,000 yen).

At the present moment enquiries are in progress on such subjects as the energy requirement of the Japanese, caloric requirement during growth, hard labour and fasting, the digestibility of various grains in various states of preparation, the chemistry of different grains, the improvement of malnutrition and many other allied problems.

Lieutenant-Colonel F. P. Mackie, O.B.E., I.M.S., the Director of the Haffkine Institute, Bombay, visited this Institute while in Japan as the delegate of the Government of India at the Far Eastern Association of Tropical Medicine in October 1925 and was more impressed by its organisation and work than by almost anything else he saw.

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APPENDIX V.

Little recent work has been done on dietetics in the physiological laboratories of the Medical Colleges of Lahore, Calcutta, Lucknow, Madras and Bombay. The two former are silent except that Lahore regards the mental lethargy as due to malaria and to be treated by anti-malarial measures.

Lucknow.—Dr. Burridge (Professor of Physiology) says that a recent survey of ryot's diet gave its caloric energy as 2,400 and, allowing for 10 per cent waste, as 2,160 as against 3,500 for a British workman of 67 kilograms weight working 8 to 9 hours per day; but the latter diet would not be suited for work in the Indian sun as is that of the Indian coolie who is very much in the dietetic position that the non-fighting German population were during the War. They became dull, listless, apathetic, felt the cold badly and were relieved by the heat of summer. It is evident then that, whenever it is easily possible for heat production to outstrip heat loss, work can be more safely and economically done at the expense of fats and carbohydrates, and the low nitrogen value of Indian diets has probably been determined through this factor. It may be that the virile race develops in a particular country because its climate makes a high nitrogenous exchange possible. The Indian ryot according to European standards has a low level of nutrition which may cause fatalism but may fit him better for his actual task.

Madras dietary of three meals with 4 oz. cold rice in the morning, 8 to 10 oz. with vegetables and sometimes butter-milk at midday, and 8—10 oz. at night with oil and sometimes fish gives a diet of protein 45 grm. and carbohydrate 550 grm. which, though deficient in protein and fat, carries them on though they show little resistance to disease and recover from it slowly. (Dr. Kamath.)

Bombay dietary (Dr. Thakar) shows no dearth of essential vitamines in all races and classes. Cost of milk is prohibitive. Food adulteration in restaurants and boarding houses is heavy. The ryot is always on a diet poor in nitrogen and fat, but his open active field life saves him. The zamindar is a generous feeder. The lower menial classes on daily wages feed their families well; the worst off being the lower middle class families, especially clerks, with large families. Bulky carbohydrate meals depress the general vitality and make people lethargic.

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APPENDIX VI.

Under the Devolution Rules framed under the Government of India Act the responsibility for sanitation is divided between the Central and the Provincial Governments, as shown below.

Central.

(1) Pilgrimages beyond India.

(2) Port quarantine and marine hospitals.

(3) Central agencies and institutions for research.

(4) Statistics.

Provincial.

(5) Public health and sanitation and vital statistics, subject to legislation by the Indian legislature in respect to infectious and contagious diseases to such extent as may be declared by any act of the Indian legislature.

(6) Pilgrimages within British India.

(7) Registration of births and deaths subject to legislation by the Indian legislature for such classes as the Indian legislature may determine.

(8) Industrial matters included under the following among other heads, *viz.*:—

* * * * * *

* * * * * *

(*f*) Smoke nuisances; and

(*g*) health and housing of labour.

(9) Adulteration of food and other articles, subject to legislation by the Indian legislature as regards import and export trade.

2. The powers of the Government of India in regard to sanitary matters in so far as they have been 'transferred' are subject to the limitations prescribed by rule 49 of the Devolution Rules. Item (1) relates mainly to the Hedjaz pilgrimage and the Government of India administer this subject because it involves relations with a foreign power and relates to their obligations under the International Sanitary Convention. The Governments of Bombay and Bengal, within whose jurisdictions the ports open to the Hedjaz pilgrim traffic are situated, make arrangements for the embarkation and disembarkation of pilgrims as agents of the Government of India.

3. As regards (2) also the Government of India are contemplating a definition of their responsibility so as to limit it only to the discharge of their obligations in respect of overseas traffic or of international requirements.

4. Item (3) relates to medical research. The Medical Research Department in India is directly under the Government of India. They determine the conditions of service of the officers including their pay, pension, promotion, leave, transfer, etc. While the postings and other changes in the Department are made by the Government of India the officers are subject to the disciplinary control of local Governments when employed in provincial laboratories, *e.g.*, the King Institute, Guindy, Haffkine Institute, Bombay, Rangoon and Shillong Pasteur Institutes. This administrative control is the result of the peculiar constitution of the Medical Research Department and its connection with the Indian Medical Service which is a central service. Local Governments are not precluded from carrying on medical research within their own

territorial jurisdiction subject to their financial powers. In fact the salaries of the officers attached to provincial laboratories are paid by the local Governments concerned, and the Central Research Institute, Kasauli, where research of varied character and manufacture of vaccines of sera for military and civil purposes, are carried on, is the only institution directly under the Central Government. Medical research is also conducted on an extensive scale by a semi-official organisation called the Indian Research Fund Association, of which the Hon'ble Member in charge of the Department of Education, Health and Lands, is the President. A copy of the rules and regulations of the Association is attached. The inquiries and investigations instituted under the auspices of the Association are conducted mostly by officers of the Medical Research Department, whose pay and allowances are met from a grant made by the Government of India for the purpose. The Association also receives an annual subsidy of about Rs. 5 lakhs.



APPENDIX VII.

Rules and Regulations of the Indian Research Fund Association.

1. The name of the Association shall be "The Indian Research Fund Association."

2. The objects for which the Association is established are the prosecution and assistance of research, the propagation of knowledge, and experimental measures generally in connection with the causation, mode of spread, and prevention of diseases, primarily those of a communicable nature.

3. Subject to the rules governing the accounts of the Indian Research Fund Association the entire control and management of the affairs, funds, and work of the Association shall be vested in and rest with a Governing Body.

4. The Honourable Member of the Governor-General's Council in the Department of Education, Health and Lands shall be the President and the following persons, *viz.*:—

The Secretary to the Government of India, Department of Education, Health and Lands,

The Director General, Indian Medical Service,

The Public Health Commissioner with the Government of India,

The Director, Central Research Institute, Kasauli,

The Officer in charge of the Malaria Bureau,

and others who may be appointed by the President from among members of the Association who have shown sufficient interest in the objects for which the Association is established, shall be members of the Governing Body.

5. The Governing Body shall appoint its own Secretary.

6. The members of the Association shall be of two classes, *viz.*:—(*a*) permanent members; (*b*) temporary members.

The following shall be permanent members:—

(1) The President and members of the Governing Body.

(2) Every donor of Rs. 5,000 and upwards.

The following shall be temporary members:—

(1) All members of the Working Committees hereafter mentioned, provided that they are not already permanent members of the Association.

(2) Every subscriber of Rs. 100 and upwards annually during the currency of his subscription.

7. Every member of the Association shall be entitled to attend, and take part in the annual general meeting of the Association, and to receive copies of the reports and other publications issued from time to time by the Association.

8. The Governing Body shall appoint a "Scientific Advisory Board" of whom not less than three shall be members of the Governing Body, who shall examine all proposals in connection with the scientific objects of the Association, which may be submitted to the Governing Body, and report as to their feasibility. The members of such Board shall be appointed for one year but shall be eligible for re-election. They shall have power to add to their number.

The Board shall appoint its own Secretary subject to the approval of the Governing Body.

9. The scientific objects of the Association shall be carried out with the aid of "Working Committees." Such committees shall be appointed by, and work under the direction of, the Scientific Advisory Board.

10. No scheme shall be financed by the Association, unless carried out with the sanction of the Governing Body, and approved by it, and no subscription

or donation shall be made from the funds of the Association to any object which is not approved by the Governing Body.

11. Subject to the conditions, laid down in rule 10, the funds of the Association (both capital and interest) shall be under the entire control of the Governing Body for the scientific objects of the Association and shall be applicable to the payment of current expenses and charges incidental to the execution of the duties of the Governing Body, the Scientific Advisory Board and the Working Committees.

12. The accounts of the Association shall be kept by the Deputy Accountant General, Central Revenues, in such form as the Deputy Accountant General, Central Revenues, with the approval of the Governing Body, may prescribe. An audit report together with a statement of the accounts of the Association shall be prepared by the Deputy Accountant General, Central Revenues, as soon as possible after the 1st of April in each year, and shall be submitted to the Governing Body, who shall forward it to the Government of India. An annual report of the proceedings and of all work undertaken during the year shall also be prepared by the Governing Body for the information of the Government of India and of the members of the Association.

13. The Association, through its Governing Body, may accept the management of any endowment or trust fund, or subscription, or donation, provided that they are unaccompanied by any condition inconsistent or in conflict with the nature, object, and provisions of the scheme. All property purchased with the funds of or acquired by or on behalf of the Association shall be held in the name of the President of the Governing Body.

14. A general meeting of the Association shall be held once in every year, as soon as possible after the preparation of the annual accounts and report, at such place and time as the Governing Body may appoint. Meetings of the Governing Body, the Scientific Advisory Board, and the Working Committee shall be held as often as may be necessary.

15. The Governing Body may frame such rules as may be necessary for the discharge of business generally, including the conduct of correspondence and the holding of meetings.

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1199. *The Chairman:* Lieutenant-Colonel Graham, you are Public Health Commissioner with the Government of India?—I am.

1200. You have been good enough to lay before the Commission a very comprehensive statement of your views on matters of public health, for which we are greatly obliged. It has to be read, of course, in conjunction with the note on sanitation which was provided for the Commission at an earlier stage. You emphasise, in your note of evidence, the inter-relationship between health and agriculture?—I do.

1201. I do not know whether in that matter, or in any other, you would care to expand your printed words by any statement at this stage?—Not immediately. There is one point which I might mention, which has arisen since I wrote the memorandum. Colonel McCarrison, working at Coonoor, on diet deficiency disease yesterday sent me an intimation of a piece of work he had done of which I was not aware when I wrote my remarks. He has actually produced experimentally stone in the bladder by dieting rats in a particular way. That is a very interesting discovery, because he is dieting these rats on diets closely approximating to the diets we know exist in the 'stone' areas. As you are of course aware, there are certain areas in India where stone is very prevalent, and that illustrates what I was trying to bring out in my note—the close relationship of diet and disease. He has done this not once but fifteen times in all, and, if this is the commencement of an inquiry which leads us to the ultimate causes of stone in areas where we have known nothing about its causation, it will be very important indeed.

1202. Provided the inference from these experiments is correct, the effect will be to show that 'stone' is a deficiency disease?—Not necessarily a deficiency disease but a disease produced by peculiarities of diet.

1203. I want to ask you, with reference to Colonel McCarrison's work, whether he has carried his researches into the growing period and the pre-natal history of the individual. It struck me that the importance of these results might be even more significant in the case of growing children, and perhaps of pre-natal life?—I think I have emphasised the fact that in India that particular phase of the inquiry is very largely in its infancy, and I do not think Colonel McCarrison has touched that side of it particularly. I have pointed out in an appendix* how the latest researches of the Medical Research Council at Home (an abstract of two papers of which I gave as an appendix) pointed towards the enormous amount of work to be done on that particular side.

1204. Do you think that the opportunities of observing men of the same race under better conditions of nourishment afforded by the Indian Army has been taken full advantage of for the purpose of comparison and control?—I do not think the scientific side of it has been looked at at all in the Army. The practical side has been. Naturally they recruit their men from the races whom they consider the best physically and from the point of view of military service.

1205. Carefully collected observations over long periods in the Army might afford a very valuable control for these experiments, might it not?—It would. I have a document here which I received since I wrote my note. It is a life assurance experience published in the papers a few days ago; it is the experience of Indian assured lives compiled by the Oriental Government Security Life Assurance Company of Bombay. As far as I know, it is the first thing of its kind that has appeared in India during my time. The statement has been largely reprinted in most of the papers. It deals with 51,000 Indian lives, Hindus, Mahommedans, Parsis and Indian Christians and covers the Presidencies of Bombay, Bengal, Madras, the Punjab, Delhi, Sind, the United Provinces and the Central Provinces. The experience is in regard to average heights and weights of this particular insurance company, and it all goes to bear out the conclusions to which we have come in regard to the

* Appendix I, page 149.

superior physique of the peoples of northern India as distinct from those of the south and east.

1206. Do you think that superiority is due to racial characteristics or to conditions of diet and life, or both?—I think I said in my memorandum that the question is very much *sub judice* at the moment. Colonel McCay went very strongly for the absence of the protein elements in the diet as being the causation; but I showed how that had been questioned by Dr. Hindhede, a leading Danish dietetic expert, and that is one of the reasons why I say we require more inquiry in India on this particular subject.

1207. Are there available any vital statistics of Indians abroad?—I think perhaps in the colonies, in Fiji, Trinidad and some of the other colonies where Indian coolies go to, we may be able to get figures. I know there are figures but I do not know fully about them.

1208. They might be very interesting?—Yes, they might be.

1209. Do you think we can compare the vital statistics of India with those for instance of Great Britain or do you think some allowance should be made for early maturity?—Well, the first fallacy is the registration fallacy. Our registration system here is, of course, nothing like so accurate as the Home system. They are dealing with a very much smaller population at Home and they have been dealing with accurate statistics for a very much longer time than we have in India. But certain statistical phases can be compared. For instance, mortalities are fairly comparable. Causes of death are not comparable; the reason is obvious. Mortalities represent facts; causes of death are merely matters of opinion.

1210. But to go back to my question, do you think that these comparisons require any adjustments in the light of the earlier maturing of the races in India as compared with Europeans, if such is the case?—Undoubtedly.

1211. You give some very remarkable figures on page 142 of your note, in which you point out that the tea garden experts in India reckon on a 10 or 25 or even 50 per cent increase in labour efficiency under hookworm control. Now, is that control expensive?—As compared with the ultimate results of course it is not expensive. I do not think any health control, anti-malarial or anti-hookworm, is expensive, if you view it from the point of view of adding to the labour efficiency, once the control has been in operation for some time. We have a very clear instance in the rubber plantations of the Federated States, where the amount spent in certain plantations on medical relief in the period before the anti-malarial operations had been in operation for some time was very much greater than is now necessary. I think that is the general experience.

1212. How is the hookworm eliminated from the body?—By various drugs (chenopodium is the particular drug) and by systematic treatment combined with microscopic examination to control the results.

1213. And that is required in each individual case?—Yes. As a matter of fact, it is done *en masse* when you are dealing with a large labour population.

1214. So that it is an expensive treatment?—It requires money, of course.

1215. You emphasise the importance of a pure water-supply. Have you any constructive proposals in that direction?—I think Provincial Governments have got the whole question of water-supply throughout the Provinces under consideration; they have indicated very clearly the lines on which progress should go both in regard to water-supply of villages and water-supply of towns. The protection of wells, of course, in villages bulks more largely than anything else as the great objective which zamindars and others should aim at.

1216. If you could give the Indian cultivator pure water it would go a very long way towards improving his health and efficiency, would it not?—Certainly.

1217. Do you think that at the present moment the machinery exists in the Presidencies and Provinces to bring about the changes which you desire?—Well, the basic machinery is there but funds are necessary and education of opinion is necessary.

1218. Have all Provinces Public Health Departments?—They have.

1219. Now what occurs to me as an important point is on page 146. You are talking about the need for the interpretation of results obtained by specialists in various lines of research; the need for correlation and wide appreciation by a man skilled on the technical side but able also to gather the strands together and come to a general conclusion. I wanted to ask you whether there were many men of that sort about, men, as you say, of great experience and capable of bringing several sciences simultaneously to bear on the work of co-ordination. Is it very hard to find men for that work?—I do not think they exist in large numbers, but there has not been any very serious attempt to discover them.

1220. Or possibly to develop them. Do you think that some attempt might be made to develop them?—I cannot see why they should not exist.

1221. How would you go about it?—Try!

1222. Is the world price of quinine important in relation to public health in India?—Very definitely, I think.

1223. Does it place a definite limit to the amount of anti-malarial treatment that can be given?—Yes, that is so. There is no question of that. We have Provinces complaining about the cost of quinine and their inability to buy sufficient for their needs.

1224. Is India capable of growing her own quinine, of producing her own quinine?—So far as our experts have been able to inform us, India is supposed to be capable of it. We have known this for many decades now.

1225. How many years does a Cinchona tree require to come to the point of maturity where quinine can be produced?—I think it is between 8 and 10 years.

1226. You think that even now more might be done, to provide quinine grown in India?—We have had a Cinchona Committee within quite recent times, last November in fact, and the position was considered and certain recommendations were then made with regard to the increase of plantations.

1227. Is their report a published document?—There are reports by both Bengal and Madras Cinchona Factories and Plantations.

1228. I mean, by this Committee to which you have just referred?—The Proceedings of the Committee are in the Proceedings of the Education, Health and Lands Department.

1229. Do you feel that the Departments of Health in India are in sufficiently close and sympathetic touch with the Departments of Agriculture?—I can only speak for the Government of India. I personally am in fairly close touch with the Agricultural Adviser whenever it is necessary. As far as being in touch with the Provinces is concerned, I cannot state the position between the Directors of Health and the Directors of Agriculture in the Provinces.

1230. But I judge from your memorandum that you are of opinion that, if an advance is to be made, it must be made all along the line, health, education, etc.?—Yes, very definitely, so.

1231. You think that more definite steps might be taken to co-ordinate a substantial forward movement?—Yes. The difficulty at present is that we are inclined to work in water-tight compartments. I do not necessarily know anything of the policy of the Agricultural Department in regard to a great many points that I might be interested in unless I take special pains to find out, and one usually does that when one is up against a particular concrete problem on which one wants help or information. For instance, there is the inquiry in regard to lathyrism which we have going on just now. Well, we

happen to have been able to co-ordinate work in that respect by having a botanist and a chemist as well as a doctor on the inquiry. This necessitated a certain amount of correspondence with the medical people and the agricultural people and in that way we have co-ordinated. But after all, it is a very small thing. It does not affect the main lines of policy at all.

1232. Can you say from your own experience or knowledge whether in the Provinces there is this most desirable co-ordination of effort between the health services, the agricultural services and the educational services?—Since decentralisation, we are not in a position to know, as we know before.

1233. If it became apparent to you as Adviser to the Government of India in these matters that a particular Province was lagging behind the rest of India in matters that come within your purview, what steps would you take?—I should have demi-official communications with the Director of Public Health in the first instance.

1234. In the particular Province?—In the particular Province. In the second instance, I should point the fact out to the Department of Education, Health and Lands of the Government of India and suggest that the Local Government be informed. But I have no assurance that any steps would necessarily be taken.

1235. So that you think that the position of the Government of India *visàvis* the Province in a matter of that sort when a Province is lagging behind would be this, that the Government of India would say "You are not doing as well as the rest of India is doing; you are not doing as well as it appears to us that you might be doing. Please do a little better"?—Yes.

1236. And of course the Government of India would leave it entirely to the Province to decide how to do better. Or in recommending an improvement, would you send down detailed suggestions as to carrying out that improvement?—At present not, unless they were asked for. I might make suggestions to the Director of Public Health; that is quite another matter: but I do not think I should put up suggestions to the Local Government direct until such time as I was asked for my opinion.

1237. That is what I thought. I see you emphasise the importance of the cinema as a means of public instruction. Do you think there is a large future before that particular method of propaganda in India?—I feel sure of it. It is a method of instruction which appeals to the uneducated very definitely and as it is a moving picture I think they understand it.

1238. The preparation of films is expensive and difficult, is it not?—It is becoming less difficult and less expensive.

1239. Do you think the preparation of films might be undertaken by the Government of India with a view to films being supplied to the Provinces for exhibition?—I should think it was a very laudable direction in which to educate the public, not only in matters of health but in matters connected with other departments as well.

1240. But if the best results are to be obtained from using this opportunity, there will have to be a definite organisation behind the movement will there not?—Yes.

1241. And there would have to be the best of skilled direction in the preparation of these films and a close touch between the organisation preparing them and the particular service towards whose affairs any particular film is being directed?—That would be necessary. At present, the Health Publicity Bureaux of the different Provinces are all trying to work out their own salvation as regards cinema film work, but, though there is quite a number of films, I do not think the total number of films in all the Provincial Publicity Bureaux in India would be important at the present moment.

1242. I want to get this matter in perspective. Do you think that the cinema as a means of public education in India offers quite exceptional opportunities for the future? Do you think it immensely promising?—In so far as public health is concerned, I think it is. But it must be combined, of course,

with other methods of instruction. It would be combined with exhibitions of various kinds in connection with what I hold to be more important than anything else, namely, the tuition of the young in matters of hygiene.

1243. Would you recommend an intensive experiment in public health education by means of cinema films in a group of villages?—I think it would be an excellent method of propaganda which we have not been able to test at the present moment to the full because of the expense entailed.

1244. And that intensive experiment would give you the opportunity of closely examining the effect of each particular film and indeed of each section of a film?—The difficulty is that we cannot expect results from this until a very considerable period has elapsed and if it is proposed to judge of the value of this by immediate results then I should say we could not look for them.

1245. I was rather thinking of testing the effect on the minds of the audience by having in the audience here and there those who would report the remarks that were made as the film is shown and who would move about in the villages after the films have been shown and do their best to come to a view as to whether the films had made a deep impression on the minds of those who had seen them. But the fact that you would have to wait a few years for the results is another reason for beginning your efforts as soon as possible, is it not?—Yes.

1246. *Dr. Hyder:* You say that disease is one of the important factors in the causation of poverty?—Yes, I think so.

1247. And do you think the Government of India or the Provincial Governments have not been able to pursue an active and forward policy in matters of public health because of the prejudices of the people, their conservatism and ignorance and things of that kind?—I do not think there is any doubt about it. The same applied to Great Britain in the early days of the public health movement. It applies to any country, but perhaps more so to India because, as I said, of the intimate way in which religious practices are bound up with the life of the people.

1248. Coming to this question of expectation of life, I suppose you are of opinion that the people of this country do not realise the great national loss which they incur when their talented persons pass away at a very early age? If you look at the life of any eminent Indian, you rarely find that he has lived to a good old age. The people of this country do not realise their great national loss as regards leadership and direction of affairs?—I should say that educated people ought to be beginning to realise it, because it has been pointed out very frequently; but the illiterate people will never realise it.

1249. With regard to the illiterate people, there is the economic loss; there is less wealth produced. With regard to those people who have the direction of national affairs, all these eminent Indians pass away at a very early age and leave the direction of affairs in immature hands. Is that your view? Or rather would you accept that view?—I would not accept that view because I have no data on which to base an acceptance.

1250. Since the period of expectation of life is shorter here as compared to that in England?—Yes, but it does not necessarily follow that your supermen amongst Indians are going to die off altogether. You must have a certain number of them living. You say the conduct of affairs is going to pass into hands of inexperienced men.

1251. I am only speaking of the average?—I would not even say that of the average, because I have no data on which to know how far this process of early demise is affecting the intelligentsia of India.

1252. You have served in the United Provinces and you are aware that hookworm prevails in the United Provinces?—It does.

1253. And it prevails largely in the eastern districts and does not prevail in the drier districts?—We do not quite know. We are making a geographi-

cal survey at the present moment and you are probably quite correct in saying that it is more prevalent in the eastern part of the United Provinces than in the western, but we could not say that it is absent from the western and at the present moment we are trying to find out more about it. You are probably correct. We are having a geographical survey all over the north of India to find out exactly how far it prevails.

1254. The report issued by the Government of the United Provinces and submitted to this Commission, says that it is practically impossible to eradicate hookworm so long as the people of this country do not put on shoes?—Well, one of the methods of entry of the infection is by the feet.

1255. And this application of night-soil to the fields has got some bearing on infection?—There is no question about it that the habits of the people are the chief cause of the infection by hookworm. Hookworm is a disease which is very largely absent from the European population.

Dr. Hyder: Because they put on shoes?

Sir Henry Lawrence: Did you say the application of night-soil?

Dr. Hyder: To the fields?—Yes.

1256. *The Chairman:* Do you mean the deliberate application of agricultural manure or the habit of relieving nature in the fields?—I meant the habit of relieving nature in the fields.

1257. *Dr. Hyder:* In answering a question put by the Chairman, you mentioned some drug. Do you think thymol a very expensive drug?—Yes, it is fairly expensive.

1258. And it is an effective drug too. So that if we could get large quantities in particular Provinces an active campaign could be carried on?—I think everything would point to chenopodium as being the drug because it can be got locally. It is a drug which is indigenous to the country and is much more likely to be useful than a synthetic drug would be.

1259. Coming to page 142 of your 'Replies to the Questionnaire' I do not quite follow these links of reasoning in your argument. You say: "Excessive death rate, decrease in population, and excessive morbidity all contribute to interference with agricultural development." Is there not also in this country an excessive birth rate? They are more or less correlated, are not they?—Do not call it an excessive death rate; call it a high birth rate.

1260. I want to ask you a question about the prevalence of high mortality in the Punjab and in Bombay, and its being less in Burma, Madras and Bengal, as regards plague. Could you assign any reason?—Various theories have been put forward. I do not think we are on sound ground yet with regard to the reason. The Plague Commission put forward some very definite reasons, but after all they are only theories.

1261. With regard to this question of diet; I wonder if you would accept this aphorism, that one is what one eats?—The question of dietetics determines a great many of the characteristics in the individual; there is no doubt about it.

1262. You say there should be a representative of the Research Council in the Assembly; your idea is that you must have a member to obtain money for you?—Those are my own personal opinions and I have given reasons for them, my chief reason being that schemes of research, it does not matter whether they are medical or connected with any other department, come up for adjudication by some one who does not know the scientific importance of them, and this suggestion I have put up is one method of allowing for the scientific importance of these schemes being brought before the Assembly.

1263. Would you like to have a representative in the Assembly so that you could enlist the sympathy of the Assembly and get more money?—Money we are always needing; nothing can be done in research without money and naturally one feels that one has to stress the pecuniary point in giving evidence before a Commission like this because there has been difficulty in the past. There is difficulty even now.

1264. With regard to this question of population generally, you have not given any attention to the cattle population? They are numerous and inefficient and similarly the human population is numerous and inefficient. So the cattle and the people in this country are on a par; it is a tragic fact. Was there ever a public health exhibition held in any town in India?—I think so, in many towns.

1265. You think the Government should encourage the plantation of cinchona trees? I believe there is a plantation of cinchona in the Nilgiris?—The Madras Government have one there.

1266. It is not a monopoly of the Central Government?—It is not of the Central Government; it is of the Provincial Government. My point is that the policy which was recommended over 40 years ago by Sir David Prain* was one of centralisation of the whole cinchona manufactory, and had that taken place at the time it was recommended, India would have been in a very different position to-day. I do not think there is any doubt whatsoever about that. The growth of cinchona bark has been relegated to two Provinces, and the Government of India, at the eleventh hour, are attempting to start plantations in Mergui in the south of Burma.

1267. In our view these indigenous systems and practice of medicine constitute one of the obstacles as regards public health?—That is a very large question and I have not got very precise views on the subject. There is no doubt that the indigenous system has in one aspect of it certain things that we may very well take advantage of. There are certain indigenous drugs which probably are very useful, and there is no particular reason why these should not be used in treatment in India; and for that reason we have arranged, both in Bombay and in Calcutta, for our pharmacological departments to test systematically the whole series of indigenous drugs as represented by the *Ayurvedic* and *Unani* systems. That is a matter of time and we are steadily casting out those which are of no use and publishing statements about those which are found to be of use. That is where the *Ayurvedic* and *Unani* systems are useful; but to claim for the *Ayurvedic* and *Unani* systems that they are going to supplant the superior scientific attainments which have come as a result of the introduction of modern medicine and surgery is to my mind quite absurd.

1268. So that this departure which has taken place in the United Provinces and also in Madras is a departure about which one cannot have definite views?—There is only one point about the departure in the United Provinces; that is, it is being put on an organised basis with registration and control of the practitioners of these particular Indian systems of medicine, and in so far as it does that it is going to be of use, because in time to come the grading up of that system of medicine will allow of large numbers of the population being treated, perhaps not as scientifically as they would be with modern medicine, but at the same time treated by local drugs which are of approved value. This is going to take time; but in so far as that side of it is concerned, the movement may be valuable.

1269. Where are these areas in India to which you were referring when you spoke about the prevalence of stone?—In the United Provinces, Moradabad, Saharanpur; yet if you go to the east end of the United Provinces you find nothing of the kind.

1270. Is that due to water?—We do not know; up to date we have not got to the proximate causes of the condition.

1271. *Sir Thomas Middleton:* Do you agree with me that one of the chief obstacles which confronts us in endeavouring to improve agriculture is the malnutrition of the men and the cattle employed on the land?—I have no doubt that malnutrition enters very largely as one of the difficulties in improving agriculture because your inefficient, disease-ridden population is

*Formerly Lieutenant-Colonel, I.M.S., Director of the Botanical Survey of India, and, on retirement, Director of Kew.

not going to apply itself to the land in the way that an efficient population would.

1272. Leaving cattle aside, and taking for the moment the human factor, to what extent are dietary studies now being conducted in India?—Ordinarily they might be conducted in the physiological laboratories and the medical schools. We know that very little work has been done on them within the last decade. It was in connection with the Physiological department at Calcutta that Colonel McCay wrote his monograph to which I have referred in my memorandum. That was fifteen years ago.

1273. So that recently there have been no, or not many, dietary studies like those referred to in your memorandum which were conducted by Professor Noel Paton in Glasgow?—The only parallel to that is the inquiry by Colonel McCarrison. Colonel McCarrison was conducting dietetic inquiries but his inquiries were closed down by the Inchcape Committee and he went home on leave. He has only come back to us on the distinct understanding that he would be allowed to resume his inquiries. He began one year ago, on the restoration of the Research grant, and he is now conducting his inquiries under the Research Fund organisation.

1274. Where is he located?—In the Pasteur Institute, Coonoor.

1275. Then you agree there is a great absence of facts in judging of the nutritional position of the Indian cultivator. We are at present without the facts?—We want more facts.

1276. Are these dietary studies costly? I put it in a general way; assuming you have a directing head, who draws up a scheme, is it a difficult thing to conduct dietary studies?—Yes, it is; it requires very expert control.

1277. But it is not a difficult matter to collect statistics of dietaries?—No, the collection is not difficult, but even there I think when you meet Colonel McCarrison you will realise how much depends on the skill of the trained assistants he has. You asked about costs. At present Colonel McCarrison's grant from the Research Fund is Rs. 66,000 odd per annum for what he is doing.

1278. I am fairly familiar with the way in which these dietary studies are conducted in Britain and other countries, and it seems to me that at a comparatively small cost there are wonderful opportunities of making dietary studies in India. In Simla here the first group I should like to see a dietary study made of would be the rickshaw coolies. Has any attempt been made to discover their requirements? Supposing we take the average calorie requirement of the population at 2,500, what are these rickshaw coolies likely to need?—Probably 3,500 or more. The Japanese rickshaw coolies want about 4,000.

1279. The point I wanted to bring out was, it is not enough to know the average requirement for the population; what one has got to get is the needs of different groups of workers in a community, and it is this kind of information which is so lacking in India?—Colonels McCarrison and McCay did a good deal of work on that and one of them actually investigated the requirements of the Bhutia coolies, who are very much like the rickshaw coolies, and various other hill races who were carrying loads in the Darjeeling area, but a great deal more is necessary and I quite agree that we probably could do it a very small cost comparatively.

1280. *Sir Ganga Ram:* Has the Central Government issued any leaflet to define what is rural sanitation? The reason why I ask that question is that it is in the mouth of every legislator nowadays to propose something for rural sanitation without knowing what it means or how the money is to be spent?—The Government of India have not issued anything since the general memorandum* on sanitation and public health.

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*Resolution by the Government of India, Department of Education, Nos. 888-908, dated 23rd May, 1914 "Indian Sanitary Policy 1914."

1281. I mean on rural sanitation?—That included rural sanitation, though it was not rural sanitation *per se*, but a general memorandum on the subject. That was about 1914.

1282. Do you not think rural sanitation has peculiarities of its own, apart from those which affect the urban population?—The Government of India is no longer issuing general statements like that in view of the transfer. These are coming from the Directors of Public Health of each Province.

1283. Can cinchona be produced in all Provinces?—I think there is a very definite limit to the area in which cinchona can be cultivated. That has been pointed out in the botanical survey, and we know the areas where it can be cultivated.

1284. Can it be produced in the Punjab?—I do not think so; it might grow but it would not be a commercial proposition.

1285. We know very well that for malaria the specific is quinine, but have you not found out any other indigenous herb for it?—We know that in indigenous systems various local drugs are used: *Neem*, for instance, has been used, but none of these have the same physiological effect on the individual as quinine.

1286. May I ask if sufficient research has been made into these herbs in the Himalayan forests?—We are not making researches broadcast, but we are taking up the actual herbs for which claims have been made by the Indian systems.

1287. Think of the enormous numbers of herbs which have medicinal value in these Himalayas?—It is for that reason that we have created the two pharmacological sections at the Haffkine Institute in Bombay and the Tropical Institute at Calcutta.

1288. Do you not think that rice, when eaten with fish, will contain all the requirements of nutrition, but when it is eaten only with pulses, it has not got sufficient nutrition to keep the body in good health?—What I have shown in the memorandum points out that a full rice diet with a little pulse added to it is an inferior diet. If you add fish to it, it stands to reason that you are improving your dietary and making a better balanced diet.

1289. On page 141 you say that the Government of India have aimed at providing the basic structure on which the organisation can rest and develop. May I ask you for a little explanation of that? What organisation do you want?—Take the organisation of the Punjab Health Department for example, with its Director of Public Health, its four Assistant Directors of Public Health and its system of District Health Officers.

1290. Does not that exist in other Provinces?—It is coming into existence in other Provinces, but I think the Punjab is the best organised in that way, with the exception of the United Provinces.

1291. Do you not think stagnation of water in the borrow pits of the railways on the banks of the canals is conducive to malaria?—It all depends on the vicinity of human habitations. I would not condemn the borrow pits of railways universally.

1292. Do you not think the wheat-eating population can resist many diseases much more than the rice-eating population?—I have shown so in the memorandum.

1293. I mean generally for all diseases?—The physique of the wheat-eating races, generally speaking, from the resistance point of view, is better.

1294. We know that in Bengal there is a large consumption of oils, not only in food but for rubbing the body. If the oil cultivation is stimulated do you not think it would to a certain extent fill the deficiency of protein?—No, it will not; oil is not a substitute for protein.

1295. Would you advocate that hygiene should be one of the subjects taught in all schools?—Undoubtedly.

1296. Are there any easy text books which can be introduced?—Primers have been written, but I do not know how far they are in use at the present moment in the different Provinces.

1297. About the introduction of the cinema for educating the populace; do you not think the Government should co-operate more largely with the Red Cross movement? They have taken up that method of educating the people?—I think at the present moment the Red Cross is very intimately in touch with the provincial health organisations. In fact the Red Cross has been the medium of the publication of a large number of pamphlets for them.

1298. Do you not think the Government should more liberally co-operate with them in this matter instead of having a separate department of its own for that purpose?—Well, I should not be prepared to go so far by any means as to say they should abolish all the publicity bureaux, because I think they are performing very useful functions.

1299. *Sir Henry Lawrence:* Can you tell us, has there been any change in the diet of the people on a large scale in the last 30 years or so?—I could not say. It is extremely unlikely, I should say. Knowing the peculiar way in which the dietary of particular areas has had a definite relationship to the productivity of those areas and the particular nature of the crops produced, I should say it is extremely unlikely that any change has taken place.

1300. Can you explain in what way the productivity of the different areas has varied with some change in diet?—In an area like the Bengal, for instance, where their production is very largely rice, rice has entered into the diet of the population in a way that it has never done up-country where wheat has been produced in very much larger quantities.

1301. And is the efficiency of the population greater in Bengal than elsewhere?—Generally speaking, we should argue I think that the efficiency of the up-country population was greater than the efficiency of the Bengal population.

1302. You connect that with the consumption of wheat?—It has been connected. I am not prepared to dogmatise on it because, as I have said, there are different points of view in regard to this. I think more work is necessary.

1303. Have you any indication that there has been increased consumption of wheat in the country?—I have no definite figures with me.

1304. Or have you any information whether any particular classes of the population have changed their diet from millet to wheat?—No.

1305. That has been alleged in the West and the Punjab and Sind?—I know it has been, but I have no figures to show whether it is so or not.

1306. If it did take place it would be to the good?—Yes, at least as far as our present ideas go on the subject.

1307. You spoke of hookworm. Has there been any investigation of the geographical distribution of hookworm among the jail population?—Yes, there has been for many years now, more especially in Burma, the Central Provinces and Madras where the jail population has been very carefully examined for hookworm and we have very definite figures in regard to hookworm infection.

1308. Can you tell me anything about hookworm in the Bombay Presidency?—Hookworm has not been investigated so carefully in Bombay as, for instance, in Madras. There are reasons for that. Initially in Madras the disease declared itself very definitely and the Rockefeller Board of New York came in to assist the investigation and it was owing to the help and the impetus given by the Rockefeller Institution that the inquiry which went on for several years in Madras took place at all, and in the systematic way in which it was organised. Madras really represents the most carefully organised investigation that we have had into hookworm in any of the Provinces.

1309. Is that because hookworm is more prevalent in Madras than elsewhere?—It was supposed to be initially, and the facts seem to bear out that it probably is.

1310. Is there very little hookworm in the Bombay Presidency?—We consider there is less than in Madras, but there again we are up against want of information, and when we have this geographical survey that we are doing now completed, we shall be better able to tell.

1311. Can that survey be effectively made by taking the jail population as a faithful microcosm of the whole population?—No; in making a survey we should deal with the general population in the villages.

1312. And you can get no correct indication in a short space of time from a concentrated investigation in the jails?—You can get facts which you can apply; but you may go very far wrong in applying these facts because there may be sections of the population where there may be very little hookworm for all we know. Of course you have a mixed sample in a jail; that is your point, I take it, that you ought to be able to argue from the mixed sample to the general population. There are fallacies in it I think.

1313. Could you tell us anything about the comparative expenditure of public funds on hospitals and on public health?—Off-hand I have not got figures, but there is no difficulty about getting them.

1314. Is expenditure greater on the cure of disease in public hospitals than on the prevention of disease through the public health organisations?—I should think so.

1315. To which do you attach the greater importance?—I am a hygienist and I naturally think that the future of all State work in this country is going to swing round to the prevention of disease.

1316. Do you find that your Legislative Councils and the Legislative Assembly appreciate the importance of public health and the expenditure on public health?—From what I have seen and read I believe that Provincial Governments are very sympathetic to public health if the presentation of the case is made properly.

1317. I am speaking of the attitude of the members of the Legislative Councils and Assembly?—I should say that generally speaking the Assembly is sympathetic towards public health. An educational process has been going on now for some time which I think is showing very definite signs of a better appreciation of public health problems now than, say, ten years ago.

1318. You have not noticed any tendency to attack public health or any proposals or to abolish the Public Health Department and its officers?—There have been proposals.

1319. That does not show much sympathy?—But that has come from particular quarters and taking a general perspective of the whole situation one comes to the conclusion that the opinions of those people do not represent the generality of opinion.

1320. You think there is no particular danger?—Well, it is a danger that has to be faced. If there was a general proposal to abolish the Public Health Department it would have to be fought out on its merits and that is a danger, of course, we cannot get away from.

1321. Is there any particular policy that you could recommend to enable the Public Health Department to secure a greater measure of confidence from representatives of the people? Do you think they do not at present have that confidence?—I think there has been a tendency to exploit the development of the Indian systems of medicine as being more or less antagonistic to modern public health policy. One has seen signs of it from time to time but it is very difficult to estimate what that means.

1322. Is there any teaching in the Indian systems, the *Ayurvedic* or *Unani*, in favour of public health? Are they not more concentrated on the cure of the individual?—They are more concentrated on the cure,

1323. There is no system of public health advocated in the *Unani* or *Ayurvedic* systems?—I am not versed, except in a general way, in the principles and precepts of the two systems, but so far as I know they are mainly concerned with the cure of disease.

1324. Then you spoke of the position of the Central Government *visàvis* the Local Governments now owing to decentralisation. Does the Government of India not address the Local Governments at all on matters of public health any longer?—They may address them, but I think they are not laying down any very definite policy. I have very little doubt in my own mind that it is only a matter of time till the pendulum swings back a little way and the Central Government perhaps desire to retain a little more control over certain aspects of public health than they have at present. I do not for a moment suggest that there should be a return or a non-transfer of public health. I think it is all to the good that public health should be a provincial subject. But at the same time there are certain large questions of policy in connection with public health when you are dealing with a number of States and Provinces, that is, public health from the federal point of view, which can only be dealt with by the Central Government having a very definite measure of control over certain things. In other words, the Central Government must not be afraid to lay down what they consider a fair line of policy for the whole country, which may, however, be developed by individual Provinces in any way they wish.

1325. What is the connection of your Department with the Haffkine Institute in Bombay?—The Research Department of the Government of India provides the Director and one or two Assistant Directors and also provides a certain amount of money for various researches that are going on in the Institute, and generally controls the policy of the researches.

1326. Then it is under your control?—Financially it is not under our control but under the control of the Government of Bombay. The Bacteriological Department of the Government of India provides a certain proportion of the senior officers to fill superior appointments.

1327. As regards the investigations that are being made into local indigenous drugs, that is a matter in which you can advise?—We do advise. Our general advisory control over all the institutes is fairly well-defined. As regards money we are able to give a certain amount through the Indian Research Fund Association for research and this increases our powers of control very definitely.

1328. Then you spoke of the difficulties in regard to quinine. Can you give us any idea of what the annual cost of quinine imported into India is?—I cannot give you figures off-hand. I could let you have them.

1329. Is it possible for India to produce a sufficient supply of cinchona from her plantations to meet her own requirements?—We have been told by our experts that it is possible to do it.

1330. These plantations have been in existence for 50 years or more; what is the reason why they have not been extended?—They have not been extended under central control.

1331. They have been left to the Madras and Burma Governments?—No, the Madras and Bengal Governments.

1332. In what other parts of India can it grow?—In Southern Burma. It is growing in the Mergui Archipelago and in Tavoy and Tenasserim.

1333. It requires a heavy rainfall and a high altitude?—A certain altitude and heavy rainfall with the humid tropical atmosphere you get at that latitude.

1334. At what altitude does it grow?—It grows in the Anamalais. This depends on the bark. Some barks grow better at 3,000 feet than others. There are a great many factors. The exact conditions surrounding the growth have been very carefully worked out by the Botanical Department. And they are contained in this report of the Government of India?—They are contained in several reports.

1335. I think you mentioned some Committee which sat last year?—There was a Committee which sat in regard to the economic aspect of quinine production and it incidentally touched on the reports of various committees which have sat from time to time. The reports of those committees will contain all the information you require. Many committees have sat on the cinchona question.

1336. But nothing effective has been done?—I should not say that; but from the point of view of the numbers requiring treatment in India, and having regard to the fact that quinine is our sheet anchor in treatment, the position at the present moment is not satisfactory.

1337. Do you regard quinine solely as a cure or as a preventive as well?—Both.

1338. Can you give us a memorandum on this subject of what can be done to increase the cultivation of cinchona in India, with definite facts and figures?—I could: but might I recommend that probably much more exact information could be got from the Director of the Botanical Survey. Mr. Calder who is now in charge of the Botanical Survey, the Bengal plantations and the Government of India plantations in Mergui, knows the position very well; much better than I do.

1339. Then you are asked whether you would not recommend the introduction of primers of hygiene in primary schools. Is it the case that lessons in hygiene are included in the primers now in use?—I have no precise information. From what I know of the work done many years ago in regard to getting primers prepared, I do not see why they should not be in the schools now.

1340. Would you advocate separate primers of hygiene or the introduction of lessons in hygiene in the existing primers?—I would advocate lessons in hygiene in the ordinary primers graduated for the age of the scholar. I think in the United Provinces there was actually a health primer produced.

1341. Your Department would be prepared to advise in preparing such lessons?—Certainly.

1342. You have not already done it?—Under the present organisation I have not done so; but this is a matter which came within the purview of the Education and Health Departments before the War, I know, because I sat on a Hygiene Educational Committee in the United Provinces before the War, when Lord Meston was Governor, and when this particular aspect of the question which you are suggesting now actually received our consideration.

1343. It is probable that such lessons are included in primers in different Provinces, but it is possible that they might be brought up to date?—It is probable that they are included in some Provinces and not in others, but the whole question should be investigated.

1344. What part of India are you chiefly acquainted with?—Northern India, from the North-West Frontier to Bengal.

1345. *The Raja of Parlakimedi:* May I know what the difficulties are in the way of improving village sanitation, in increasing the number of sanitary inspectors, etc.?—I think it is a question of money entirely. The matter of the personnel comes in to a certain extent, you must have trained personnel up to a point, but this personnel is usually forthcoming if the money is.

1346. You think the pay is not sufficient?—It is not a question of the pay so much as of the fact that the budget allotment for it does not exist in a great many Provinces. I mean it is evolving now.

1347. Is it the intention of your Department to train more men than are being done at present?—I do not know details of what the Provinces are doing. There is no central organisation. I am only advising the Government of India. I am not an executive officer.

1348. Has this matter attracted your attention and have you suggested to the Central Government that the Provinces should have more centres for training sanitary inspectors?—No, I have made no suggestion.

1349. Is there any specific preventative such as inoculation for diarrhœa which is appearing in an epidemic form in Madras?—Not for diarrhœa, there is a serum for dysentery.

1350. Is there something for typhoid also?—There is a preventive vaccine for typhoid.

1351. But dysentery and typhoid are not being tackled as epidemics at present in any Province?—We have not got epidemics of typhoid at present. Dysentery from time to time becomes very prevalent and it is treated in accordance with our latest ideas by inoculation, if it is of a particular kind. There are two kinds.

1352. Both kinds are very prevalent in the Madras Presidency, especially in rural areas. As regards the milk supply in rural areas, has the Health Department ever thought of suggesting measures to the Agricultural Department which controls dairies?—So far as I know not in rural areas. Of course, there have been many proposals for the control of dairies in cities.

1353. Has anything been done through the Municipalities and District Boards in regard to this matter?—Naturally I cannot speak for the whole of the municipalities of India, but I have not the slightest doubt that advanced District Boards have had the question of dairy control under their consideration on many occasions and have taken the advice of their local Health Officer, the Civil Surgeon or Assistant Director of Public Health. But you are asking a very general question now.

1354. Has the Sanitary Department ever thought of meeting the difficulty in regard to the milk-supply?—In towns yes; they are thinking of it now. There is hardly an organisation in the country which could tackle the question of milk control in the rural areas of India.

1355. Is the mosquito the only agency by which malaria is carried into the human system?—We believe so.

1356. Has any definite altitude been fixed for the cultivation of cinchona?—I think the limitations of growth for commercial purposes are well recognised by the botanical experts and the extent of the rainfall also.

1357. *Sir James MacKenna:* There was one disease to which no particular reference was made, that is, tuberculosis. Is that more prevalent in rural than in urban areas?—I should say more prevalent in urban areas. Our difficulty with tuberculosis is that it is not a registrable disease and our figures now are very largely hypothetical. We have had some very definite and precise statements made in public utterances in regard to the increase of tuberculosis; but we have no definite statistical evidence that those statements are anywhere near the truth. Tuberculosis has occupied the attention of the Government of India for the last 20 years and even as far back as 1910-11-12, when Colonel Leslie was Sanitary Commissioner, he made the statement I am making now, that though it was claimed that tuberculosis was on the increase there was no proof that it was. I do not say that it is not on the increase, but it is extremely difficult to be on sound ground statistically in regard to it.

1358. *The Chairman:* Is the incidence of tuberculosis mainly in the pulmonary forms?—Mainly in the pulmonary forms.

1359. *Sir James MacKenna:* I put the question because it is asserted that there has been an increase in my own Province. With reference to the statistics at page 141, apart from deaths from definite diseases like cholera and small-pox, the figure for fevers is enormous and I suppose it covers a multitude of other causes. Do you put much faith in these figures of fevers?—Those are the mortality figures. We apply a correction figure of one-third to one-quarter in estimating deaths from malaria. This has been based on individual verifications of death in certain areas.

1360. When I inspected health registers in Burma I usually found that anyone over 60 was put down as having died of old age, and anyone under 60 as having died of fever?—For practical purposes we come approximately near the truth.

1361. In regard to cinchona I take it your idea is to have centralisation the arrangements can be made?—That is my idea.

1362. The position became very acute during the War?—It did.

1363. With reference to the Burma scheme of plantations in Mergui, they cut down the area?—They were rather unfortunate in having a large area washed out. I think the Mergui area is really the functioning area now and that ought to be bearing somewhere about 1930.

1364. That is under the Central Government?—Yes.

1365. Then with reference to publicity, the Chairman asked you a number of questions about the cinema. Have you used the poster much in publicity work?—I think the Provincial Bureaux are using the poster very much now.

1366. Have you heard of any public opposition to them and demands for their withdrawal?—No, I have not heard of any. I have often wondered why.

Again my unfortunate Province provides an example. A wonderful poster on the effects of small-pox was produced, but it had to be withdrawn.

1367. *Professor Gangulee:* In the last sentence of your excellent note, you state that expenditure upon public health is a sound investment. Can you kindly tell us, if it is a sound investment, what are the obstacles to persuade the finance people that the money ought to be granted. In other words the Finance Departments will not subscribe to your view that it is a sound investment?—The Finance Department naturally looks upon anything connected with public health in the same way as it looks upon any other subject. It preserves a very neutral attitude as to the merits or demerits of a particular question. I am only giving you my own impression. The result is that very often what we consider a very necessary thing is turned down for reasons which we know nothing at all about.

1368. Although it is considered a sound thing?—Yes.

1369. What is the total revenue spent on medical relief and kindred activities?—I said I did not have the figures.

1370. At page 141 of your note you say 'the aim of the Government of India is to provide the basic structure on which this organisation can rest'. What basic structure have you in mind?—The machinery by which public health is controlled throughout the country: that is, the provincial public health organisation as represented by a Director of Public Health and his Assistants, by District and Municipal Health Officers and Sanitary Inspectors. That is the basic structure.

1371. You make the interesting statement that mortality affects agriculture. You know perhaps that it is asserted that the increase in population in India is one of the causes of our poverty because it is said that the pressure of the population on the cultivated area is excessive. Do you agree?—I think it undoubtedly contributes. I am not referring there to the depopulation of the whole country. We know that in certain areas where depopulation has followed certain occurrences the effects of that depopulation have been obvious. But, generally speaking, the increase of population throughout the whole country must naturally cause in certain areas very definite economic pressure.

1372. In that case a high mortality rate really affords relief to agriculture? —Not necessarily. Your high mortality rate may remove your workers at their very best age period so far as agriculture goes.

1373. Is the female mortality greater than the male mortality at all ages?— No, it varies in different Provinces at different times. The male mortality during the working years in all populations is usually higher than the female mortality: that is, during the period of exposure to the greatest risks, say, from 20 to 40 years of age.

1374. I am referring to Mahommedan females, for instance, in Bengal. There is a larger mortality amongst them; and so is the case with Hindu females in the Punjab than amongst men. How do you explain that? Is it

due to the *purdah* system or anything of that sort?—Well, it has been generally supposed that the *purdah* system has not been beneficial to the health of women.

1375. You have put a great deal of emphasis on Indian dietaries and their effect on health. Have you any definite suggestions to make for improving the dietary?—I have made a suggestion that we want to spend more money on research in regard to this to find out what the truth of the position is at the moment.

1376. Do you think the Agricultural Department can assist in the matter by the introduction of new crops?—Not until the facts are known. They can assist by co-ordination of research work in a central institution. If such an institute could be established I should say that it should not necessarily be a medical research institute only, but a place where workers from other departments could correlate their work.

1377. For instance, research on dietaries?—That would only be one section. There would be another section inquiring into disease and so on.

1378. Coming to the question of malaria, do you agree that the prevention of malaria must be the combined task of the engineers, sanitary experts and medical men and should not be confined, say, to medical authority?—Generally speaking I should say, Yes. You must remember that the problem of anti-malarial operations is one which requires that each scheme should be considered on its merits.

Conditions which may be applicable generally to a particular place may not be applicable to another place so that it might be possible to envisage anti-malarial operations which might be controlled by the advice of one man. But I find there may be other anti-malarial operations which could not possibly be controlled easily that way and might require the co-ordinated advice of the three people.

1379. For that reason I suggest that in Panama, the Federated Malay States, or any other part of the world where this has been done, you find that there was this co-ordinated effort. The medical men, the sanitary experts, and the engineers, all combined to improve the conditions of particular areas. Can such a combination of efforts be made in this country?—I think so.

1380. It is often asserted that the railway embankments have interfered with the natural drainage of the country. Do you agree with that?—In certain areas. Yes. In Bengal, I believe.

1381. Do you think the silting up of rivers in some parts of the country is responsible for the prevalence of malaria in those parts?—One of our authorities insists that that is one of the causes.

1382. Referring to the remedies for malaria, is there any shortage of cinchona and quinine production in this country?—Yes, there is.

1383. Could you give us an idea of the profit balance on the sale of quinine for the last ten years?—Those figures are all available in the annual reports of the Bengal cinchona factory and of the Madras factory, but I cannot tell you off-hand.

1384. Are you satisfied with the existing methods of its distribution among the rural population?—No. I think they might be improved. But you have to have a very definite cheapening of the drug before you can think very seriously of improving the distribution.

1385. At the present moment you do it through the post office?—That is one method.

1386. You are aware of the existence of certain fever mixtures sold in the rural areas. Is there any control over such drugs?—None.

1387. You agree of course that the Central Government is quite conscious of the fact that cinchona cultivation is essential and you said that opportunities have been missed which Java has seized. What is your explanation of this apathy?—The opportunity I am referring to is the complete central of

the production of bark at a period when it was recommended. Had the Central Government controlled it on a big enough scale then, we should have been in a position to be absolutely independent of other countries.

1388. What was there to prevent the Government from taking such steps?—It goes back to before my time and I cannot speak as to that. It may have been financial or it may have been that the Central Government did not want at that time to embark on the risks connected with manufacture.

1389. The whole question of cinchona is in the hands of the Botanical Survey?—The Bengal portion but not the Madras portion.

1390. To what extent has the Java trade affected our Indian market in quinine?—We are only producing somewhere about one-tenth of the supply of quinine in the world. I think that is what it is. I am talking subject to correction, but I think it is about a tenth.

1391. Is the Java market likely to oust us?—It has ousted us. The Java market is controlling prices at the present moment.

1392. It is the Dutch manufacture?—We are importing from Java at the present moment.

1392*a*. On page 146 you say that the therapeutic needs of India are deserving of every attention and encouragement by the Agricultural and Forest Departments. You are referring to cinchona cultivation there. Do you mean to say that this work should be taken up jointly by these Departments of Agriculture and Forestry?—I think that perhaps if the Forest Department had taken it over initially 40 years ago, it would have been a good proposition at this moment. This is my personal opinion.

1393. My point is, what can the Agricultural Department do?—I think the Agricultural Department has some say in these matters in Madras. I think the Agricultural Department comes in, in connection with the factories there.

1394. You could not suggest a definite line of action that the Agricultural and Forest Departments could undertake?—It is rather late in the day at the present moment. There are a great many interests involved in this; there are the financial interests which the two Provincial Governments have put up for the particular factories which have been created. I could not answer your question definitely because all these interests would have to be taken into consideration in any scheme of future control.

1395. Referring to the team work which doctors, chemists, botanists and others could do together, do you propose to achieve these results by establishing the All-India Research Fund Association that has been suggested in the memorandum?—The All-India Research Fund Association exists at the present moment; it is already established.

1396. You would entrust that organisation with this task?—The task of co-ordination?

1397. The team work to which you refer here?—Not necessarily; I did not suggest that at all. This Research Fund Association is functioning as far as medical research is concerned and would naturally be kept apart for medical research; but I was looking at it from the larger point of view of the co-ordination of various types of research which were bearing on a particular problem.

1398. How do you suggest that this team work which you desire could be achieved?—Well, one of the methods is in regard to diseases which could be dealt with in the institution which I suggested, on the lines of the Japanese institute, for instance.

1399. You would have another institute in which doctors, chemists and botanists would all co-ordinate their research?—For a particular purpose.

1400. Do you not think the Tropical School of Medicine could undertake such work?—As regards direction, perhaps yes; but not as regards accommodation at the present moment.

1401. Do you carry on any propaganda work in rural areas, I mean systematically?—The Provinces do.

1402. And is any impetus given by the Central Government?—Well, through communications with the Directors of Public Health, yes, and through the Red Cross. But not directly.

1403. Has there been any attempt to suggest to the Provinces the introduction of the subject in the system of adult education?—Not otherwise than through the ordinary methods of public propaganda; that is, exhibitions at fairs, here and there cinematograph and magic lantern exhibitions, and so on.

1404. But not definitely through the existing adult schools?—Years ago, in pre-war days, in 1910-11-12, at all the fairs in the United Provinces you could find an exhibition of the actual facts of malaria for the populace to learn and digest if they cared to. They were very popular. I do not know if they are going on now.

1405. You made a reference to thymol as being a very effective medicine for hookworm. Do you not think thymol can be manufactured in India?—I do not suppose there is any reason why it should not be. I do not know the commercial aspects of the question at all.

1406. At the present moment there is a certain amount manufactured in this country and exported to New York. It comes back in the form of Listerine and other forms of drugs. As it is produced from *ajwan* seeds, do you think there is any scope for its cultivation in this country?—I should be prepared to leave a question like that to experts in pharmacology.

1407. Some years ago, there was a Committee which submitted a report to the Government of India showing the possibilities of drug cultivation in India, the cultivation of things like *bella donna*, *nux vomica*, etc. Could you tell us what happened to that unpublished report of the Committee?—Was that a War Committee?

1408. I think it was in 1915-16?—I think the Committee is defunct now. But the difficulty with all this is that, if you have proved a plant to be capable of producing a drug which is efficient, it does not necessarily follow that it is a simple matter to introduce that drug as an indigenous product into India. We have a case in regard to the drug *santonin* which we have demonstrated can be produced from a shrub which is abundant in Kashmir. Well, despite that demonstration, no Indian firm of chemists would take it up and it was left to a European firm to take it up. They are now removing the *santonin* and having it manufactured and sent out. These are the handicaps.

1409. *Mr. Calvert:* I am very grateful to you for this very interesting note you have given us and inspite of the long ordeal which you have been undergoing, may I put a few questions to you? I was rather struck by page 140 of your memorandum in which you give a list of headings on this question of hygiene; I see you put education last?—They are not in order of priority.

1410. Then you give some very interesting matter on the efficiency of labour as affected by health conditions. In a number of the memoranda submitted to us we have been told a great deal about the shortage of labour. Would you be inclined to make a distinction between, say, the shortage of labour power and the shortage of labourers?—Yes, they are two different things altogether.

1411. Then you get on to this question of diet. To a large extent of course you know that the people of this country cultivate solely for food, so that this Royal Commission on Agriculture is very largely a Royal Commission on Diet. I was rather surprised to hear you say, in answer to a question put by Sir Henry Lawrence, that you had no details of any very marked changes in diet during the past 25 years. Has there not been in Northern India a very much bigger consumption of fruit?—Are you referring to the Punjab?

1412. Well, we know there has been a great increase in the cultivation of fruits and presumably the consumption has increased in proportion. The same is true of vegetables, English vegetables and so on?—I could not make a definite statement in regard to the use of English vegetables amongst the Indian population. Undoubtedly, as far as Europeans are concerned, there

has been a very definite improvement in the cultivation of both fruits and English vegetables and the amount consumed.

1413. It struck me that your answer to Sir Henry Lawrence gave a good illustration of lack of co-ordination. During the last 25 years the area under cultivation in the Punjab has increased by a million acres and there has been no increase in export. Does not that rather point to the increased consumption of wheat?—These are points I have not had time to go into fully. I began my memorandum by stating that I have been very hurried over this and there are a good many points that I wanted to verify.

1414. You did mention, I think, the increased consumption of wheat in Bengal?—In Bengal, yes.

1415. On page 145 you refer to the influence of irrigation on health and give an instance of where a badly-designed canal led to ill-health in Karnal. Would you say that increased ill-health was due to irrigation or lack of drainage?—As far as I understood the position, there was no drainage at all initially; I mean there was no drainage project. Undoubtedly that must have accentuated the conditions of water-logging which I refer to later.

1416. The point is, it is more a question of drainage than irrigation?—It is not irrigation *per se*, but drainage or rather want of drainage.

1417. As far as your investigations go, would you be prepared to say definitely that there is a higher mortality from fevers in irrigated than in non-irrigated districts?—I think, generally speaking, one would be on firm ground in saying there was.

1418. You have seen that note in the Punjab Census Report in which this is discussed in some detail?—I read it some time ago.

1419. That shows practically no connection whatever between irrigation and malaria. Your note, as it stands, suggests there are some evils attending irrigation?—I think this is another of the questions where we want a considerable amount of further research in order to clear up different points of view. We have had assertions made that there has been an intimate connection between the two, and then we have this statement in the Punjab Census Report showing a diametrically opposite point of view; this has occurred not only in regard to one area, but in regard to several areas and we require more light on this than we have. It is for that reason that I thought there was a possibility of some of these points being cleared up in the future owing to the extension of our malarial department.

1420. *Dr. Hyder:* Does not Mr. Howard mention that as one of the problems to be investigated?—He probably does. We hope to be able to get on with this at once because we are bringing in two very expert officers for the purpose and we hope to put them on to problem exactly like this when they arrive.

1421. *Mr. Calvert:* Some of our memoranda refer to quinine as being a Dutch monopoly. I understand that there is no question of a monopoly; there is nothing to prevent India producing as much quinine as she requires?—Nothing at all.

1422. Do I understand from you that if you did inaugurate a big campaign against malaria you would be brought up at once against a lack of quinine?—At present prices, certainly. Are you supposing sufficient funds being given to tackle a campaign as it ought to be tackled from a health point of view?

1423. Yes?—You must remember that we have a big reserve of quinine which has been created and is being added to from month to month, for the specific purpose of meeting an epidemic should one occur and also to tide us over the difficult period between 1928, when our contract for the importation of bark ceases, and 1930 when our estates in Mergui come into bearing. If that were utilised we might be able to put up a very considerable fight. Without that and relying solely on what we are producing ourselves annually we could not come anywhere near tackling the situation at all.

1424. One gentleman who has given us a memorandum suggests that we should improve the health of the rural population if we could get them to move from their villages to live on their lands more in the English farm system?—You have that exemplified in Assam. The holdings in Assam are very much on the principle of little holdings in the country at home, but there you have your *kala-azar* attacking them irrespective of where they are.

1425. So many of these theoretical considerations do not work out in practice?—In regard to certain things it might be advantageous to have them by themselves, but you are at once up against the absence of communal services which, if properly organised, can make for the comfort of a large number of people very definitely if they are living in a village.

1426. You would not describe the custom of living in villages, apart from the congestion, as a predisposing cause of ill-health?—The mere living in villages is not a predisposing cause of ill-health, but the living in villages under conditions as they exist of course is.

1427. Have you any connection with the Kasauli Research Institute?—We control it. I happen to be in control of the medical research under the Government of India.

1428. Was that in any way affected by the Inchape Committee?—Not the Kasauli Institute. The Kasauli Institute is a Government of India institute and its grants were not subject to any serious retrenchment by the Inchcape Committee.

1429. Is the work there in any way being hampered by lack of funds?—No, I think the Kasauli Institute gets the money it asks for.

1430. Then the Food laboratory at Kasauli has nothing to do with you?—The Food laboratory at Kasauli is under the Army Department, and under the Quartermaster General.

1431. Is there any corresponding institution for the civil population to have food tested?—Not otherwise than in the existing institutes we have, such as Kasauli, the Haffkine Institute, Bombay, the King Institute, Guindy (Madras), and the Calcutta School. Local food research could take place in any one of these institutions. I ought to amplify that. In certain towns, for instance, Madras, Lahore and Lucknow, we have Food Health laboratories under the Directors of Public Health, in which certain investigations in regard to the purity of food, adulterations, etc., are done.

1432. I suppose we should be quite correct in saying that the value of the work done in the research Institute at Kasauli is simply beyond value? You could not put a money value on it?—A large amount of research work has been done at Kasauli just as at other institutes, but in addition to the research work there is a certain amount of routine work to be performed. It prepares the bulk of the typhoid vaccine for India; it also supplies most of the cholera vaccine and also all the anti-venine for India. The actual venine is recovered in Bombay and sent up in a dry condition and the anti-venine is produced in Kasauli, so that we have three things produced in Kasauli for the whole of India, typhoid vaccine, cholera vaccine and anti-venine. During the period of the War these activities had to be extended enormously, not only to cope with the wants of the whole of India, but to cope with our armies in East Africa, Irak, Persia, and Egypt. To give you an instance of how it affects other countries, the Federated Malay States get their cholera vaccine from Kasauli, just as many other countries get their plague vaccine from Bombay.

1433. Do you think the enormous value of that type of work is now sufficiently realised to make any financial stringency almost impossible?—I would not say by any means that it is sufficiently realised. I think that one of our chief efforts in that connection is to bring home from time to time the very great importance of it, and we are not always satisfied that we succeed.

1434. You sometimes have to bring it home to people who ought to know better?—There is no question about it.

1435. We have been hearing something about epidemic forecasts. Do you think that is coming to be of real practical value?—It has only been attempted in one Province, the Punjab, and mainly through the work of Colonel Gill. This year when I was attending a meeting in Paris I made a reference to some of Colonel Gill's work; curiously enough the Italians suggested they were doing work on similar lines; they had already read Gill's work and they thought there was a great deal in it, and they were attempting forecasts in certain regions of Southern Italy in regard to malaria. You can take that for what it is worth, but generally speaking the Punjab has been in a more favourable position to make these forecasts than many other Provinces because the Punjab has been one of the great storm centres of epidemic malaria, and I think perhaps on that account its malarial condition has been more thoroughly worked out perhaps than that of many other Provinces, taking the Province as a whole. For instance you have this system of spleen examination, which is universal. You can get the spleen rate of the Punjab at certain periods and it has been going on for several years. You cannot ascertain that from the figures of any other Province as far as I know in the same way. So that the data on which Colonel Gill is basing his forecasts are perhaps a little more precise in the Punjab than elsewhere. The value of it has got to be proved by what happens and I do not know how far you believe in it, but I think that the forecasts have been fairly near the mark in the last two years.

1436. They have been trying cholera forecasts too?—There they are on very debatable ground.

1437. *Dr. Hyder:* And small-pox?—The same. If you take Sir Leonard Roger's statements, he would lead you to believe it was only a matter of watching meteorological conditions, for instance absolute and relative humidity and winds, in order to enable you to come to a conclusion as to when you are going to get an epidemic of small-pox. I do not think it is quite so simple as that. Those are all empirical matters about which we have no precise information; they are largely theoretical.

1438. *Mr. Calvert:* A great deal of that kind of work on epidemiology has been done by officers outside the strict line of their official duties?—Undoubtedly.

1439. Does the Government encourage that kind of research?—Yes. In the general programme of research which we discuss at Calcutta at our annual conference in December, every line of research is brought under our scrutiny and we usually try to elaborate a priority programme as far as possible, and we try to work our allocation of money on that priority programme.

1440. Apart from inquiries into specific things like dietary or disease you do encourage the study of the epidemiology of particular diseases?—Yes.

1441. It is commonly stated that a pure milk diet plays a large part in the health of children, but I understand in most Buddhist countries, Japan, China, Siam and Burma, there is practically no milk obtainable. How are those two facts reconciled?—I think that so far as the young children are concerned they are breast-fed till about 2 to 2½ years. If any children are unable to be so fed they must die. If they cannot get animal milk and they cannot be breast-fed they will not survive. Of course they have goats and a large amount of goat milk is drunk.

1442. I am only trying to get a sense of proportion. There are people who assert that milk is vital and I should like to know exactly to what extent it is vital. There are those countries where no milk is obtainable?—Milk is vital for children in some form or other and if it does not exist the child is not going to subsist in any other way.

1443. *Mr. Kamat:* With regard to the relations between your Department and the Provincial Departments of Health you told the Chairman that you have no means of influencing the Provincial Directors of Health except by writing to them demi-officially?—I did not say that. I said that was one of my methods of approach, through the Directors of Public Health. But there

are other means such as by asking the Department of Education, Health and Lands to address the Local Government.

1444. When you ask the Government of India to take up a particular question on which you tender advice have they the power of direction or interference in health matters in the Provinces?—Only in regard to what the Devolution Rules have left as Reserved subjects. For instance, in epidemic diseases in certain circumstances the Central Government can step in and lay down a definite law to Provinces. Port health work in the major ports, marine hospitals, quarantine stations and international relations are all matters in which the Government of India is paramount from the health point of view.

1445. In other respects they have not the power of influencing the Provincial Health Departments?—Not otherwise than by suggestion.

1446. How do you get into close touch with the Provincial Departments of Health, with the work they are doing and the problems that are being tackled?—Almost entirely through the Directors of Public Health.

1447. Do you yourself do much touring? Do you visit every Province each year?—I tour over India and Burma.

1448. I am asking whether each Province is visited at least once a year?—My touring is regulated very largely by my visits to the major ports, Bombay, Karachi, Calcutta, Rangoon and Madras, all of which I should visit; and incidentally, while I am passing through the different Provinces, if I have time I usually make a point of seeing the Directors of Public Health and sometimes the Ministers and their Secretaries in regard to any points they may wish to discuss with me.

1449. But do you get sufficient opportunities to see into village sanitation apart from the large ports?—Not under the present arrangements unless I went to look into some specific problem.

1450. So that the position is that you have not sufficient opportunities of getting a closer acquaintance with village sanitation, nor have the Government of India power to influence the Local Governments in matters of village sanitation?—That is the position.

1451. Now as regards diet and its relation to the efficiency of the agriculturist and the population generally I would like to know from you whether you can make any practical suggestions so as to bring about at an early date a change in the national system of diet and encourage the production of particular crops in areas where they are not at present grown?—On the analogy of Great Britain and other European countries we know that certain definite changes in diet can take place over the course of fairly short periods. Increased facilities for the transport from foreign countries of fruits of all kinds and other things have shown us at home how the diet, generally speaking, of the population can alter very materially. There is no particular reason why the same changes should not take place outside of Europe. But it is extremely difficult for a European to say precisely what could be done as regards the alteration of the diet of, say, a large rice consuming community like Bengal.

1452. Did I understand you to say that it is easy in Western countries like Great Britain?—I do not say it is easy to change the diet radically, but it is easy to make alterations in diet and that seems to me to be largely dependent on the cost of particular articles and the quantities in which they are offered for consumption.

1453. *Sir Thomas Middleton:* In Britain we import the great bulk of our food supplies and in that way we have acquired a taste for a great variety of foods and have the means of satisfying them?—My opinion is that, knowing the conservatism of the Indian population, it would be an extremely difficult matter to change the basic diet of any particular Province.

1454. *Dr. Hyder:* Could you draw any conclusions from the consumption of salt. For instance, salt of a particular variety is consumed in Madras but the Bengalis like imported salt. Do you think that may be associated with racial characteristics?—I should not care to say.

1455. *Mr. Kamat:* To pursue the analogy, in one particular part of Great Britain the people are fond of porridge but not in other parts. Could you change those habits by persuasion and reverse the position?—Those of us who happen to belong to porridge-eating countries, I think, agree that the amount of porridge that is consumed now is not as large as it used to be, and probably one of the reasons for it is that various other products have been offered which are more attractive than porridge.

1456. It is not only conservatism; there is one other factor in this country on which I should like to have your valuable opinion. For instance, the people on the western coast of India in the Konkan, even if they could be persuaded to buy wheat may conceive the idea that owing to centuries of rice eating they cannot digest wheat. Is that likely to be true?—I should not think so.

Professor Gangulee: In Bengal we are consuming a great deal of wheat to-day.

1457. *Mr. Kamat:* You told the Chairman about the value of cinemas. Something is being done I suppose by the educational authorities in the Provinces to show magic lantern slides to school children. Do you think that system of conveying knowledge to children in villages should be extended very largely?—I do not know what the Education Department are actually doing in the matter of cinemas.

1458. Do you also agree that the new experiment that the G. I. P. Railway Publicity Department are making in the matter of cinemas should be extended by compulsion or persuasion on other State-managed railways?—That particular experiment which I referred to in my memorandum, and probably referred to wrongly, I thought was an agricultural experiment, as it dealt with agriculture. But I discover now that it was a Railway Board experiment. There is no reason why it should not be repeated by the various railway companies.

1459. Speaking about the *Ayurvedic* system of medicine you said in answer to one of the questions just now that certain tests were being made in connection with *Ayurvedic* drugs. In which particular Province are these tests being conducted?—Bombay and Bengal.

1460. May I know in this connection what is the character of the tests, whether it is on the raw material on which the *Ayurvedic vaids* depend or the chemical product which they turn out?—The raw vegetable product is investigated by the pharmacologist (Major Chopra in Bengal), and the active principles are discovered and tested therapeutically in the wards of hospitals.

1461. But the actual drugs made by the *Ayurvedic vaids* and *hakims* and the utility of these things are not tested?—Yes, the whole claim is being tested from start to finish.

1462. I do not know whether I have made myself clear?—Yes, you have. The claim of a particular drug to do a certain thing is being tested by recovering the drug from certain vegetable products and by exhibiting the drug in actual cases of disease.

1463. For instance, take what the *Ayurvedic* calls *Iambosma* which is used in certain diseases and weaknesses; you are testing that in certain hospitals?—That is partly the case, but as both these inquiries are being run by Indians, it is extremely unlikely that they are going to allow any *Ayurvedic* claims to pass without proper investigation. I think you may take it that, when a particular drug is being investigated or its claims are being investigated, the whole circumstances are being inquired into.

1464. What I want to make clear is that the test is not a laboratory test but is done in hospitals on actual patients?—Both. The tests are being conducted in both ways; by laboratory experiments and by actual clinical experiments involving the exhibition of the drug in actual cases of the disease in hospital.

1465. If these tests are found to be favourable, do you not think that certain *Ayurvedic* drugs may be found extremely convenient and extremely cheap for the population in the villages?—That is the *raison d'être* of the inquiry.

1466. And the publication of the results by the Government should be as broadcast as possible?—The results are already being published in the Medical Research Gazettes and in the press.

1467. You referred to the criticism of the Public Health Department by local bodies. Was there any tendency to your knowledge on the part of the members of legislative bodies to oppose measures for sanitation, or was it only criticism with the object of securing all possible retrenchment and economy?—I think I made myself perfectly clear on that point in reply to another question. I said that, generally speaking, there was the development of a sympathetic attitude, that here and there were instances where there had been opposition; but that in the general perspective I looked on that opposition as being localised.

1468. With reference to certain diseases, especially epidemic diseases in the villages and in village areas are the present methods of notification of outbreaks of epidemic diseases fairly satisfactory?—Notification of cases of epidemic disease in rural areas does not exist as it does in Europe but there is a chain of notification which enables us to get the facts very early from rural areas through the revenue and civil machinery.

1469. May I know briefly what the machinery is? Supposing there is an outbreak of cholera in a village, how long would it take for the officers of the Health Department to come to know about it?—It all depends on the organisation of the Province. For instance, if we take the United Provinces, where we have District Health Officers, it would be at once known to the *lumbardar* of the village within probably a few hours of its happening and as the symptoms of a disease like cholera are very well known, he would lose no time in reporting it to the nearest *thana* and through the tahsildar's staff also to the nearest Health Officer.

1470. Are you in favour of stricter methods, of compulsion, or penalising any negligence on the part of the village officers in this matter of reporting cases of epidemic disease?—I think we want to tighten up our system of notification of infectious diseases more and more. The only method of effectively tackling epidemic disease is to get at it early and any measure which tightens up our methods is all to the good.

1471. If a village officer fails to report a case of such disease would you make it a criminal offence, in the interests of rural health?—No, I do not think so; not a criminal offence.

1472. As everyone knows, huts and cottages in the villages are ill-ventilated, insanitary, surrounded by tethered cattle and that sort of thing. Is there any method of improving the conditions without extraordinary cost?—To my mind, the easiest method of improving it is for zamindar to improve it. If the zamindar will not improve, well then, nobody is going to do much in the village. The zamindar if he is at all enlightened could do more than anyone else.

1473. But in certain Provinces there is no system of a zamindar in each village; each man is his own master?—Yes, but the villages are owned by some landlord.

1474. *Mr. Calvert:* By zamindar you mean landowner?—Yes.

1475. *Mr. Kamat:* Would it be worth while to have a model village for instance by giving certain facilities of land where people could build, being given guidance as to how to build sanitary houses, and how to lay out streets without the insanitary conditions which are preserved by the conservatism of the villages?—There is no objection to it at all. It is all to the good and I think in the Punjab canal colonies there has been every attempt to do this.

1476. You were asked whether it was not possible that villagers should live each one on his own land with benefit to himself so far as health was concerned. The difficulty perhaps is that they do not feel secure so far as their own safety is concerned if they have to live scattered over the land?—It depends on the Province. Internal security varies so very much.

1477. Although Mr. Calvert said that certain investigations proved that there was no direct connection between irrigation and malaria, still in certain Provinces that is the prevailing feeling and also perhaps the experience. For instance, in the Deccan canal tracts people are under the impression that more villagers are stricken than before. So that the point should be investigated at an early date and the last word should not be accepted as coming from a particular investigation in the Punjab. Do you agree?—I agree to the further investigation.

1478. *Dr. Hyder:* Do you think there is any connection between night-blindness and the inferior quality of grain consumed? I notice that in the case of the coolies who are working at New Delhi, though they are not very strong they are not so bad, but that some of them cannot see at night?—We do know that certain of the inferior grains produce a chain of symptoms which have been variously labelled. For instance, lathyrism, which we are investigating just now, is a disease which is supposed to have been caused by the grain *lathyrus sativus* mixed with other grains. Our investigations all point to the fact that the grains of *lathyrus sativus* are not pathogenic as we thought in the past but that the symptoms of lathyrism so-called are due to another contamination altogether which has been discovered in the investigations. Eye symptoms of course have come in as part of the chain of clinical symptoms which we see in some villages. But for the cause of ordinary night-blindness, I think, we must look elsewhere. Nightblindness is very often associated with peculiar changes in the retina and might be a thing quite independent.

1479. *Sir Henry Lawrence:* Could you tell us a little more about this question of milk in diet? Do you regard a greater supply of milk as a very important matter for the rural population?—I think so. I have very little doubt that a population which has access to large quantities of milk is enormously benefited thereby.

1480. Is there a geographical distribution? You say there are certain areas in India where they have sufficient milk and certain areas where they have not?—I do not think there is any doubt that much more milk is consumed in certain areas than in others; which means that that amount of milk is more readily available. In the Punjab, for example, the Sikh community drink, generally speaking, fairly large quantities of milk.

1481. With good effect on their health and constitution?—We have only got to look at them to see that.

1482. Is it correct to say, as Mr. Calvert suggested, that there is no milk in the diet of the people of China?—I know the Chinese are averse from drinking milk but I cannot speak of the actual Chinese diet intimately. I have never been in China.

1483. The Chinese labourer is one of the strongest in the world?—The Chinese labourer, as I knew him during the War and as I have seen him in the Federated Malay States, is a very generous feeder; he supplements any ration he gets by buying largely and I should say that his diet is extraordinarily generous and well-balanced. It has been, I know, asserted that the Chinaman does his enormous amount of work on a very low caloric diet, but that has been disproved; we know that a Chinese labourer has a very high caloric diet, probably in the region of 4,000 calories.

1484. Then, for people whose economic condition does not permit them to have a very generous diet, you would consider milk a very important substitute and any improvement in the milk supply is a matter of very great importance to India?—A matter of the very greatest moment.

1485. *The Chairman:* Quinine was an indigenous medicine in South America, was it not?—In South America, yes.

1486. It was used there long before Bacon was born but it survives modern scientific methods of medicine as one of the few specific remedies in the world?—Yes.

1487. Do you not think it is possible that the Spaniards laughed when they saw the South American indigenous population eating the bark of a tree to prevent their teeth chattering. And probably other practices in the pharmacopœia of those natives might have been proved under investigation not to have so sound a basis. So that perhaps in considering these matters we may bear in mind the words of a not inconsiderable contemporary of Bacon, "There are more things in heaven and earth than are dreamt of in your philosophy." Is there a satisfactory explanation to account for the cyclical swing of malaria?—I do not think so. At the present moment we have had many explanations put forward, but they are still largely theoretical.

1488. Of course each year that goes on without a serious outbreak of malaria means that more and more young people are moving about who have not been infected?—That may be so.

1489. You come to a moment when there is a large proportion of the population without the degree of immunity produced by a first infection?—That of course is a very cogent reason for the cyclical attack.

1490. Do you keep in touch with circumstances existing in irrigated areas in other countries?—I am in touch with practically all the countries in the world in regard to health statistics. My bulletins reach practically all countries, and I am in receipt of information from all the leading countries of the world in regard to what is happening.

1491. Are you familiar with the malaria statistics in the area irrigated by the new so-called *Sennar* or *Makwar* dam on the Blue Nile?—I have the details, but I have not studied them at all.

1492. They are interesting and I commend them to you for this reason. I happened to be there myself this year. There is no malaria at all there although the area is irrigated, and that is accounted for by the local medical men by the fact that every canal is cut with a sufficient slope to give the required velocity to the water to prevent the breeding of the anopheles mosquito. Curiously enough when I was there there was a small outbreak of malaria, which proves that the conditions are malarious but it was at once traced to the fact that a run-off had been led into a natural water-course which was supposed to have no part of its bed at a less slope than that required for safety, but that there had been an error in the survey. The water had slowed up, anopheles had bred and malaria was present. But otherwise, in that large and important irrigated area under high conditions of cultivation, there is no malaria I understand whatever. That would be very significant if that is so?—It would be, but there is the other factor that the conditions there have not been operating for a very long period. I am not quite sure of the actual date of the commencement of the *Sennar* dam, but the moment you cease to have close attention to the disposal of a particular amount of water on a particular amount of soil the conditions of overflow set in, as they may very easily do with flow irrigation. Then your whole malarial problem assumes proportions which perhaps it would not assume in the early stages of very effective control in a new work.

1493. Are venereal diseases an important cause of inefficiency amongst the agricultural population of India?—In connection with the approaching visit of the Social Hygienic Council delegation to this country I have said officially to the Government of India that they are not. Of course, we do know that in our large ports they bulk very largely and in certain areas, for instance in Burma, we know that the problem is a more serious one than it is generally in India. In certain hill tracts it exists, but generally speaking, my experience is that in the rural districts it is not a serious problem.

(The witness withdrew.)

APPENDIX I.

Statement showing the profit or loss of the Madras Cinchona Department from 1915-16 to 1925-26.

(Furnished by the Government of Madras.)

Year.	Profit.	Loss.
	Rs. A. P.	Rs. A. P.
1915-16	9,51,624 15 1	.....
1916-17	22,62,657 1 3	.....
1917-18	3,42,758 14 9	.....
1918-19	.....	1,59,655 10 10
1919-20	3,32,599 2 11	.....
1920-21	.....	31,368 6 11
1921-22	5,68,470 0 11	.....
1922-23	3,55,486 3 2	.....
1923-24	2,52,519 4 4	.....
1924-25	3,28,115 10 7	.....
1925-26	1,79,097 7 7	.....

NOTE.—In 1918-19 there was a disastrous fire at the Factory.

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APPENDIX II.

Statement of the profit and loss account of the Bengal Cinchona Factory for the years 1915-16 to 1924-25.

(Furnished by the Government of Bengal.)

Year.	Profit.	Loss.
	Rs. A. P.	Rs. A. P.
1915-16	3,49,705 5 0	.....
1916-17	9,76,394 11 6	.....
1917-18	24,10,548 14 8	.....
1918-19	1,68,306 3 9	.....
1919-20	5,39,602 2 11	.....
1920-21	7,62,177 12 3	.....
1921-22	8,82,095 4 2	.....
1922-23	7,64,446 6 3	.....
1923-24	5,73,935 10 3	.....
1924-25	5,17,336 5 4	.....

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APPENDIX III.

A note on the Activities of the Indian Red Cross Society in the fiel of Public Health by Sardar Bahadur Balwant Singh Puri, A Organising Secretary.

The Indian Red Cross Society owes its existence to the Great War. In 1916 the operations of the War spread in the East to an extent which directed the attention of the British Red Cross Society and the Order of the Hospital of St. John of Jerusalem in England, to the urgent need for a Red Cross organisation in India to cater for the needs of the Army operating in the Eastern theatres of War. The result was the formation of the Joint War Committee of the Order of St. John of Jerusalem and the British Red Cross Society, Indian Branch.

The operations of the Joint War Committee expended proportionately to the expansion of the military forces, and after the armistice was signed, its resources which had by that time developed considerably, were directed to the relief of the Army engaged in Frontier warfares. While the Committee was thus occupied, some of the larger Red Cross organisations were impressed with the fact that if the forces of the Red Cross as a whole were to be demobilized with the demobilization of the military forces, and the enthusiasm aroused by the War were allowed to lapse, there would be lost to the world one of the few important results of the War which might be preserved in the interest of mankind.

A conference was accordingly held at Cannes (France) to formulate an extended programme of Red Cross activities in the interest of humanity. In addressing itself to this task, the Conference expressed it as its belief that while every measure should be taken to repair the ravages of war, it is no less important that most serious attention should be paid to the prevention and amelioration of the ever present tragedies of unnecessary sickness and mortality which occur in the homes of all peoples. The conference therefore came to the conclusion that it was most important to the future progress and security of mankind that intelligent steps be taken to instruct the peoples of the world in the observance of those principles which would contribute to their health and welfare, and that the Red Cross Societies of the world were the best means to carry out this object.

The conference closed its labours by the foundation of a League of Red Cross Societies with headquarters at Geneva (subsequently transferred to Paris), with the object of stimulating and co-ordinating the voluntary efforts of the peoples of the world through their respective Red Cross Societies in promoting the development *inter alia* of sound measures for public health and sanitation.

In 1919 an invitation was received from the League of Red Cross Societies for India to join it as a member. Steps were at once taken to dissolve the Joint War Committee and to establish an Indian Red Cross Society by an Act passed by the Imperial Legislative Council in March 1920. Thus the Indian Red Cross Society came into being with a programme of work to promote effective measures for human betterment under conditions of peace. The objects to which the funds of the Society may be applied are:—

(1) The care of the sick and wounded men of His Majesty's Forces, whether still on the active list or demobilized.

(2) The care of those suffering from tuberculosis, having regard in the first place to soldiers and sailors, whether they have contracted the disease on active service or not.

(3) Child Welfare.

(4) Work parties to provide the necessary garments, etc., for hospitals and health institutions in need of them.

(5) Assistance required in all Branches of nursing, health and welfare work, ancillary to any organisations which have or may come into being in India and which are recognised by the Society.

(6) Home Service Ambulance Work.

(7) Provision of comforts and assistance to members of His Majesty's Forces, whether on the active list or demobilized.

(8) Such other cognate objects as may, from time to time be approved by the Society.

(9) The expenses of management of the Society and its Branches and affiliated Societies and Bodies.

(10) The representation of the Society on or at International or other Committees formed for furthering objects similar to those of the Society.

The creation of an intelligent demand for better health conditions and the dissemination of knowledge of the means of securing them have been one of the most important items of the Society's programme of work ever since its foundation.

A survey of the field made it clear that the very rudiments of public health are unknown to the great masses among the people, and that a prolonged intensive campaign of education in the alphabet of health was necessary. Steps were at once taken to compile short and simple literature, posters and magic lantern slides aiming at:—

(*a*) the awakening of the people to the advantages of the hygienic equipment already at their disposal, and to the necessity of providing more;

(*b*) the education of women in motherhood, child welfare, health, nursing and general hygiene;

(*c*) the education of the people in the elements of the diseases which are most prevalent in India.

By the end of 1923, the Society was able to publish—

(1) 20 separate booklets and leaflets dealing with the A. B. C. of health, the causes from which the commoner diseases spring, and the simple methods of dealing with the diseases themselves;

(2) 21 graphic coloured posters illustrating the same subjects;

(3) 7 different sets of lantern slides appropriate to Public Health; and

(4) a considerable quantity of miscellaneous material for special or local use.

Booklets, etc., on other subjects have since been added to the above list according to demand, and in the end of 1925, the Society had published 31 pamphlets in English, as well as in all the principal vernaculars of the country. In addition to these, eight interesting and instructive cinematograph films dealing with problems of health have been obtained from the League of Red Cross Societies and are being widely shown.

During the last three years the headquarters organisation of the Society has spent a sum of Rs. 1,40,500 in the preparation and printing of its public health propaganda material and distributed about 10,00,000 pamphlets. The distribution of this material is carried on through the Provincial Branches of which there are now 24 including 6 in the Indian States. The Education and Public Health Departments of the Local Governments have been of great help in distribution of this literature. The officers of these departments have carried the message of the Society far and wide by disseminating its literature and other propaganda material in the mofussil. In the United Provinces, the Hygiene Publicity Bureau of the Public Health Department actually carries on this work as a part of its normal activities and the Provincial Branch of the Society pays to it an annual subsidy. In the Punjab, with the active co-operation of the Education and Public Health Departments, every district now possesses a magic lantern for health propaganda purposes. In Burma

too, the Public Health Department is closely associated with the public health activities of the Provincial Branch.

This, in short, is the general outline of the aim, programme and activities of the Indian Red Cross Society in the direction of improving the health of the people as a whole. These are only the beginnings and they have touched only the fringe of a vast field, and as the progress must be slow and steady it is yet too early to comment upon the effect of the steps which have been taken. The two other cognate items in the health education programme of the Society are:—

(*a*) The Junior Red Cross.

(*b*) Public Health Nursing.

The Junior Red Cross is intended to enlist the sympathies of boys in the schools in the aims and objects of the Society. The object of this organisation is to prepare the child to be a useful member of the community and a good citizen of the country, and in effect to accustom him to consider the needs of others by training him in affection and sympathy and co-operation with his neighbours. The programme of activities include the care of health in that a child should know how to care for his own health and to help to protect the health of others. This is achieved by

(*a*) health instructions and certificates courses in hygiene, first aid, diet, etc.,

(*b*) some sort of competition in the observance of simple health rules, and

(*c*) lessons on community health by making surveys, under suitable guidance, of the local sanitation, water-supply, street cleaning, etc.

With regard to public health nursing, it has not yet been possible, owing to other pre-occupations, to inaugurate any scheme but it is the aim to create a service of Indian Red Cross Public Health Nurses. The Society lately deputed an Indian nurse to England to receive a special course of training in public health nursing at the Bedford College of Women, London. She has just returned after completing the course and after visiting some of the leading nursing institutions in Belgium and Germany, and is being appointed the Principal of the Training School of Nurses of the Poona Seva Sadan Society which provides trained nurses to Institutions in Southern India and elsewhere. It is hoped that she will be able to stimulate the interest of the better class Indian ladies in the profession of nursing.

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Mr. J. H. FIELD, M.A., B.Sc., Director General of Observatories.

Memorandum on Indian Meteorology in relation to Agriculture.

The terms of reference which have led to this memorandum involve the questions:—

(*a*) What has the Meteorological Department done for practical Indian Agriculture in the past?

(*b*) What could be done in the future, given adequate means?

2. The Meteorological Department has for some 50 years been collecting Indian data of a climatological nature, and has discussed them in published Memoirs of some 23 volumes, too heavy to hold with comfort: they form the solid basis on which any system of further meteorological enquiry for India must rest, and have current application in periodic publications on weather, in cyclone-warning at sea, and in flood and wind warning on land. Valuable as these activities are, they fill but a small part of what a live meteorological department should undertake, but in India they have always absorbed the bulk of the available weather budgets; for it is unfortunately the case that until a few years ago, when measurements of upper-air characters began to draw some small quantum of financial support from Government, no representation of the department was able appreciably to raise its funds towards a level suitable even for departmental purposes, apart altogether from any direct help to agriculture.

3. However needless it may seem in these days, with the Agricultural Commission threatening the Gate of India, to point out the intimate connection between Weather and Agriculture, I have constantly been impressed in the course of my many years' work in this country with the too scanty official realisation how intimate and detailed that connection is, and how fruitful must be a well-equipped programme of co-operation.

This drawback is little apparent in countries abroad. From early in the nineteenth century America emphasised the matter as calling for enquiry and study, and has since taken progressively vigorous action, with most other nations following suit; but, from the nature of the pre-occupations of the East India Company in the earlier half of that century, nothing on similar lines was possible then, and very inadequate attention was paid to the subject by Government in the latter half of the century. Even within the last ten years the only attempt, I believe, that has ever been made to deal seriously with this relationship for India on statistical lines (the very first step in aid of agriculture) was regarded so unsympathetically in official quarters that it could not be continued: it was judged to be "only scientific" and essentially condemned. This attempt was by Mr. S. M. Jacob, I.C.S., who for years spent his personal leisure, and from time to time employed his private purse, to work out the body of statistics which appear in his admirable papers:—

"Correlation of areas of matured crops and rainfall": Memoirs of the Asiatic Society of Bengal, 1910, Vol. II, Part 11.

"Correlation of rainfall and the succeeding crops with special reference to the Punjab". Indian Meteorol: Memoirs, 1916, Vol. 21, Part 14.

It is to be feared that, with respect to India's inaction, a candid but irreverent critic (could any such be found) might even venture, having bared his head, to whisper, with Edgar Allan Poe,

" And I rest so composedly
Now, in my bed,
That any beholder
Might fancy me dead;
Might start at beholding me
Thinking me dead ".

4. It may be said, then, with regard to question (*a*) above, that, apart from laying the meteorological foundation on which to build in aid of agriculture, very little has yet been done, in spite of the example of other countries: but with the coming of the Agricultural Commission, and with an open examination of the subject, all this should be changed, for it is now impossible on any grounds short of communal war or of bankruptcy to condone further neglect.

No prospect of added usefulness would be more eagerly welcomed by this Department than that of co-operation with agriculture on a definite and considered programme; but budget allotment must be suitably expanded, or the work be still refused.

5. The question remains " What could be done in the future, given adequate means?" and in considering a suitable programme and its cost, an account in outline may be given of what is done in other countries.

England.—The Royal Meteorological Society began to collect systematic phenological data as early as 1875, and these have for many years been regularly analysed, discussed and published. Besides the ordinary collecting stations there are now, under the British Meteorological Office, some eighteen " crop-weather stations " with objects specially agricultural.

From 1900 onwards it came to be recognised that the meteorological organisation was inadequate generally, and could not deal with this and cognate matters of moment to the British farmer, and the other public services affected by weather; the official budget was accordingly raised from about £29,000 in 1913-14 to some £120,000 in 1923-24 with officer staff expansion from 9 to 40 in the same period. In a recent reply to an enquiry whether England could supply, if needed, a British Meteorologist for Karachi when the airship flying programme matures, the Director of the British Meteorological Office replied that it was perhaps doubtful, for his organisation was so continuously increasing in size that he found difficulty in recruiting and training men for his own ranks.

To fix our ideas it may be mentioned that over the period of 10 years named above, while Britain expanded its meteorological budget and staff some four fold (with income-tax at 4*s.* 6*d.* in the £) India raised her officer staff by only 3 men, and her budget by 25 per cent. Some improvement on these figures has since occurred, but not enough to cope with the needs of agriculture.

America spends on meteorology roughly 10 times as much as India.

America, U. S. A.—The Weather Bureau was established in 1870, with agricultural objects among others. It issues telegraphic weather information on a large scale to farmers, with warnings against floods, winds and especially against frost. These services are regarded as very valuable over the countryside. Its main periodical, the American Monthly Weather Review, is full of excellent articles of direct current use to agriculture, and is a production such as we could not imitate in India with present staff strength, even if the cultivator were trained to use it. There are agricultural experimental stations

in 12 regional areas interested respectively in corn, cotton, wheat (2 seasons), potatoes and other crops, and one of their main enquiries relates in great detail to the critical periods of plant growth in association with weather. Very thorough experimental means are adopted for determining the optimum conditions of temperature (degree and duration), radiation, and moisture in air and soil, during the several periods of fruit production. Their dealings with coming frost are, I believe, particularly valuable to fruit farmers, who, on warning received, take steps to protect their orchards with low-lying smoke screens. The Americans have definitely concluded that they have now a basis of experience reliable enough to let them predict dates and periods of seasonal events for all latitudes and longitudes in United States of America, according to what they term their bio-climate law. That claim may be well-founded is indicated by their weather insurance systems, which deal with all meteorological features separately; some of them are run by the individual States themselves, and so complete is the weather information that premium rates (for instance, for hail) vary with the kind of crop and the location of the fields in which it lies.

South America—The Argentine.—Sir Frederick Gebbie, who knows that country well, informed me that a very active meteorological organisation exists, to which on all occasions the country farmers apply for forecasts and warning information for agriculture.

Canada has recently started operations similar to those of America.

Russia, according to available information, seems to have been early (1896) in the field with experimental stations, and by 1912 had 81 such institutions, large and small. They paid special attention to determination of the critical periods of growth in field crops, in relation to weather.

Brazil, Germany and *France* instituted, in 1910, 11 and 12 respectively, separate divisions of their weather organisations for work on agricultural meteorology.

6. With these examples before us, it is possible to put forward a scheme of work as a basis of discussion, and this scheme I would divide into two heads (*i*) Statistical, (*ii*) Experimental. From half a century's work the Meteorological Department has accumulated a great store of numerical data on rainfall, temperature, wind, cloud and humidity, and there are available corresponding data of crops in India. All this material invites examination for casual relationships, and the methods of examination have become well known. The meteorological divisions and sub-divisions of India, as hitherto used, are based on political or geographic limits, and will in many cases require remodelling for the purposes in view: the divisions of the year hitherto adopted are likely also to be found to have been artificial from the agricultural standpoint. These two features together will mean extensive rearrangement and recalculation of accumulated data.

7. On division (*i*), then, I should purpose that we recruit now a Statistical Expert, give him a staff of 3 or 4 young Indian mathematical graduates, and as many computing clerks as necessary, perhaps 12, and start him to work in earnest on the great bulk of data ready to hand. In considering whom we should engage to put into charge, I recognise that in addition to securing mathematical ability, it is essential to choose a man of imagination and critical faculty, and with such keenness on the "yield" of his work that progress may be rapid, and the fullest value for expenditure be secured. It is *not* enough to choose by brilliant mathematical ability only, and thus possibly invite a slow drifting of the whole project to a discreditable end. On imagination and keenness I should place $\frac{3}{4}$ of the value of the man in charge, the remaining $\frac{1}{4}$ lying in ability with statistical methods, which is freely available among mathematicians.

8. In intimate relation with the results of this statistical work will be their application to field agriculture, and this will certainly involve the improvement of meteorological headquarters in short-period and small-area forecasting. For the purposes of the present memorandum I have considered

he expenditure upon this matter of progress to be included in that of the statistical staff; and my estimate stands as follows:—

(*i*) Statistical scheme of work—

	Initially Rs. per mensem.	Average throughout service. Rs.
Officer-in-charge	2,000	2,000
4 junior mathematicians (400—50—600—600—50—1,000—1,000—50—1,250 average 804½)	1,600	3,218
6 upper division clerks (120—8—160—10—300 average 205-12-0) . .	720	1,234
6 lower division clerks (75—4—155 average 113)	450	678
Plus travelling allowance and office expenses put roughly at 10 per cent. .	480	720
TOTAL .	5,250	7,850

9. With regard to division (*ii*), it is perhaps the Agricultural Adviser to the Government of India, and his Provincial Colleagues, who are in the best position to advise: I have, however, counted that this department might be called upon to help in such questions as the following:—

(*a*) Determination of "effective rainfall" with reference to the critical periods of growth of crops; it is known that the value of the same amount of rainfall is different at different times of the season, and the total rainfall weighted by these values would be the "effective rainfall."

(*b*) Collection of further statistics to determine the most favourable conditions for the various crops and in various localities.

(*c*) Study of the different elements required to secure a good harvest, *e.g.*, amount of light, heat, humidity and rainfall and their time distribution.

(*d*) Study of weather phases in relation to plant disease.

(*e*) Determination of bio-climatic zones.

(*f*) Determination of the effect of the many meteorological elements on growth and yield.

(*g*) Study of effect of extremes of temperature, as met with in India, on plant growth.

(*h*) Study of soil temperature distribution, and of soil humidity, in relation to growth.

(*i*) Study of the nature and extent of damage by abnormal weather factors.

To deal with these matters staff will be required on the meteorological side, and for some of them physical apparatus will have to be devised and made. It is not possible, without further guidance than I have yet received as to the proposed agricultural programme of work on such problems, to suggest an estimate of cost with any value at the present time. There is no doubt, however, that Indian science graduates (physics) can be obtained fully capable, under headquarters advice, of carrying out all such work; and that headquarters officers can design as good apparatus for any ordinary physical work as could be done anywhere. The scale of pay of the former officers is indicated in the estimate above for junior mathematicians.

Oral Evidence.

1494. *The Chairman:* Mr. Field, you are Director General of Observatories? —Yes.

1495. You have put in for the Commission a very interesting memorandum on the work of your department, with special regard to agricultural matters? —Yes.

1496. I do not know whether you would care to make a statement supplementing what you have written, or whether you would rather proceed by way of question and answer?—I think I should prefer to answer questions first, and then make any suggestions which may arise.

1497. Your memorandum appears to be so complete that I have really very few questions to ask you. As I understand the position, in your view, you have now as a department come to a stage when the statistics patiently accumulated over a period of years amount to a sufficient basis on which you could proceed to useful deductions, provided you had the staff to do the work?—I think that is right.

1498. Will you tell us what you consider the most urgent service you could render to Indian agriculturists which is not at present being afforded them?—I think the first thing to do is to make use of the statistics we have by means of an officer who would be an expert in that matter, and who would correlate our statistics with those of agriculture as collected, say, in the Punjab and United Provinces. I have a file of notes on these points, and I believe the records for North-West India are much more accurate than they are, say, for Bengal in relation to field areas and the yield per acre over a long series of years. I do not know why that is, but I believe it is the case. What I should propose is that an officer who has a knowledge of India and of district work, and who is a mathematician and has these matters in mind, should take up the work of correlating these two things, which up to the present have had no work done on them at all; they have merely been collected. The results have probably been sticking up at us, but we have not taken advantage of them so far. I have suggested in paragraph 8 what staff would be necessary to do the work in a liberal manner, and I do not think the expense should be considered great. It has been suggested to me that this has been planned on rather too big a scale, but in the early stages it will be less expensive than I have shown (I have taken the average), and in any case the subject is very important. Two or three years' work at this expenditure would, in my view, give us a basis for judging whether to expand, contract or simply continue the work.

1499. You will probably agree with me that knowledge of an impending calamity would only be of advantage to the cultivator if it were possible for him to take some steps to ward it off or mitigate its effects?—That is so. We can at present forecast drought and good and bad monsoons to some extent; not in a very satisfactory manner, but we are getting better. Forecasts can be conveyed to the agriculturist quite independently of any steps on our part. Their preparation does not serve to connect agriculture and meteorology, because we deal with them independently of agriculture in the normal course of our work.

1500. Given an ideal system, how early in the year do you anticipate that you would be able to publish your monsoon forecasts?—The position at present is this. At the beginning of June data for our standard method of preparing forecasts have matured and we are able to form a judgment then. There are, however, several features much earlier in the year which are showing promise of becoming useful. When we develop these, and have sufficient experience to have confidence in them, we may be able to forecast in the middle of April.

1501. Let us assume that in any one year you prophesy a bad monsoon in April. What steps, do you suggest, are open to a cultivator to mitigate the

bad effects of such a bad monsoon, assuming he gets the information in April only?—I think he would probably curtail or postpone his sowings or his agricultural operations, but actually the precautions that were necessary would be for the Government to take, precautions against famine.

1502. Yes. You are, of course, familiar with the work of the Meteorological Bureau of the United States of America? Am I right in thinking that warnings as to early frost and hail are amongst the principal services which the Bureau in America gives the cultivators of that country?—Yes, I believe they are quite good on those two points. They certainly make very great claims in regard to them.

1503. And, of course, early frost and hail, though lasting in themselves only a short time, are dangerous to crops, and it is possible to take steps to mitigate their effects at short notice?—Against frost, certainly; as to hail, I think it is rather doubtful.

1504. I fancy there is a covering up of certain crops, but I speak under correction there. Is it, then, your view that an April forecast of a monsoon would in practice in India be useful only in so far as it enabled Government to come to an early estimate of the crop of the year and to take steps against famine?—I should think that is the present position. When we enter into more detail, with more work, that may be changed.

1505. What steps do you suggest are open to Government in April against a famine in the coming season which could not be effectively taken after the monsoon itself has obviously failed?—I am afraid that is a question on which I am not an authority.

1506. You will admit it is an important question in connection with your claim?—Yes.

1507. Are you in touch with the Agricultural Department?—To some extent. We have not had official dealings. I have followed their doings, and I have followed the correlation, so far as it has gone, of the two sets of data. Mr. S. M. Jacob, I.C.S., did a good deal of work years ago on that in the Punjab. He was very keen on this, but he has left India now. He used to get a great many statistics from me and show me his results, and I have certain notes as to them. I had him in mind as the only suitable man I know of to tackle this work and, in its initial stages, put it on a proper basis.

1508. Do you wish to lay any exhibits before the Commission?—I have some exhibits here.

1509. Do you wish to say anything about them?—If the members would care to look at them, I could explain anything afterwards.

1510. That would probably be a very convenient way of proceeding. How much do you think it would cost the Government of India to develop and sustain your plan in full?—I have suggested here that so far as the statistical work is concerned we should begin with an expenditure of about Rs. 5,000 a month. With regard to experimental work, it depends entirely on what the agricultural people call on us to do.

1511. Quite. I gather you would welcome closer touch with the Agricultural Department?—Yes, certainly.

1512. Are we to understand that for the sum you have mentioned you could begin work on the correlation of the data at present collected by the Department?—Yes.

1513. Would that be a rising annual item on the budget?—On page 196 of my memorandum I have put in the initial pay, because the men employed start on the lowest pay. Then I have given the average throughout the service, calculated in the ordinary way, which is about Rs. 7,800, and that throughout 20 years with that staff would be the average pay. It would end off slightly higher and begin slightly lower. I think this would be quite liberal enough in the early stages, until we knew where we were. After 3 years'

work of this kind, we should be in a very much stronger position to see what advantage we were getting out of it.

I need hardly tell you how greatly we appreciate the trouble you have taken to prepare this material for the Commission and lay it before us.

1514. *Mr. Calvert:* On this question of Jacob's attempt to correlate rain fall and so on, if I recollect aright, he was able to assign a definite value to each inch of rain that fell in the sowing period?—That was part of his work.

1515. And further a definite value to the rainfall month by month up to the maturity of the crop?—Yes.

1516. That would be of commercial value, would it not?—I think it would.

1517. But hardly of agricultural value?—Would you not call commercial value agricultural value? Would you separate them?

Not of value so much to the agriculturist as to the commercial man.

The Chairman.—The position being that the buyer is always best able to take advantage of early information on these matters.

Mr. Calvert.—Jacob's assumptions were perfectly correct; when there had been rainfall for a certain time people put down wheat, and the more rainfall the more wheat, so that one could practically foresee how many acres would be sown with wheat. He worked out the value of each inch of rainfall up to the maturity of the crop.

The Chairman.—That is to the advantage of the commercial man mainly, is it not?

1518. *Mr. Calvert:* Yes. With regard to the question of winter rains, which is very important in the Punjab, could you improve the value of your forecast if you had more information from countries west of Persia?—I do not think so. I have a diagram here which shows our winter forecast for rains in North-West India for the period November to March and the actual rainfall in that area. The forecast was made entirely from the strength of upper winds about 4 miles above Agra in September and October, well before the winter season to which it relates. (*The witness then showed the diagram,* which was for the years 1914 to date, to the Commission, and pointed out that so far as the accuracy of the forecasts was concerned it showed a correlation co-efficient of 0·91.*) We have made our forecast for this year, and I know what the probabilities are for the coming winter. In answer to your question, therefore, we can give a very close idea of the rainfall in North-West India provided that this short series of years does not let us down. In all these correlation matters one is very liable to be let down; we want a series of 30 years to be reasonably certain, and this is only for 12 years. However, it is very promising indeed. We sent this to the British Meteorological Office and they thought it unusually hopeful, but the series is short and we need the experience of 15 more years before we can have confidence in it. If it does not let us down as its history develops, it will be worth a tremendous amount of money.

1519. My next point is the Himalayan snowfall. Your information about snowfall is only guesswork, is it not?—No, we have reports from the Political Agents.

1520. I used to supply them. They are mainly guesswork, I think. If we knew the height of a mountain we could tell the height of the snow on it. The point of importance to the Punjab is the time when the snows will commence to melt and so fill the canals. Have you sufficient evidence on this point?—No, I do not think so. In regard to treatment of snowfall reports our method is necessarily somewhat rough. It is to take all the written reports, which are non-numerical and assign to each a value on the scale *minus* 3 through 0 to *plus* 3, as well as we can estimate them, multiply that number by a constant and add it to the rainfall, which is definitely numerical. That is our method all through with regard to snowfall, and we get our correlation co-efficients on that basis.

* For diagram see opposite page 208.

1521. One point on which I should like your opinion is this. I understand that the factors mainly affecting the monsoon in India are factors outside India?—On our present method of forecasting we use outside factors largely, yes.

1522. Does the question of afforestation or denudation of forests come in at all?—We are not able to use it, if it does come in.

1523. Would you entertain the opinion that denudation of forests had anything to do with rainfall?—Very little: the subject has been examined carefully.

1524. In India?—No: in India we do not do these things. We have to go to Germany or France for that. They have the money; we have none.

1525. In the provincial memoranda there are several references to a supposed decline in rainfall. Do you know if there is any evidence in support of that?—That is a matter that has been gone into. You will remember there was some scare about a change of climate in the closing years of the last century, and a memoir on the subject was written by our department, by Sir Gilbert Walker, which showed that rainfall had tended to increase to a maximum between 1892 and 1894 and sink to a minimum in 1899, since when it had slightly improved. That was written in 1908, but the years since 1908 have not suggested any coming disaster in the way of permanently diminished rainfall.

1526. There is a certain amount of evidence in favour of a periodic weak monsoon. The famine years run roughly in decades over a long time up to about 1900 and prices varied with them in decennial periods. Since 1900 we seem to have had no really bad monsoon?—I do not think that is true. We should require to have evidence over a very long period before we could say there was real periodicity. I rather question the assertion that years of scarcity have been in decades; there were 1877 and 1899; those are not decades apart.

1527. 1877, 1887, 1897?—We should want more data than those; 1887 was not a famine year.

1528. The inquiry into food prices in the last 60 years does suggest periodicity?—I do not know about food prices. I have a paper here on that subject by Mr. Jacob, but I have not gone into it sufficiently myself.

1529. *The Chairman:* Had you thought of putting that paper* in?—I should like to. I have several papers to put in that I have collected together. Curiously enough, most of them are written by Mr. Jacob; he is the only man who has paid any serious attention to these things; he was steeped in them. He was not directed to do this work; he did it on his own initiative.

1530. *Mr. Calvert:* I understand you have given considerable time and thought to the question of the higher organisation in the Government of India, including the position of your own Department?—Yes.

1531. Have you any views you would like to put before the Commission as to where your Department should come in in connection with other Scientific Departments?—I have thought about it, and it seems to me that Scientific Departments generally are handicapped because they are necessarily put under a Member of Council who in general has no scientific training. He is busy over other matter in which he is fully knowledgeable. Moreover, all the Scientific Departments are not together under one Member, so that one Scientific Department, which can perhaps represent its case more cogently than another, is liable to get more support than it should receive in relation to its needs, or *vice versâ*. I merely suggest that if they were all under one Member, who had scientific knowledge, he would be able to apportion any funds that were available in a more suitable manner than is sometimes done now. In past years my Department has fared worst of all, but our present Member has been taking broad views in the interest of India, and has greatly improved our prospects of usefulness.

* Measurement of prices by Mr. S. M. Jacob read before the Sixth Indian Economic Conference, Lahore, 1923.

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1532. Could you give us a more definite suggestion—something in a more concrete form?—I see that Dr. Clouston has suggested we might have another portfolio, a portfolio of science. That would deal with the point.

1533. Including Agriculture, Meteorology and Medicine?—I think he suggested a Ministry of Agriculture, with a Member in charge with a new portfolio. If we could have a Member in charge who had some scientific knowledge, rapid decisions could be come to on a sound basis, without the delay and the miscarriage of judgment which must necessarily occur frequently with superior control lacking special scientific training. In existing circumstances an administrative department is unable to judge a specialist proposal put up for sanction, and has to accept it, or not, according to power of meeting the expenditure involved. It must be exceedingly embarrassing for a non-scientific Honourable Member to have to settle important scientific programmes, while uncertain whether he is turning down a sound scheme, or admitting an unsound one: this consideration suggests that present Honourable Members would breathe more freely if they could have a scientific colleague on whom to unload all such awkward questions.

1534. Do you find the ordinary administrator sometimes experiences difficulty in understanding the language you use?—He does not show it.

1535. For instance, Jacob's papers are very difficult for a non-statistician to understand?—Yes, if they are going to try to understand his methods of deducing things, but I do not think that is necessary. The theoretical statistician has worked out his tools, and anyone can use them. We do not require a workman to be able to turn out tool-steel, but he must be able to use it. In many cases I cannot do the things myself, but I can use the methods because they have been standardised.

1536. Are not your monsoon forecasts also used in the epidemiological forecasts of Colonel Gill?—I believe he has been using them a good deal, yes.

1537. That opens up a further value for them?—Yes.

1538. *Professor Gangulee:* Would you agree that your department has done practically nothing up to the present of real value to the agriculturist?—We have not applied our information yet.

1539. You think you have accumulated a mass of relevant meteorological data which may be correlated with agricultural data?—Yes.

1540. Has Mr. Jacob's method been tested?—Yes; he is extremely well received in all statistical publications; his work is spoken of in the highest terms.

1541. His papers have been tested by the Royal Statistical Society?—Yes.

1542. Can you determine quantitatively the relation of different climatic features to crop production?—We can determine the quantitative data of meteorological events and if those are then correlated with the quantitative data of crops the result is quantitative.

1543. With the data you have in your possession, do you think you can determine optimum conditions of weather for agricultural operations?—We do not know the optimum conditions for agricultural operations because our attention has not been directed to the matter; there must be co-operation between the two departments before we can determine that; but I think it should be possible to do so with the actual data collected. We have innumerable data.

1544. Can you give any warning against floods?—Yes, we do a great deal in that direction. In fact, if we were given a budget which at all took into account our work against floods and cyclones, we should never have to ask for another anna.

1545. Given a Department for Agriculture and Meteorology, how best could you hope to provide the meteorological information so as to benefit the farmer? I am now referring to organisation. Given a scientific Agricultural and Meteorological Department or office where you have the information, how best can that information be made to reach the farmer?—I think that is hardly

a question to put to me; I am not an authority on things of that kind. I sit in Simla; I have no experience of district organisation.

1546. Have you thought out, in the scheme you have presented to us, the question of the broadcasting and distribution of meteorological data?—I have here copies of our various publications, which are distributed by post and telegram; beyond that I have nothing to suggest without further consideration.

1547. Have you thought out a definite line of co-operation with the Department of Agriculture?—Yes; it is what I have suggested here. I have suggested that we shall start immediately this correlation business, because we have all the material to work on; and then I suggest in the last paragraph on page 196 that with regard to physical work we start from the beginning with the advice of the agricultural people and we do what they ask us to do; for instance, the soil temepratures and soil humidities as we go down in the ground are at various times of the year important in different degrees; those things can be measured, and as far as I know they have not been measured in India except on a small scale, at Pusa, for instance. But it may be the case that work on that point is needed in various parts of the country in many centres, and we could put instruments into a standard form with a little thought; but it has not been done. That is merely a suggestion under my last paragraph, that we should get on to physical work.

1548. Then you believe we have in the provinces organisations which can be utilised for the purposes of distributing meteorological data and also collecting meteorological data?—But we do collect it; we have all the facilities for collecting meteorological data.

1549. Data with reference to agricultural crops, soil temperature, and that sort of thing?—Yes. With reference to agriculture we may have to modify our method of dealing with the data, but the data are the same. Instead of at 8 o'clock in the morning, perhaps we should have to observe three times a day at these special posts.

1550. You would utilise for such purpose our experimental stations at different parts of the Provinces?—If we are invited to co-operate with agricultural experimental stations, yes, or anywhere else.

1551. *Sir James MacKenna:* Do you telegraph to local Governments forecasts of exceptional weather conditions, such as the recent cyclone in Akyab?—Yes, we have a great number of officers to warn. I could not give the number off-hand, but it is something of the order of 2,000* who in different parts of India and Burma have to be warned of all disasters of that kind; and the number is steadily growing.

1552. I recollect in the old days you sent a daily telegram?—We send a daily telegram now at any time of the year.

1553. Under what department of the Government of India are you at present?—Industries and Labour.

1554. You would be more at home in Education, Health and Lands, would you not?—I do not think it makes much difference, so long as our recommendations are accepted.

1555. *The Raja of Parlakimedi:* Indian monsoons depend largely upon the barometric pressure India has for the time being, do they not?—The relationship of the barometric pressure here and in other parts of the world, yes.

1556. So therefore we do not depend upon the conditions outside India for our monsoons?—Yes, largely; the whole world is inter-connected in those matters. We cannot tell which are correlated effects and which are true causes, but we can use them all: we can observe pressure in South America and temperature elsewhere, and wind and rain, and we know their correlated value on the Indian monsoon. It is impossible to forecast the monsoon at present by dealing with India only. On the other hand, we are coming across some new facts very similar to the curve that I gave for the winter rains. For

* 2,000 was wrong: the present number of officers warned is 763, and the warnings issued last year amounted to 8,000.

instance, we have been working for 10 years in Bangalore with balloons, and we find that at about 6 or 7 kilometres above sea level at Bangalore in April there is a very strong correlation of the strength of winds through April at that height and the subsequent monsoon in the Peninsula. There is a correlation of about 0·8 as far as we have gone. There again, the series of years is much too short to say more than that it is a hopeful method; we want another 20 years, and then we shall be able to speak with some confidence.

1557. By what length of time could the occurrence of floods be foreseen?—Floods commonly result from a disturbance in the Bay becoming a storm and running overland up the Gangetic plain; for instance, as happened the other day at Jubbulpur. In that case we should know two or three days beforehand what course the storm was likely to follow; that it was likely to give heavy rain at Jubbulpur in three days' time, and roughly what amount of rain there would be.

1558. From what station was this foreseen?—From Simla.

1559. I suppose you can foresee it for any part of India?—Simla can foresee everything over India, yes. It depends upon the information we get by telegraph daily. Bombay would do equally well; any other station would do equally well if the complete meteorological information were received there instead of in Simla.

1560. How do you propose to popularise these meteorological forecasts with regard to agriculture throughout India?—I do not propose to do so at all; I want to get on with the work itself; to popularise them is outside my Province.

1561. You have some data which would be useful to agriculture; in order that those data may be of benefit to the country, what action would you advise the Government to take to popularise it?—This is a new question and would require consideration. In America there is no charge even for special messages of information to individuals, but in this country we have, in recent years, had instructions to charge for every thing done, and free distribution is practically a thing of the past. There is therefore no sign that Government wish as yet to popularise our data. For myself, my sole concern has been to extract an improved budget to do the work itself, but somewhat unsuccessfully up to recent times. Prospects are however brighter than they used to be, when budget extraction was like drawing teeth, a painful process on both sides.

1562. *Sir Henry Lawrence:* I think in answer to Mr. Calvert your reply was to the effect that there is no indication that there has been any serious decrease of rainfall in recent years?—Yes.

1563. Is that general, or might there have been a decrease of rainfall in certain areas?—I cannot say that certain areas are not feeling it. I was talking of India as a whole.

1564. Would your statistics indicate that in particular areas there had been a decrease, or is that work for a separate officer?—Yes, I think we could examine the point, but it is probable that any apparent change would not be found to have lasted from 1900 right up to present time; there is nothing to be feared as to a real change of climate.

1565. We hear statements made that wells have ceased to give water owing to the constant decrease in rainfall; you have no indication that that is true on any large scale?—No, I do not think so, and also I think that result would be complicated by effects of the water-table down below which are not known. I know that in our observatory in Agra the water-level, of which the log has been kept for many years, varies in an apparently erratic manner, which often shows little relationship with the rainfall of the season. It does not necessarily rise in the monsoon time; but also it may continue a monsoon rise into mid-winter.

1566. There are variations in the subterranean water which are not correlated to the rainfall of the year?—In that particular case it shows less connection than would have been expected.

1567. Now in certain parts of the world experiments have been made in control of rainfall; have any such experiments been made here?—No; control is impossible. I think that such control would only be claimed in America (and possibly Australia), and then only by private cranks as a means of filling their pockets. The rainfall is controlled there, according to the controllers, by an impressive apparatus which is carted about and erected on a farmer's land, but it must not be looked inside. The basis of business is that the farmer shall pay, say, $1,000 per inch of rain in excess of the normal: if rainfall fails to reach the normal, no fee is paid and, with mutual condolences, the apparatus is dismantled and carted away. It is an ingenious application of the case "Heads, I win; tails, I don't lose."

1568. Do you suggest that these farmers actually do pay these sums in America?—Oh yes, according to the Press it is really done; I do not say it is common. These people can make a very fat living by just taking in one or two farmers a year; their apparatus is very elaborate-looking and impresses the credulous.

1569. Do they send up electricity into the clouds?—Not in the apparatus I am referring to. It is merely a thing that looks like a railway water-tank mounted on a big girder frame: then they stir up something inside. There is probably nothing inside, but they stir it. If the rain comes, it costs $1,000 per inch of excess: if not, the operator probably says "I regret the failure, and must go as I have an engagement elsewhere: kindly provide me with introductions further west."

1570. You do not see any future hope of tapping the rain that passes over the Western Ghats, and giving us rain in the Deccan?—I am afraid there is no control.

1571. *Sir Ganga Ram:* Did I understand correctly what you said to the Chairman, that you will be able to say in April what kind of monsoon there is going to be?—Yes, I think so, later; it is a matter of many years. There is no question in my mind that we shall be able to do it in 50 years' time, and the degree of help that we are given by Government in the meantime will determine how much that 50 years' period can be shortened.

1572. And in June again whether the monsoon will continue in September and October?—Yes, we shall know all details in 50 years' time.

1573. You may be able to give us some fairly reliable figures?—I think our figures are fairly reliable now.

1574. The figure you gave to the Chairman was Rs. 5,000 a month; is that non-recurring?—No, that is recurring.

1575. Will there be some non-recurring expense for equipment and so on?—Not on this problem; this is not a problem of forecasting at all.

1576. By your forecast can you tell us the weather in America, because we are very much interested in learning whether the cotton crop in America has failed? Can you give us any indication of what sort of weather prevails in America, because whatever is learned in the papers is put in by speculators?—I do not know; I could not say about the American weather; but I know America is very much interested in Indian weather and I think for politico-economic reasons.

1577. And we also are interested in the American weather. Can you give us a reliable figure; the figures in the newspapers are put in by speculators?—I know they are; but figures that are published by the official American Weather Bureau can be trusted.

1578. You do not publish them?—We do not publish but we receive them.

1579. The weather conditions in America in reference to cotton?—We receive them continually.

1580. In the Punjab when there is no frost we get three pickings, but when there is frost we lose one picking. Is there any practical way of protecting our crops from frost?—But you do not have frosts in the Punjab, do you?*

1581. Oh yes, we get bad frosts about the 15th December?—But you do not get frosts which ruin the crop, do you?

1582. Oh yes, if we did not get frosts on the 15th December we should get an extra picking which would mean an increase of one-third in the value of our crop. Is there a practical remedy?—Yes, I think there would be; for instance, a smoke screen is commonly used in America to avoid very intense frosts when they know they are coming; we know when the temperature in the Punjab is likely to go down.

1583. Could you give us any detailed information as to the use of a smoke screen?—Yes, it has been done in America; a farmer receives a warning that there is likely to be a frost, he goes to windward of his ground and starts some smouldering fire which slowly spreads smoke over the ground up to a height of, perhaps, 6 ft., or, over his fruit trees, perhaps, 10 ft.

1584. You see, I tried tree cotton; but the tree cotton always comes into flower about December, with the result that I could get nothing from them and had to cut them down. I should like to have some practical remedy?—Well, I think that is a practical remedy. Whether it would pay or not to do it, I cannot say.

1585. Did your Department give any warning in 1917 when in the Punjab we got 17 inches of rain in 24 hours at places where the annual rainfall was only 9 inches?—I am afraid I was away then, so that I could not tell without reference.†

1586. Will you please make a note of that: in 1917 the rain in 24 hours was 17 inches whereas the average annual rainfall is only 9 inches; it ruined our cotton crop and we lost crores?—Yes, I will see.

1587. *Sir Thomas Middleton:* Sir Henry Lawrence has already referred to the failure of the water in certain areas. The attention of the Commission was drawn specifically to an area in Bombay in which the wells have been failing in the last 30 years. You said that from your information the absence of rainfall would not account for that failure?—I said that on my observations of a particular well one could not draw definite conclusions from that only.

1588. The point I wanted to make was this; I looked up the area and I see that in that particular area you seem to have about 10 observing stations?—Yes.

1589. I was wondering whether you consider that generally you are sufficiently supplied with rainfall stations?—I think that for our own purposes we are sufficiently supplied, but for agricultural purposes I doubt whether we are, for the following reason: if one takes the rainfall records of one rain gauge and correlates it with the rainfall records right through the monsoon of the next gauge, it does not come to anywhere near unity. It should come to 1·0, but it does not; it comes to perhaps ·7 or ·8; sometimes it will be more and

* The witness was speaking of air temperature not reaching the freezing point, while the questioner had in mind the freezing of plant tops by radiation. Examination of records for Lahore for the period 1916 to 1925 (10 years) shows that while a minimum thermometer laid on the grass, and therefore cooling mostly by radiation, recorded temperature below freezing on 461 occasions, there was only 1 night (21st December 1919) during which the actual air temperature at 4 feet height (the standard height for measurement) fell to the freezing point.

† On examining daily rainfall registers it is found that when a depression was passing through the Punjab in September 1917, the most conspicuous rainfall (*i.e.*, the heaviest in proportion to the normal) over that area in one day was at Montgomery, when 8″ was recorded against an annual normal of 10″.

sometimes less. That means to say that one rainfall station is not really representative of an area of which one would have thought it was representative.

1590. I was comparing the distribution of your rainfall stations with the distribution of rainfall stations in Britain, for example, and noticing the enormously greater areas you have got to cover in the deductions you draw?—Yes.

1591. But generally speaking, you are satisfied that you have sufficient for your purposes?—I think so; we have got as many as we can work; we have something like 3,000. They are very badly represented in Sind, Baluchistan and Hyderabad State, but for our present purposes we are never handicapped.

1592. In reply to Sir James MacKenna, I think, you said you had about 2,000* correspondents?—I think we warn about 2,000 officers of various types for cyclones, floods, bores, heavy wind and all types of warning. These are exclusive of warnings to ships at sea by radio broadcasts.

1593. A warning list?—Yes, all types of warning.

1594. Then what is your system of forecasts in the monsoon?—Daily we issue a forecast and report which issue together as the Daily Weather Telegram; I should not say that the forecast was of any very great value, except to engineers and others specially interested in heavy rain.

1595. It goes to the Press and is distributed in that way?—Yes, and it is also sent by telegram to any subscriber of, I think it is, Rs. 12 or Rs. 10 a month; he gets a daily telegram like a Press telegram giving him all the information of the rain that has occurred and the rain that we expect to occur.

1596. Does that arrangement last for the monsoon period or throughout the year?—Throughout the year.

1597. The Rs. 12 a month covers it?—Yes. I think it is Rs. 10;† it is the Daily Weather Telegram. The Daily Weather Report itself costs only Rs. 3 a month, but that goes by post.

1598. *Sir Thomas Middleton:* Then you make two points in your memorandum. The first is that there is a large amount of information which has never been worked up?—Yes.

1599. And it is time, in your opinion, that it was worked up?—Yes.

1600. You submit here a specimen of a correlation. I have looked at many correlations, but I have never seen one of this kind of weather forecast that worked out at higher than ·9?—Yes, but the series of years is short.

1601. In Britain we generally adopt 35 year-periods for weather, as you know?—Yes.

1602. This correction extends over about 12 years; it is an extraordinarily close correlation. And you indicate that if your records were worked out it is likely that you might get quite a number of similarly close correlations?—We could get correlations. They would vary, but in any case, even those pieces of information which lead to purely negative results represent work which has been done and which has got to be done some time. It does not necessarily lose pecuniary value because the results are negative.

1603. I quite follow that. Then your next point is that there has been no attempt in this country to correlate the study of weather and crops except the work of Mr. Jacob?—As far as I know that is all.

1604. And Mr. Jacob has worked on Mr. Hooker's method?—Yes. Hooker may not have been originally responsible for it, but he adopted it.

1605. Now you suggest that at certain stations in India, experimental farms and so on, there should be crop weather stations like those that have been recently established in England?—Yes.

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* 2,000 was the number which had been estimated in error in earlier evidence: reference has shown it to be 763.

† The charge is Rs. 10 per mensem.

1606. Has anything at all in that direction been done yet?—I suppose Pusa observes the weather.

1607. What records does Pusa actually take, do you know?—I do not know; they have published various things about soil temperature and soil humidity and a good many publications of that kind which I have glanced through, and which are valuable to the public. I could not say what they are doing now; I believe they are continuing.

1608. I am surprised to hear that these records do not come to you automatically, anything in England of that description goes to the Meteorological Office?—I think they do, but I have such enormous piles of publications come to me that attention fails unless specially directed.

1609. I thought you said they had not reached you?—I do not know; it is quite likely that these things reach me but I do not know.

1610. Then from your personal knowledge you can only remember Pusa as a station that keeps pretty complete crop weather records?—I suppose that Indore is doing it now where the Howards are, but I do not think we get anything from them.

1611. *Dr. Hyder:* Do you think your system of rainfall registration is good, that is to say, that you go round and inspect and see that the gauges are correct in the districts —It is very difficult to say what accuracy there is, but it is probable that the inaccuracy remains more or less steady, so that though the records must contain errors, their value as comparative statements from year to year remains.

1612. But you think it is desirable that the Head of the department should occasionally go and see whether these instruments are properly kept?—These things are done by District Officers; there are 3,000 of them, and all the different States report yearly that a certain proportion of them has been inspected. It would be impossible for the officers of my Department or for me to inspect things of that kind, except at our own meteorological stations.

1613. I was going to ask you further about forecasting the weather. At present you do not have any stations of your own either at Mauritius or in the Seychelles or at Zanzibar: it is only by way of courtesy that you receive this information?—That is practically so.

1614. With regard to co-operation with ships, that also is simply by way of courtesy; if anyone wishes to oblige you, then the Captain of the ship sends the record from his log?—Yes, we have no compulsory powers at present.

1615. Do you think we could do anything of that kind with regard to the Peninsular and Oriental and British Indian Steam Navigation Company, if they were put into some definite relations with you to supply you with extracts from their records; they receive Government money as a subsidy?—Well, that could be done, but our method of dealing with it now is fairly satisfactory from the point of view of logs; we have clerks at Calcutta, Bombay, Madras, Rangoon and Karachi, and when ships come into port they go on board and copy the relevant data of the log on regular forms, and we plot them on maps and use them.

1616. I see in your report you want the services of a Marine Meteorologist? —Yes.

1617. That is necessary?—Yes.

1618. You do a good deal of work at present for the Air Service, do you not?—Yes, a good deal.

1619. Could you not ask for a slice from the heavy Military Budget?—I am afraid not; the Military Budget has the habit, somehow or other, of absorbing some of my budget. We agree that over the Quetta and Peshawar district we shall do the work in certain proportions. Perhaps an item of their work fails: I have to do it in some other way, and I have to pay for it in my budget at present. I am talking of small matters, not really worth mentioning at present, because the whole expense is small; but still I have been a little disappointed over the apportionment of cost.

1620. Every Finance Member here says that the budget of the Central Government and the budgets of the Provincial Governments are really in the nature of a gamble on the monsoon; you are the soothsayer, and I am surprised to hear they do not supply you with adequate funds, when they say that, in view of the fact that you have the duty of forecasting the weather and the probable prosperity. Does the Finance Member read your Report?—I could not say; I have not asked him.

1621. The survey of the upper air currents is a thing that has got to be done?—Yes, we are getting quite active on that; it is a most hopeful procedure.

1622. You know that in England they are engaged in a study of industrial cycles; I was wondering whether anything of that kind, particularly with regard to the periodicity of famines in India, had been done?—I do not think there is a periodicity of famines; I do not think there is any cyclical order in regard to that; but it is a thing that has been suggested over and over again for hundreds of years and received a great deal of attention. There is probably very little in it at any rate, in comparison with the more spasmodic changes of weather.

1623. But the statistical material in your possession has not been worked out to find whether there is such a periodicity?—I should say we have not wasted time on it in India. It has been very exhaustively worked out elsewhere for other countries, and if there is any periodicity, the amplitude of it is so small that it is swamped by other facts and has little economic value.

1624. Are you quite satisfied with the method of giving flood and storm warnings in the Bay of Bengal area?—I think we are fairly good. We are improving, and Government has recently helped us considerably, by giving us further staff to place as whole-time officers at Calcutta. We have two now, whereas two years ago we had only a half-time man.

1625. When India is (as it may be in the near future) linked up with Europe by means of aeroplanes, do you think there will be a greater demand for the services of your department?—Yes, very much greater. We shall have to spend a great deal more money when that becomes a serious proposition and gets going; when we have aeroplanes flying regularly from Bombay to Calcutta and Rangoon, and from Karachi to Allahabad, Calcutta and Rangoon, very serious precautions will have to be taken.

1626. Would you require stations at Aden and elsewhere in Arabia?—Yes; and there would have to be stations inland in India staffed by a comparatively expensive staff. Our present distribution of observation stations in India is staffed mostly by men who draw Rs. 15 a month to take observations and send telegrams.

1627. The subjects dealt with by your department are seismology and meteorology. Do you think the former should remain?—Yes.

1628. *The Chairman:* Do you wish to put in any other papers* ?—I have here a paper I should like to put in; a paper by Jacob on forecasts of crop areas with curves, which he sent in many years ago to the Punjab Government. There is a note attached by Sir P. Fagan (at that time Financial Commissioner of the Punjab Government) in which he discusses the subject and the question of their taking up the work. They did not take it up; I do not know why.

1629. Would you have any objection to the publication of the note in the Central Government Memorandum which you have prepared?—I have no objection.

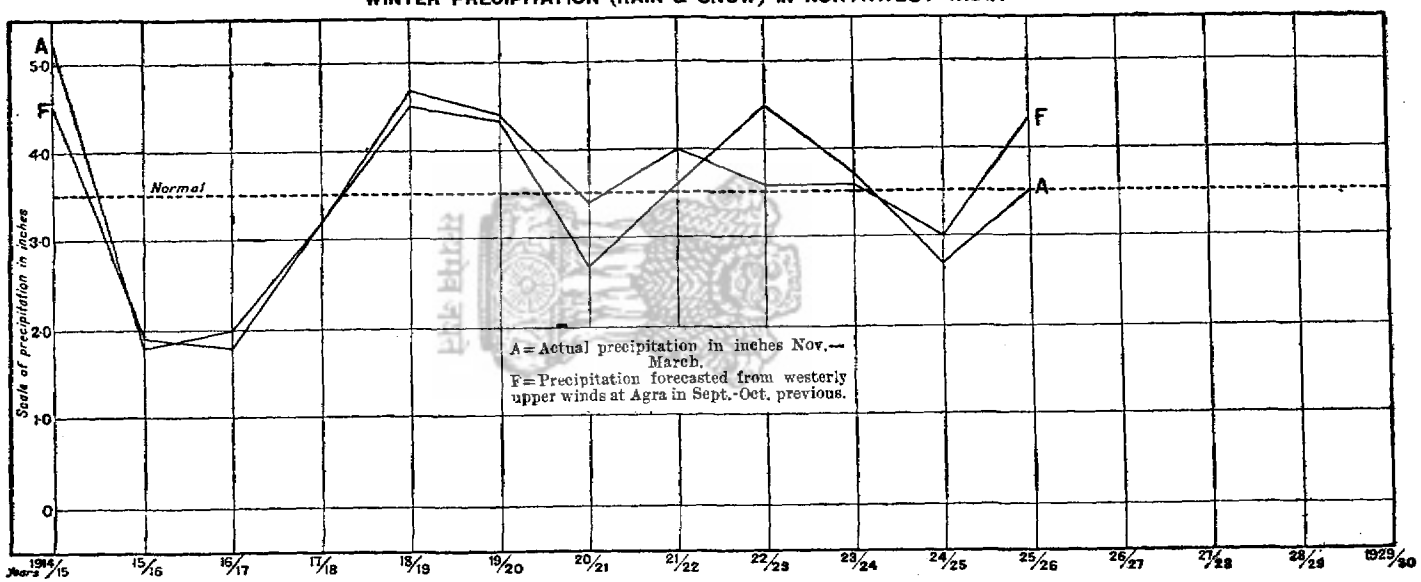
(The witness withdrew.)

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* Not printed.

APPENDIX.

WINTER PRECIPITATION (RAIN & SNOW) IN NORTHWEST INDIA



[Mr. F. WARE, F.R.C.V.S., I.V.S., Officiating Director, Imperial Institute of Veterinary Research, Muktesar.

Memorandum on the Imperial Institute of Veterinary Research, Muktesar.

Brief History of the Institute, its Organisation and Control.—In 1890, Dr. A. Lingard, M.B., was appointed as Imperial Bacteriologist at the Laboratory attached to the College of Science at Poona with the following instruction:—"to investigate diseases of domesticated animals in all Provinces in India and to ascertain, as far as possible, by biological research both in the laboratory and, when necessary, at the place of outbreak, the means for preventing and curing such diseases".

At first the Imperial Bacteriologist was under the administrative control of the Bombay Government, but in 1893 he was placed directly under the Inspector-General, Civil Veterinary Department, as it has been previously decided to move his laboratory from Poona. In 1895, therefore, the Imperial Bacteriological Laboratory was opened on its present site at Muktesar and the staff then consisted of the Imperial Bacteriologist, Assistant Bacteriologist, one Indian laboratory assistant, 3 clerks, one artist and some menials.

In 1898 the control of the laboratory was transferred to the Director-General, Indian Medical Service, but in 1901 it again passed to the Inspector-General, Civil Veterinary Department. Dr. Lingard retired in 1907 and Colonel (then Captain) J. D. E. Holmes, I.C.V.D., was appointed to relieve him as Imperial Bacteriologist. By this time a third Imperial Veterinary Officer and 3 European Laboratory Assistants had been sanctioned for the laboratory, and in 1909 a Physiological Chemist was added.

In 1912 following upon the abolition of the post of the Inspector-General, Civil Veterinary Department, the control of the laboratory was undertaken by the Agricultural Adviser with the Government of India, under whom it still remains.

In 1913 the post of Pathologist was created, and early in 1915 Colonel Holmes died suddenly at Bareilly. For some time the administration of the laboratory was carried on by the Assistant Bacteriologist until the arrival in October 1916 of Mr. (now Dr.) A. L. Sheather, B.Sc., M.R.C.V.S., who had been recruited in London. A year after Dr. Sheather's arrival his title was changed to Director and First Bacteriologist, and other alterations in the staff were the addition in 1919 of an Imperial post of Veterinary Officer and a provincial post of Veterinary Deputy Superintendent, and the abolition of the post of Physiological Chemist. Dr. Sheather proceeded on leave in April 1920 and failed to return, so that the post of Director was again held for sometime in an officiating capacity only, until the arrival in November 1921 of Mr. J. T. Edwards, B.Sc., M.R.C.V.S., who was also recruited directly from London. This officer remained in charge until 7th March 1926, when he proceeded on leave to England, and during his time the name of the laboratory was changed to its present title, and the Imperial posts were re-designated Director, first, second and third Veterinary Research Officers and Pathologist. At the time of writing, the posts of first and second Veterinary Research Officers have no occupants and the Government of India have recently sanctioned 4 new provincial posts to be designated Assistant Veterinary Research Officers two of which are also unfilled at present. Concurrently with the grown in the superior veterinary staff there has, of course, been a corresponding increase in the subordinate, clerical and inferior staffs, and the addition of such officers as Engineer, Medical Officer, etc. The list of Sections printed as Appendix* 1, if compared with the staff enumerated by Holmes in his "Description of the Imperial Bacteriological Laboratory, Muktesar; its Work and Products", 1913, will give a good idea of the great expansion

* Not printed.

which has taken place since that date, and yet it will be observed that pure research is represented by only 2 Sections, *viz.*:—Pathology, and the temporary Section of Tuberculosis, which is being financed partly by the Indian Research Fund Association. Sections representing such important subjects as Protozoology, Helminthology, Entomology, Bio-chemistry, etc., have not yet been formed.

Estate, Buildings, Cultivation, etc.—The land occupied by this Institute is situated partly at Muktesar and partly at Izatnagar, near Bareilly. The total area of the Muktesar Estate is now 3,453 acres, of which 2,724 acres is classed as Reserved Forest. The management of the Reserved Forest is regulated by a working plan prepared by the Forest Department, which is carried out by the Estate Section under the supervision of the Director, and is designed to supply the Institute with all the fuel and some of the hay and grass it requires. The amount of land now under cultivation at Muktesar is 206 acres, and this is gradually being increased in order to supplement and animal fodder supplies, the majority of which at present are obtained through contractors.

What is known as the station area comprises 523 acres, and includes the land on which all the buildings stand. A reference to Holmes' Memoir referred to above will show the large increase made in the number of buildings between 1895 and 1913, and this has gone on at a still greater rate in recent years, until to-day the number of buildings in Muktesar carried on the registers of the Public Works Department is 111. The buildings are under the charge of the Executive Engineer, Imperial Civil Works Division, Dehra Dun, and an Overseer of that Division is resident at Muktesar. The main laboratory building at Muktesar was destroyed by fire in 1899 and rebuilt in 1902 and a wing was added to it in 1910, but since that date there has been no addition, in spite of the great increases in staff, which have been and are still being sanctioned. In adidtion to the Director's office, which is located in it, this building has accommodation for only 3 research officers, a library, and a class room for 7 students. There is also available one out-laboratory at Muktesar for a research officer.

The Izatnagar Estate, sanction to purchase which was first obtained in 1899, comprises nearly 800 acres, of which 700 are under cultivation, so that, in all, the area under cultivation by this institute is over 900 acres. It is intended to use Izatnagar mostly as a branch laboratory for the production on economical lines of anti-rinderpest and anti-hæmorrhagic septicæmia sera, for which there is a very great demand, but development is greatly handicapped at present for want of accommodation. The only buildings erected so far are quarters for some of the staff, but it is proposed to commence the construction of laboratory buildings and cattle sheds during the current year.

Method of Recruitment of Imperial Staff.—The recruitment of the Imperial staff of this Institute has passed through three phases. Beginning with Dr. Lingard's appointment in 1890 the appointments appear to have been specially made up to 1898, when a Medical Officer was appointed as Assistant Bacteriologist and resigned the same year. From then until 1914, with the exception of the special post of Physiological Chemist, recruitment to fill vacancies was made entirely by selection from members of the Indian Civil Veterinary Department (now called Indian Veterinary Service) working in the Provinces, and during that period 7 such officers held appointments at this Institute. Of these, 2 died in service, 2 resigned early, 2 retired on a pension after approximately 20 years' service, and 1 is still in service. Between 1914 and March 1926, 13 Imperial Service Officers have held appointments at this Institute and only 2 of them were obtained from the provinces. Ten of the remainder were either recruited specially, or recruited to the regular service and posted direct to Muktesar. Of these 12 officers, 1 died in service, 8 have resigned, and 3 are still in service, but none of the latter has yet been 5 years in India. The remain-

ing officer was lent from the Royal Army Veterinary Corps for a short time in 1917. It is true that the period 1914-16 includes the War period, but it cannot be said that there has been any improvement in the stability of the staff of this Institute since the War ended.

The figures appear to indicate that the most satisfactory method of recruitment, with a few exceptions for highly specialised work, would be by long term agreement to a service and not to any particular post, thus making interchange easy between this Imperial Institute and the Provincial Departments.

Production of Sera and Vaccine.—Since the production of an anti-serum against rinderpest, the most serious cattle disease in this country, was first undertaken about 1896, the main routine work of this institute has always been the production of sera and vaccines for the diagnosis, prevention, and cure of disease in the domesticated animals, and this is the only place in India where standardised products for the above purposes are manufactured for sale. The growth in the demand for these products has been phenomenal, and the table below will show the enormous proportions that have now been reached. It will be readily understood that the work connected with their manufacture, testing, standardisation, distribution and accounting places, is at the present day, a very great strain on the administration. By far the largest customers for the products of this institute are the Provinces, and the latter are therefore keenly interested in its welfare in this respect. Other customers are the Military Department, Indian States, and such places as Persia, Iraq, Malay, Ceylon, etc.

Table.

Number of doses of sera and vaccines issued from the Imperial Institute of Veterinary Research.

No.	Name of product.	Number of doses issued.		
		1905-06.	1915-16.	1925-26.
1	Rinderpest serum	204,979	969,460	5,224,523
2	Anthrax serum	26,712	48,337	72,777
3	Hæmorrhagic Septicæmia serum	18,603	79,965	379,189
4	Mallein, ordinary	2,537	30,332	40,836
5	Hæmorrhagic Septicæmia vaccine	...	124,150	211,150
6	Blackquarter Vaccine (pillules)	...	20,257	21,500
7	Mallein for "I.D.P." test	...	112	24,100
8	Tuberculin, ordinary	...	434	3,388
9	Anti-streptococcic serum	...	17,132	22,949
10	Special Vaccines	...	205	250
11	Blackquarter serum	...	...	7,893
12	„ Aggressin	...	...	36,756
13	Tuberculin, concentrated	...	...	13,325
14	Avian Tuberculin, ordinary	...	...	1,130
15	„ „ concentrated	...	...	4,836
16	Triple Strangles Vaccine	...	..	345
17	Abortion Vaccine bovine	...	...	180
	TOTAL	252,831	1,290,384	6,064,627

Lines of Research and List of Publications.—The research work undertaken at this institute has naturally been, almost without exception, connected with disease in the domesticated animals as found in India, particularly with a view to providing efficient methods of prevention. At different times work of a more or less intensive nature has been carried out

at this institute on almost all the known disease conditions of Indian stock, of which the following is a list Rinderpest, Surra, Dourine, Rabies, Kumri, Hæmorrhagic Septicæmia, Blackquarter, Anthrax, Foot and Mouth Disease, Tetanus, Strangles, Equine and Bovine Abortion, Tuberculosis, Johne's Disease, Pyroplasmosis, Coccidiosis, Parasitic Diseases, Bursati, Glanders, Epizootic Lymphangitis, Bovine Lymphangitis, Nasal Granuloma, etc. For further details a reference is invited to page 12 of Holmes' Memoir referred to above, and also to two notes, dated 27th May 1922, and 9th March 1925, prepared for the Government of India by Mr. Edwads, who refers at some length to the investigations which have been undertaken during recent years. Work on many of the conditions mentioned is still in progress, and it should be noted that in no single case in this imposing list can it be said that our knowledge is complete.

Advisory work and Co-operation with other Departments.—The departments with which this institute may be said to come most in contact are:—

(*a*) Provincial Veterinary Departments.

(*b*) Army Veterinary Service in India.

(*c*) Agricultural Department in connection with the Imperial Dairy Herds at Pusa, Karnal and Bangalore.

(*d*) Medical Department.

The intimate connection between this Institute and the Provincial Veterinary Departments in the matter of supplies of sera and vaccines has already been referred to. Apart from this, there is very little correspondence or connection between the two. Pieces of research work have been carried out at this institute at the instigation of Provincial Veterinary Departments, and occasionally advice is sought by them, but in nearly every case this can be traced to some personal arrangement. There is no other means of co-ordinating the work of this Institute and that of the Provinces, with the result that there is little co-operation. In at least one recent case there was distinct friction as a result of what a province considered intrusion by this Institute in the matter of investigating a disease. Most of the Provincial Veterinary Departments now have a laboratory of their own, but this should be no cause for friction. Rather, with proper co-ordination, as the number of laboratories increases in the Provinces so should the amount of work done in them and in this Institute increase. In many ways this Institute is ideally situated for research work, but in others it has distinct limitations, and these might be admirably filled by the provincial laboratories.

By far the greatest demand for advice and help comes from the Military Department, and there is at the moment a considerable amount of investigation into such diseases as Abortion, Tuberculosis, Johne's Disease, Strangles, etc., being undertaken by this institute in co-operation with Army Veterinary Officers in charge of Military Dairies, Remount Depôts, etc. There is also quite a large correspondence in smaller matters with Army Veterinary Officers who, probably because they have no similar institution of their own in this country, appear to look on this one as the natural place to which to apply for laboratory help. Although, therefore, this institute has usually been considered a Civil institution, it appears that the Military Department makes more use of it in the way of seeking advice, than the civil authorities do.

The connection between this Institute and the Imperial Dairy Herds is not a very close one. Serum simultaneous inoculations against rinderpest are periodically carried out in them by members of this institute, and occasionally they are made use of for other field experiments, but there is not the same close co-operation as seen in at least one of the Provinces, where the Veterinary Department is wholly responsible for the health of the animals belonging to the local Agricultural Department.

The connection between this Institute and the Medical Department has naturally not been so close since its control was removed from the Director-General, Indian Medical Service, but there is no doubt of the sympathy which exists between it and the Research Institutes concerned with what may be called Human Medicine, as opposed to Veterinary Medicine. An example is furnished by the present arrangement under which an officer lent by the Indian Research Fund Association is working at this institute on Tuberculosis, a disease which concerns both sections of Medicine.

Education and Training.—Since its inception, this institute has been looked upon as a place where post-graduate training could be obtained, both by members of the superior and subordinate veterinary staffs in the Provinces. When the use of an anti-serum against rinderpest first came into vogue it was the custom for Provinces to send up certain of their Veterinary Assistants for training in its application, but of recent years this has been undertaken mostly by the Provinces themselves. At the same time Imperial Officers in both the Civil and Military Departments have been in the habit of coming to this institute for 2 or 3 months at a time, in order to learn something of the latest developments in serum and vaccine therapy, and generally to brush themselves up in laboratory technique. A few years ago the present Director endeavoured to develop the institute as a teaching centre and instituted 3 kinds of courses, *viz.*:—2 short courses for Imperial and subordinate officers, and a 2 years' course for Provincial officers. The first of these was not well supported and the Government of India have recently ordered the short courses for subordinates to be discontinued, on the ground that this is a prerogative of the Provincial Veterinary Colleges. The 2 years' course for Provincial officers was attended by men, who have now returned to the Provinces, and it is not proposed, at the moment, to hold another such class. The object of this class was to train these men for the highest posts, and it is for the Provinces to say how far that object has been achieved. To an unprejudiced observer it appears that this institute is not in a position to give the all-round training necessary to fit a man for the highest posts in the department. It lacks teaching staff, accommodation, a museum, and clinical work—all most important considerations. As a place where a man can improve his knowledge of epizootiology and vaccine and serum therapy it is unrivalled, and, of course, it is admirably suited for a man who wishes to undertake, under expert direction, a piece of research work connected with the diseases of the domesticated animals, but under present conditions that is all that can be said. The following table shows the number of students who have attended courses at this institute during the last 10 years:—

Name of year.	Number of students from Provincial Governments and Indian States.			Number of students from Military Department.
	Subordinate officers.	Provincial officers.	Imperial officers.	
1916–17	1	...	...	1
1917—18	2	...	...	...
1918—19	2	...	...	8
1919–20	1	...	...	1
1920—21	...	...	4	14
1921—22	...	...	1	...
1922—23	2	6	1	1
1923–24	3	6	3	...
1924—25	13	1	2	1
1925—26	8	...	1	1

Finance.—For the sake of comparison a table showing the receipts and expenditure of this Institute during the last 10 years is given below:—

Financial year.	Expenditure.	Receipts.
	Rs.	Rs.
1916—17	2,65,754	1,62,321
1917—18	3,36,827	2,70,877
1918—19	4,35,173	3,44,809
1919—20	5,09,033	3,87,831
1920—21	6,59,544	3,85,302
1921—22	7,20,983	4,49,759
1922—23	7,60,178	5,09,376
1923—24	6,94,782	4,90,721
1924—25	7,32,030	6,62,821
1925—26	8,53,634	13,09,398

It will be observed that in most years there has been a slight excess in expenditure, but during the past year receipts have greatly exceeded expenditure. This may be attributed mostly to the fact that the year was an unhealthy one for cattle, particularly in the matter of rinderpest. The sale of anti-rinderpest serum alone provides this institute with about 77 per cent of revenue. The Inchcape Committee, which sat in 1922-23, decided that this institute should be self-supporting, but in doing this it appears to have entirely overlooked the necessity for increasing its usefulness as a pure Research Institute, in addition to a manufacturing centre for biological products. If the efforts of the institute in the latter direction are going to be crowned with success, it should lead to a gradual diminution in the amount of contagious disease amongst animals for which vaccines and sera are prepared, and at any time the demands for the main products of this institute may become so small that the balance of funds available for pure research will reach vanishing point. Such a position appears to be unique, for it is doubtful if there is any other Government research institution, which has to rely on the sale of its products for its funds for research. The amount allotted to research at the Provincial Veterinary Colleges is very small, so that the total expenditure of this country on pure veterinary research, *i.e.*, apart from research connected with the manufacture of biological products, is almost negligible.

Quarantine arrangements for the inspection, etc., of animals imported into India.

Under rule 47 of the Devolution Rules, as amended in the Home Department Notification No. F.-447-23, dated the 19th November 1924, the establishment of live-stock quarantine stations is a central subject.

2. The importation of kine into India except through certain specified ports (*viz.*, Calcutta, Bombay, Madras and Rangoon) is prohibited under the Government of India Notification No. 84, dated the 16th January 1920. This

notification, which was issued under section 3 (1) of the Live-Stock Importation Act, 1898 (IX of 1898), is still in operation. The object is to prevent the introduction of bovine tuberculosis into India with cattle imported from other countries. By the provisions of the Government of India Notifications Nos. 1491 and 1120, dated respectively, the 15th November 1923 and 14th August 1924, which were also issued under section 3 (1) of Act IX of 1898, horses, asses and mules cannot be landed at any port in the Bombay Presidency other than at the port of Bombay. This restriction, however, does not apply to horses, asses and mules imported for military purposes, being either the property of Government or imported on their behalf, or to authorised chargers of military officers. The prohibition was issued by the Government of India, at the instance of the Government of Bombay, with the object of preventing the introduction into India of infectious and contagious disorders. The notifications are still operative.

3. The embargo on the importation of animals at Karachi was placed on the ground that no facilities exist at that port for the proper inspection and identification of animals by qualified inspectors under the direct supervision of responsible veterinary officers. However, the question of throwing open the port of Karachi for the importation of horses from overseas has been taken up by the Government of Bombay.

4. In exercise of the powers conferred by section 4 of the Live-stock Importation Act, 1898 (IX of 1898), the Governments of Burma, Bombay, Madras and Bengal have issued certain rules to regulate the detention, inspection, etc., of animals imported into their territories from overseas.

Burma.—The rules apply to bulls, bullocks, buffaloes, goats and all other ruminating animals and swine. The Veterinary Officer of the Corporation of Rangoon is the Inspector of Live-stock for the purposes of the Act, and the rules thereunder. The quarantine stations are:—

(1) The Corporation Slaughter-house, Kemmendine, Rangoon, in the case of swine; and

(2) The Corporation Bullock depôt, Theinbyu, Rangoon, in the case of all other animals.

Bombay.—The rules apply to horses, asses and mules after their importation into the port of Bombay. The Government Veterinary Officer for the City and Harbour of Bombay is the Veterinary Officer for the purposes of the Act and the rules thereunder. It is not necessary for inspection to have a quarantine station in all cases. Animals not accompanied by certificates are sent to lazaretto for quarantine. Similar rules for the inspection, etc., of cattle have been framed, but as a quarantine station is essential to deal with cattle efficiently, the rules cannot be applied until such a station is provided.

Madras.—The Act is applied in respect of tuberculosis and to a bull, bullock, buffalo, cow, sheep, goat, or any other ruminating animal or a pig or the young of any of the aforesaid animals. The Madras Veterinary College has been declared as a quarantine station. The duties of the Veterinary Officer under the Act and the rules thereunder are performed by an officer subordinate to the Principal, Madras Veterinary College, or to the Superintendent, Civil Veterinary Department.

Bengal.—The rules apply to kine. The Principal, Bengal Veterinary College, performs the dual duties of the Veterinary Officer and the Quarantine Officer under the Act and the rules thereunder. The Bengal Veterinary College Hospital is used as the quarantine station.

In the case of horses, Glanders and Farcy, Epizootic Lymphangitis and Surra are dealt with under the Glanders and Farcy Act and the rules framed thereunder.

5. During 1924-25 the total number of horses and other kinds of living animals imported into India was 2,516 and 2,743, respectively. The share of the Provinces was as follows:—

	Horses.	Other kinds.
Bengal	313	1,077
Bombay	2,110	1,259
Madras	39	188
Burma	54	219
TOTAL	2,516	2,743

Out of the total number (5,259) 5,028 animals were from countries in the British Empire, the remaining (231) being from foreign countries.

Number of livestock in British India including Indian States as ascertained by a census held in 1924-25.

Oxen.				Buffaloes.			Sheep.	Goats.	Horses and ponies			Mules.	Donkeys.	Camels.
Bulls.	Bullocks.	Cows.	Young stock (calves).	Male buffaloes.	Cow buffaloes.	Young stock (buffalo calves).			Horses.	Mares.	Young stock (colts and fillies).			
5,386,127	47,556,336	40,258,697	33,330,438	5,576,494	15,152,417	11,469,176	23,793,361	34,851,182	738,760	724,675	246,520	70,250	1,481,924	633,365

Note.—The figures under Bengal and Baluchistan relate to 1919-20.

Note on the Civil Veterinary Department in India.

Introductory.

Presuming that the most important duty of the Civil Veterinary Department in India is the cure and prevention of disease among all classes of animals, and also that it is the general desire that India shall be provided with an efficient veterinary service, I find it difficult to submit answers to the Preliminary Questionnaire, framed by the Royal Commission on Agriculture in India, which will help the members of the Commission to frame recommendations to this end and at the same time deal adequately with the many difficulties with which this service, of which I have the honour to be a member, has to contend. The only questions which appear to deal with veterinary work are Nos. 1 (*a*) (*ii*) Veterinary Research, and 4 (*a*) and (*c*) Administration, and if I confine myself strictly to these two questions as drafted, I

shall by no means exhaust the problems which, in my opinion, need investigation, if India is to have the benefit of an efficient veterinary service.

Before proceeding further I wish it to be understood that I do not look upon the Civil Veterinary Department merely as an adjunct of the Agricultural Department. Agricultural operations cannot be carried on satisfactorily without an efficient veterinary service, but the Civil Veterinary Department does not depend on agriculture for its existence. Apart from agricultural animals the Civil Veterinary Department has to deal with other beasts of burden such as horses, camels and elephants, pet and sporting animals, and co-operate with the Medical Department in public health work, and in none of these activities is the agricultural department *per se* interested. It may also be added that, as far as the Imperial Institute of Veterinary Research at Muktesar is concerned, a considerable amount of investigation work is being carried on for the Military Department at the present time.

My proposals below therefore are based on the assumption that an efficient veterinary service is required in this country for all the different classes of work it may be called upon to perform, and if any improvement can be effected in it the rural population will benefit at the same time as other sections of the community. I propose to deal with the subject under the following heads:—Research, Education, Executive Work, and Administration.

I. *Veterinary Research.*—It may be said without hesitation that there is no organisation, little administration and most inadequate financing of veterinary research in this country. Dealing with the last point first I have shown in the Memorandum on the Imperial Institute of Veterinary Research, which I prepared for the Commission, that the difference between expenditure and receipts at this institute for the last 10 years is only Rs. 9,95,323, and presuming that the approximate cost of its products has been correctly arrived at, this may be taken as the amount of money spent by the Government of India on veterinary research during that period. The position in the Provinces is I believe worse, most of them allotting nothing for this subject. It is not possible to state the exact amount of money spent at Muktesar on veterinary research in recent years, as no distinction is drawn in the accounts between Production and Research work, but it may be stated quite definitely that owing to the small amount of scientific staff and the enormous demand on their time for the manufacture of its products, there has been little research work performed at this Institute compared with the amount waiting to be done. For reference in this respect I attempted to prepare a list of the veterinary problems still awaiting elucidation in this country, but it has attained such enormous proportions that I have decided not to include it for the present. Suffice it to say that there is work in this list, not only for Muktesar, but also for provincial research laboratories, even if every Province possessed one, for many years to come, and it seems important to impress both on the Government of India and on Local Governments the necessity for providing the staff and funds for carrying out properly organised research into veterinary subjects throughout India.

As regards finances it has been suggested that an Indian Veterinary Research Fund might be opened in order to induce private persons interested in this subject to contribute and so provide a regular supply of money, but it will probably be necessary for the different Governments to provide most of the funds for this work for many years to come, if any advance is to be made. Another suggestion is that the Rockefeller Foundation might be asked to allot funds for the advancement of veterinary science in this country, as they have recently done in America.

The question of organising and administering veterinary research is an important one, and it is obvious that if several research laboratories are to be set up, and funds are to be spent to the best advantage, some co-ordination of the work by a central veterinary authority will be required.

Another point connected with veterinary research, which is in an unsatisfactory state at the present time, is the lack of any suitable medium through

which the scientific work of the Civil Veterinary Department can be published. The Government of India insist, quite rightly, that the work of the members of this department shall be published as official publications, and the Agricultural Journal and Memoirs of the Agricultural Research Institute at Pusa have been selected for this purpose. These publications, however, are not generally found in the medical and veterinary libraries of the world, and there is no doubt that there is a disinclination on the part of several members of the service to publish the results of their work in anything but veterinary journals.

The position could easily be remedied by the institution by the Government of India of a series of veterinary memoirs and bulletins, edited by a senior Veterinary Officer assisted by an Advisory Staff.

II. *Veterinary Education.*—The question of educating the staff which will be required for the superior branches of this department in future is of the utmost importance in connection with any endeavours to form an efficient veterinary service for this country, and it is moreover one of the most difficult questions on which to obtain an unanimous opinion. It was discussed before the Islington Commission on the Public Services in India, whose report is dated 1915, and, although the Imperial Veterinary Service has been closed to recruitment since that date, its recommendations will serve as a basis for discussion at the present time. This Commission recommended that "classes teaching up to the highest (veterinary) standard should be established in India, and the passed students of these classes should constitute the normal field of recruitment for the Imperial branch of the department," and at the same time they recommended that, pending the creation of these higher classes, Indians should be recruited to the Imperial Service by promotion from the Provincial services, or by sending young men to England on State scholarships to obtain the Diploma of the Royal College of Veterinary Surgeons.

Presuming that it is now the general wish that India should be self-contained in the matter of providing the education necessary for all the officers recruited to its veterinary service in future, it seems desirable that this Commission should make further recommendations for the purpose of obtaining this result. The question of instituting a Central Veterinary College, teaching up to the highest standard, has been discussed for many years, notably at the Veterinary Conferences at Lahore and Calcutta in 1919 and 1923 respectively and by a Committee of Principals of Veterinary Colleges in Bombay in 1921, but no decision appears yet to have been arrived at. The disadvantage of such a scheme is undoubtedly the great expense that would be incurred in running a central college for the small number of students it would be likely to attract.

In my opinion, the alternative of recruiting to the new provincial services by promotion from the subordinate services offers a better chance of success, but it will be necessary in the first place to improve greatly the standard of teaching and examinations at most of the existing veterinary colleges, for the position at these at the present day is much like it was at the time of the Islington Commission, who state as follows:—

> "But really efficient provincial services cannot be mainly recruited from persons of a relatively low standard of education who entered the service as subordinates, and the true line of advance will be to raise the level of the training in the Veterinary Colleges and at the same time to offer such prospects in the Department as will suffice to attract students of good educational qualifications to the Colleges."

The Punjab Veterinary College is now affiliated with the University and has a 4 years' course comparable with that of veterinary colleges in England, and if other Provincial Governments could be induced to make the same advance there would soon be in the Provinces an abundance of well-trained and experienced veterinary graduates, from whom specially promising men could be selected for post-graduate training to fit them for the highest posts

in the department. It might be necessary to send a man abroad for such post-graduate training in special cases, but when the staff at the Central Research Institute at Muktesar is complete, it would as a rule be available there.

Whichever of these schemes is adopted it should be noted that a considerable amount of responsibility will be thrown on the Government of India to provide the higher training required; and the necessity for an experienced Veterinary Officer to advise the Central Government in this matter will undoubtedly be felt.

III. *Executive Work.*—The executive work in the Provinces may be classed under three heads:—

(*a*) Contagious disease.

(*b*) Non-contagious disease.

(*c*) Public Health.

The work falling under the two latter heads is essentially of a local and municipal nature, and the only remark I wish to make is that there is no uniformity in the manner in which it is carried out, and therefore the progress made varies considerably in the different Provinces. It is in connection with the contagious diseases of cattle that this department comes closest in contact with the agricultural community, and in fact it may be said that such disease may and does prove a very considerable limiting factor to the progress of agriculture in this country.

The two recognised methods of dealing with contagious disease are the use of biological products, and what are known as Veterinary Police measures. For the supply of the first the Central Research Institute at Muktesar is responsible, and except that progress is to some extent handicapped by lack of research staff, it may be said that as much as is possible is being done in this direction.

Veterinary Police measures, however, for the suppression of contagious disease in cattle, may be said to be almost non-existent in India. There is no all-India Act for this purpose and if there were, there is no agency with the Central Government, and even some of the Provinces do not possess a provincial staff, by which its provisions could be carried out. In Madras a Cattle Disease Act and a large provincial staff of veterinary subordinates exist, but contagious disease knows no boundaries, and much success therefore cannot be expected while no action is being taken in the bordering Provinces or Indian States. The case for a Central Veterinary Bureau of some description, in connection with this question of contagious disease alone, appears to be overwhelming, and I cannot do better than quote, in support of this statement, from paragraph 17 of Sir Reginald Craddock's Minute on certain of the conclusions of the Lee Commission on the Superior Civil Services in India, which sat in 1924. He says:—"Central Research Institutions like Pusa, Dehra Dun and Muktesar must be maintained and it would certainly be expedient for the Government of India with the provincialisation of the Veterinary Department once more to appoint a Veterinary Adviser, to advise both itself and, if need be, local Governments, in matters of cattle disease which may be of national or even international importance. There is scientific work to be done which knows no provincial boundaries, and it will be necessary for the Government of India to provide itself, especially in such departments as Agriculture and Veterinary, with a few officers recruited under all-India service conditions, whose services can be lent occasionally to particular Provinces at particular times and for particular purposes. The Provinces of India have not yet become separate States, and even were they to be so constituted in future, the Central Government could not be entirely unconcerned with matters of such vital importance to the country as a whole as to the progress of agriculture or veterinary science. Animal transport has not yet been entirely superseded for military purposes. The hide trade is not confined to any single Province, and foreign restrictions against India with regard to the export of hides would have very serious results."

IV. *Administration.*—It will be gathered from what has been stated under the previous headings that I am not satisfied with the services afforded by the Civil Veterinary Department to this country, and I consider the chief reason for this lies in the lack of proper organisation of the department, which prevents the different Governments from obtaining the best advice available.

The history of the abolition of the Inspector-General, Civil Veterinary Department, in 1912 and the arrangement by which the Agricultural Adviser to the Government of India took over charge of the Muktesar Laboratory and became the connecting link between the Civil Veterinary Department and the Government of India is, no doubt, well known, but the story of the Civil Veterinary Department in the Provinces has not received so much attention. In most of the Provinces the first officer to be appointed to the Civil Veterinary Department was a Superintendent who had charge of the executive work in the field, and later in some of the larger Provinces veterinary colleges were opened and to each of these another Veterinary Officer was appointed as Principal. For purposes of administration these officers were placed under a Civilian, who usually held the post of Director of Agriculture, of which subject he often had an intimate knowledge. The result naturally was that in most Provinces most attention was paid to the development and proper organisation of the Agricultural Department, but this Civilian officer did at least act as Head of the Veterinary Department and co-ordinating officer as the department expanded. About 10 years ago, when it became the rule for members of the Agricultural Department to be appointed as Directors of Agriculture, it was decided in most Provinces that it was no longer desirable to keep the Civil Veterinary Department under the Director of Agriculture, so it was placed directly under Government. The point I wish to emphasise, however, is that before doing this no attempt was made to improve the superior organisation of the department, or to bring the officers in charge of the different branches of the work under one departmental head, as is the case in all other departments in India, but they were placed individually under Government.

In my view such an arrangement cannot be too strongly condemned. It leads to continual friction, with the result that no progress is made, and this state of affairs is still further aggravated by the great discontent which prevails amongst the senior members of the service, owing to the absence of any administrative posts to which they can aspire. I would therefore urge most emphatically that, if the Provinces desire an efficient Veterinary Service, the first essential is to place its organisation on a sound basis, and it follows that, if for a subject like contagious disease, India is to be treated as a whole, the organisation in each Province should be more or less the same. Each Province should possess a recognised veterinary head, who would be responsible to his local Government for all the different phases of veterinary work, *i.e.*, executive, educational, research, and breeding operations where these are carried out by the Veterinary Department, and, with advice that should be forthcoming from the Central Government, he would organise his department on those lines which have proved most effective elsewhere.

In support of my plea for an administrative head in each Province I wish again to quote Sir Reginald Craddock, who in paragraph 34 of his Minute on the Emoluments of the Superior Staff of the Civil Veterinary Department in India, printed in the Lee Commission Report, says:—"There is no similar head of department in the Indian Veterinary Service, but a senior officer called the Veterinary Adviser to the local Government is given an allowance of Rs. 150 a month. (This allowance is cancelled when the officer reaches Selection Grade.) There is really no prize appointment in this service at all. It is impossible for a Veterinary Superintendent holding one of several circles to keep proper supervision over the other circles in addition to managing his own as a sort of *primus inter pares.*"

"Veterinary" being a transferred subject it is admittedly difficult to make provision for the proper co-ordination of the work in the different Provinces and to define exactly what the future relationship between the Central and Local Governments in this subject should be, but I trust that I have been

able to show that some recommendations on this question are called for, and in my view the solution lies in the reorganisation of the Central Research Institute at Muktesar on the lines of the Bureau of Animal Industry in America.

The present arrangements for running Muktesar have definitely failed, and I would advocate the immediate creation of a post of Veterinary Adviser with the Government of India, with headquarters at Muktesar, whose first duty would be the very onerous one of administering the Research Institute. The staff of the Institute should be expanded so as to enable it to undertake any form of veterinary research, either alone or in conjunction with the Provinces, to provide post-graduate courses of a high standard, to help the Provinces, if required, in the suppression of contagious disease, and to form an editorial council for the publication of scientific veterinary papers.

The Veterinary Adviser with the Government of India would, of course, be referred to by that Government in all matters relating to civil veterinary work in India, and, being in a position to tour, his services would be available to the Provinces when required. He would also be in a position to compile an annual review of civil veterinary operations in India, at present not obtainable, and would act as Liaison Officer between his own and kindred departments working under the Central Government.



Oral Evidence.

1630. *The Chairman:* Mr. Ware, you are Officiating Director of the Central Institute of Veterinary Research at Muktesar?—Yes.

1631. You have been good enough to submit a note of your evidence, which my colleagues and I have had an opportunity of reading, and your Department has also provided the Commission with various memoranda dealing with different branches of the work of your service?—I have not seen those memoranda.

1632. Not the memorandum dealing with the Central Institute?—Yes; that is my own.

1633. The memorandum on the arrangements for the inspection of animals imported into India: have you seen that?—No.

1634. You are prepared to answer questions, I take it, on such subjects, though not, of course, on the memoranda themselves?—Yes.

1635. We are greatly obliged to you for what you have prepared for us. Do you wish to make any statement before we ask you a few questions?—No.

1636. Do you think the present arrangement, according to which the Veterinary Service is subordinate to the Agricultural Department, is a sound one?—I do not.

1637. Would you like to develop that a little?—It is a very difficult subject to speak about, because it has been the cause of a great amount of heartburning.

1638. You may address the Commission *in camera* if you wish to do so?—I do not mind what I say being published, but it might perhaps hurt the feelings of the Agricultural Department; that is the only point. Ever since 1912 we have been subordinate to the Agricultural Adviser to the Government of India, and ever since we have been striving to get away. We are, of course, very good friends with the officers personally; a very large number of my friends are in the Agricultural Department.

1639. It is a question of principle and not of personalities?—Entirely. I have very strong feelings on the subject of (to use ordinary language) "running my own show," and I think in the Provinces the feeling is the same. I see no reason why Muktesar should not be controlled by a very senior veterinary officer; in fact, I see every reason why it should.

1640. Would you like at this stage to give one or two practical and administrative reasons why you think the public interest would be better served (for I imagine that is your view) if the step which you advocate were taken?—My idea is that if Muktesar were placed under a senior veterinary officer he would also act as Veterinary Adviser to the Government of India in civil veterinary matters. In the last paragraph of my note I refer to some of the duties such an officer would perform, and in addition to that it would be of very great advantage for the staff. Our veterinary staff throughout India is at the present time very discontented, and the men feel that in some ways their interests are apt to be disregarded 3 or 4 years ago what is known as the "Burma case" arose, when a Veterinary Adviser was required in Burma. Three or four of us in India were willing to go, and could have got permission to do so from our local Governments, but instead of sending a man from India an absolute outsider was appointed. That has rankled a very great deal. I think it very important that the Imperial Veterinary Service men should be made contented if possible, because while all this discontent is prevailing it means inefficient work.

1641. I observe you attach very great importance to adequate co-ordination of work between the different Provinces?—I certainly do, if it can be effected. I realise, of course, how very difficult it is at the present time, but I feel quite certain that if there were a Veterinary Adviser with the Government of India the position could be greatly improved. I have been touring India to some extent myself in the last two or three months, and I am convinced

that if I had been doing so in the capacity of Veterinary Adviser with the Government of India I could have got certain things done. That, however, has not been possible since 1912.

1642. You express that view quite apart from your view as to the need of correlation in those subjects obviously of Imperial importance, such as contagious diseases and so on?—Yes.

1643. If you could have your way both as regards the Imperial Service and the Provincial Services, and obtain a complete divorce from the Agricultural Department, what field of work would you place under the Civil Veterinary Services?—In the first place, as I have stated in my note, I look on our primary duty here as the cure and prevention of disease amongst all classes of animals; anything else, in my view, is subsidiary. I have been out here now nearly 19 years, and I have always felt that up to the present we have not really touched the fringe of disease amongst animals in India, and until we do a great deal more in that matter I think such questions as animal husbandry, cattle-breeding and so on are really taking us away from our legitimate duties, which are not being performed, as they should be, at present owing to lack of staff.

1644. In your ideal system, would you allocate the improvement of the breeds of cattle in India to the Agricultural Department or the Veterinary Department?—I would allocate it to an entirely separate staff, which could be controlled by either department; either is capable of doing it. On the whole, I would lean towards the Veterinary Department, but it requires a separate staff.

1645. Its control is mainly an administrative question?—Yes.

1646. One more question on this matter of improving the breeds of cattle. I take it your view is that some officer of Government should be definitely responsible for the improvement in the breeds of cattle in India; is that your view?—Yes.

1647. I suppose you do not contemplate a special Imperial Service of that kind?—At present there is an Imperial Dairy Expert, whose Department does deal with cattle-breeding to some extent.

1648. But under your ideal system you would have an Imperial Officer dealing in the main with the improvement of the breeds of animals?—I do not want to say anything to detract from the work of the Imperial Dairy Expert, but I think it is a provincial subject more than an Imperial one.

1649. I do not think it is a question of detracting; we want your views as to what you think is the ideal system?—Quite so.

1650. You are definitely of opinion that departments of that nature could as well be controlled by the Agricultural Department as by the Veterinary?—It is a very moot point. In one Province it is under the Veterinary Department and it is in that Province that the greatest success has been obtained.

1651. The Punjab?—The Punjab. If we are to take that as an example, I should say it should be controlled by the Veterinary Department. It has certainly been a greater success there than in any other Province, as far as I know.

1652. Do you think there is sufficient touch between the Civil Veterinary Services and the Agricultural Services in the Provinces?—I think there is. I can only speak for Madras in any detail. I have spent nearly all my service in Madras, and it so happens we have not been subordinate to the Director of Agriculture there for many years; and either in spite of that or because of it there has been very close co-ordination between the two departments. There has never been any friction.

1653. I observe from what you say on page 220 that you are not too well satisfied with the manner in which the Provincial Departments are organised?—I am not.

1654. You say on the same page "no attempt was made to improve the superior organisation of the department, or to bring the officers in charge of the different branches of the work under one departmental head, as is the case

in all other departments in India"?—I was referring particularly there to those Provinces where we have got veterinary colleges. When we were separated from the Directors of Agriculture, instead of all veterinary work being placed under one departmental head, as I think should have been done, the Principal of the Veterinary College and the Superintendent of the Province (as he was then called) were simply placed individually under Government and each of them corresponded with Government. I know that has led to a great deal of friction in some Provinces.

1655. *Sir Henry Lawrence:* Friction between those officers?—Yes.

1656. *The Chairman:* Is that friction going on to-day?—It is still going on in some Provinces where a departmental head has not been appointed. In Madras, where a departmental head has now been appointed, I do not think there is any friction whatsoever.

1657. Have you yourself taken an active interest in cattle-breeding in India?—I am afraid I have never served in a Province where the veterinary people were in charge of cattle-breeding operations, or only in my first year of service.

1658. There is something in the nature of a breeding station at Muktesar, is not there?—No.

1659. I thought you had a herd you were improving?—We have a dairy herd, but it is for the supply of milk, not the improvement of cattle.

1660. I should have thought both might be achieved by one and the same herd, but it is a fact that no experiments have been carried out in the improvement of breeds at Muktesar?—That is a fact.

1661. My memory was at fault. Now I want to turn to page 221, where you say, "The present arrangements for running Muktesar have definitely failed." Do you mean they have failed to the extent of the research work not being satisfactory?—No. I should say it is in research that most success has been attained. It is in the matter of administration, and recently in the case of a very large field experiment.

1662. What are you thinking of?—I am thinking of Bangalore.

1663. How about the financing of the Muktesar Institute? I see you are expected to pay your way by the sale of sera?—Yes.

1664. Is that to say that the whole cost of the Muktesar Institute is expected to be defrayed by the sale of sera?—I understand it to be so, yes.

1665. Do you think it a sound principle that sera should be sold at a profit, or do you think that these prophylactic substances should be provided to the public at the lowest possible charge?—My own view of the matter, which I have recently placed before Government, is that our production work at Muktesar should be self-supporting. As all these products are manufactured at a very low price, we can make that part of the budget self-supporting, without charging any more than a few annas a dose.

1666. I said "paid for by the public," but I think it is only indirectly, through the Provincial Governments, that the members of the public pay?—I think it varies in different Provinces. In Madras, for instance, the entire cost of sera is borne by Government. In Bengal and the United Provinces it is borne by Local Boards, and I think in Bihar and Orissa the ordinary private person has to pay, but I am not sure of that.

1667. You say the sale of the sera should be expected to pay for the productive part alone?—For its own production, yes.

1668. If that were all, it would make an important difference in the price of the serum?—I am afraid I cannot tell you, because as far as I know up to the present all our charges at Muktesar have been borne on one budget and there has never been any separation between our production and research expenses. I am going into the question at the moment, but it is impossible at present to say how much these different products are costing and how much is being spent on what may be called pure research.

1669. For the purposes of your budget, you would take it that production begins at the moment when you sell the sera on a large scale to Governments

or the public; *i.e.*, if you were engaged on a particular line of research to produce a particular serum you would not add the cost of the preliminary research to the cost of producing the serum?—Quite. At a definite point there is a break and it could then be handed over to our production section.

1670. Do you think the cost of sera controls the amount used?—It does in some Provinces, I understand. In the United Provinces where rinderpest has been very bad recently, I believe they would have used a lot more serum if money had been available. In my own Province of Madras, on the other hand, the price has not been the controlling factor. I have always got as much money as I required for the purpose.

1671. You said just now that in your view the problem as a whole had only been scratched so far?—Yes.

1672. Can you give the Commission, so far as rinderpest is concerned, what proportion of the total cattle population of British India has been immunised?—Before answering that question I ought to explain that in the immunisation of cattle against rinderpest we use two processes. Until a few years ago there was only one process, which conferred immunity for 9 days only. It is only recently we have used the simultaneous method of inoculation, which confers a permanent immunity.

1673. Just as the disease itself does?—Yes. The number of animals (outside Government animals) immunised by that method is infinitesimal.

1674. Is it a dangerous method?—In about 0·05 per cent of cases. The number is very small indeed; but there is always a chance, of course, that the most valuable animal in the herd to be immunised is the one that dies. It often happens that it is so, and one has to explain that risk.

1675. Is there hope, by further research, of reducing the mortality?—I think so. The mortality is not from rinderpest alone, but from other diseases like pyroplasmosis and coccidiosis; into which more research is needed in this country.

1676. Do you mean that animals suffering from those diseases die when you apply the serum?—They very often get pyroplasmosis at the same time as they get the rinderpest virus, and they really die from a combination of the two diseases.

1677. So that in administering the live culture you cannot be certain that you are administering the pure culture?—At the present time we cannot, no; the live culture, of course, is always taken from another animal; it is not an artificial culture.

1678. Could it not be?—It cannot be at present, our researches have not got as far as that yet; the rinderpest virus cannot be cultivated artificially.

1679. In the case of an organism which could be cultivated artificially, there is no reason why you should not use the attenuated live organism from stock, is there? When I say from stock, I mean from the culture?—There is no reason in the ordinary case, no; of course, that is usually done.

1680. In the serum-simultaneous method?—In rinderpest it is not.

1681. Rinderpest is the only disease which so far has been dealt with by the serum-simultaneous method, is it?—No, it is not the only disease.

1682. What other diseases are there?—For instance, hæmorrhagic septicaemia is sometimes dealt with in that way. There we are using an artificial culture, an absolutely pure culture, and serum at the same time.

1683. In the case of hæmorrhagic septicaemia do you find the mortality is lower than with the rinderpest inoculation?—Yes, it is much safer I think.

1684. Because you can guarantee that it is pure?—Yes, I think that is probably the reason.

1685. Who invented the serum-simultaneous method with culture and serum?—I cannot tell you who invented it; it has been in vogue for different diseases for a large number of years now, both in human and in veterinary practice as far as I know.

1686. Is simultaneous inoculation against rinderpest expensive?—It is usually more expensive than serum alone because it requires a larger dose of serum. An animal which would be given only 15 or 20 c.c. in serum-alone inoculation would probably receive 50 or 60 c.c., and possibly more, in simultaneous inoculation. But then, of course, he only receives that dose of serum once, whereas if he is getting serum-alone, he may be inoculated 4 or 5 times until the outbreak of the disease disappears; so that in the end it may not cost any more.

1687. How much does it cost per animal by the simultaneous method?—Rinderpest serum is sold at the rate of As. 3 per 5 c.c. It is very difficult to fix an average dose, because it varies tremendously according to the size of the animal and the breed; but perhaps one could take an average dose at about 80 c.c. At the present moment we are not making any charge for rinderpest virus; it is distributed free, but if it becomes a very popular practice, we should I think have to make a charge, because it throws a good deal of expense on our budget. It has all to be despatched by post.

1688. Do you think that under Indian conditions it is conceivable that by some such method as the simultaneous method an important proportion of the cattle population might be immunised?—I think it is quite conceivable. It would certainly take a very large number of years before any such action really had any effect because of the enormous number of animals in the country. It is very difficult, of course, at the present time to induce everybody to have their animals inoculated in the villages, We can always get a certain proportion done, but it is very difficult to get them all done.

1689. If you could bring the mortality still lower, would it be possible, do you think, to work out a system of insurance by a slightly higher charge per animal immunised?—In Madras just before I left we had actually started two or three cattle insurance societies. One of the rules was that these animals were to be protected against rinderpest if the Veterinary Department considered it necessary; but I am unable to say what result has been attained, because I left soon after that. It seems to me it is quite a practical proposition, but I understand these societies have failed in other Provinces.

1690. Do you think it is prejudice, or fear of economic loss, that disinclines the cultivator to subject his animal to these protective measures?—I think it is mainly superstition.

1691. In districts where the older method was applied and where there was ocular demonstration of its value, was that prejudice lessened by the experience?—Yes, it was. I am thinking particularly of outbreaks of this other disease, hæmorrhagic septicaemia; I know several instances in which after using our hæmorrhagic septicaemia serum we had very large demands for inoculation; but I am afraid that is not always the case in dealing with rinderpest. Rinderpest is not so easily controlled by serum as hæmorrhagic septicaemia is.

1692. You have to be on the ground very quickly to be in time, by any method other than the simultaneous method, in the case of rinderpest?—No, that is not the case, because rinderpest is a disease which often hangs about a village for some months. Our great difficulty in dealing with rinderpest by this serum-alone method is that it takes so long to go through a village. We cannot get all the animals inoculated the first time; a certain number, about 50 per cent, as a rule, are not brought up the first time for inoculation. We inoculate the other 50 per cent; these animals are only immune for 9 days, and our inoculators pass on to another village. During that 9 days the disease has been going on in the 50 per cent. uninoculated. At the end of that time it comes back into the inoculated animals, and our serum then comes in for a certain amount of criticism; the ordinary ryot not understanding that it only confers immunity for 9 days. I have tried myself many times; it is extraordinarily difficult to induce the ryot to allow his animals to undergo another inoculation. You do it once with a certain amount of ease, but you cannot get it done the second time. I cannot explain the reason why. He thinks once ought to be sufficient for any number of months.

1693. Twice is more than he can bear?—Well, he will not take them off the plough; I think that is possibly the explanation; it means a day's rest, of course.

1694. I think the whole Commission has read with great interest section II of your memorandum. On page 218 you say, "The disadvantage of such a scheme is undoubtedly the great expense that would be incurred in running a central college for the small number of students it would be likely to attract." Is there no hope that it might be attractive to students if the teaching were sufficiently good?—The annual recruitment figures for the whole of the Superior Veterinary Services in India, I believe, have been worked out to be about 2 or 3. It would attract a certain number of private students and some from the Indian States no doubt, but I think it is very unlikely that any class at present would run into double figures.

1695. Are there many persons in private veterinary practice in India?—Very few indeed, except in the towns of Bombay and Calcutta. I only know of one private practitioner in the whole of Madras City.

1696. If the question of animal diseases in India is going to be tackled at any time on a sufficient scale to give any hope of substantial mitigation of the trouble, do you think it would be necessary to have a very important recruitment to the services, very substantial additions to the services?—I would not like to say a very substantial addition.

1697. For instance, how are you going to get your sera administered; who is going actually to give the dose?—All inoculation work now is carried out by the Veterinary Assistants; they of course are only subordinates who go through a not very advanced course. I was not thinking of them when I talked of a central college.

1698. I recollect that point was made clear in the first memorandum. So that it would only be for the control of that work that additional officers would be required?—Yes, and for that reason I do not think the recruitment would be very substantial, at any rate, in the near future.

1699. Do you think the quarantine arrangements for the inspection and control of animals imported into India are satisfactory?—I am afraid I have no information on that subject at all, except in so far as the inspection of cattle for tuberculosis at Madras is concerned.

1700. Have you had any experience of the control of diseased animals as between Province and Province?—The only experience I have had has been of a negative kind; there is no system of preventing animals, even if they are diseased, moving from one Province to another.

1701. Still less when they are being moved from point to point within a Province?—Except in the case of Madras. Madras has got a Cattle Disease Act; it is a very old Act and is badly in need of revision, but it is occasionally applied in small areas. Under that Act we insist on owners reporting disease, and we can insist on segregation of animals diseased and in contact, the disposal of diseased carcases, and so forth. Compulsory inoculation is also possible under that Act. But, as I say, up to the present we have only applied it in small areas like the hill areas where, if rinderpest does get a footing, it plays tremendous havoc. The animals are very susceptible, and it is very important to try and keep it out. It is very difficult to enforce the provisions of the Act in the ordinary villages in the plain.

1702. Can you tell the Commission anything about veterinary conditions in the Indian States?—I am afraid very little; I know a certain number of the Indian States do have a very small Veterinary Department. Mysore has a Veterinary Department of considerable size. I do not think any other of the Indian States, except possibly Hyderabad, have such a big one.

1703. Are there any appointments going in the Indian States?—In Mysore there is one quite well-paid appointment, but I think that is the only really well-paid appointment in the whole of the State.

1704. So that the fact is that there are very very few appointments in any one year in India open to a veterinary officer?—Very few.

1705. *Dr. Hyder:* You have just said that your inoculation gives immunity for 9 days; suppose the cultivator gave you another opportunity, for how many days could you give his cattle immunity?—9 days every time in the case of anti-rinderpest serum. In fact all sera of that kind confer a very short immunity.

1706. Is that the case also with surra?—There is no serum used as a preventive against surra.

1707. What is used against surra?—Usually the pistol. Animals are destroyed under the Act; no treatment or prevention is usually adopted.

1708. I have been sent a paper for translation which describes how a method of dealing with surra has been worked out in Dutch East Indies; it is called Bayer 205?—I have read that paper, but it cannot be carried out in India at the present time, because under the law all animals suffering from surra should be destroyed.

1709. Do you think these small associations which operate in districts on contagious disease work should be placed under the administrative control of the Provincial Veterinary Department?—Yes, I am strongly of that opinion.

1710. *Sir Thomas Middleton:* In connection with the training of your veterinary officers you indicated that the number of appointments in the higher service would be something like two or three a year; is that so?—I believe so.

1711. That is the probable demand? Now can you give any indication of the number in the subordinate service?—I can only judge by analogy; in Madras our annual recruitment of assistants is about a dozen, and there are 8 or 9 such Provinces in India.

1712. Where did the subordinates whom you recruited in Madras get their veterinary training?—At the Madras Veterinary College.

1713. For what period?—3 years.

1714. What period of training do you think would be required for the men in the higher service?—At least 4 years.

1715. And a higher entrance standard?—Yes, that is most important, of course.

1716. *Sir Ganga Ram:* Do you think salt is necessary for horses and cattle for their health?—I think it is.

1717. How much salt would you give?—The usual dose I believe is 1 oz. a day.

1718. Would it promote milk in cows if they were given salt?—I am afraid I would not like to answer that question without investigating it.

1719. *Sir Henry Lawrence:* Would you put the total bovine population of this country at about 150,000,000?—Probably. I think the large Provinces have an average of about 20,000,000, but I am hazy about the exact figures.

1720. I have a figure of about 150,000,000 for all-India?—It would be about that.

Mr. Calvert: It is in the Indian Year Book.

Professor Gangulee: That includes the Indian States.

1721. *Sir Henry Lawrence:* Can we have the figures?

Dr. Hyder: 47,000,000 bullocks, 40,000,000 cows and 40,000,000 young stock.

1722. *Sir Henry Lawrence:* Have you any idea of the total mortality from rinderpest in British India in a year?—No figures are published on these matters at the present time, but I can tell you definitely that in a bad year we have lost about 50,000 animals from rinderpest in Madras alone.

1723. 50,000 out of 20,000,000?—Yes, or so it was reported. I think those figures are approximately correct.

1724. The total number of doses for cattle that you issue from Muktesar would be somewhere about sufficient to immunise 300,000 or 400,000 cattle

a year?—Last year we issued 5,000,000 doses of rinderpest serum from Muktesar.

1725. Doses of 5 c.c.?—Yes.

1726. You want 16 of those doses to immunise, do you not?—By the simultaneous method, yes, but the vast majority of those doses are used in the serum-alone method. If one divided that figure by 3 or 4 it would give an idea of how many animals were immunised.

1727. How many animals, roughly, do you calculate were immunised?—A little over 1,000,000.

1728. Roughly, the cost would be Rs. 2 to Rs. 3 per animal, would not it?—It would be less than that by the serum-alone method. It would work out at about 12 annas.

1729. As little as that? I see from some figures that have been supplied to us that your Institute at Muktesar had receipts of 13 lakhs and an expenditure of 7 to 8 lakhs, so you have actually made a profit of 5 lakhs on the administration of your Institute?—Yes.

1730. That is fairly correct, is it?—Yes.

1731. That is money which goes into the coffers of the Government of India?—Yes.

1732. *The Raja of Parlakimedi:* Is there any special training necessary for men who give the inoculation for the permanent cure of animals?—In the case of rinderpest?

1733. Yes?—No training is insisted on, but it is usual, before a man undertakes these inoculations, to arrange for him to be trained.

1734. So he should undergo training?—In my opinion he should.

1735. Can this inoculation be given to animals at all stages, or are there any restrictions?—It is not usually performed on a cow if she is more than six months pregnant.

1736. Because the development of the calf is retarded?—It may produce abortion if she has a very severe reaction.

1737. Are the different breeds of Indian cattle receiving sufficient attention from the Veterinary Department for maintaining their existence: there are working animals and milking varieties?—You mean, as regards looking after them from the point of view of disease?

1738. Maintaining those different breeds of cattle in India?—Except in the Punjab, the Veterinary Department is not responsible for looking after cattle-breeding of any kind.

1739. *Sir James MacKenna:* The functions to be performed at Muktesar divide themselves into two distinct parts: (*i*) research; (*ii*) manufacture of serum?—I would put it the other way round: (*i*) production; (*ii*) research.

1740. That is the actual position, but of course research must precede manufacture?—Yes.

1741. The research stage being completed, the manufacturing process does not require so much supervision from highly-qualified officers; does it?—I think I must disagree with that. Supervision by highly-qualified officers is most essential in the manufacture of our products; the actual carrying out of the work, of course, can be done by others.

1742. The actual manufacture can be done by a routine process?—It needs constant supervision; I would like to emphasise that.

1743. At the same time, the whole of the research staff need not be occupied in the supervision of manufacture?—It depends on the size of the research staff. At the present time all our staff, with one or two exceptions, are employed on production and manufacture.

1744. What is your sanctioned staff?—A Director and 9 scientific officers.

1745. What is the staff engaged?—There is a Director, 2 other Imperial officers, and 3 Provincial officers.

1746. Instead of 10. Were the 10 sanctioned all Imperial officers?—No, the 10 are Imperial and Provincial together.

1747. So you are 4 short?—Yes.

1748. In 1913 there was a Physiological Chemist. Has that post disappeared now?—It was abolished.

1749. How many Bacteriologists have you?—I have not anybody who is known as a Bacteriologist, but I have a Pathologist who does a certain amount of Bacteriology.

1750. The fact of the matter is that this Institute is very badly equipped at present?—Exceedingly.

1751. Is not it a fact that during the last ten years the Institute has suffered very much from constant changes and resignations of the staff?—I tried to bring that out in my memorandum; it is undoubted.

1752. What are the reasons for these resignations? You have had a Physiological Chemist who has resigned, and a Pathologist, and a Director?—I think in nearly every case it was a question of personal reasons and, very unfortunately, practically all these men were lost to India. They resigned from Muktesar and went away. For that reason it would be very much better if it could be arranged that a man, who was not getting on well at Muktesar, could be transferred to a Province. I am afraid that is a difficulty now.

1753. Do you think the isolated position of Muktesar and the extremely uncomfortable conditions under which the officers live and work has had something to do with it?—I think the isolation has something to do with it. There is no doubt that after several years at Muktesar and never leaving the hilltop it is a common thing for an officer to become cranky and to fall out with his brother officers.

1754. What about your sub-station at Izatnagar? Could not that be developed to take over a great deal of the research work now being done at Muktesar?—I think it might, and at present there is a very big project before Government for developing it.

1755. Making Muktesar the sub-station?—I do not think that has been contemplated up to the present by past Directors, but it might happen.

1756. It would make a great difference to the amenities of the service?—It would.

1757. Then you refer to interchange of officers between Muktesar and the Provinces. Is it still the custom that Muktesar officers are regarded as outside the cadre of the Civil Veterinary Department?—I think at present our Imperial officers are carried on the cadre of the Indian Veterinary Service, but in the case of at least two of them they are not subject to transfer.

1758. I thought they were outside the cadre?—It has been changed of recent years.

1759. Do you consider there should be a Veterinary Adviser to the Government of India just as there is an Agricultural Adviser? You seem to imply that that officer should be the Director of the Muktesar Institute?—It should be a combined post in my opinion.

1760. How do you think the Provinces would take that?—I am quite certain it would be received with complete acclamation in the Provinces.

1761. Then on the question of veterinary education, Sir Thomas Middleton asked about the central college. That would be a course for the training of officers for the Indian Civil Veterinary Service?—Yes.

1762. But is it not a fact that a condition of admission to the Indian Civil Veterinary Service is membership of the Royal College of Veterinary Surgeons of England?—Yes, but I think the Indian Veterinary Service has now been completely abolished and the intention is that in the future what is known as a Superior Provincial Veterinary Service should be established,

1763. It means that whatever local qualification they may have, they will be of inferior standing to a Member of the Royal College of Veterinary Surgeons?—Until our colleges in this country are sufficiently advanced.

1764. Until you get the Royal College of Veterinary Surgeons to recognise it?—Yes. Of course it will be a matter of opinion as to whether they are inferior or not, even if the Royal College will not recognise them.

1765. I notice that the sale of your serum has gone up in a remarkable way during the last 10 years. How do you account for that enormous increase, especially with regard to rinderpest, where it has gone up 5 times?—I think in the first place it must be due to a very large increase in the number of outbreaks of rinderpest in the country. That is certainly true of the last year or two. Another big factor is the increase in subordinate staffs which has taken place in the Provinces so that there is now a very mueh larger agency for carrying out inoculations.

1766. You have had a considerable sale for your products outside India, to Mesopotamia, Ceylon and so on?—It still goes on, but I do not think it can be called considerable.

1767. It is not considerable now?—No.

1768. Of course during the War it was very great?—Yes.

1769. Apart from the central college we talked about, practically every Province now has its veterinary college for training its officers, has it not?—No.

1770. Madras has?—Yes, and Bengal, Bombay, the Punjab and Burma have.

1771. The Central Provinces?—No.

1772. Bihar and Orissa?—They talk of having one.

1773. The provincial veterinary college trains up to the highest grade of what one might call the Provincial Deputy Superintendent?—If as high as that.

1774. Do you think it desirable that the Royal Commission should visit Muktesar?—I think it most desirable.

1775. The whole Commission or a section?—A section of the Commission should; I am afraid to do anything more than that would be very difficult for us because of the transport.

1776. *Professor Gangulee:* In a country like India, which is an agricultural country, do you think the Government have paid adequate attention to veterinary research and education, speaking generally?—No, I think, speaking generally, they certainly have not.

1777. You have said in your memorandum that by far the greatest demand for advice and help comes from the Military Department. Do you obtain any contributions from the Military Department?—We do not.

1778. I see you refer to the recommendation that classes teaching up to the highest veterinary standard should be established in India and passed students of these classes should constitute the normal method of recruitment for the Imperial branch of the Department. Have any steps been taken to give effect to this recommendation?—No steps have been taken. A certain number of Indian gentlemen have been sent to England and have obtained the diploma of the Royal College of Veterinary Surgeons.

1779. In which Provinces in India are there facilities for veterinary education? There is in the Punjab?—Yes, and in Madras, Bombay and Bengal.

1780. None in the Central Provinces?—No.

1781. You recommend a central veterinary college. Do you think there is a real demand for such a central veterinary college?—I do not think I recommended a central veterinary college. I think, I pointed out the difficulties,

1782. Would you discontinue the provincial colleges and have one central college?—No, I would certainly not do that; I think it would be an enormous problem to try and educate all the veterinary assistants required in one college. Besides, of course, there is the question of language and taking a man so far from his home to be considered.

1783. In view of the fact that there is an inadequate demand for veterinary education, instead of diffusing your colleges all over the Provinces, would you centralise your efforts and make one central college?—And abolish those in the Provinces? No, I would not recommend that.

1784. Are you satisfied with the standard of instruction in these provincial colleges?—I am not.

1785. Have you any suggestions to make as to improving the standard of education of the provincial colleges?—Well, the first thing to do is, of course, to increase the number of years of study. At the present time, except at Lahore, students spend only 3 years at the colleges. The course contains no pathology and bacteriology, for instance, and until those two very important subjects are included, it is quite impossible to turn out an efficient veterinary graduate.

1786. I agree. Have you facilities at Muktesar at present for carrying on researches on all-India problems?—No, I think the list of research problems is so enormous that it could not be undertaken at one research institute without a very enormous increase in staff.

1787. Is there scope for research in every part of India?—I think there is scope for research in each Province. There should be a Pathological Department of the college where a college exists, and it should also carry out a certain amount of research.

1788. Referring to your executive work you say: "The only remark I wish to make is that there is no uniformity." How would you secure the desired uniformity?—It seems to me at the present time the only way to secure uniformity is by appointing some senior veterinary officer with the Government of India, who would by his own personal influence in the course of his tours suggest certain improvements in each Province until he had managed to get them all more or less the same.

1789. Referring to what you say as to Veterinary Police measures, do you think legislative efforts in this direction are likely to be successful in India?—I think it is going to be very difficult, but I would certainly emphasise the necessity for instituting such measures and making a start, which has not been made up to the present.

1790. What are the real difficulties, do you think, in the way of introducing cattle disease legislation?—Well, I suppose the greatest difficulty is bound to be, in the first place, the backwardness of the cattle-owner, the ryot.

1791. Is it possible to have uniformity in regulations throughout India?—It might be possible if there were some central veterinary authority, but it certainly does not appear to be possible under our present organisation.

1792. You rightly point out here that contagious disease knows no boundaries. How would you control inter-provincial movement of animals?—As far as I can see, it can only be done by the central authority, or Central Government, placing a particular Province in quarantine. I believe that is done in America: If any particular State is affected by scheduled disease, that State is placed in quarantine.

1793. Do you think anything could be achieved by co-operation with the railway?—I think so, yes, because in these cases it is usual I think for a certain amount of movement of animals to be allowed under supervision.

1794. How would you control the spread of disease at these big cattle markets and fairs?—The obvious thing to do, of course, is to close the fairs and cattle markets for the time being.

1795. You make a case for a central veterinary bureau; what would be the exact functions of this bureau, purely advisory or executive or both?—I would prefer to say both; but I think it remains to be seen whether that is going to be possible. It would certainly be advisory.

1796. Turning to the question of administration, at the present time the Agricultural Adviser is really in charge of Muktesar?—It is under his administrative control, yes.

1797. What is the advantage of this arrangement?—I am afraid I do not see very much advantage in it. I think I should explain that it was an arrangement arrived at in 1912 when the post of Inspector General of the Civil Veterinary Department was abolished; ever since those days the Director of Muktesar has been a very junior officer and it was necessary for him to be placed under somebody's control. But, considering our work there, I think it would have been more appropriate if he had been placed under the control of the Director General, Indian Medical Service, as he actually was many years ago.

1798. In your memorandum you say that the administrative control of the Muktesar Institute is in the hands of the Agricultural Adviser. The Imperial dairy herds in Bangalore, I suppose, are also under the administrative control of the Agricultural Adviser; and yet you say the connection between this institute and Imperial dairy herds is not a very close one. How do you account for that?—I am referring to the fact that although we are an Imperial Institute and these are Imperial herds, there is no member of our staff attached to these herds, as I think should be. The result is that it is only very occasionally we are asked to visit the herds and give our advice. I think it would be far preferable if we were given more responsibility in the matter.

1799. I see you say that veterinary being a transferred subject it is difficult to make provision for the proper co-ordination of the work in different provinces. Are you referring to the scientific or the administrative side?—I was referring to all phases of our work.

1800. Do you think that scientific work knows any provincial boundary —It does not.

1801. In what way do you think that the fact that the veterinary service is a transferred subject has affected that co-ordination?—Because, as I understand the position now, even if we had a Veterinary Officer with the Government of India, he could only act in an advisory capacity; he could only visit a Province if he were invited to do so. That is, as I understand, the position and it is very difficult to get over that.

1802. In answer to a question by the Chairman you emphasised the superstition of the cultivator. At the same time I see there has been a phenomenal increase in the demand for your sera?—I can only say that this has been done in spite of the superstition of a large number of the populace, and if that could be removed we should do even more inoculations, I take it.

1803. That indicates that we can go ahead in spite of this superstition?—Yes, there has been a very great advance.

1804. You made a profit last year of about 4½ lakhs of rupees on the sale of sera, did you not?—Yes.

1805. And it is now a recognised biological product. Would it not be possible to interest some commercial firm to take it up under some Government control?—I suppose it might be possible; but I think it would need nearly as large a controlling authority as it requires staff for the production.

1806. In the case of human diseases we trust ourselves in the hands of private bio-chemists; do you not think it is possible in the case of bovine diseases?—Yes, it is certainly possible, but very careful standardisation would be necessary.

1807. The commercial firm might standardise it for their own benefit. Is there any scope in that direction?—Knowing the difficulties of preparing

anti-rinderpest serum, I cannot imagine any commercial firm taking it up, but it certainly is a possibility.

1808. *Mr. Calvert:* On the question of the enormous increase in the number of doses of serum issued, has that large increase interfered with the research section of your work?—I would not say it has interfered with it.

1809. Has it distracted you from the research work?—As I understand, ever since the beginning most of the staff at Muktesar has been employed on manufacture, and you will notice that although there is quite a long list of publications relating to work done at Muktesar, a great deal of it is in connection with research into production, and it is not what I would call pure research.

1810. Assuming now this rate of increase continues, would you be able to meet the increasing demand?—Yes, I think with the development of Izatnagar we should be able to meet any demand.

1811. I once committed myself to the opinion that preventible mortality amongst cattle was a prominent cause of borrowing by cultivators. Does your village experience corroborate that?—I am afraid I have not any information on that point.

1812. Is the Punjab Veterinary College the only one in India which is now affiliated to a University?—It is the only veterinary college.

1813. I suppose the lack of control of disease is a bar to the production of high class animals?—It is certainly a fact that if disease visits a village it always seems to carry off the high class animals first.

1814. Is not it true that in England very little progress was made in cattle-breeding until the land enclosures took place?—I am afraid I could not answer that question.

1815. I understand that in England until cattle were enclosed in the fields and so prevented from mixing with the common herd, no progress was made in cattle-breeding because each man's cattle were exposed to any disease of the village common herd?—Yes, the only point is that it must go back a very great number of years.

1816. 1745?—It is of course perfectly understandable.

1817. As long as the cattle mixed with the common herd, you could not risk putting out an animal worth about half a lakh of rupees?—Certainly not.

1818. So that as long as you had your animals mixing with the common herd, you could not really make much progress in the way of high class breeding?—It certainly stands in the way.

1819. *Dr. Hyder:* I do not know whether you should answer this question or my colleague Mr. Calvert: does this system of enclosures prevail, for example, on the Continent of Europe, in Germany and especially in Russia?

Mr. Calvert: I am only speaking of it as a means of preventing the spread of contagious diseases.

Dr. Hyder: Rinderpest prevails here to a greater extent than in Russia, but there they have not got a system of enclosures.

1820. *Mr. Calvert:* You have no difficulty, then, in meeting the present demand for serum?—No.

1821. Is it a fair question to ask you, whether you think the horse will ever be of economic value in agriculture in India, or does the climate prevent the horse being a good draft animal?—I should think so; I cannot foresee the horse being of any use, at any rate, in the south of India, where our indigenous horse is very rarely over 13 hands. I have not very much information regarding the north of India.

1822. You do not wish to speak of cattle-breeding?—I have got no detailed information.

1823. *Mr. Kamat:* You have said in your memorandum that the present arrangements for running Muktesar have definitely failed, and that you would advocate the immediate creation of the post of Veterinary Adviser; you also say it would be advisable to combine the post of Director and Veterinary Adviser to the Government. What is your scheme, that it should be a separate post or a combined post?—In addition to administering the Muktesar Institute, I would make the Director also Veterinary Adviser with the Government of India, as I believe is the case both at Pusa and at Dehra Dun at the present time.

1824. Just as the Agricultural Adviser is also the Director of the Pusa Research Institute, you would make the Director of your Veterinary Institute the Veterinary Adviser?—Yes.

1825. But in this memorandum we are told that the work of the Imperial Institute of Veterinary Research has so increased that the Director cannot attend both to his research work and his routine work. Is that so?—Yes.

1826. Is it also true that the Director has to supervise a vast estate of something like 2,000 acres at Muktesar?—Nearly 4,000 acres.

1827. And yet you think the Director can combine the additional duty of Veterinary Adviser to the Government of India?—I think it certainly could be arranged by adding, if necessary, a personal assistant to his staff. A certain amount of his internal work could then be delegated to this assistant.

1828. That is to say, under your arrangements the Director would require some further assistance?—I would not say so at present; I think these two posts could be combined quite well at the present moment.

1829. You have also told us just now that it would be desirable to have research work done in the Provinces. I want you now to visualise, if you are in favour of overhauling the whole thing, how your scheme as a connected whole would work both at Muktesar and in the Provinces. I will ask about the Provinces first. You would attach to the veterinary college a research laboratory and research work?—Yes.

1830. Which would be in charge of a veterinary officer of some high grade?—Yes.

1831. Would such local research institute in the Provinces relieve the research work of the Muktesar Institute?—It would not relieve research work there, but it would be the means of turning out more research work for India as a whole. It would merely add to the amount done.

1832. I mean certain local problems of research could be tackled in the Provinces?—Yes.

1833. Thereby relieving you of certain problems which you are now solving at the instance of local Governments?—Which we would like to solve, but we have not the staff to do it.

1834. In the Provinces you have advocated that the Veterinary Service should be in charge of a high administrative officer instead of the present arrangements?—Yes.

1835. That is to say, instead of the superintendent, you want an officer of a higher grade?—Yes.

1836. You have also said that the training at the veterinary colleges in the Provinces should be improved?—Yes.

1837. And the subordinate services should be strengthened; is that right?—Well, they are being added to, of course, every year; but there is still a good deal more to do.

1838. Have you considered the cost to the Provinces of such a scheme?—I have not worked out any figures, no.

1839. Would it be possible for the Provinces besides doing research work to start manufacturing the sera just as you are doing at Muktesar?—It is quite possible that a certain amount of serum production work might be undertaken in the Provinces, but I am very doubtful whether any of the

present provincial veterinary officers would be inclined to advocate the policy, when it can be made at Muktesar where all our arrangements are in working order, and the serum distributed by rail at a small cost.

1840. *Mr. Calvert:* Is a large city where most of these colleges are situated, a suitable place to manufacture these sera?—It could be done near a large city.

1841. There is no danger at all?—No, there is no danger, under proper precautions.

1842. *Mr. Kamat:*—Given a research officer for the Provinces under whose supervision manufacture also could be carried out, would it be possible for the Provinces to manufacture sera in a self-supporting manner, that is to say, the proceeds to balance the expenditure? I am trying to find out whether a policy of decentralisation would be a practicable policy?—I think it is a very difficult question to answer without going into some figures.

1843. If you are making it a self-supporting commercial proposition to manufacture your sera at Muktesar at present prices, would it be possible, I ask, for even the Provinces to manufacture their own sera and make it a self-supporting proposition if you decentralise?—Of course it would mean having a very greatly increased expert staff: I mean a staff who have been specially trained in this class of work; and it seems to me it is doubtful whether it would pay each Province to maintain such a staff for the amount of sera it is going to require.

1844. We have been told in this memorandum that the present system of bringing in Directors for the Muktesar Institute with a definite number of years of service could be improved by having a cadre and taking men from the provincial cadre by promotion to Muktesar. If that idea is carried out, would not it be possible to have in the Provinces men of high standing and with prospects of being promoted to the Muktesar Institute? Do you follow what I mean?—Yes.

1845. I want to get over your point by developing, or rather carrying out, the system set forth?—As I said just now, it would mean a very large increase of staff in each of the Provinces if they are going to undertake the manufacture of their own sera, and it is quite easy to see that these provincial staffs might be increased to such an extent that there would not be any outlet for them at Muktesar.

1846. Would not this scheme have the double advantage of removing some of the discontent to which you referred at the beginning of your remarks and also, by this process of decentralisation, popularise sera work and bring it to the notice of villages in the Provinces? At present you are too isolated, and your work is not as well known as it ought to be, whereas if it were carried out in the Provinces it would be well known in the neighbourhood?—I cannot see that it would lead to any improvement if the production of these sera and vaccines were undertaken, for instance, in places like Bombay and Calcutta instead of at Muktesar, because these big towns are a long way from the villages where the sera are actually used.

1847. But the officers immediately in charge would see to that. It would be their business to popularise it, whereas you are too far away to do so?—I think it could be popularised quite as well by the ordinary executive officers in the Provinces.

1848. Under your proposal, to give some sort of relief to the Director by additional staff, additional expenditure at Muktesar would be involved, would it not?—Yes.

1849. Under this scheme of decentralisation, is it possible if we have research work done in the Provinces that you may not require those additional officers at Muktesar?—There is a very large amount of research work in veterinary matters waiting to be done. I should like to see an increase in research work and research staff both at Muktesar and in the Provinces

1850. And in the Provinces?—Yes.

(The witness withdrew.)

The Commission then adjourned till 10 a.m. on Saturday, the 16th October, 1926.

APPENDIX.

Note on Veterinary Research in India. Its Co-ordination and Financing.

In continuation of the previous evidence which I have offered to the Commission I beg permission to submit this further note, in which I make some proposals regarding the future co-ordination and financing of veterinary research in this country. It has been my previous endeavour to show (1) how much veterinary research work there is to do and how little has been done up to the present, (2) how completely unorganised are the veterinary staffs, and (3) how it is a mistake to think that veterinary work ends with agricultural animals.

Assuming that these points are admitted, my first proposal is the establishment of a Veterinary Research Council for India, to consist of the Director and at least one Research Officer from the Central Institute at Muktesar, a representative from the Civil Veterinary Department of each of the major Provinces, one or two representatives from the Indian States, together with an officer from the Army Veterinary Department in India, and the Public Health Commissioner with the Government of India, in order to ensure close co-operation with their respective departments in matters of research. Contact with the Agricultural Department would be obtained by placing the Director of the Muktesar Institute, or as I should prefer him to be called, the Veterinary Adviser to the Government of India, on the Agricultural Advisory Council contemplated by the Agricultural Adviser in his evidence before the Royal Commission.

This Veterinary Research Council would meet at least once a year, discuss the research work carried out during the previous year, and consider the programme for the coming one. In this way an opportunity would be provided annually for the ventilation of all urgent problems, and at the same time overlapping of work would be prevented. This Council would, of course, also supervise through a small Committee the publication of the results of veterinary research workers in this country. The main lines of work decided upon would naturally fall on the Central Institute and its branch laboratories, but it would no doubt be possible, as well as desirable, to allocate certain subsidiary lines of work to the provincial laboratories. This would in no way interfere with the freedom of the provincial departments in carrying out researches from funds which they are able to obtain from their own Government, for it is intended that any additional work undertaken by them at the request of the Veterinary Research Council should be paid for from a fund, the details of which will be described later.

In the same way as it is anticipated that, as a result of the evidence placed before the Royal Commission, local Governments will see the necessity of providing funds for research into local veterinary problems, so is it expected that the Government of India will in future devote a definite part of their revenue each year to veterinary research to be carried out at Muktesar and any permanent branch laboratories which may have been established in connection with it; and while on this subject the advisability of transferring to Muktesar the direction of a special investigation like that of the Camel Specialist at Sohawa, now under the Punjab Government, may be referred to. It is obvious that there must be a much greater accumulation of research experience at a large Central Institute like Muktesar than in a provincial department, where executive and educational matters are necessarily the first consideration, and moreover the question of camel diseases is not confined to the Punjab, but it affects the whole of Northern India. Apart, however, from the funds likely to be provided annually by the different Governments for veterinary research something more permanent is required. Those funds are liable to considerable fluctua-

tion each year, either on account of changes in revenue, political party in power, or personnel of the Ministry, and it is most essential that there should be available a permanent fund, which could be drawn upon, either to start a new piece of urgent work, or continue one already in existence which is likely to be closed down owing to the lack of Government funds. I can quote two specific instances of recent occurrence where it is unlikely that an important piece of veterinary research work would have been undertaken if Government funds had had to be entirely relied upon. One of these is an investigation, which is still proceeding, into bovine tuberculosis at Muktesar and the other, some work on pyroplasmosis in the dog in Madras. In each of these cases the Indian Medical Research Fund came to the rescue and provided part of the funds, but it is obviously desirable that there should be a Veterinary Research Fund for such work.

As regards the establishment of an Indian Veterinary Research Fund my proposal is that the Government of India should be asked to form the nucleus of this Fund by placing in it each year an amount equal to that made as a profit by the sale of biological products from the Muktesar Institute. If the price of these products is regulated so that in a year when the demand is small this part of the Institute will just pay its way, it is obvious that when the demand is large, either from within or without India, a considerable increase in receipts over expenditure must result, as happened in the year 1925-26, and it seems most appropriate that when this happens this money should be set aside for further research into problems of animal disease. Others which might be expected to contribute regularly to this Fund would be the Army Department in India, for the investigation of problems affecting horses and other military animals, the proposed Agricultural Advisory Council for researches undertaken particularly at their request, and, of course, contributions from the Indian nobility and other private persons interested in the domestic animals should be encouraged to the utmost.

The allocation of money from this Fund would be made at the annual meeting of the proposed Veterinary Research Council, and in order that this shall be done to the satisfaction of the Government of India they might wish that a Secretary to Government in the department concerned should sit on the proposed Council.

सत्यमेव जयते

Saturday, October 16th, 1926.

SIMLA.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.

Sir THOMAS MIDDLETON, K.B.E., C.B.

Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.

Sir JAMES MACKENNA, KT., C.I.E., I.C.S.

Mr. H. CALVERT, C.I.E., I.C.S.

Raja SRI KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.

Professor N. GANGULEE.

Dr. L. K. HYDER.

Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Mr. J. S. PITKEATHLY, C.I.E., C.V.O., C.B.E., D.S.O., Chief Controller, Indian Stores Department.

Memorandum on the Manufacture and Sale of Agricultural Implements in India.

There is a number of foundries and engineering workshops in India capable of turning out agricultural implements and machinery of suitable design and quality. In the case of the simpler implements such as ploughs, cane mills, chaff-cutters, etc., it has been proved that manufacturers in India can successfully compete with the prices quoted for imported implements.

There are in addition numerous importing firms who hold agencies of well-known English and American manufacturers of agricultural plant and machinery, and hold ready stocks of these goods.

In a few cases manufacturers in India have been successful in disposing of considerable quantities of ploughs and cane mills, but it can be safely stated that the fringe of development has hardly yet been touched. Manufacturers generally complain of difficulty in getting into touch with the actual buyer because of the vast area to be covered, and they state that it would not be a practical commercial proposition to set up the organisation necessary to canvas potential buyers, and to distribute the implements which they are in a position to manufacture. In many cases they explain that payment, for such implements of a modern type as are used, is not made by money, but there exists a system of hiring, payment being made in kind. No modern engineering works could contemplate doing business on these lines, and it is therefore necessary to employ some agency which would distribute the implements to the farmer, and, if necessary, afford facilities for payment on an instalment system, and collect payments as they fall due. The only organisation of such a character available is Government itself and this problem of distribution therefore is capable of solution only by Government.

The Indian Stores Department understands that implement depôts have already been established in some Provinces and that they have amply proved their value, but it is necessary that the number of such depôts should be increased.

It is believed that Provincial Governments provide credit facilities by a system of *taccavi* loans, but that the amounts allotted for this purpose are quite inadequate. If it is really intended to give impetus to the development, these credit facilities should be increased, and as it is understood that the loans are properly secured and that failures to repay are the exceptions, Provincial Governments should not be unwilling to provide further accommodation.

Moreover, manufacturers would be willing to bear a part of this burden of affording credit provided that payment of their bills was guaranteed by the Provincial Government concerned. In a number of cases manufacturers in India would be prepared to invoice their goods for payment in six or even twelve months' time, but a premium would naturally be added to provide for the loss of interest involved.

Implement depôts could be reimbursed for the expense in connection with sales and collection of payments by means of a discount given by suppliers.



1851. *The Chairman:* Mr. Pitkeathly, does your department purchase implements for free distribution or for sale?—My department only purchases implements against specific demands. We comply with an order when we receive it.

1852. Are there any obstacles to the adoption of improved varieties of implements for the removal of which you would care to make suggestions?—I would answer that question by saying that one of the main difficulties in the way of the ryot adopting improved implements is finance. The ryot is a poor man and he cannot meet the financial cost of the implements. Another difficulty is the difficulty of distribution. The users are spread over a very large area and firms in India have difficulty in getting into touch with the users. In order to overcome this, it would be necessary to establish in various parts of the country depôts for the issue of implements either on sale or on hire. Another difficulty is the lack of skilled labour. The ryot is entirely ignorant of engineering matters and in the higher class of mechanical implements such as tractors, many of the failures in the past have been due to a lack of knowledge of engineering on the part of the user. Then another difficulty is the lack of facilities for repairs and facilities for obtaining spare parts when a part goes wrong.

1853. Have you any methods that you wish to suggest for the cheapening of implements?—The most important method for cheapening implements is standardisation. At present we have innumerable types of implements and the existence of a large number of types reacts on manufacturing in this way that firms have got to maintain a large number of jigs, tools and appliances for the manufacture of these different types. The only way in which you can cheapen implements is by placing a steady flow of orders for implements of more or less the same type.

1854. So that mass production is the ideal?—Yes.

1855. You think that mass production would substantially cheapen implements?—I am certain of it. We have in front of us the example of the motor car industry in America and in Europe. Only a few years ago a motor car was beyond the reach of any one but a fairly wealthy man, but to-day a comparatively poor man can afford a car.

1856. Do you wish to say anything upon the provision of pumps for wells?—Here again I think the only way to develop mechanical pumping is by standardisation. We have in India to-day many types of pumps and prime-movers. With no exception they are all too complicated. I personally feel that the right type of pump and prime-mover for wells has not yet been invented. The essentials are that it shall be cheap and reasonably efficient. To-day the cost of a pump and engine, capable of dealing with a well the yield of which may be 5,000 gallons an hour, is somewhere in the neighbourhood of Rs. 1,200.

1857. Does that include the prime-mover?—Yes. Very few Indian agriculturists can possibly afford an initial cost of Rs. 1,200. There again by standardising and by giving firms large orders you will be able to reduce the price very considerably. Manufacturers should aim at producing a pump and prime-mover at a cost somewhere in the neighbourhood of Rs. 300.

1858. There again it is a matter of mass production?—Entirely a matter of mass production.

1859. Do you wish to develop at all your suggestion that the Government should facilitate the purchase or hire of improved appliances?—My view is that the engineering branch of the agricultural services should be very considerably strengthened, and should go in for a great deal more propaganda and a great deal more education than at present. Not only so, but they ought to establish depôts in various parts of the country, not necessarily for the sale, but for the issue on the hire-purchase system if necessary of implements, pumps and all kinds of mechanical appliances used in agriculture. Also a very necessary part of their duties should be the training of skilled mechanics and operators required for running these appliances.

1860. Do you agree that there is an important opening before firms in India able to produce implements and appliances?—I agree, provided something is done to help to bring these firms into touch with the users and also to give them a definite assurance of a take-off for their products.

1861. You do not think they are capable of developing that outturn by the ordinary commercial means?—I do not think so.

1862. But once the flow of orders was established, then I take it you contemplate Government standing aside?—I do.

1863. Is there any other subject upon which you would care to address the Commission?—I do not think there is any subject on which I can talk from intimate experience.

1864. I just want to make one point clear. Your department does not produce or manufacture for sale or distribution to cultivators any agricultural implements, does it?—No. I have here a pamphlet* in which we have described the functions of my department. I can send as many copies to the Commission as they require.

Yes, I think we should like a few copies of that if we might have it.

1865. *Mr. Kamat:* Do you expect mass production in this country on the American scale on the part of Indian manufacturers in the near future?—Yes, provided Government gives the manufacturers definite encouragement. You would start by instructing the ryot in the value of improved methods and create the demand, then you will have mass production.

1866. You mentioned the example of American mass production in motor cars. You had Henry Ford's business in view. Can an effort on that big scale ever be thought of in India on the part of manufacturers even with Government assistance?—I do not think it would be necessary to undertake a factory on the Henry Ford scale, but the principle remains, that producing a large number of articles of the same size and design is the only way to cheapen production.

1867. Taking the Indian ploughs required for different soils, heavy soil, light soil, medium soil, is it possible to standardise any of these various types of ploughs?—I consider it possible to standardise a certain number of types, each type being suitable for a different type of soil. At present we have perhaps 30 or 40 different types differing in very small essentials. All these small essentials should be worked out and brought down to a common standard.

1868. How many types do you expect will be necessary as the minimum for the different soils of this country?—I should think eight or nine.

1869. So that standardisation will have to be reduced to at least eight types?—Yes.

1870. And your suggestion is that Government should subsidise establishments for all these different types?—An establishment to develop the type suitable for the soil in each particular area.

1871. When placing your orders with different firms for machinery, what procedure do you follow in order to encourage and support manufacturers?—My department is governed by rules issued by the Government of India called the Stores Purchase Rules. These rules definitely lay down that in the case of articles manufactured in India from Indian material, we shall give a definite preference to them over imported articles. Rule 2 lays down that articles manufactured in India from imported material shall also be given a preference over articles not manufactured in India. These are the principles we follow in placing orders.

1872. Is it a definite percentage of your total order that you give to the Indian manufacturers, or what is the substance of the rule which you quoted?—The procedure we adopt is that if prices are equal and one article is made

* Indian Stores Department. Its Organisation and Functions, Government Press, 1926.

in India and the other is not made in India, the order will be placed with the Indian manufacturer.

1873. The whole of the order?—The whole.

1874. It is not distributed?—It is not distributed provided it is within the capacity of the Indian manufacturer to undertake. In the case of a difference in price against the Indian manufacturer, we have a figure in our mind and we place the order with the Indian manufacturer provided the price is not above a certain figure. In this matter we have to keep in mind the interests of the consuming department.

1875. If the difference in price is very slight, have you any discretion under the present rules in spite of the difference in price to give preference to certain firms?—I have discretion under Rule 1; I am allowed to place the order with the Indian manufacturer provided the price is reasonable.

1876. Looking to the quality?—Yes.

1877. You follow that principle?—We follow that.

1878. *Mr. Calvert:* To what extent are you able to assist village industries?—I have examined our records of purchase of the last few years and up to date we have placed with co-operative credit societies and industrial societies orders to the value of Rs. 55,000 only. These orders are for *durries, lungees* and dusters. Our difficulty in dealing with these societies is that in many cases the prices are not competitive, the prices do not compare with the prices quoted by industrial concerns using machinery. Again we have great difficulty in getting the required standard of manufacture. The standards are sometimes low and there is also lack of uniformity. We recently had a case where we bought a large number of dusters for the army. These were bought against specification. Orders were placed in the Punjab where dusters were manufactured. It was found that the materials did not comply with the specification and were rejected. There are other cases where we placed orders for *durries* and they have been more successful in manufacturing *durries*. The attitude which my department takes up towards these societies is sympathetic. We are anxious to place business with them. We receive tenders from them. Wherever possible we consider the question of giving them an order if it is within their capacity and the specification is such that we feel they can reasonably work to.

1879. But do you not think that the co-operative societies might be more successful in complying with your requirements if your requirements were more carefully explained?—In one or two cases we have discussed the matter with representatives from your societies before placing the order. We went into the question in detail and explained more or less what measures were required in order to produce articles to suit our specification but still there have been difficulties. My feeling about it is that your societies have got to improve their organisation and they have got to have greater experts dealing with particular things which they wish to manufacture.

1880. I take it then that you are prepared to do all you can reasonably to encourage village industries?—In every way possible; we are anxious to encourage them.

1881. *Professor Gangulee:* What would in your opinion be the effect of the introduction of labour-saving machinery for farm operations?—I am afraid I have not sufficient knowledge of agricultural conditions to give you an answer.

Would it not affect agricultural labourers?

(*The Chairman here remarked that the witness had made it plain that he did not know.*)

1882. You referred to mass production and standardisation. Would you suggest establishment of large industrial works for the purpose?—I would not recommend any State aid in connection with the establishment of agricultural implement works, beyond bringing them into touch with users and also developing the use of implements and encouraging farmers to use the implements.

Private enterprise would do all that is necessary beyond that in the way of establishing works and manufacturing implements.

1883. *Sir James MacKenna:* Do you consider agricultural engineering of vital importance to the development of agriculture?—I consider it a matter of great importance.

1884. You consider that the agricultural engineering sections should be strengthened and developed in all Provincial departments?—Yes.

1885. And do you consider that agricultural engineers should be members of the Indian Agricultural Service?—I do.

1886. *The Raja of Parlakimedi:* How would you solve the difficulty of distribution among the Provinces?—That is a matter that I would leave to the Provincial Agricultural Department. They, in consultation with the ryots and the manufacturers, would get out a type and design of implement which would suit their particular area. Having done that, the type ought to be standardised for that area.

1887. Are the Government considering how to improve ploughs and pumps used in different Provinces now?—I understand the Agricultural Department have done a very great deal to improve the design of pumps and mechanical appliances generally, but I do not think they have gone far enough.

1888. *Sir Henry Lawrence:* Do you ask this Commission to recommend further Government expenditure on your department, and if so, in what particular direction?—Having standardised various implements and various mechanical appliances, I consider the next step is to centralise and co-ordinate purchases in order that one co-ordinating authority may be able to examine the manufacturing capacity of each of the works manufacturing these appliances. Then that co-ordinating department could place orders up to the full economic capacity of the works concerned. That brings me to another point. Many of the appliances which are manufactured in India to-day have failed because of the quality of the material used and the standard of workmanship not being as high as is required. These difficulties can be got over if all appliances and implements were subjected to a very rigid inspection before they were despatched from the works.

1889. To what extent would the department require to be strengthened for this purpose and what would be the further expenditure involved?—Our existing organisation could deal with it, I think.

1890. *Sir Ganga Ram:* At what rates do the railways carry implements in this country?—I am afraid I cannot quote figures from memory.

1891. Do they give any concessions?—As far as I am aware, no.

1892. What is the import duty on implements?—There is no import duty. Implements are allowed in free, provided they are used for agricultural purposes.

1893. If we copy implements in this country, what difficulties would there be?—There is no difficulty in copying implements; it is done very freely now.

1894. It can be done?—Yes, if the implement is not patented. If it is patented then the manufacturer in this country would have to come to some arrangement with the owner of the patent to manufacture under a license.

1895. Scrap iron of the railways is sold very cheaply nowadays. I ask you as an engineer whether we cannot utilise that for the purpose of making implements in this country?—That is to me a question of economics. If we are going to make these implements, we have got to make them very cheaply. The using of scrap iron will entail in many cases a very great deal of fabrication. Your scrap iron will come in all shapes and sizes. You have got to reduce that to the size required to put into the plough or harrow or other machine you are fabricating. In many cases the cost of working up the scrap iron will to my mind make the whole project uneconomical.

1896. I recently bought one harrow from Spedding & Co. for Rs. 35 but I was able to make one for Rs. 10 out of scrap iron?—It is quite possible that

you can make one or two or a dozen or a hundred. The question is manufacturing in large numbers at economic prices.

1897. If I could give an order for 100 at a time, I could make it for Rs. 8 instead of Rs. 10?—Another point in connection with that is that if we are going to develop implements in this country and encourage their use, the great point is that it is absolutely necessary that all parts should be interchangeable. If you are going to utilise scrap iron, I am perfectly sure it would be quite impossible to guarantee interchangeability.

1898. Are you aware of the fact that sugar mills are nowadays hired to the zamindars for the season and the contractor who hires them gets his own man to go about and repair them. It is only on that system, in my opinion, that it would be possible to carry on with these implements. I wonder whether Government should give some help in the way of *taccavi* in that respect?—I am aware that in the Punjab and Bengal certain firms are carrying on a large business in connection with sugar-cane mills, and with the type of organisation that I had in mind, when I referred to the establishment of depôts for the issue of these implements either on hire-purchase or rent per annum.

1899. When you said in reply to the Chairman that a pump could be made for Rs. 300, what kind of pump had you in mind, and would that include the prime-mover?—I think probably my answer was not quite clear. I said that the ideal type of pump has not yet been produced. There are three considerations, to my mind, for the ideal pump: (*a*) it should be cheap, (*b*) it should be reasonably efficient and (*c*) it should be very simple.

1900. What kind of prime-mover would you suggest?—An oil engine.

1901. What is the size of pump you have in mind?—I have in mind a pump capable of pumping 3,000 gallons per hour at the outside.

1902. 3,000 gallons to a lift of what?—To a lift of 12 to 15 ft. pumping into an open channel.

1903. Are you aware of the fact that oil engines are now made in Lahore?—I have heard that they are making oil engines in Lahore; in fact, several firms in India are making oil engines to-day.

1904. *Dr. Hyder:* Do you think the technical conditions for mass production exist in the case of manufacture of agricultural implements?—Yes, I think so.

1905. What is your view of the recent changes in the tariff and the granting of subsidies to the iron and steel industry in their bearing on the welfare of agriculturists?—This is a question I should not like to answer straight off. I should like to think over it.

(The witness withdrew.)

Mr. A. RODGER, O.B.E., Officiating Inspector General of Forests, Dehra Dun.

Memorandum on Forestry and Agriculture in India.

The attitude of primitive races to Forests.—Primitive races, who live mostly by agriculture, have as a general rule, in every part of the world, regarded forests as being part of the bounteous provision of Nature. They have seldom considered that they were in any way concerned in preserving the beneficent effects of the soil, rain and the sun, which they have been accustomed to regard as being inexhaustible sources of all that is required to produce crops. Forests have been, as a rule, placed by them in much the same category, and have been drawn upon to an ever-increasing extent as soil fertilisers and as suppliers of timber and fuel. It has seldom occurred that primitive agriculturists have realised that a time might come when the advantages conferred by forests in their neighbourhood would disappear, when the forests themselves vanished, and they have heedlessly continued the wanton destruction of the forests which have been literally the principal source of their livelihood.

Recent and present destruction of forests in India.—As a result of the increase of population in India due to the peaceful conditions which have obtained under British rule, land for grazing and cultivation has become ever scarcer and the forests have continued to suffer. One of the most destructive methods of cultivation is that known as *jhuming* or *taungya* cultivation. This system is still carried on over many hundreds of thousands of acres in the hilly parts of India and especially in Burma and Assam. The following extract from a lecture delivered by J. C. Mills, I.C.S., on the Assam Burma frontier will give a good idea of what it means:—

> "The Sema (Naga) method of cultivating rice, job's tears, and millet is that known as "*jhuming*". The jungle is felled and allowed to dry. It is then burnt and the ashes dug into the soil, and the crop sown. The same area is used two years in succession, and is then abandoned until enough jungle has grown up for it to be used again—usually from five to ten years. Of course, the thicker the population the shorter the period of rotation before the same land has to be used again, and the less chance the jungle has of growing up. The less the jungle grows up the more the soil is denuded, and the less soil there is the less jungle there will be in future; and so on in a vicious circle. A secondary effect is that the less roots there are in the soil the less is rain held up, and the more quickly do torrents come down in flood.
>
> The denudation is terrible. Once from a hill top after some heavy rain I could count no fewer than thirty-six new landslips on the opposite side of the valley over which I was looking. Scores of tribes in Assam and Burma practise "*jhuming*", and what is going on in the Sema country is only an example of what is happening over a huge area. Vast quantities of soil are carried down the rivers, which deposit the silt as they slacken speed in the plains. One result has been the gradual growth of huge sandbanks at such places as the junction of the Brahmaputra and Ganges near Goalundo. These in turn hold back the water and cause floods, which do an immense amount of damage to crops in the plains. I do not mean to imply that sandbanks would not be caused in any case. But the amount of silt brought down by rivers flowing through virgin jungle is very different from that carried by streams fed from steep hillsides covered with freshly dug soil on which rain has been pouring at the rate of half an inch an hour or more.

"Altogether, the problem is a difficult one. To forbid "*jhuming*" is impossible: it would condemn thousands of people to starvation. Moreover, "*jhuming*" by tribes who are not compelled by pressure of population to use the same land too often, and who leave a reasonable number of trees standing on the land, probably does no harm at all. It is in the crowded areas such as the Sema country that the harm is done. There we are trying two remedies with some success. We have been sowing quick-growing trees, such as Nepal alder and acacia, which will hold the soil, and we have been teaching Semas to terrace like the Angamis.

This "*jhum*" cultivation is one of the most primitive and probably one of the earliest methods of those employed by man, and must, it seems, have preceded irrigation. One wonders whether it was not one of the causes of desiccation of large areas of the globe. Possibly hill-sides which are now bare rock were once covered with forest. As this was "*jhumped*" denudation would set in, and the destruction of forests would cause a diminution of rainfall, and so eventually desiccation. It is interesting to think that in watching a hillman of Assam "*jhuming*" his land we may be watching an agricultural process which has had an incalculable effect on geography and human history."

This system of cultivation is by no means confined to India and it may very well be world-wide. It is believed to have been carried on by the Maya Indians in the Isthmus of Panama, 2,000 years ago, and is probably responsible for the erosion and desiccation of considerable areas of the surface of the earth.

3. *Progress in Forestry as a help to Agriculture in another country—Cyprus.*—In an article which lately appeared in the "Times" on the subject of Farmers and Forests, the writer in referring to the forests of Cyprus says:—

"These forests, famous for centuries, provided timber for Palestine in Biblical times, were used for the building of his fleets by Alexander the Great, and were so valuable a source of timber that Ptolemy, I, Soter, the first of the Maccedonian Lagidae to reign as Pharaoh in Egypt, conquered the island expressly to possess them as he aspired to sea-power, just as Sultan Selim, the Sot, sent the unspeakable Mustapha to seize Cyprus some 19 centuries later because he wanted to drink its wine. The smelting of iron ore in Sussex is generally supposed to have broken the pride of the once mighty Forest of Anderida, in the same way the smelting of copper ore in Cyprus, begun under the Phoenicians and continued down to the time of the Romans, led to the denudation of large areas. Much still remained, and more than 1,000 years later King Richard found the island clothed with forest, the Lusignans were able to cut freely to provide timber for their splendid buildings, and as late as their last decade in the island, 1560-1570, the Venetians are said to have relied largely on Cyprus to supply the material for their galleys. Indeed, it is curious that, although their island produced the copper, the timber, the flax, and the hemp required for old-time shipping, the Cypriots were never celebrated as a seafaring race, or even as fishermen, and their maritime riches were generally exploited for the benefit of foreign conquerors, for even the Lusignans, under whom the island so long enjoyed independence and prosperity, were an outland dynasty supported by a dominant class of foreign origin, constantly recruited from abroad.

After the arrival of the British it was some time before the surviving forests, which had suffered much from neglect and from the wasteful methods of the peasants in clearing hill-land and cropping it until the rain had washed most of it away, and then repeating the process, were able to receive proper attention. In the first year for which the official expenditure on the forests is on record, 1880-81, only £156 was spent, and in 1884-85 the revenue was £1,134, and it was not until the early nineties that the laborious work of restoring the forests was properly taken in hand, for it was by then beginning to be realized that the forests alone could be relied upon to prevent the winter rains from being wasted. The rainfall is small—about 22 inch per annum is the average for the whole island—and it nearly all occurs in a comparatively short time. The Cypriot for centuries has seen the water which he so urgently needs for summer use rush destructively down the mountain watercourses, hurry past his farm perhaps tearing away a slice of his best land or depositing unwanted shingle and rubbish in its useless passage, in order to lose itself in the Famagusta marshes or in the sea.

Where the forests survive, or have been restored, much of the rainfall gets a chance of soaking in, to reappear in the springs later in the year, and now the department has begun to terrace the hills across rain-scored clearings or on barren slopes in such a way that the terraces slope gently inward towards the mountain, and thus, when planted, retain the rainfall which, before the terraces were made, would have run destructively to waste without more ado.

This naturally is an expensive process, costing about £30 an acre, but it acts as a most efficient check on further local erosion and saves good land on lower levels from being overwhelmed under spate-borne spoil and detritus. In this way it is hoped that the restored forests will gradually form a natural reservoir for the retention of the mountain rains, which are much heavier than in the plains (one hill-station registered 61 inches in 1925) and preserve the water for summer distribution; for experience has shown that ordinary dams are of little use on these torrents as they so soon get filled with silt. So long-sighted a policy naturally requires a good deal of time to mature, although in Cyprus trees grow with satisfactory rapidity, and meanwhile the department is busy with work of immediate and everyday utility. From special plantations of quickly-growing trees, as well as from forest growths which have reached their prime, it supplies fire-wood for the whole Island at the rate of 38 *s.* a ton cut and delivered to the door; and through its own stores it sells timber for building at reasonable prices. It provides too wild-olive seedlings for free distribution and subsequent cultivation and grafting; takes charge, when asked to do so, of privately owned woodlands; and co-operates with various public authorities in planting trees for ornament, for firewood or other forms of utility outside the forest areas, with a most beneficial effect upon the health, amenity, and appearance of the Island. Since the department, began to function it has spent over £684,000 in rehabilitating a wasting asset, and has drawn just under £600,000 in revenue from its forests which have, at a net cost of about £85,000, been increased tenfold in actual timber value, from an estimated £200,000 to at least £2,000,000."

What the Forest Department is doing in India for the Agriculturist.—The following extract from Volume VI of the series " India of To-day "—

entitled "India's Forest Wealth" by E. A. Smythies, B.A., Conservator of Forests (Oxford University Press) will give some idea of what forests mean to-day to the Agriculturist in India:—"An overwhelming proportion of the population of India is dependent on agriculture for its maintenance, and one of the most important aspects of forest management is to meet the requirements of the agricultural population. Among the peasant's greatest needs are firewood to replace manure, small timber for houses and wood for implements, as well as grazing and fodder for his cattle. It has been recognized with increasing clearness that forestry is an important vocation as the handmaid of agriculture. The importance of this aspect of forestry naturally varies considerably in different Provinces. In areas of comparatively sparse population and extensive forests such as parts of Burma, Assam or the Western Ghats, the pressure on the forests is almost negligible, and the requirements of agriculture are limited and met with ease. But in other areas, notably in parts of the Himalayas, in Kumaon and the Punjab, in parts of the Central Provinces and the Deccan, and elsewhere, the absolute possibility and existence of agriculture is intimately dependent on an adequate forest area in the vicinity. The comparatively poor and infertile soils cannot produce sufficient crops to support the population, who are compelled to eke out a precarious existence by heavy manuring with forest humus, by trading in cattle, sheep, or goats which graze and multiply in and through the forest, by earning wages in forest industries or by other means. And as the population increases the pressure and demand on the existing forest areas also rapidly increases, and a perpetual struggle results in trying to meet the urgent needs of the surrounding villagers and in trying to keep in existence an adequate area of forest to meet future needs. And in other areas again, notably in those less fertile parts of the densely populated plains of the United Provinces and the Punjab, where cultivation is somewhat precarious and where forest lands no longer exist, the pitiable economic condition of the people, the miserable mud hovels in which they live, the debased breed of half-starved cattle which they possess, the burning of stable manure as fuel instead of using it for enriching and manuring their fields—these and other unfortunate results must to some extent at least be ascribed to the complete absence of forest in the vicinity, and to the fact that the purchase price of essential forest products is thereby raised beyond the reach of the inhabitants.

In the legal process of reservation of Government forests and waste lands, the chief and most arduous duty of the reservation or settlement officer is the recording of claims of all the surrounding villages for forest produce, for timber, fuel, grass and grazing, leaf litter and humus, for rights of water and rights of way, for bamboos and edible fruits, and a score of other requirements. When the settlement officer has passed final orders allowing all legitimate claims for the *bona fide* and agricultural use of right-holding and concessionist villages, these demands have the first claim on the produce of the forest area, even up to the maximum output of the area, and as such rights and concessions are usually supplied free (but occasionally at reduced rates) it frequently happens that blocks of Government forest are managed entirely for the benefit of the adjoining villages, without hope or expectation of any direct profit or commercial exploitation. A few figures may be cited to illustrate how intimately the well being of the agricultural and village populations of India are bound up with the forests. (Figures given below refer to British India only, excluding Indian States, and for the year 1920-21). The total number of animals permitted to graze in Government forests was 12 millions, of which 2·8 millions paid fees (even full grazing fees are almost nominal, varying generally from 2 annas to Rs. 2 per annum per animal), 3·7 millions grazed at half rates, and 5·5 millions grazed free. The value of free grazing and fodder grass is put at 3·8 million rupees.

Right-holders and concessionist villages were given free of cost about five million cubic feet of timber and seventy-six million cubic feet of firewood,

while the value of a hundred other forms of minor forest produce, such as edible fruits and flowers, fibres for ropes, grass for thatching, bamboos, gum, resins, dye and tan materials, etc., is put at one million rupees, although this is probably far below the real value, since no accurate record is kept of these petty demands. The total value of rights and concessions given away to villagers every year from the forests of British India under the control of the Forest Department must be put at nearly £1,000,000 sterling, despite the extremely low rates at which these concessions are rated. This is an item which never appears in the statistics of financial results of the working of Indian forests. Admittedly a certain proportion of this produce has no commercial or sale value, *i.e.*, it could not be sold eleswhere if the adjoining villages were not in existence; but on the other hand the actual value to the villagers, to whom the produce is given, is incalculable, since in many cases the very existence and economic life of the village is so intimately connected with the assistance to its life and agriculture, provided directly or indirectly by the adjoining forests.

The importance of forests in supplying grazing and grass for cattle kept for manure and for ploughing has been mentioned above, but two further points must be emphasised. An important article of food both for the agricultural and urban population is *ghi* or clarified butter, and the *ghi* industry is very closely connected with adequate grazing grounds within the borders of the Government forests. For example in the moist Tarai tracts along the submontane belt at the foot of the Himalayas, great herds of buffaloes are kept, which roam over the extensive areas of grass lands, and it is on the existence of this never failing supply of grass and fodder that the extensive export of *ghi* from the submontane belt to the crowded cities of the plains depends. From these same areas also a steady stream of young buffaloes and cattle are exported to supplement the agricultural resources of the adjoining districts to a distance of two hundred miles or more, and the support of this cattle-breeding industry is a further important function of the Indian forests. India is unfortunately and periodically afflicted with a failure of the monsoon rains, and in those years of famine, when the food and fodder crops fail and the very indifferent village grazing grounds fail to produce grass, it is a piteous sight to see the starving cattle wandering forlornly over the burnt-up plains or lying down by the wayside to die, with the vultures gathering to their ill-omened meal. It is then that the forest areas are heavily tapped to supply vast quanties of fodder grasses which are exported to the famine stricken districts. The importance of these practically inexhaustible reserve supplies of fodder in times of famine cannot be exaggerated. To the poor peasant the loss of his cattle by hunger and famine is an overwhelming blow, for without cattle he can neither plough nor manure, and even if he can raise the money by loan or mortgage to buy a fresh supply, after a bad fodder famine there are not sufficient cattle surviving to meet the demand. In the famine of 1918-19, in one part of one district of the United Provinces (in the Bah Tahsil of Agra), an inaccessible and inhospitable tract of barren and broken ravines, no less than 200,000 cattle of the agricultural classes were lost. There can be no doubt that the mortality amongst the cattle would be far greater in every serious fodder famine than it actually is, but for the reserve supplies of fodder available in the forests. These fodder reserves in the forests of the United Provinces, the Central Provinces, Central India, the Bombay Deccan, parts of Madras and elsewhere are in short a very important economic asset in India's forest wealth. It may be noted also that during the war, 50,000 tons of fodder grasses were collected in 1917-18 from Indian forests, to help the military operations in Egypt and Iraq. In times of famine and food shortage also, the edible fruits and roots and flowers that are available in forest tracts, and that help to eke out the inadequate food stocks of the people, are worthy of brief mention. There is another aspect of importance connected with forests in the general economy of the rural population. In all civilised countries of the world who work their forests intensively, the wages bill on the exploi-

tation of forests and on forest industries is a big item, and as typified in many parts of America may be the dominant factor in the prosperity of whole districts. In India, perhaps more than in most countries, we find this to be the case, partly perhaps because the Indian population is so predominantly agricultural, and forest works can fit in so well with the slack periods in agriculture, partly because the relatively low standard of life and rate of wages has militated against the introduction of mechanical appliances, and the working of Indian forests usually makes a far higher demand for units of manual labour than corresponding work in other countries. To give one small illustration of this aspect; in the pine forests of Kumaon, the amount of money distributed every year amongst the local hillmen for the collection and export of crude resin (to feed the turpentine and resin distilleries) exceeds three lakhs of rupees (£20,000). This is not a very vast sum by the standards of international finance, but represents an asset of very considerable importance to the poor peasants of that tract, and in excess of the whole land revenue (or land tax) of the district where the resin collection is carried out. But in India, the influence of wages paid for forest exploitation usually spreads far beyond the confines or vicinity of the forests themselves. All the major tracts of primeval or virgin forest are necessarily largely uninhabited or very sparsely inhabited (their present existence is in fact due to their uninhabited nature), and very often the labour gangs required for their working have to be brought from far afield. To quote again an example from the submontane forest at the foot of the Himalayas, every railway and road is blocked biennially with sawyers, carters, carriers and every form of labour, first in their migration to the forests after the winter crops are sown in November, and again in their migration back to their homes in time for the harvest at the end of March. From the hills they come, from the far away plains of the Punjab, and the Ganges, and convert the great forests for a few months into a scene of intense bustle and activity and then again depart leaving the forests to the lonely fire-watcher and the roaming tiger, but the wages they have earned go with them to be spent in marriage festivals or to be converted into gold and silver trinkets. Again the great forests of the Andaman islands have to be worked entirely by imported labour, partly by the involuntary labour of the convict gangs of that great penal settlement, and latterly to some extent by Kachins from far away Burma. There is no use in multiplying examples, it is a feature common to most Indian forests, the great influx of labour working furiously for a while to render available for the industrial life of the country the valuable products of the forests, and then departing with their well-earned wages with the ripening of the fields to harvest, or when the terrific heats of summer or the tropical rains of the monsoon render further jungle work impossible.

Taking India as a whole, the proportion of forest land to total area (*i.e.*, 25 per cent.) is ample, but as has been indicated already, the distribution of forests is irregular, and while some Provinces such as Burma and Assam have more forests than they require or can work intensively, in other parts of India and notably in the Gangetic plain, and in the Punjab the area of forests is quite inadequate, and the rural population have to a considerable extent to carry on as best they can without forests. At the same time there are extensive areas of waste land which by skilful management are capable of being made into successful plantations, for the production of small timber, firewood, grass, etc., which have the double advantage of ameliorating the agricultural conditions of these treeless tracts and of putting to a profitable economic use lands which are otherwise barren and valueless. In a consideration of India's forest wealth, a brief account must be given of the very successful plantations which have been, and are being, created in certain parts of India where the demand for forest produce is keen, and where there are no natural forests to meet the demand. The best known examples which will be briefly described are: (1) the *babul* (*Acacia arabica*) and *sissu* (*Dal bergia sissu*) plantations of the Jumna and Chambal ravines in the United Provinces. (2) The irrigated *sissu* and mulberry (*Morus alba*) plantations of

Changa Manga near Lahore in the Punjab. (3) The Eucalyptus (*E. globulus*) plantations of the Nilgiris near Ootacamund in Madras."

Mr. Smythies goes on to give an account of the three examples of plantation work which he mentions and these descriptions will well repay perusal. One short quotation may be given here from the note on *Afforestation on the Jumna Chambal ravine tracts of the United Provinces.*—" In the untreated ravines, at the end of the monsoon rains, measurements showed that the moisture had penetrated a bare six inches, while in areas treated with an elaborate system of breaking up the surface soil, making small ridges and ditches and dams, moisture penetrated to 4 feet depth in the first year and to 9 feet depth in the second year, and resulted in a most luxuriant growth of valuable tree seedlings and fodder grasses, which automatically stopped further erosion. The results obtained have surpassed all expectations. In some of the more fertile patches, *sissu* (*Dalbergia sissu*) plants have attained 50 feet height in the six years from sowing; *babul* (*Acacia arabica*) seedlings reach four and five feet height in four months; in 1922 a thousand tons of good fodder grasses were obtained from about 5,000 acres of plantations. The ever-growing islands of vivid green and flourishing plantations in a sea of barren and aching desert afford as striking a contrast as can be found."

The Influence of Forests on Rainfall and storage of water in India.—The extent to which forests increase humidity and rainfall in a country and regulate the distribution of water has been the subject of many enquiries in India and in other countries. It is impossible to refer here at length to these matters, but in the publications, a list of which is attached to this note, will be found the results of many valuable observations. In Dr. Voelcker's report he notes, on page 30 (2nd Edition) as follows:—

> " Taking all the months of the year except June, July and August (which are excluded because the rains of this period are not local in origin, but are those of the south-west monsoon and come from a distance), it was found that during the tree-less period 1870-4 there was a total of 374 rainy days only, whilst during the wooded period 1886-90 there were 416 rainy days. Further than this, it was ascertained that the character of the rainfall had altered within late years. Light and regular rain showers taking, to a great extent, the place of destructive occasional torrents. The agricultural importance of these facts is very great indeed."

I have obtained from the local forest officers data for more recent years and we now have the following figures:—

Period.	*Excluding June, July and August.*
1870-74	374 rainy days.
1886-90	416 ,, ,,
1902-06	467 ,, ,,
1918-22	481 ,, ,,

It thus seems clear that the number of rainy days at the Nilgiri Hills has increased with the increase of forests on those hills. On the 467 rainy days in 1902-06 the rainfall was 165 inches; on the 481 rainy days in 1918-22 the rainfall was 177 inches.

6. *General proposals for future action.*—I cannot do better under this head than draw particular attention to the report by Dr. Voelcker already referred to.

Dr. Voelcker was deputed by the Secretary of State to enquire into and advise upon (1) The improvement of Indian Agriculture by scientific means; (2) The improvement of Indian Agriculture generally. He arrived in India in December 1889, and, after a thorough investigation, submitted his

report which was discussed at an Agricultural Conference held at Simla in October 1890.

The report is of much value and must be so well known that it will be sufficient for my purpose, if I draw attention to the following:—

Recommendations, page 33	2nd edition.
Remarks on Green manuring, page 107 . .	,,
Recommendations, page 134	,,
Destruction of Forests, page 135 . . .	,,
Sir Dietrich Brandis' work, page 138 . .	,,
Forests, pages 140—166	,,
Recommendations, page 167	,,
Recommendations, page 189	,,

It would be difficult to improve, in a general way, on the proposals set forth in Dr. Voelcker's report.

Proposals to increase the forest areas in British India.—There can be no doubt that the agricultural communities of India would benefit very greatly indeed by an extension of the forest areas. The general humidity and distribution of rain would be improved and the supply of water increased and regulated: timber and fuel would be available for the villager and he would be able to put cattle manure on his fields instead of burning it; the provision of good grazing and fodder would be increased.

It will probably be difficult to obtain the necessary funds for the establishment of these desirable forest areas from Provincial revenues, and it may therefore be considered whether it is not possible to provide for them by means of loans. As regards the management of these forest areas, it would appear advisable that this should, to begin with at any rate, be in the hands of the Forest Departments of the Provinces. Forest villages and panchayets have had a certain amount of success in some parts of India, but there is no doubt that for the present greater progress in the establishment and management of forests of the class required will be made if they are in the hands of experts and not in the hands of local bodies whose members are usually at present unable to realise the immense benefits that may ensue from continuous skilled management.

सत्यमेव जयते

Replies to the Questionnaire.

QUESTION 19.—(*a*) Forest lands for the purposes of my answer may be divided into (1) Reserved Forest, (2) Village and unclassed forests.

(*i*) *Reserved Forests.*—I think that in a number of Provinces reserved forests could be made of more use to the villagers for agricultural purposes than they are at present. Wood for houses, fences, etc., and green manure and fodder could be made permanently available on a large scale than at present if it were found feasible to have them utilised in an economical and systematic manner. This is rarely possible at present because the habits of the ordinary peasant in such utilisation are extremely wasteful. He does not look ahead and will sacrifice the prospect of future benefits for present advantage. A change which would be desirable would be to have thoroughly reliable officials in charge of the forests, who would see that the produce was properly utilised. Inspection by gazetted officers of the methods of utilisation should be carried out frequently. The large size of forest divisions prevents this being done at present and at times reserves are closed because there is no one to supervise the extraction of the produce. The ordinary forest guard is of little use. Education of the agriculturist would help.

(*ii*) *Village and unclassed forests.*—Village forests are utilised by agriculturists under a certain amount of control but it has been found difficult to interest villagers sufficiently in the matter to ensure that the forests are cared for. Recently in the Punjab it has been necessary to take away the control from the villagers who made even a worse job of it than the forest subordinates. Panchayats have taken over the management of certain forests in Madras and are reported to be doing well. Progress in the management of these forests is to be found in the growth of public spirit and the spread of education. Unclassed forests are found principally in Burma where the agricultural problems in connection with forestry are not acute, as a rule.

(*b*) The supply of firewood and fodder in rural areas near forests can be increased in the manner suggested under (*a*) above.

In areas where there are no forests, I believe, that it would be a great advantage if land were acquired by the Forest Department for the formation of plantation.

(*c*) Deterioration of forests has led to soil erosion. Examples are the Punjab, the Himalayas, and the ravine areas in the south of the United Provinces.

The remedies are (1) control of grazing, (2) planting up.

(*d*) The methods by which the supply of moisture in the soil, the rainfall, and supply of canal water can be increased and regulated by afforestation and by the increased protection of forests so as to benefit agriculture are:-

(1) Control of grazing.

(2) Control of felling of trees.

(3) Planting up.

Please see my note "Forestry and Agriculture in India" written for the Commission.

The same methods would be useful in preventing the destruction by erosion of agricultural land.

(*e*) Openings could undoubtedly be made for schemes of afforestation in the neighbourhood of villages.

(*f*) Many forests are suffering deterioration from excessive grazing, and soil erosion is thereby facilitated. 3¼ million of animals are estimated to have grazed in the forests of the Punjab during the year ending March 31, 1925. A few days' tour almost anywhere where there are forests in the Punjab will show what this means to the forest growth. Other Provinces which I believe suffer heavily are Bombay, Madras, the Central Provinces and the United Provinces.

The figures for the year ending March 31, 1925, are approximately:—

Punjab—3¼ million animals grazed over 6,000 sq. miles.

United Provinces—1 million animals grazed over 5,000 sq. miles.

Central Provinces—9½ million animals grazed over 16,000 sq. miles.

Bombay—2½ million animals grazed over 12,000 sq. miles.

Madras—1 million animals grazed over 16,000 sq. miles.

The remedies are (1) reduction of the number of cattle kept by villagers, and (2) limitation of grazing to the amount that the forest can stand without deterioration.

सत्यमेव जयते

Oral Evidence.

1906. *The Chairman:* Mr. Rodger, you are the Officiating Inspector General of Forests?—Yes.

1907. You have put in a memorandum of the evidence which you wish to give us, and the Commission have read that in conjunction with the previous memorandum which has been circulated as a separate Government paper to the Commission. I do not know whether at this stage you would like to make a statement, or would rather proceed by question and answer?—Well, if you question me on what you would like me to tell you, it will probably be easier. What I have to tell you will emerge in that way, I expect.

1908. I notice from your memorandum that you are fully alive to the importance of the services which it is within the power of the Forest Department to render to agriculture?—We are fully aware of that, yes.

1909. I have no desire to be critical, but will you tell me whether in the past those opportunities were fully realised by your service?—Yes, I think they were realised, but for many years past the establishment of the Forest Department has not been nearly as large as we should have liked it to have been, and we cannot manage forests with detailed care unless we have a large supervisory establishment. If we had had a trained establishment able to look after our small isolated forests, particularly those of interest to the agriculturists in the neighbourhood, we should have been able to do more for them than we have been able to do so far. As it is, in certain areas, our work has been, I think, to look after areas without being able to utilise them properly because we knew that if they were utilised without due care and inspection the material in them would be wasted.

1910. Do I understand from that that your attention is necessarily concentrated in the main upon forests which are not so important from the agricultural point of view as are some of the smaller and less valuable forests?—Yes.

1911. The main work of the superior establishment and the subordinates who work with them is mainly in the large important commercial forests, because in the past we have had to make revenue; the Forest Department has always been considered as a commercial department, and that is where our revenue comes from?—The revenue which may be realised from small scrub forests, grass forests and small areas available for cultivation is very small compared to the large revenue we get from the important timber forests.

1912. On the whole, you think that there is close touch and sympathetic understanding between the two services?—Yes, I have always found that. You will naturally understand, however, that the main and important blocks of forests are far removed from civilisation. Where there are fewer people we get larger areas. If a Province is very much broken up by cultivation, we find it impossible to reserve large blocks of forest, so that our most important and biggest forests are rather remote.

1913. Now, it is knowledge of the other man's business that makes for sympathetic understanding. I want you to tell me whether you think that all is being done that might be done to instruct your candidates and your junior officers in those things that forests can do for agriculture?—Well, I think probably we could do more than we were doing now to teach the forest officers and forest subordinates the needs of the villagers.

1914. Would you go so far as to say that a short examination paper on these questions might be included in the tests for appointment?—Well, sir, we do not examine them in forestry matters before they take the course in forestry.

1915. I will put in this way and say, at the appropriate moment?—If you do that, it will be a very excellent thing. In fact we should like to see that they have a useful knowledge of how they can help agriculture.

1916. You think that might be adopted?—Certainly.

1917. I see on the very first page of your "Replies to the Questionnaire" you say that it would be more easy to help agriculturists if the habits of the ordinary peasant in the utilisation of such opportunites (I paraphrase your words) made such assistance easy. What exactly do you mean by that?—I mean to say the ordinary peasant's way of using a tree is to cut it down at 3 or 4 feet from the ground and leave about three-fourths of it to rot in the jungle, and so the utilisation is almost invariably wasteful in forests.

1918. You have not the number of officers required to control the ryot?—That is the trouble. Our divisions are very large, and our officers are not able to see the forests which are near agricultural areas as often as they could wish.

1919. Do you think it might be possible to develop the Panchayat system (not for forest control) in the villages where rights and privileges are enjoyed and to control the way in which those rights and privileges are made use of?—It varies in different Provinces. We tried it in the Punjab, and we found that the village elders have been able to make less progress, and have incurred more dislike in managing the forests than the forest subordinates.

1920. That is so far as panchayet management of forest goes?—Yes.

1921. What I am asking you now is whether you do not think some control by panchayets over the ryots in their enjoyment of their privileges in forests controlled by you and not by panchayets might be useful?—You mean the panchayets should look after the enjoyment of the rights in the reserved forest?

1922. That is my idea?—No, I would not recommend that.

1923. I should like to have your reasons?—Because we find that expert control over these matters is more satisfactory than village control.

1924. I am sure it is, but you have just told me that you have not the number of officers required to exert it?—As far as we can do it, we open the forests and look after them. The ordinary village headman has not the understanding of the necessity of economical forest utilisation.

1925. You could not fix the responsibility on him and teach him?—He is not a very easy person to teach.

1926. You are probably familiar with Dr. Voelcker's report?—Yes.

1927. You know the view that he there puts down regarding the manner in which forest can assist agriculture?—Yes.

1928. You think sufficient attention has been paid to that advice?—No, I do not.

1929. Who do you think is responsible for that?—I suppose the Local Governments.

1930. Take first the provision of preserved fodder. Have you in your mind the possibility of any extension of a system whereby the Forest Department cuts and makes hay or silage?—It can be done. During the War several of the provinces where fodder is an important item cut and supplied very large quantities. Whenever there is any necessity such as the demand during the War or the demand during famines, the Forest Department has always been able to supply fodder on a very large scale.

1931. So really it is a question of an assured demand?—Yes. When necessary the Provinces have been able to supply it.

1932. In the main it should be regarded as an insurance against the loss of cattle during famine?—Yes.

1933. If there is no famine, is there a market for your fodder?—Yes.

1934. Even if there is no famine?—There is always a certain amount of demand for it.

1935. For preserved fodder?—There is always a market for baled fodder. There is always a good market for it, in Upper India at any rate.

1936. In non-famine years can you obtain a price for baled fodder which covers its cost of production?—I believe so.

1937. What then prevents the expansion to a large extent of this very important service?—In the ordinary forest we do not encourage grass land. We try to grow trees. In certain areas it is found that we can make more money and better forest revenue out of an area under grass land than under trees, but we would rather grow trees if we can, generally speaking, unless it was necessary for the agricultural needs of the community to have grass land.

1938. That is your business?—Yes.

1939. Are there important and considerable areas contiguous to important agricultural communities where fodder might be grown for baling and where fodder is not now being grown?—I do not think so.

1940. You point out in one of your memoranda that the percentage of forest land to cultivated land in India taken as a whole is sufficient?—Yes, but in some of the Provinces it is anything but sufficient.

1941. Its distribution is unsatisfactory?—Half of it is in Burma, to begin with.

1942. Do you contemplate the planting of further forests in the neighbourhood of agricultural land?—After a fairly thorough study of the subject I am convinced that we can do good to the districts by starting forests in them.

1943. That is to be taken as applying both to dry land and irrigated land?—Yes. We have now good irrigated plantations in the Punjab which are most valuable.

1944. You think you have discovered the best quick growing timber for the purpose of providing fuel?—Yes. I have noted down the names of about a dozen that we might try which we know will be suitable for planting in various parts of the country according to rainfall and temperature. The eucalyptus is a very important tree in the Nilgiris. It has a wonderful annual growth there.

1945. I am fairly familiar with the eucalyptus. What type are you thinking of?—They have several kinds. I do not remember the scientific names, but it is a wonderful timber tree, which has not, however, proved very satisfactory in Upper India up to date.

1946. Have you in mind a definite scheme of afforestation? Taking the Punjab, for example, have you in mind any definite scheme for afforestation there?—I have not been through the dry districts of the Punjab.

1947. About the irrigated?—I have not been through them either.

1948. Have you any definite schemes in your mind?—No. It should be done in every district where it is found possible to undertake some scheme of this nature. I would suggest that every district should be critically examined with a view to seeing what areas we can take up on which we can plant forests which will pay and be of general good to the district as compared with keeping the land under agriculture. It is not a matter where one can produce a scheme even for a Province. You would have to do it for the districts.

1949. I was going to ask you what steps you take to obtain the consent of the responsible authorities to the afforestation of a particular plot of land? How do you link in there with the provincial services?—In the United Provinces they have done it. With the consent of the landowners they have taken up a very considerable area of what we call barren ravine land and handed it over to the Forest Department.

1950. Who are "they"?—The Local Government. That is ravine land near the Jumna, land which has become barren owing to excessive grazing and erosion and the cutting of timber. Successful planting has been done there. I have seen that, and I think that a great deal may be done on those lines, especially on the barren lands in the south and south-west of the United Provinces.

1951. Do you think it would be a sound policy if in formulating the main outlines of development under irrigation in new areas a definite plan of afforestation under irrigation were settled upon in the initial stages?—To fix a percentage of the whole land to come under forest?

1952. Yes?—I should like to see that.

1953. I am thinking of a case where a desert is being irrigated, where the planting of canal colonies is contemplated and where there are no vested interests?—I should like to keep 15 or 20 or 25 per cent under forest if it is found possible.

1954. It is not a question of keeping it under forest but of putting it under forest?—At the time of creating the irrigated land?

1955. Yes. Do you think it could be shown that over a period of 50 years it would be a paying venture to take the steps you suggest?—Not everywhere. Sometimes you would only get 2 or 3 per cent. We cannot expect 7 per cent from afforestation. It is only in a few places that you will get a high percentage. 2 or 3 per cent could not be considered as a paying investment for Government money at present.

1956. It would be a doubtful step from the financial angle to hypothecate 15 or 20 per cent of your newly irrigated land to forest?—But then there is the general point of view of the good to the countryside.

1957. What do you mean by "good"?—Provision of fuel and grass and the effect upon the local climate of good tracts of woodland.

1958. You think those have an important economic bearing on the crops?—Yes.

1959. May I suggest to you that whereas the *primâ facie* advantage may be 3 per cent the actual advantage cannot be estimated and may be much more important?—Yes.

1960. I am aware that the matter does not come within the immediate purview of your department, but are you interested at all in the culture of cinchona (quinine)?—I have talked the matter over with the men in charge. I have seen some of the work. I have had a little to do with it.

1961. Where?—In Burma.

1962. What department is at present carrying on that work?—It is under the officer who is Superintendent of the Botanical Survey of India. The officer in charge is called the Superintendent of the Botanical Survey of India and also Superintendent of Cinchona Cultivation, or some title like that.

1963. Is the culture of quinine intimately bound up with the presence of an appropriate growth of other varieties?—Colonel Gage used to be in charge of that. I have talked the matter over with him. He told me that they must have primeval forest if possible on the land before they can plant cinchona.

1964. Is the altitude important?—Apparently not so important, because they are planting it near Mergui in Lower Burma now, which is little above the sea, and they also plant it in Tavoy at an altitude of 800 to 900 ft.

1965. Do you think your department can undertake the development of cinchona plantations?—Yes, I think so.

1966. Do you think it would be a good thing if your department did so?—It is not right to say that another department is not doing it properly. I would not like to say that we could do it better until I see what is being done at present, but it seems to me the matter is intimately connected with forestry. Cinchona plantations are usually in forests.

1967. Now, a word or two about another subject, the grazing of cattle in forests. Are you satisfied with the system and the scale of fees charged?—I think that in the majority of Provinces the scale of fees charged is nothing like what the grazing is really worth. The Bombay Government in their note say that they have sacrificed about 12 out of 20 lakhs, some very large sum, which was really the value of the grazing. The fees are almost always

reduced to a small sum. The Central Provinces Government are insistent on the point that the villagers in the neighbourhood should have the utilisation of their own natural resources at a reasonable rate.

1968. Is there sufficient grazing opportunity for the total cattle population?—No, nothing like what is required, in Upper India. There are far more cattle than the forests can support.

1969. Would you go so far as to say far more cattle within easy reach of forests than can be grazed in those forests?—Yes.

1970. Do you think that the charging of a higher scale of fees would tend to confine grazing to better animals to the advantage of agriculture as a whole?—What we want to get at is to reduce the large herds of cattle of very poor quality and it is very doubtful if that can be done. I am rather afraid just a few animals would be put into good grazing in the forests and others would be left to pick what they could, as happened in famine years when many thousands of them died.

1971. You mean the effect of a general high rate would be to reduce the numbers?—I suppose it would cause a good many deaths; I do not know whether it would succeed in improving the breed. I do not advocate the increasing of the rates.

1972. That has been suggested from one quarter. If forests were within the terms of reference of the Commission I should have many other questions to ask you, but they are not, and we are only interested in matters where forestry administration touches agricultural interests?—Yes.

1973. *Dr. Hyder:* The policy for the Forest Department is laid down in a circular* of the Government of India which was issued in 1894, in which it was said that, subject to certain restrictions, the claims of cultivators are stronger than the claims of forest reservation. Does your department still adhere to that policy?—Certainly.

1974. And there have been no changes?—No, as far as I know. Generally speaking, we adhere to it. It is in our Code and every forest officer has a copy of the circular and knows it.

1975. Why is there then this complaint on the part of agriculturists in the neighbourhood of forests that their facilities for grazing and other matters have been reduced?—Because, as I noted in the beginning of my memorandum, in the old days the agriculturist was accustomed to use the forests as he was accustomed to use the water and air and sunshine, and now, with an increasing population and increasing utilisation, that is not possible. If you allow them to do that, the forest will be destroyed in a very few years, as they have been in many parts of India.

1976. Coming to this question of grazing of animals, do you think all animals are equally destructive of forest growth and young plants?—No.

1977. Do you then make any discrimination in favour of some animals as against others?—Yes.

1978. Does your department, or do the provincial departments, keep out certain animals, for instance, goats and sheep and camels, and allow grazing facilities to a larger extent in the case of cows and bullocks?—Yes.

1979. Because the latter are evidently not very destructive?—They are not so destructive. A goat will climb a tree to eat it and a cow cannot do that.

1980. A cow will not eat young shoots?—Yes, it will eat the tender shoots of a great many trees, and game also eat a lot.

1981. Have any experiments been made as regards the plantation of young plants for the purpose of fuel?—Many.

1982. Has anything of that kind been done in the United Provinces as regards for instance, Casuarina?—I have not seen Casuarina in the United Provinces. They have it in Bombay and Madras.

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* Circular No. 22F., 19th October 1894, Department of Revenue and Agriculture.

1983. You think the climatic conditions in the United Provinces are not suitable?—Generally speaking, I think, Casuarina grows best near the sea shore. It also grows in Central India to a certain extent. It is a good fuel wood and might be tried.

1984. You think that would be suitable for villages?—Yes, that is one of the trees that might be tried.

1985. Coming to these figures you have given in your memorandum, I notice a very great discrepancy as regards the animals which graze. In the United Provinces, for an area of 5,000 square miles the number is only one million, and if you compare the area with the areas in other Provinces, you will find the number of animals is much larger in other Provinces. Why is there this difference?—You are talking about forest grazing. Numbers of districts in the United Provinces have no forests at all. There is no forest officer there and we have nothing to do with them.

1986. But the total area is 5,000 square miles. In the case of the Punjab you have 6,000 square miles and the number of animals that graze there is 3,250,000. In the case of the United Provinces there is only one million. Do you think you are tightening up forest control in the United Provinces?—I suppose people in the Punjab keep larger herds.

1987. Could I draw that inference from the total animal population of the United Provinces and the Punjab?—I do not know, I am sure.

1988. *Sir Thomas Middleton:* From the point of view of grazing, there are three classes of forests, first of all the forests in which grazing is freely allowed, second, the forest in which grazing is not allowed but grass-cutting is allowed, and thirdly the forests in which neither grazing nor grass-cutting exists. Are there any figures which would enable us to ascertain the approximate areas of these three groups either for India as a whole or for Provinces?

Mr. Calvert: I have the figures for the Punjab.

The Witness: I do not know; I would have to look that up.

1989. *Sir Thomas Middleton:* Could you, without looking up figures, give us a very rough idea as to the relative proportion? Would the open forests amount to 10 per cent of the whole?—We have in one of our annual forms the areas closed and open to grazing, and these are divided into those closed to animals for part of the year and closed to animals for the whole year.

1990. Would it be possible, without much trouble, to get some information showing for the different Provinces approximately the area open to grazing?—I will give it to you now; I think this is what you want. (*Document* handed in.*)

1991. The next point is as to the method of grazing. When you open forests you open them for a specified period of a year or the whole season. You have two classes of forests?—Yes.

1992. Is there any rule that when the forest is open, it shall be grazed in sections, or is the whole area thrown open for the season for which grazing is permitted?—In a few cases they try to do that, but if you had much to do with village-grazing you would see that detailed control of that kind is almost impossible.

1993. I have seen a good deal of it and I know the difficulties, what I want to know is whether there has been any attempt to regulate grazing?—There has been.

1994. I was sorry to hear that in answering Dr. Hyder you classed the sheep with the goats in grazing regulations?—It was Dr. Hyder who did that.

1995. *Dr. Hyder:* May I point out to you that in this statement which you have given, you class camels, sheep and goats as browsers and you give greater facilities to other animals than to these?—Yes.

* *Vide* Appendix.

1996. *Sir Thomas Middleton:* Would you agree that the sheep might be a desirable animal to include along with cattle?—I would say the goat was much the worst.

1997. *The Chairman:* Have you ever seen a sheep up a tree?—No, but I have seen a goat up a tree.

1998. *Sir Thomas Middleton:* You agree with the Chairman that some examination as to the requirements of the agriculturists would be desirable for forest officers. When would you propose to examine them, before appointment or after appointment?—I do not think that is the point. The thing is to teach them, not to give them an examination. After they have had a short series of lectures on the utilisation of forests for agriculturists and villagers I would give them an examination, after their forest course.

1999. *The Chairman:* I had hoped that I had persuaded the witness that an examination at some stage might be of use because it stimulates interest? —Quite so.

2000. *Sir Thomas Middleton:* I asked with the object of getting an opinion as to when that examination should come?—We examine them in general subjects only, before they start their forest course.

2001. Personally I should hope you would not attempt to examine them on agriculture before entrance to the service?—No.

2002. In those forests in which grass-cutting is common and which are not grazed, is any attempt being made to build up reserves against famine years? Do you store for more than two seasons?—Experimental work on these lines is now being carried out to see to what extent baled grass can be kept in small houses and depôts in the forests.

2003. You mentioned that you possessed a list of trees which in your opinion would be of value for fuel purposes. In order that we may get the names perhaps you will read out your list?—I have put down two small heads; one is for woods which would be useful to people for agricultural implements, for fences and house-building, and the other for fuel. I have got the Indian names and I can tell you the scientific names.

2004. Give us the Indian names*?—*Babul, Khair, Haldu, Kokko, Kakli, Dak, Careya, Amaltas, Shisham, Gumhar, Lagerstroemias, Champak, Odina, Kosum, Teak, Sain, Ber, Simul, Toon and Jaman.*

2005. You would perhaps send in the scientific names*?—I will. There are possibilities for planting for agricultural implements and fuel.

2006. *Sir Ganga Ram:* I have heard all these names. I know only about *Babul.* But it casts a very injurious shadow over the crop and is therefore unsuited to grow on the edge of the fields?—Yes.

2007. Can you give us the name of any tree which will not cast any injurious shadow over the crop and could be grown on the edge of the fields? —If the crop does not want any shadow, I do not know any tree that would not cast a shadow.

2008. An injurious shadow, I am referring to?—I think *Acacias* will do little harm.

The Chairman: There is nothing lethal in the shadow; it is the size of it that matters.

2009. *Sir Ganga Ram:* You have been in the Punjab and you have seen the Chenab colony?—No, I have not seen that.

2010. Sometime ago at the suggestion of the late Commissioner Mr. Booth Tucker I planted *Rheudus* and *Rustraka* trees. They grew about 30 feet high in three years and by cutting one of them and allowing it to dry I got 1 maund and 29 seers of fuel. Those trees are still in my village. If the Commission goes to my village I shall show them. They do not cast any injurious shadow, because they have no shadow; they are not very leafy. Do you know anything about those trees?—They are kinds of eucalyptus. I know a little about them. They are not easy to grow.

* For revised list of trees with the Indian and scientific names, *vide* Appendix, page 274 (*ii*).

2011. They grew a tremendous size in three years. I had 5 of them?—That is garden work, not forestry, is it not?

2012. Would you kindly define 'reserved forests'? In reserved forests do you have new trees or are they forests which contain trees of olden times?—The majority of reserved forests in India and Burma are taken up from primeval jungle.

2013. If you have old trees there and you do nothing there, what is your objection to allow free grazing there?—If there are plenty of old trees, there is no grazing. Lots of old forests have no grass in them.

2014. You have no objection to allow grazing there?—Yes, we have, because cattle destroy the young trees which are coming up to take the place of the old ones.

2015. The old trees are very high, beyond the reach of cattle. What is your objection to allowing free grazing there?—When the old trees are mature, they must be felled and sold.

2016. There are hundreds and thousands of forests where there are old trees. You require time to cut them?—We do not mind grazing there, but if we are going to start felling and planting we should object.

2017. You mention in your memorandum the process of terracing inwards towards the hill side. Why do not you carry that still further and then allow the people to cultivate?—You cannot make cultivation there. The land is too steep. We have not got far enough for that. If the people want to cultivate in these forests, they will cut down all the trees that we have planted there.

2018. In this connection you have not seen my article in *Indian Engineering*, I take it. I will give you a reprint of it now. You admit in your memorandum that floods are due to the too precipitate discharge of rainfall?—Yes.

2019. Why do not you carry out the system, to which I have alluded, on a large scale, so that floods may not cause so much damage?—We do wherever we get a chance.

2020. Do you want special funds for this if this idea is to be carried out on a large scale?—We should need special funds.

2021. Could not that terracing inwards be done in the Khyber hills?—I suppose it could. I have not seen the Khyber. I understand it is very barren and rocky.

2022. Terracing inwards will make some grass grow there and provide livelihood to those restless people who commit so much crime?—Yes, it sounds a very good idea.

2023. I hope to show that to the Commission when we go to Peshawar. One more question. Do you allow the leaves which fall from the Pine and Deodar trees to be taken by the neighbouring zamindars? Have you any objection to the neighbouring zamindars taking them away?—I believe they do take them to a great extent.

2024. They are prevented by the Forest Department. Zamindars have complained to me that they are not allowed to take them. I have told them they are good as manure, but they tell me they are not allowed to take them away?—If you take these things away from the forest soil for many years running, it becomes very much impoverished, and your next crop of trees will certainly be inferior.

2025. If a zamindar wanted to plant walnut trees, would you be prepared to give him saplings?—We always do that.

2026. You said in reply to the Chairman that you kept baled fodder. How do you bale it?—We have some machines, the same as are used for *babar* grass.

2027. Hand-driven?—I have not seen anything done by machine. I believe in War time in Bombay they did use steam, but I do not think it is used as a rule in the forest.

2028. You are aware of the fact that in the Chenab Colony, under the rules they kept 10 per cent reserve for *chirag* and other purposes; for years they did nothing because neither could they get any assistance from the Forest Department nor could they get any from the Irrigation Department, they would not give any water; and the result is that this year our Governor has reduced the area from 10 to 5 per cent and made a crore of rupees by selling land. Do you think the Forest Department could help the zamindars in any way if the Irrigation Department gives water? These are very important fuel reserves for the villages. When these colonies were established, each village, supposing it had 65 squares of land, kept one sixth for fuel and for grazing purposes. For 20 years they did nothing about it because the Irrigation Department was so unkind as not to give any water for it and the zamindar would not give his own water and the Forest Department paid no attention to them, and so it is now reduced to 5 per cent. Even 5 per cent is good enough if the Forest Department will guide them how to plant trees or anything of that sort for fuel. I understand the Irrigation Department is willing to give water for it?—I am certain they would.

I only ask that a note may be taken of that.

2029. *Sir Henry Lawrence:* You have told us that the great majority of your forests are remote from habitations and population?—Comparatively so, yes.

2030. Could you give us any idea of the total amount which is available for assistance to agriculturists? You have some 220,000 sq. miles altogether. What percentage of that is within easy reach of agricultural habitation? Could you give us any sort of figure?—Generally speaking, the reserved forests are the more remote, the protected and unclassed forests are nearer the cultivator; our areas for that are 104,000 sq. miles of reserved, 8,000 sq. miles of protected, and 120,000 sq. miles of unclassed. That is a very rough classification; but if you wish to have more detailed figures I could get them worked out.

2031. Nine-tenths of the unclassed is in Burma?—That is quite true.

2032. I mean that is not a fair distribution?—The figures I have given are for the whole of India; I could get the detailed figures for you probably in a few days. It would probably be more useful than any estimate I could give you now.

2033. Would you accept the statement as regards Bombay that not more than one-third of the forests in Bombay is within reach of the agricultural population?—I fancy that is about right.

2034. For instance, taking Kanara District which has 5,000 square miles and has a population of 600,000 or Khandesh and the Panch Mahals which have 3,000 square miles and a population of less than a million, the remainder is about 4,000 square miles which could be utilised for agricultural purposes, or a third of the total area in Bombay. Is that a fair statement? And would it be applicable to most Provinces?—That could be utilised for agricultural purposes?

2035. Yes. Will you think it out and give us some figure?—Yes. Do I understand that you include *jhuming* or temporary hill cultivation for agricultural purposes? To our ideas it is an illegitimate form of cultivation.

2036. I would not include that as being legitimate assistance to permanent agriculture. I mean in the way of grazing or providing fuel or minor woods for implements and such purposes. You mentioned *jhuming* or hill cultivation: do you take that as an important factor in forest policy throughout India?—Yes, in the wilder tracts.

2037. It may be so in Bombay, but does the same problem exist elsewhere?—In Assam and Madras and in a good many other places, I think.

2038. We call it *kumri* in Bombay; but it refers only to a minute percentage of our forests?—Yes.

2039. In your printed memorandum here the statement is made that the value of free grazing and fodder grass was put at 3·8 million rupees. Is not that a very great under-estimate?—We never put any great value on these figures of free produce from the forests; the figures are obtained through headmen's statements.

2040. It works out at less than eight annas per head per annum?—It may be much more; in many districts it is certain to be much more; the way in which these figures relating to free grazing and fodder grass are collected convinces us that in a good many cases the figures are quite unreliable; but we must put down something; we do not pretend the figures are accurate; they can never be accurate.

2041. It may be said against the department that you do not do enough for free grazing and fodder grass, if you put down 38 lakhs for all-India or 8 annas per head per annum?—I have got here the estimated figure for the year 1924-25, which is 67 lakhs.

2042. Even that would be only a rupee per annum?—Yes.

2043. That is rather on the low side?—Yes; it might be a hundred lakhs.

2044. In regard to the baling of grass you are not perhaps acquainted with the experiments which have been made in Bombay where machinery is used for baling grass?—I have heard of it.

2045. Baled grass has been kept for the last ten years; it is not a perfectly new experiment?—No.

2046. But the grass that is available for baling is of very poor quality?—Yes.

2047. Naturally, because it grows on such poor soil and under high forest?—Yes.

2048. You spoke of cinchona. What would be your estimate of the total area that should be put under cinchona in order to fulfil the requirements of India? Would it be any very large area?—I imagine it would be some thousands of acres.

2049. Not a large proportion of your forest area?—No. But a large portion of our forest area is quite unsuitable to grow cinchona.

2050. The area under cinchona at present is about 3,000 acres?—Yes.

2051. If you multiply it by ten you would fulfil the requirements of India?—I do not think so; you would probably want more than that. I believe at present a large quantity of bark is being bought to meet the deficiency in India.

2052. Would a hundred thousand acres suffice?—I could not tell you offhand, but I should say that it would be enough.

2053. What I want to know is whether it is an undertaking of such dimensions that it should frighten the Government of India from proceeding with it?—Certainly not, it ought not to be.

2054. *The Raja of Parlakimedi:* In addition to the methods for supervision you suggested, what do you think of introducing a system of doing the work of distribution among the ryots for their domestic purposes by some sort of token system in the hands of village headmen?—It can be done, but it does need a great deal of supervision. We have found in certain cases that the village headmen will take advantage of it for their own purposes. That has happened in the Jhelum district of the Punjab already and in the annual report it is said that they decided to take forests away from the villagers in the Jhelum district and give them back to the Forest Department. In Madras I believe they have started the Panchayat system and it is working well, but it is only a very recent experiment and one cannot base very much on it yet.

2055. As regards protection of grazing land, would it not be better if the department did it by rotation?—That has been mentioned already, and I have stated that it has been done to a small extent in some places already; but

it needs a great deal of careful supervision and in many cases you need to fence, which is an expensive matter; the cattle stray a good deal.

2056. Could not that be entrusted to the village headmen? Can they not be held responsible?—They can be held responsible, but what the results are is another matter.

2057. It has not been experimented?—It has been experimented within what are called the Hazara village lands to a certain extent, I believe.

2058. Sandal wood is very much affected by some sort of borer?—Spike.

2059. Are any steps being taken to protect it against spike?—It is not a matter of protection; it is a matter of finding out what it is caused by; as far as I know we have not found yet what the cause is; a great many scientists have been at work to find it, but have not succeeded yet; the experiments are still going on.

2060. Sandal wood does not require any elevation for growing?—It will grow at a height of 2,200 feet and flourish at that height. Mysore and those parts grow a great deal of it.

2061. *Sir James MacKenna:* I want to put a few questions from rather a different aspect than that of my colleagues. What is the policy of the Government of India with reference to Indianisation of the superior grades of the Forest Service?—The policy of the Government of India is to have 75 per cent of Indians in the Indian Forest Service.

2062. Am I correct in saying that the Forest Department is the first Department in India seriously to take up the training of Indians for these superior courses?—I fancy so, yes, as far as I am aware.

2063. How long has your scheme for this training been running?—We opened the first course on November 5th of this year.

2064. So that you are not yet in a position to give an opinion as to its success?—No.

2065. What was your opinion of the first group of candidates who came up before the Selection Board for admission to this advanced course?—Half of them we decided were not suitable.

2066. On what ground, physical or educational?—We had various headings; we divided up our notes into headings; the three of us marked the points separately: appearance and manners, English, intelligence and so on, and we found that we were practically unanimous in our judgment of the various candidates.

2067. What was the composition of the Board?—Mr. Richey, the Educational Commissioner, Dr. Ziauddin, Vice-Chancellor of the Aligarh University, and myself.

2068. Then as we shall probably have to consider the problem of higher education of Indians for the Agricultural Service, do you think that a visit to the Dehra Dun Institute by the Commission, if it can be arranged, will be helpful?—I think it will be a most excellent thing.

2069. That will probably be when we tour the United Provinces?—Yes; it is very little out of the way.

2070. There is only one forest question I want to ask: *Kans* is a very big problem in the Forest Department?—In Southern India.

2071. Is that prejudicial to agriculture as well as to the forests?—I believe it is bad when it gets on to a place used for cultivation.

2072. That is a problem which you must tackle both in the interests of forests and of agriculture?—Yes.

2073. *Prof. Gangulee:* With regard to reserved forests, do you record the claims and requirements of all the surrounding villages?—Before an area is reserved, the most minute inquiry is made about the claims of all the surrounding villages, and any man who can possibly have any claims has them recorded; in fact, even if he walks through the forest, he is allowed to do it, and his claims are always recorded.

2074. In answer to the Chairman regarding the habits of the ordinary peasants, will you kindly explain what habits you have in mind? I am not quite clear what you mean when you refer to the habits of the ordinary peasants?—You are aware that in Upper India a good deal of lopping is done. Many trees such as Elm, Chestnut and Maple have been killed in the Himalayas by people lopping the branches off.

2075. That indicates scarcity of fuel, does it not? They are driven to do that because of scarcity of fuel?—This is for fodder. The point is that there are too many cattle. If there were half the number of cattle, they would not need so much fodder.

2076. You ascribe the lack of fodder to the habits of the peasants?—They keep more cattle than their village tract can support.

2077. Do you suggest that at present the cattle population is excessive in our villages?—I should think so, in a good many villages.

2078. In order to remedy those habits, you suggest that there should be officials in charge of forests. I am not quite clear in my mind what definite steps these officials would take in order to bring about this change?—The ordinary Divisional Forest Officer has got a very large area under his jurisdiction, perhaps a thousand square miles of reserve, and he cannot be sure that his Ranger, Deputy Ranger and Forest Guards are looking after the interests of the neighbouring people in the best way, whereas if he goes round himself and the villagers come to him, they say that they are not getting the produce they want when the subordinate officials are in charge, and if the Divisional Forest Officer or the Assistant Conservator of Forests go round they see that the villagers get more.

2079. Then you think that if you educate the agriculturists it would be a great help in this matter?—I suppose it would be a certain extent.

2080. Do you carry on any propaganda?—We have been trying to get a scheme up, but we have not got the funds to carry on the propaganda. Propaganda costs a good deal of money. We do publish a great deal of forest literature and that is circulated all over India, and large numbers of people read it.

2081. Referring to the Punjab, you said that it was necessary to take away the control from the villagers. But was there any systematic attempt made by your department to convince these villagers that proper forest management would be to their interest?—Yes, I believe there was a great deal of trouble taken by the officers of the Punjab Forest Department, and it was found that the villagers themselves unanimously desired that this experimental control should be taken away from their own people and that the control should be put back into the hands of the Forest Department.

2082. Could you tell us if the supply of firewood has really replaced cowdung to any large extent?—In the United Provinces, in some parts of Central Provinces and the Punjab, I do not think it has so far. You see, carriage costs a great deal and we have not got the wood near enough to the man who wishes to burn it.

2083. With regard to the question of the land acquired by the Forest Department for the formation of plantations, do you think that a good deal of suitable land is available in the Provinces for the purposes of afforestation?—I have no doubt that, looking to the good of the village tract or district, on the whole, we could get suitable land in most districts.

2084. For instance, in Bengal do you think there is sufficient land?—I do not know much about Bengal.

2085. You agree with me that the question of soil erosion is very important. Are you in touch with the agricultural research institutes in investigating the factors that are responsible for soil erosion?—Do you mean personally?

2086. No, I mean the Forest Department as a department. Does your department present this problem to the agricultural research institutes to

see what are the factors responsible for soil erosion?—I am not aware whether this has been done.

2087. With regard to afforestation, again, which, I think, is very important, do you think any definite progress is being made in this direction?—Not enough.

2088. The reason being that the provincial departments are slack or they have not got the necessary staff?—I will not say they are slack, but it is rather a big thing to put down money to acquire decent tracts of land for forest.

2089. Then the difficulty is to secure proper land?—It is always difficult to get land in India, is it not?

2090. You do not think there is any possibility of further extension?—I think there are great possibilities if the question is taken up. Speaking as a Forest Officer, I should like to see the forest areas increased in quite a number of districts.

2091. Do you have forest nurseries in India?—Yes.

2092. How many nurseries have you in this country?—There are numerous small nurseries all over the country. They must be local.

2093. From the point of view of flood prevention, you consider that afforestation is most important?—Yes, most important.

2094. Is there any possibility of extending the manufacture of forest products in India, resin and things of that kind?—Resin is going ahead as fast as it can. It is a very flourishing industry in the Punjab and in the United Provinces the industry has been brought up to date by scientific means.

2095. Are you able to secure the necessary labour?—In most parts we get all the labour required. I have just been through Hazara, and we do get villagers for work. They get a nice little sum in cash.

2096. That gives them an opportunity of getting a subsidiary income?—Yes.

2097. You suggest, which is very interesting, that the work might be extended by a provincial loan?—Yes, the profit of the Forest Department last year was about one and a half million pounds, and it goes to the Provinces. They are, however, very reluctant as a rule to part with any large sums for things of this kind.

2098. Therefore, if the Government of India adopt a definite policy of extension of forestry, they will have to depend on loans?—They will have to depend on provincial goodwill, first of all.

2099. With regard to the management, you think it should be in the hands of the Forest Departments of the Provinces; you do not think there will be any necessity for direction from the Central Government?—It is not necessary, because the Provinces are quite capable of carrying on the work by themselves.

2100. Independently of any stimulus?—Well, stimulus is good for everybody, but they are quite capable of doing it.

2101. With regard to the problem of education on forestry, do you emphasise the agricultural aspects of forestry in your college curricula in Dehra Dun?—We emphasise it in this manner, that the rights and privileges belonging to or enjoyed by villagers in the neighbouring forests are a most important consideration on which great stress is laid. The students are fully instructed in those things. We also teach them the importance of forest denudation, the erosion of hills and so on.

2102. Also about the composition of fodder?—Yes, the use of grass is taught.

2103. *Mr. Calvert:* Have you read one of the essays of Elia on a new method of roasting pig?—Yes.

2104. Is not that typical of the average point of view in the villages towards the forests?—Yes.

2105. In your "Replies to the Questionnaire" you mention the exepriment carried out in the Punjab. Was it made in the Kangra district?—Jhelum, I think. I can show you the Report if you like.

2106. In the last Administration Report of the Punjab it was stated that out of 6,700 square miles under the Forest Department in only 150 square miles was there neither grass-cutting nor grazing. Does not that furnish a complete answer to all charges of lack of consideration to agriculturists?—I think so.

2107. You suggest an extension of forest plantations on the Punjab system, but is it not a fact that there is sometimes an excess of fuel available for which you cannot find a market?—That is owing to dearness of communication, I presume.

2108. The fuel is there if the local people would like to buy?—Yes.

2109. *Dr. Hyder:* Is that your experience as Commissioner of the Rawalpindi Division?

2110. *Mr. Calvert:* We have no plantations up there.

Dr. Hyder to Mr. Calvert: Is that your experience?

Sir Ganga Ram: It is stacked and sold by auction every month in Changa Manga.

2111. *Mr. Calvert:* You suggest at the end of your type-written note a reduction of the number of cattle kept by the villagers. Would you make any specific suggestion as to how that could be done?—Well, it goes to the root of the whole Indian village organisation.

2112. You are opposed to taxing them?—Do you mean to tax them so much per head? Yes, I am.

2113. Could not a good deal be done by selective breeding to prevent this indiscriminate breeding that goes on? Would you advocate selective grazing?—Let a few animals have the grazing? It might be done, but it would be very difficult.

2114. Then, might I ask if the post of Inspector General of Forests is to be retained or abolished?—I believe it is to be retained.

2115. You think it should be retained?—Yes.

2116. There are specific advantages to the agriculturists of India by retaining this post?—I hope so.

2117. You have given a list of trees to Sir Thomas Middleton chiefly for wood purposes?—For agricultural, fencing and housebuilding purposes.

2118. We also have got lac culture, but you did not mention Mulberry?—It is a very good thing.

2119. *The Raja of Parlakimedi:* Castor?—Castor, yes.

2120. *Mr. Calvert:* Sometimes grass-cutting, I believe, gives far more fodder than grazing?—Yes, because the cattle do not destroy it.

2121. Three or four times more?—Well, twice any way.

2122. So that by limiting grazing you could add enormously to the forest ground?—The villagers themselves do that in some parts; they keep large tracts of country in which no cow is allowed to go until the hay has been cut. There is not much done on the land under our control, because if we get good ground we want to grow trees, and if you get a lot of trees you do not grow much grass.

2123. Generally the forest supply could be increased by regulating and by cutting?—Yes, because the cow probably tramples as much grass as it eats.

2124. At Dehra Dun you are carrying out certain researches which will be of economic value to the agriculturist?—Yes.

2125. So that in the future we may look for greater help from the Forest Department than we have had in the past?—Certainly.

2126. You have just been given a list of questions, the list subsidiary to the Questionnaire. I should like to ask you the very first question. We have

had questions on whether you are doing your best for agriculturists, but in your opinion has this opening of forest rights been carried to an extent which is dangerous to the existence of the forests?—Only in a few areas which are practically surrounded by agriculturists and villagers. Generally speaking, the greater proportion of the forest area is sufficiently safeguarded.

2127. Dr. Hyder mentioned the Rawalpindi Division the other day. I think you have been to Murree?—Yes.

2128. Is that an area where the rights have been carried to excess?—Yes, there is no doubt about it.

2129. The opinion is that the rights have been carried to such an excess as to cause a permanent injury?—The famine of 1921 was the reason of that; that has caused thousands of broad-leaved trees to be exterminated.

2130. So that taking the question from both aspects, the interests of the future generation of agriculturists and the interests of the present generation, you think the interests of future generations have been sacrificed to the interests of the present generation?—In areas in proximity to villages.

2131. There is not much to protect forests for future generations?—No, not much in tracts of that description.

2132. There should be further restrictions?—If it were legal; you see in the Central Provinces forest report they lay great stress on the necessity of giving the villagers in every case as much, or even more than, the forest can stand.

2133. *Professor Gangulee:* That tendency is not to be found in all Provinces?—No, but you may say that the smaller the area percentage of forest in any Province, the greater the pressure.

2134. *Mr. Calvert:* Sir Ganga Ram asked you a question about helping villagers to put certain areas under trees?—Yes.

2135. I understand there is a limit to the area in which such work is economical?—Yes, small areas are most expensive.

2136. You want about 10,000 acres?—You need not have it necessarily as big as that; in the plains I should think you could work a thousand acres quite well.

2137. What is the size of the Punjab plantations?—I cannot remember.

2138. What is the limit?—In tracts of that sort I should think a thousand acres would be quite easily workable on an economical basis.

2139. Can the Forest Department establish grass reserves or grazing reserves on a business basis?—I think we might make 2 or 3 per cent on it, if you call that a business basis. It takes a great deal of conservation and looking after, and, after all, the demand is most in the famine times, in time of War, or other exceptional circumstances.

2140. You mentioned the reclamation of land at Etawah. Is that economic?—We are not going to make a big revenue out of it.

2141. It will pay the cost, will it?—It will pay the cost. When this waste land was taken over by us it had practically no grass on it. In 1921-22, 20,000 maunds of grass were cut, and in 1924-25, 50,000 maunds were obtained from the same area. That is entirely owing to afforestation, the conservation of moisture and the fixation of the soil.

2142. In fact, so far from cutting down the rights of the people, you are doing your best to increase the forest supply for them?—I think that is quite a fair thing to say.

2143. There is another similar proposition relating to lands which are unsuitable for agriculture, such as saline lands?—Yes.

2144. Is there scope there?—Certain trees can be found to grow on those lands; I have no doubt that with proper methods of trenching and draining, and getting the right trees, we can get them planted up.

2145. Speaking generally, I suppose in a Province like the Punjab it is useless in the plains attempting afforestation without irrigation?—I fancy so; it would be too expensive.

2146. It is hopeless in the Sind valley to attempt afforestation without irrigation. Now this question of grazing falls roughly into two classes, grazing by owners of neighbouring lands and grazing by pure traders?—That is right.

2147. Would you be in favour of restricting the traders?—Every time. The only thing is that if you do that, you cut the supply of *ghi* for the big towns, and they have got to get their supply of *ghi* from somewhere.

2148. In fact the traders actually injure the rights of the agriculturists?—Yes, these people who wander about do enormous damage and do no good to the district they graze in.

2149. Your department is now on a purely business basis?—We call it semi-commercialised.

2150. And therefore your kindness of heart towards the agriculturist has to be restrained by considerations of the balance sheet?—No, I do not think you will find that; most forest officers have a bias in favour of doing everything they can for the villagers, if the villagers will help them. That is a policy of the Government which has been laid down on numerous occasions, and I think the ordinary forest officer understands that perfectly.

2151. *Mr. Kamat:* Have you heard any allegations of corruption regarding your forest subordinates?—I have heard of them, yes.

2152. Are they very numerous?—Well, a fair number at times.

2153. Have you reason to believe that the harassing by subordinates has gone in certain Provinces to such an extent as to require close investigation?—No, I have never heard that.

2154. On the first page of your typed statement you say with reference to the proper utilisation on a systematic and economic basis of the forest reserves that a change that would be desirable would be to have thoroughly reliable officials in charge of the forests?—Yes.

2155. Do you suggest that the present officers are not reliable and that you require a change?—I know from personal experience that the ordinary forest guard is very careless, and unless he is supervised he does not do his work properly.

2156. I presume you are referring to the officials?—I mean the forest guards; I did not mean the gazetted officers.

2157. Then for this utilisation what you require is not new and reliable officials but an entire change of outlook on their part, a more liberal outlook; is that what you mean?—The gazetted officer should be able to see more of his forests and to help the agriculturists by seeing that they get the produce to which they are entitled without trouble. That is what I meant by saying it is necessary to have thoroughly reliable officials in charge of the forests.

2158. As this is very important from the point of view of the agriculturist, should not it be made perfectly plain to your officers throughout the Provinces that their policy should be liberal and that the widest publicity of this liberal policy should be made, so that agriculturists may know that you have adopted a liberal policy?—When the gazetted officer goes round and talks to them they understand that.

2159. Are you satisfied that sufficient publicity is given to your liberal policy?—Would you mind telling me what you mean by publicity in this connection?

2160. I have reason to believe that the villager does not know of this liberal policy of the Government. Do your officers and subordinates make it plain, either by posters or by circulars in the villages, that Government would be prepared to give the wood and fodder provided no waste is committed by the villagers?—They all know that.

2161. Sufficient publicity is given?—I think so; I do not say there is a great deal of posting up of notices, because I am not very keen on that, but I think the thing is talked about and the ordinary forest officer explains to his villagers what they can get.

2162. *Mr. Calvert:* They all know their rights?—Yes, they know their rights to the fullest extent.

2163. *Mr. Kamat:* Apparently you are prepared to give the wood and other things on a more liberal scale, but there are complaints that this is not being done. Why is not some system evolved by your officers to ensure the wood being cut properly and given to the agriculturist?—Because the ordinary forest guard is a very careless man, and he would very often rather sit in the village than go and look at his forest.

2164. Then it is the fault of the forest guard and not of the villager?—The villager takes advantage if his cutting is not supervised, he cuts as he likes.

2165. Is it the fault of the habits of the people or of the guard?—Both.

2166. With regard to village forests, do you receive complaints that the grazing allowed round about villages is not sufficient for the village cattle?—Do you mean the amount we give them out of what we have is not all we can give them, or that there are too many cattle for the grazing?

2167. I mean too many cattle for the grazing?—Well, that occurs in many places; we know that.

2168. Then by way of relief do you see that there is adequate grazing in comparison with the cattle of the village, and if it is inadequate, do you release forest area for further grazing?—No, there is not any; we give them all we can as a rule in the areas where grazing is intensive.

2169. That means that whatever the census of the cattle, the area reserved for forest grazing round villages is awarded; you do not reserve it?—We give them all we can on every occasion.

2170. You mean you revise the area available from time to time?—Yes.

2171. As a matter of general policy should agriculture or the semi-commercial interests have the prior right?—In the neighbourhood of villages the agricultural interests should have the prior right because it is essential for the well-being of the village.

2172. And this policy is being adhered to?—Yes.

2173. *The Chairman:* You agree it is important to inform forest officers of the points on which the forestry service can be of assistance to agriculture. Would it be possible, do you think, to attach certain suitable officers to the agricultural service for a short period in districts where agriculturists make use of forest facilities? I am thinking of developing the corps of lecturers who could carry out the work which you agreed might be useful, in an earlier stage of your examination?—Yes; you mean to send selected forest officers to a place like Pusa?

2174. I was thinking at the moment of attaching them to the agricultural service and allowing them to see for themselves from the agricultural side what is going on and what the requirements of field crops are?—Yes, that would be very sound.

2175. How about the planting of windbelts; is there much demand for that for the crops or stock?—I do not know.

2176. It would not come within your purview I suppose?—It would, but one sees these very large bare areas all over Upper India, and I am not aware as a rule that the wind does much damage.

2177. The planting of a windbelt in an area where there was not much forest would come to your notice, would it?—It might be done by the Deputy Commissioner if it were land under him; but he would be sure to call us in to carry out the planting for him, as a rule.

2178. But there is not much demand for that?—No, I think not.

2179. Do you know of any tree or shrub that will grow on alkali land?—I believe they grow in some parts of the North West, but I have not been there, and I am afraid I cannot give the name of it for the moment, but there is a shrub.

Mr. Calvert: Tamarisk.

2180. *Dr. Hyder:* And *Babul*?—That does not like it very much, but there is one shrub that grows fairly well, I think, on the *Usar* land.

2181. *The Chairman:* Is it within your knowledge whether the planting of *Usar* land with shrubs which will grow under the conditions, makes any contribution towards the reclamation of that land?—I cannot tell you that.

2182. I now put the same question in relation to *Kans* infested land. Have you any trees which would hold their own where the *Kans* weed grows (*Saccharum spontaneum*)?—We have a lot of trees which are quite happy growing in *Savannahs*.

2183. So that a rest of 30 or 50 years under forest might be a cheap and practical way of reclaiming *Kans* land, might it?—Yes.

Dr. Hyder: I think the proper remedy for that is deep ploughing.

2184. *The Chairman:* Yes, I am sure deep ploughing can be done, but it occurred to me that financial difficulties might arise. According to the documents which have been put before me, there are areas which apparently have been depopulated by the *Kans* weed; that is to say, they have gone completely out of cultivation. I wanted to get from the witness whether, as an alternative to the more expensive method of deep ploughing, it might be possible to reclaim by afforestation?—I am pretty sure it could be done. We have done similar work to that by proper planting.

2185. *Sir Thomas Middleton:* From the statement which I have here, I see that, if we exclude Burma, grazing is permitted on 4 square miles out of 5 in British India?—Yes.

2186. And in addition to the 4 square miles which are grazed, grass-cutting is permitted on the 5th mile?—Well, not quite everywhere.

2187. Could you give any indication of the extent of the grass-cutting in the reserved forests. In the Punjab we have heard from Mr. Calvert that about two-thirds of the reserved area is open for grass-cutting?—You say grass-cutting is permitted on the remaining 5th mile. Well, a good deal of that would never be cut, for one reason because there is no grass, and for another reason, because it is so remote that no villager would go there.

2188. So that the Punjab case is quite exceptional?—Yes, it is the worst for incidence of grass-cutting.

2189. *Sir Henry Lawrence:* Have you been consulted by the Irrigation Department with regard to the location of plantations in the irrigated colonies?—No. I could not tell you whether the Punjab Forest Department has been or not, but I can tell you in a few days.

2190. There is a statement in the irrigation paper presented that some 40 square miles have been planted in certain colonies, and that it is very difficult to dispose of the produce of that area?—Yes.

2191. Have you any information about that?—No, I have not heard that.

2192. Do you think there would be any difficulty in settling with the irrigation officers for the reservation of certain areas for forests?—I should not think there would be any difficulty.

2193. They would not want you to pay the full value of the water?—We pay in Changa Manga, I believe, now.

2194. You cannot expect to get places like Changa Manga all over the area?—No.

2195. That is one instance of a thoroughly productive paying proposition, is not it?—Yes, I suppose we should have to pay the irrigation dues, certainly in part, if not in full.

2196. That has been the difficulty in Sind?—Yes.

2197. That the Forest Department were not prepared to pay the rate which the Irrigation Department thought they were bound to charge?—Yes.

2198. That has been a very great obstacle in the plantation of forest areas on the Sind canals?—But it seems reasonable that they should charge us less if we are planting for the good of the countryside.

APPENDIX I.

Forest Areas open to Grazing and Grass Cutting.

Province.	Area in square miles.							
	Areas in which grass cutting and grazing are allowed.			Areas in which grass cutting is allowed but not grazing.			Areas in which neither is allowed.	
	Reserved Forests.	Protected Forests.	Total.	Reserved Forests.	Protected Forests.	Total.	Whole year.	Part year.
Assam . . .	1,907	14,739†	16,646	...	...	...	4,367	59
N.-W. F. Province .	5	...	5	38	...	38	53	1
Coorg . . .	433	...	433	...	...	...	88	419
Bihar and Orissa .	1,284	762	2,046	1,147	351	1,498	706	...
Ajmer . . .	76·40	·2	76·60	41·88	...	41·88	17	121
Burma* . . .	...	...	...	...	...	...	23,419	...
Punjab . .	900	4,339	5,239	366	23	389	448	50
Central Provinces .	16,261	...	16,261	3,089‡	...	3,089	3,382	16
Bombay .	10,104	1,260	11,364	938§	1	939	2,256	249
United Provinces .	4,904	870‖	5,774	2,186	39¶	2,225	2,194	69
Baluchistan .	69	432†	501	4	...	4	192	...
Madras . . .	16,981	...	16,981	1,830	...	1,830	2,441	1,052
Bengal . . .	877	...	877	1,836	1	1,837	6,241	...

* For all practical purposes the area and demand for grass cutting can be considered as negligible. The area of reserved forests in which grazing is allowed is 7,133 square miles as recorded in 1925-26.

† Unclassed State Forests.

‡ Excluding 20 square miles open to grazing for part of the year.

§ In addition there are 380 square miles of closed forests under sanctioned working plans in which grass cutting only may be allowed with the permission of the Divisional Forest Officers.

‖ Include 26 square miles of Unclassed Forests.

¶ ,, 3 ,, ,, ,, ,,

APPENDIX II.

Trees suitable for planting for fuel and house building timber in the plains and lower hills of India.

1. Babul	Acacia **Arabica.**
2. Khair	Acacia **Catechu.**
3. Kokko	Albizzia **Lebbek.**
4. Dak	Butea **Frondosa.**
5. Kumbi	Careya Arborea.
6. Shisham	Dalbergia **Sissoo.**
7. Gumhar	Gmelina **Arborea.**
8. Jarul	Lagerstroemia **Flos Reginae.**
9. Champak	Michelia Champaca.
10. Jingan	Odina **Wodier.**
11. Kosum	Schleichera Trijuga.
12. Teak	Tectona Grandis.
13. Sal	Shorea Robusta.
14. Sain	Terminalia **Tomentosa.**
15. Ber	Zizyphus **Jujuba.**
16. Simul	Bombax Malabaricum.
17. Paper Mulberry	Broussonetia Papyrifera.
18. Jaman	Eugenia **Jambolana.**
19. Farash	Tamarix Articulata.
20. Nim	Azadirachta Indica.
21. **Mulberry**	Morus **Indica.**
22. Tamarind	Tamarindus **Indica.**
23. **Pithecolobium**	Pithecolobium Dulce.
24. **Papar**	Pongamia Glabra.
25. **Jiban**	Trema **Orientalis.**
26. **Bamboos**	Especially **Bambusa Arundinacea.**

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2199. That problem has not been discussed between your department and the Irrigation Department in recent years?—Not as far as I know.

I think it is very important, it should be taken up.

2200. *Sir Ganga Ram:* In connection with Changa Manga, you are only paying a lump sum; you are not paying on the area of land?—I am afraid I have never been there; I cannot say.

2201. Would it affect the value of the water if the land were given for grazing? You are paying a lump sum in Changa Manga?—But they have cut the water recently, have they not? They are giving much less water.

2202. Well, I think you deserve it?—Many of the trees are dying.

Because there was a tremendous waste of water there.

2203. *The Chairman:* Is it within your knowledge that about 200,000 acres in one district in the Central Provinces were reported by the Settlement Officer to have gone out of cultivation as a consequence of the spread of *Kans* weed?—I have not heard that.

2204. Assuming that were so and afforestation were advisable in that district, would you choose that land, provided it were reasonably fertile, for the purpose of afforestation?—Yes, it seems to me that a case like that is one of the principal objects of afforestation.

(The witness withdrew.)

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Mr. H. A. SAMS, C.I.E., Deputy Director General of Posts and Telegraphs.

Memorandum on the work of the Post and Telegraph Department in rural areas.

There are, I imagine, few departments of the Government of India which do more to promote the welfare of village communities than Posts and Telegraphs. In addition to despatching and delivering letters and telegrams and maintaining communication between distant relatives, it brings to the door of the villager newspapers sent at a concession rate of 3 pies per 8 tolas, which keep him in touch with the outside world, it offers him facilities for investment in Government Securities and Cash Certificates, and encourages habits of thrift by furnishing a ready means of saving in the Post Office Savings Bank. To the agriculturist it brings parcels of seeds and in many cases acts as the vehicle for the sale of his produce by means of the V. P. system. It also brings information about new methods of agriculture and offers facilities for advertising his goods.

2. The extent of the facilities offered by the post office can be gauged by the fact that there were 20,791 post offices in India on the 31st March, 1926, of which nearly 16,000 are in the villages. The majority of the village offices are run by the villagers themselves who are not whole-time servants of the Post Office but follow their own callings, as Appendix I will show.

3. The postal needs of the less important localities not provided with post offices are met by the village postmen, who are peripatetic post offices. They accept letters and money orders for despatch and deliver them like the postmen in the towns. There were about 8,500 village postmen at the end of the year 1925-26.

4. When there is reason to believe, that the provision of greater postal facilities in a locality would result in the development of postal traffic and consequently of revenue, an additional village postman is employed as an experiment. If as the result of the experiment, which might extend to two years or even longer, it is found that the new revenue created by the employment of the village postman covers his pay, the appointment is placed on a permanent basis.

5. When again there is a probability, that if a village were provided with a post office of its own, instead of having to share the services of a village postman, there would be a growth of business, a Branch Post Office is opened in charge of an extra-departmental agent, *i.e.*, a person who has an income apart from his allowance from the post office, *e.g.*, the village school master, a local shop-keeper or the village headman. If as the result of the experiment, which may also extend to two years or more, it is found that the new revenue created by the opening of the post office, is sufficient to cover its cost, the office is placed on a permanent footing.

6. The money-order system in India is a great boon to the rural population. It brings money to the door of the village instead of his being required to call for it at the post office as is the practice in many western countries. The confidence of the public in this institution is illustrated by the figures of money-order transactions in 1924-25 given in Appendix II.

7. The Savings Bank system is very popular in India. In a country where banking facilities are by no means adequate, and where speculative investment is not the fashion, specially in the villages, the Postal Savings Bank meets a real want. The magnitude of its business and its popularity will be evident from the fact that out of 19,652 permanent post offices standing open at the end of the year 1924-25, 10,727 functioned as Savings Banks Experimental or newly opened post offices, however, are not vested with Savings Bank powers until they have won the confidence of the Postal authorities and of the people. Appendix III shows the transactions of the Post Office Savings Bank during the year 1924-25. Orders have recently been issued to extend the Savings Banks system to the fullest extent possible.

8. As a subsidiary to its Savings Bank business, the post office purchases and sells Government Securities for its depositors. The most popular form of securities is the Cash Certificate which is greatly appreciated by the small investors—who form the majority of the clientele of the Post Office Savings Bank. This form of investment was first introduced in India in 1917-18 and at once found favour with the Indian public. The extent to which the Cash Certificate habit has grown will be seen from Appendix IV.

9. The post offices in the villages perform many non-postal duties for the public, *e.g.*, the sale of quinine, the receipt of salt revenue, payment of pensions to Indian military pensioners.

10. During the year 1924-25, 13,707 lbs. of quinine were sold through the postal agency at a total price of over 4 lakhs of rupees. The quinine sold at the post office is in the form of tabloids and provides a ready antidote for malaria in the villages where medical aid is not easily procurable.

11. In the Central Provinces and in the United Provinces, a large number of post offices act as the agents for the receipt of salt revenue and thereby enable the villagers to get a supply of salt from the Government depôts in those Provinces. During the year 1924-25, there were 300 transactions involving the sale of 181,235 maunds of salt of the value of Rs. 1,82,031.

12. In the Punjab and North-West Frontier Provinces 1,31,801 pensioners of the Indian Army receive their pensions aggregating to Rs. 1,62,48,593 through the agency of the post office. In Baluchistan, 531 military pensioners receive their pension aggregating to Rs. 71,209.

13. To meet the growing needs of the Indian villages the Director-General has ordered Heads of Circles to prepare a five years' programme for the extension of postal facilities which had received a set back for a time on account of the vigorous retrenchment in public expenditure during the last few years. In order to treat the subject methodically, the local Postal Officers have been directed freely to consult the District Officers and to depart from a rigid observance of departmental rules where a genuine need for extension of postal facilities is recognised. Particular stress has been laid on the extension of the agency of the village postmen in their capacity of peripatetic post offices to encourage the postal habit in the outlying areas.

14. The telegraph needs of villages are met by the combined post and telegraph offices which transact postal business as well as receive and despatch telegrams. The number of such offices is about 3,000. In addition, there are 3,618 branch offices all situated in villages, which receive telegrams and forward them to a combined post and telegraph or purely telegraph office for onward transmission.

15. It has, however, been felt that there is yet further scope for increasing telegraph facilities, and it has recently been proposed that all post offices should receive telegrams for despatch and effect their delivery, and that all village postmen, who go out into the remote parts of the country and cater to the postal needs of the villagers, should receive telegrams from them for despatch and if necessary help them to write their telegrams.

16. Outside the principal cities broad-casting has not attained any degree of popularity in India. Facilities exist for issue of licenses through the post office for receiving broad-cast messages. A broad-casting Company has already been formed and a license has been drafted. It is impossible to foresee what will be the future of broad-casting in India. But the Broadcasting Company will be wise if they cater for the villager to whom it may prove an important educational factor not only to the man, but what is equally important, for the women and children of the villages.

17. The real need of the country, at present, is the extension of education especially among women. The post office works hand in hand with educational institutions as will be seen from the calling of the majority of the extra-departmental postmasters given in Appendix I. A post office is demanded wherever there is a literate population and wherever there is a village school. The existence of postal facilities also stimulates the desire for literacy. From

the statistics available to the department and given in Appendix V it appears that much lee-way remains to be made up. When primary education is more general amongst the rural population, the Post and Telegraph Department will prove a very potent help.

18. A very noticeable feature of Appendix V is the high degree of literacy prevalent in Burma. This is due to their wonderful indigenous system of primary education. In every village or group of villages the *hpoongyi* or monk is the schoolmaster. He lives on the beneficence of the villagers and in return he teaches all the boys and girls of a school-going age. The result is that Burma has a greater proportion of literate population than any other province of India. In Bengal and other parts of India, the ancient system of *Gurus* and *tols* worked on the same lines, but to-day they are partically non-existent. If the villagers insisted on their Hindu priests or Mahommedan Moulvis being their schoolmasters as well as their religious teachers, the literacy of the country would be greatly augmented and therewith the postal and telegraph facilities and their attendant benefits would be considerably extended.

19. When the social reformers of the country realise this fact, when even 150 million instead of ony 22 million out of 310 million people of the Indian Empire become literate, the power of the department for good and for the uplift of the people will be incalculable.

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APPENDIX I.

Classified statement of the Branch offices in each circle in charge of the Extraneous Agents.

Description of Agency employed.	Circles.									
	Bengal and Assam.	Bihar and Orissa.	Bombay.	Burma.	Central.	Madras.	Punjab and N.-W. F.	Sind and Baluchistan.	United Provinces of Agra and Oudh.	Total.
Extraneous Agents.										
School Masters . . .	856	267	1,926	36	956	883	1,647	158	496	7,225
Station Masters . . .	43	13	17	1	115	6	71	23	4	293
Telegraph Masters . .	2	..	..	1	..	..	14	..	2	19
Government Pensioners .	35	11	13	..	12	39	59	4	63	236
Hospital Assistants, etc. .	5	2	..	3	7	1	..	..	1	19
Pound-Keepers . . .	18	..	..	..	3	2	2	7	97	129
Miscellaneous Government Servants.	32	..	5	5	51	30	59	..	9	191
Traders and Shop-keepers .	168	30	21	8	26	144	231	2	163	793
Village Headmen . .	6	..	..	..	1	54	23	..	14	98
Landholders and Cultivators	543	183	25	2	28	1,160	71	4	383	2,399
Planters and Zamindars, Clerks, etc.	132	40	35	6	5	51	54	3	73	399
Medical Practitioners . .	80	3	1	..	1	2	11	..	4	102
Lincensed Stamp Vendors .	3	2	2	..	2	205	15	2	5	236
Moulvis, Munshis and Village Gurus.	163	4	2	..	8	18	87	..	9	291
Indian State Officials . .	..	1	2	..	30	3	12	..	14	62
Unclassified . . .	421	57	23	17	15	82	67	4	202	888
Total .	2,507	613	2,072	79	1,260	2,680	2,423	207	1,539	13,380

APPENDIX II.

Money-order business in the last ten years.

Year.	Inland Orders (Issued).				Foreign Orders (Issued and Paid).				Grand Total.			
	Number.	Amount.	Percentage of increase (+) or decrease (—) in number.	Percentage of increase (+) or decrease (—) in amount.	Number.	Amount.	Percentage of increase (+) or decrease (—) in number.	Percentage of increase (+) or decrease (—) in amount.	Number.	Amount.	Precentage of increase (+) or decrease (—) in number.	Precentage of increase (+) or decrease] (—) in amount.
		Rs.				Rs.				Rs.		
1915-16 . .	31,281,231	53,92,17,506	+6·70	+4·61	1,041,363	4,74,18,701	+11·39	+4·73	32,322,594	58,66,36,207	+6·84	+4·61
1916-17 . .	32,331,652	57,54,48,259	+3·36	+6·72	1,117,513	5,55,24,532	+7·31	+17·09	33,449,165	63,09,72,791	+3·4	+7·56
1917-18 . .	33,903,625	62,77,87,899	+4·86	+9·10	1,285,727	12,92,78,378	+15·05	+132·83	35,189,352	75,70,66,277	+5·20	+19·98
1918-19 . .	34,881,624	69,93,62,433	+2·88	+11·40	1,225,316	9,74,20,140	—4·69	—24·64	36,106,940	79,67,82,573	+2·60	+5·25
1919-20 . .	37,632,888	74,71,43,409	+7·89	+6·83	1,357,927	12,73,67,907	+10·82	+30·74	38,990,815	87,45,11,316	+7·99	+9·76
1920-21 . .	37,226,484	85,73,96,210	—1·80	+14·75	1,278,330	12,62,52,106	—5·86	—0·87	38,504,814	98,36,48,316	—1·25	+12·48
1921-22 . .	33,328,207	78,41,66,052	—10·47	—8·54	1,038,048	6,56,14,734	—18·79	—48·02	34,366,255	84,97,80,786	—10·75	—13·61
1922-23 . .	31,742,713	78,29,30,898	—4·75	—0·15	1,011,488	5,21,86,435	—2·56	—20·46	32,754,201	83,51,17,333	—4·69	—1·72
1923-24 . .	32,579,252	80,06,60,606	+2·64	+2·26	1,050,778	4,86,08,296	+3·88	—6·85	33,630,030	84,92,68,902	+2·67	+1·68
1924-25 . .	33,834,367	82,75,60,989	+3·85	+3·36	1,142,962	4,96,72,475	+8·77	+2·19	34,977,329	87,72,33,464	+4·01	+3·2

Names of Circles.	Number of head banks.	Number of sub-banks.	Balance of Accounts.				Opening balance.	Deposits.
			Balance of the preceding year.	Opened during the year.	Closed during the year.	Balance.		
							Rs. A. P.	Rs. A.
Bengal and Assam.	39	2,595	613,754	76,388	38,407	651,735	6,59,57,066 2 8	5,29,73,372 9
Bihar and Orissa.	21	864	140,687	21,796	12,200	152,283	1,61,38,940 13 10	1,25,33,635 15
Bombay .	25	1,446	364,138	47,313	59,290	3,511	4,81,00,812 12 6½	2,70,91,224 11
Burma	23	392	70,863	16,990	15,033	81,820	79,97,702 15 3	76,46,071 6
Central .	21	860	103,228	18,071	30,246	91,053	1,27,68,110 14 3	1,02,25,297 10
Madras .	37	1,788	250,248	50,013	24,099	276,162	1,52,91,650 0 11	1,90,58,944 0
Punjab and North-West Frontier.	38	880	240,279	66,410	53,788	252,906	3,89,53,243 15 10	3,92,20,356 11
United Provinces.	47	1,419	246,848	55,852	43,630	259,070	3,57,97,369 0 5	3,03,72,724 14
Sind and Baluchistan.	4	228	50,269	10,745	11,731	49,283	68,78,272 13 11	64,15,385 13
Total for 1924-25.	255	10,472	2,089,314	364,478	289,319	2,164,473	24,73,83,170 2 7½	20,55,37,103 12

)IX III.

)ffice Savings Bank.

Interest.	Total.	Withdrawals.	Balance.	Average number of depositors per bank.	Average balance in each bank.	Average balance at credit of each depositor.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.		Rs.	Rs.
19,19,358 8 10	12,08,49,707 5 1	5,07,23,524 5 10	7,01,26,272 15 3	247·43	26,623·48	107·59
4,65,166 7 6	2,91,87,743 4 7	1,20,61,103 4 2	1,70,76,640 0 5	169·81	19,295·63	113·62
13,67,850 7 5	7,65,59,387 15 7½	2,96,75,474 6 3½	4,68,83,913 9 4	239·40	31,872·13	133·13
2,21,170 6 0	1,58,64,944 11 3	76,17,414 9 1	82,47,530 2 2	197·15	19,873·56	100·89
3,59,303 7 2	2,33,52,711 15 5	1,03,58,538 5 8	1,29,94,173 9 9	103·35	14,749·34	142·70
4,21,146 14 10	3,47,72,056 0 2	1,92,64,515 4 11	1,55,07,540 11 3	151·32	8,497·28	56·15
11,29,330 10 2	7,93,02,931 5 2	3,81,55,394 10 9	4,11,47,536 10 5	275·49	44,823·02	162·69
10,43,528 12 2	6,72,13,623 3 10	2,97,71,694 14 5	3,74,41,928 5 5	176·71	25,540·19	144·52
1,94,016 0 2	1,34,87,674 11 10	65,18,303 9 0	69,69,371 2 10	212·42	30,040·39	141·41
71,20,686 10 3	46,05,40,870 8 11½	20,41,45,963 6 1½	25,63,94,907 2 10	201·77	23,901·82	118·45

Statement of Post Office 5-years Cash

Names of Circles.	Issued.						
	Denominations.						Cost price realised.
	10	20	50	100	500	1000	
							Rs. A. P.
Bengal and Assam .	7,893	5,647	6,290	23,906	9,747	8,653	1,23,17,13 12 0
Bihar and Orissa .	942	899	1,149	4,086	1,836	1,717	23,46,337 8 0
Bombay . .	7,656	6,880	9,121	36,119	13,473	11,131	1,66,12,207 8 0
Burma . . .	289	490	406	1,499	923	773	10,63,042 8 0
Central . . .	2,538	1,894	2,490	7,737	3,640	2,397	38,83,845 0 0
Madras . . .	2,029	2,024	1,991	5,812	2,249	2,192	30,43,515 0 0
Punjab and North-West Frontier.	2,539	2,643	3,774	13,278	7,507	5,828	83,83,402 5 0
United Provinces .	4,203	4,339	5,386	17,707	8,305	8,248	1,09,25,230 0 0
Sind and Baluchistan .	1,619	1,187	1,631	5,772	1,796	1,629	24,19,260 0 0
TOTAL .	29,708	26,003	32,238	1,15,916	49,476	42,568	6,09,94,453 9 0

DIX IV.

Certificates issued and discharged.

Discharged.								
Denominations.						Amount paid.		
10	20	50	100	500	1000	Principal.	Interest.	Total.
						Rs. A. P.	Rs. A. P.	Rs. A. P.
17,767	3,122	2,744	9,830	4,231	870	33,07,126 8 0	4,27,495 2 9	37,34,621 10 9
3,507	705	645	1,723	855	140	6,25,599 12 0	95,720 11 9	7,18,320 7 9
8,572	3,084	3,019	9,452	4,124	827	31,38,727 8 0	3,68,790 6 0	5,07,517 14 0
1,863	879	469	1,374	655	132	4,99,518 12 0	65,531 6 9	5,65,050 2 9
3,611	1,449	804	1,436	1,226	163	8,53,572 12 0	95,750 9 9	9,49,323 5 9
3,353	1,042	1,009	2,348	921	264	8,06,682 12 0	85,687 13 6	8,92,370 9 6
4,685	2,173	1,745	5,328	2,776	530	19,91,186 4 0	2,10,380 7 3	22,01,566 11 3
6,193	2,996	1,780	5,701	2,802	746	22,03,674 12 0	2,09,560 12 0	24,13,235 8 0
1,799	484	430	1,797	866	125	5,98,076 8 0	74,422 0 3	6,72,498 8 3
51,350	15,034	12,645	39,989	8,456	3,797	1,40,24,165 8 0	16,30,339 6 0	1,56,54,504 14 0

APPENDIX V.

Number of post offices and letter boxes in relation to area and population and number of postal articles (excluding money-orders) in relation to population.

Names of Circles.	Area in square miles.	Census of 1921.		One post office serves			One letter-box serves			Total number of postal articles (excluding money-orders).	Number of postal articles per head of	
		Population.	Literate population.	Square miles.	Population.	Literate population.	Square miles.	Population.	Literate population.		Population.	Literate population.
Bengal and Assam	148,381	55,582,708	4,817,437	40	14,894	1,291	10	3,758	326	263,825,763	4·75	54·76
Bombay . .	140,568	23,421,771	2,047,334	50	8,374	732	11	1,858	162	232,042,496	9·91	113·34
Madras . .	182,111	66,111,019	5,595,266	50	18,053	1,528	15	5,584	473	210,449,457	3·18	37·61
United Provinces	161,886	47,765,832	1,735,016	69	20,421	742	18	5,274	192	132,380,084	2·77	76·30
Punjab and North-West Frontier.	234,340	31,204,029	1,191,079	74	9,822	375	28	3,694	141	172,668,988	5·53	144·97
Bihar and Orissa	111,829	37,961,858	1,701,489	85	28,737	1,288	24	8,294	372	67,963,288	1·79	39·94
Burma . .	236,738	13,212,192	3,652,043	504	28,111	7,770	71	3,942	1,090	55,238,831	4·18	15·13
Central . .	282,614	31,063,263	1,218,549	159	17,432	684	75	8,207	322	75,309,899	2·43	61·86
Sind and Baluchistan.	187,194	4,272,133	222,081	503	11,484	597	211	4,822	251	32,847,900	7·89	147·91
Total .	1,685,661	310,594,805	22,180,294	86	15,805	1,129	24	4,462	319	1,242,796,706	4·00	56·03

Replies to the Questionnaire.

[It will be understood that the opinions expressed are my own personal opinions and do not necessarily represent the opinions of the department.]

QUESTION 4.—ADMINISTRATION.—(*c*) (*v*) *Post Office.*—As I have stated in my reply to Question 23 (*iii*) on elementary school education, the activities of the post office can only follow the advance of education.

I propose to show what facilities the post office gives to the population of India generally and in some instances in rural tracts in particular.

The figures below show the figures for the 31st March, 1925 compared with those for the 31st March, 1904.

	31st March 1904.	31st March 1925.
Post Offices	15,403	19,652
Letter Boxes	34,005	49,959
Village Postmen, *i.e.*, peripatetic post offices	8,242	8,468
Runners and boatmen	92,137	87,089
Miles of lines served by—		
(*a*) Railways	26,517	36,570
(*b*) Steamers	18,289	18,485
(*c*) Mail carts, etc.	8,712	8,763
(*d*) Motor cars	*Nil*	5,211

Out of the total of 19,652 post offices approximately 18,000 serve rural areas. All the 8,463 village postmen serve rural areas.

It will be observed that the total increase of post offices during the last 20 years has been considerable. During the second decade which includes the Great War and the activities of the Retrenchment Committee, the increase is small; but in 1924-25 the number of post offices has increased by 162 and by August of this year there has been a further increase by 1,239 including experimental offices making the total number 20,891.

The department is fully alive to the necessity for extending postal facilities in rural areas and during the last year and the current year has been devoting special attention to this subject.

The post office watches the demand for postal facilities in the following way.

The Postal Inspector, the officer in charge of a postal sub-division, receives in June and December of each year direct from each head, sub and branch office in his sub-division a return, called the "Half-yearly Village Return," kept for the first fourteen days in those months, showing the number of articles of all sorts within the jurisdiction of the office. The Inspector examines these returns and forwards them to the Superintendent with any remarks he may have to make. From these half-yearly village returns the Superintendent decides whether an increase is required in the number of letter boxes, of village postmen or of offices.

If it is decided that another village postman (*i.e.*, a peripatetic post office) or even a new office is required, he takes steps to get sanction to an experimental establishment. The experiment is carefully watched and, if the village postman or office is justified according to the standards of the Department, the experimental establishment is made permanent. These experimental establishments include also the conveyances of mails usually by runners' lines.

The process of postal evolution in rural areas usually follows the following lines—

(*a*) a letter box in the village,

(*b*) a village postman serving the village,

(*c*) a branch office with restricted powers served by an extra-departmental agent, *e.g.*, a schoolmaster, *patwari*, *lumbardar*, shopkeeper, on an allowance,

(*d*) a branch office with greater powers served by a departmental or whole-time branch postmaster,

(*e*) a sub-office with full powers.

One of the postal facilities most helpful to the agriculturist is the savings bank. Appendix I gives some statistics for the last twenty years. It will be observed that there has on the whole been a steady increase in the number of savings banks. Out of 20,891 post offices open up to August, 1926, 9,528 do no savings bank work. These comprise branch officers, departmental and extra-departmental, where the standard of education of the branch postmaster is not sufficiently advanced to entrust him with savings bank work. We hope gradually to extend savings bank powers to as many offices as possible.

Another facility which must play an important part in rural life in India is the money-order system which enables a villager to be paid a money-order by the village postman at his own door. In 1905-06 the number of money-orders was 19½ million valued at over 33 crores. In 1924-25 the number was nearly 34 million valued at nearly 83 crores. Out of a total of 20,891 post offices open up to August 1926 only 438 have no money-order functions and these are offices which have recently been made permanent or are not yet permanent and have to prove that their stability deserves the grant of money-order powers, which of course involve no little monetary responsibility.

The money-order business includes the V. P. business which means a great deal to the tradesman in the cities. The villager can take the same advantage of the v. p. p. system. He can despatch his produce from the nearest railway station and receive payment at his door.

(*c*) (*vi*) *Telegraphs including Wireless.*—1. The rural population is chiefly concerned with combined offices, *i.e.*, offices which do both post and telegraph work. In 1904-05 there were 1,917 combined offices: in August, 1926, there were 3,654.

Out of a total of 20,891 post offices 3,654 are combined. Out of these 3,484 are sub-offices, most of them in small towns and in the larger villages.

Besides these, combined offices are 4,841 post offices which have no signalling staff but receive and forward to the nearest telegraph office messages received from the public. An effort is being made widely to extend this system to the still smaller post offices and even to village postmen.

A wide extension of telegraph facilities without expectation of an adequate return is, I fear, out of the question on financial grounds. The cheapest average estimate for a *mile* of posts and a single wire is Rs. 300. A long lead to a remote village would obviously result in a very great capital expenditure which would require a considerable amount of traffic to meet the interest alone. As with the post office, the spread of education will inevitably lead to the extension of the telegraph system. But in a country, where there are only four postal articles per head of the population, it may well be imagined that the genuine demand for telegraph facilities in rural areas cannot be great. According to the figures for 1924-25 the average number of telegrams per head of the population is ·04. It is hoped, however, that the measures now being taken to extend the Receiving Office system will bring the telegraph system to the village without any considerable extra expense.

With respect to Wireless I attach a note (Appendix II) by Mr. Edmunds, the Director of Wireless, on Broadcasting and its bearing on agriculture in India.

QUESTION 23.—GENERAL EDUCATION (*i*) *Higher or collegiate.*—I make the following remarks with great diffidence, as I am not conversant with the recent development of higher or collegiate education.

Considering that the boys who attend such colleges as the Mayo College, the Daly College, the Raj Kumar College at Raipur, and the Chiefs' College at Rajkot, are the sons of landowners on a large scale, I venture to think that an important part of the college curriculum should be in subjects dealing with the management and improvement of the land, knowledge of fertilisers, irrigation by canal or mechanical means, the marketing of produce, stock breeding, etc.

The interest taken in these subjects by the big landowners, including His Majesty the King, in the United Kingdom, has, I think, played a very considerable part in the agricultural development of that country.

It seems to me that if we could induce the sons of Ruling Princes and Noblemen of India to take a practical interest in agriculture, we should go some way to helping its development in India. Such an interest is obviously best acquired during the impressionable period of boyhood and early manhood.

(*iii*) *Elementary School Education.*—One of the outstanding features of India is the amazing lack of literacy of the population. As I have stated in the Memorandum which I have submitted to the Royal Commission, out of a population of 310¼ million according to the census of 1921, only 22 million are literate. The average number of postal articles per head of the population is 4 only. This state of things may be due to a defect in the educational system but it is more probably due to the social system. It is regrettable for the sake of India that its indigenous education has not followed that of many countries where in the initial stages it was in the hands of the religious teachers. Most of the great public schools in England were founded by leaders of religion or by rich merchants who came under that influence. In India so far as I am aware, the recognised leaders of the two great religions, *viz.*, the Mohants and Moulvies, have done little or nothing to educate the people. Most if not all of the education in this country has been the result of Government activities or the work of Christian missonaries.

In striking contrast to this, as I have noted in my Memorandum, is the indigenous system of primary education in Burma. At the risk of repetition I recapitulate that system. In Burma the *hpoongyis*, or Buddhist priests, enjoy the hospitality of the villagers in the shape of a monastery (*hpoongyi kyaung*) and free doles of food. The Burman considers that he acquires merit by housing and feeding the *hpoongyi*. In return the *hpoongyis* teach every boy and girl of the village the three "Rs". The result is that in Burma out of a population of 13¼ million, including children and a very large alien population, 3½ million or roughly 25 per cent. are literate, whereas in Bengal with a population of 55½ million, only 4½ million—about 7 per cent—are literate. In Madras where perhaps education is more advanced but where the caste system is stricter than elsewhere in India, the percentage is about 7 per cent. In the United Provinces it is a little more than 2 per cent. In Burma not only is there a high percentage of literacy, but what is more important for a community, the girls and future mothers are literate.

Until the Hindu priest and the Mahommedan Moulvi teach the young villagers in the same way as the *hpoongyi* does in Burma, the prospect of largely increasing the literacy of India will have to depend on Government and for financial reasons will be far distant.

I venture to make a suggestion for what it is worth. A Brahmin priest or a Moulvi who as part of his religious duties has an organised school for the education of the village boys and if possible the girls, should receive a definite honorific title to be bestowed by Local Governments answering somewhat to the Scotch 'dominie', and a *Sanad*. Such a practical [illegible]

As soon as the people as a whole are literate, the Post Office will play a very important part in the life of India. In fact, it is not perhaps too much to say that it will be the biggest organisation of its kind in the world. The post office meets the demand for postal facilities but it cannot stimulate it to any great extent. It is obviously useless to provide postal facilities where only two people out of 310 are able to read and write. The Post Office tries to keep pace with but cannot for financial reasons be in advance of the demand.



APPENDIX I.

Savings Bank Business.

Year.	Number of savings banks.	Average of depositors per bank.	Average balance at credit of each depositor.
1904-05	7,855	134·79	126·62
1905-06	8,071	135·89	130·83
1906-07	8,049	147·87	133·99
1907-08	8,328	151·62	120·22
1908-09	8,501	155·11	115·53
1909-10	8,767	157·28	115·07
1910-11	8,929	160·20	118·28
1911-12	9,502	157·95	125·92
1912-13	9,460	165·63	131·55
1913-14	9,824	166·81	141·88
1914-15	10,161	161·80	90·58
1915-16	10,386	159·87	92·27
1916-17	10,421	158·08	100·73
1917-18	10,975	149·21	101·27
1918-19	10,587	158·44	112·22
1919-20	10,670	164·08	121·26
1920-21	10,713	175·29	121·73
1921-22	10,758	182·03	113·68
1922-23	10,730	190·44	113·52
1923-24	10,535	198·32	118·64
1924-25	10,727	201·77	118·45

APPENDIX II.

Note on use of Wireless Broadcasting for Agricultural Education by Mr. P. J. Edmunds.

The present position regarding broadcasting in India is that an agreement was signed between the Indian Broadcasting Company, Limited, and the Secretary of State on 13th September 1926, under which the Company undertakes to erect broadcasting stations at Calcutta and Bombay within 9 months of the date of that agreement; the Company is granted a virtual monopoly for ten years in broadcasting in British India excluding Burma and will be granted 80 per cent. of the fees realised by Government on the issue of Broadcast Receiver licenses at Rs. 10 per annum per receiving set. It is not known whether the Company propose to broadcast matter dealing with agriculture; they are a commercial company and will presumably model their programmes according to public demand in order to obtain the maximum number of licenses. There is however a provision in the agreement under which Local Governments have the right to transmit from these stations, free of charge, providing the time occupied does not exceed 10 per cent. of the total period occupied by the programme of which the Government matter forms a part. Agricultural information is specifically mentioned in this connection, and there is no reason why the Local Governments should not take advantage of this provision for the purpose of agricultural education. No arrangements for commercial broadcasting have yet been made in Burma or in the Indian States; as regards the former, Government is prepared to enter into an agreement similar to the present agreement with the Indian Broadcasting Company should application from a suitable person be received; regarding the latter it has been decided that Indian States should be permitted to erect broadcasting stations subject to some general conditions which have been laid down. At the present moment small broadcasting stations are being worked in the towns of Bombay, Calcutta, Madras, Rangoon by Local Radio Clubs but their range is insufficient to reach agricultural districts.

2. As regards prospects in the immediate future (*i.e.*, when the Company stations at Bombay and Calcutta are working), I am personally of the opinion that the agricultural population will not be reached by wireless to any extent unless a special effort is made to encourage it. The proposed stations will not be received from greater distances than 200 miles unless a fairly elaborate form of receiver is employed. The great part of the agricultural population is probably not sufficiently rich to purchase such a set and there is further the language difficulty. I believe, however, that if Government were prepared to organise a system of hiring out wireless receivers on a maintenance basis and to undertake suitable propaganda work to make the arrangement well known in the districts, a large number of sets would be hired by village communities for common use and the organisation would eventually become self-supporting. Careful organisation and propaganda are however essential. It would probably not be worth while to make such an organisation for agricultural purposes, but it would be of immense value for all kinds of Government educational work and propaganda, and should be considered from all points of view simultaneously.

3. As regards the future I personally am convinced that broadcasting is going to become a very important factor in India, and I do not think it is at all unreasonable to anticipate that the number of Broadcast Receiver licenses will be measured by millions within the next 20 years. It may be within the next 5 years, but the rate of progress depends so very much on how the problem is tackled that it is difficult to estimate. Eventually I have no doubt that there will be at least a dozen broadcasting stations in India; every village of 10 or 20 families will have its own receiver with loud speaker and broadcasting would then offer a very powerful instrument for the spread of all kinds of education including that relating to agriculture.

2205. *The Chairman:* Mr. Sams, you have been good enough to put in a note of what you wish to lay before the Commission. The Commission has also before it a memorandum on the work of the Posts and Telegraphs Department in rural areas, prepared by yourself and circulated some time ago?—Yes, it was however prepared by my assistant under my direction.

2206. I think the two documents together give the Commission some very interesting information, and I am greatly obliged to you for the trouble you have taken in preparing them. You emphasise, I notice, the relationship between the spread of literacy, of education and the demand for the services of your department?—Yes.

2207. You think, at the same time, that your department is capable of and does in fact stimulate the desire for literacy and also does something to sustain literacy once attained?—Well, I think it does. If there is a post office in a place, or if there are postal facilities, I think it is an encouragement. At the same time, as I have said in my replies to the Questionnaire on the question of education *vis-a-vis* the post office, we cannot be in advance of the demand; we must be slightly behind it. We cannot afford to have a post office or even a pillar box where one is obviously not wanted.

2208. Do you put up bulletins in the shape of news on your post offices at all?—No, we do not.

2209. Do you think it would be possible; would short bulletins be expensive?—Bulletins prepared by the department?

2210. Possibly, or by some other department?—We can always put them up in the post office; it would be quite easy to do that. In fact, we actually do use the post office for putting up Government notices in case of loans or in the case of epidemics.

2211. Of course, tastes in these matters differ, but I do not think information about epidemics or Government loans are very pleasant reading; I was thinking of something in the shape of a short news bulletin to encourage reading in villages where newspapers never appear?—It would be quite feasible for us to put them up in the post office; it would not, I think, be for us to prepare these bulletins.

2212. If they were transmitted during the quiet hours of the day, do you think the expense of transmission would be an important consideration?—Do you mean by telegraph?

2213. You would either have to post or telegraph them, would you not?—Yes.

2214. I am asking you whether you think the expense would be important, provided they were, let us say, telegraphed during the quiet hours of the day?—Yes, it would be a very considerable amount, I imagine, if it were done by telegraph.

2215. It might be done by post?—Yes, it could be done by post, at the expense of the Publicity Department.

2216. I was wondering whether you were going to say that or not. You do not think it might be a good investment from the post office point of view. You point out the close connection between literacy and the requirements of your services; you do not think the putting up in rural villages of short but interesting bulletins might stimulate the demand for literacy?—It certainly would I think, but it is very difficult to say how far it would bring us in much as a department.

2217. It does not attract you on the financial side?—I do not think there would be much in it.

2218. What interest do you pay on your savings bank certificates?—3 per cent.

2219. Do you make money on it at that rate of interest?—We only act for the Finance Department; they pay us for our services as managers of the bank.

2220. Is it within your knowledge whether the Financial Department makes money at that rate of interest?—No, I cannot say.

2221. But I suppose you would welcome an important addition to the amount that passes into the savings bank, would you not?—Yes, certainly.

2222. Would it be possible to give any direct encouragement to individuals bringing in new subscribers?—To the savings bank?

2223. To the savings bank?—I do not think so, because the idea of the savings bank is laid down as the helping of people to save and the encouragement of thrift. It is not looked on as a money-making concern.

2224. I am anxious if possible to stimulate the practice of saving. Without knowing the conditions in Indian villages, it occurs to me that having regard to the fact that a large portion of the population is illiterate you are quite unable, by advertisement or other means, to bring to the notice of a large part of the cultivators the advantages and attractions of saving. I am asking you whether you do not think you could get, at very small expense, an active body of agents, if you gave some small monetary reward to persons bringing in new subscribers?—Yes, undoubtedly; we certainly would, if we were prepared to give a reward.

2225. The idea does not attract you?—I do not think we as a department are prepared to do so. We provide the facilities and it is for the people to take advantage of them.

2226. Do you think a knowledge of the advantages of saving is likely to reach an illiterate population without any effort on your part?—I think so, if there is a savings bank in the nearest town or village and they know one or two people who send their savings to it. I fancy that that would encourage others to do the same.

2227. I should have thought the savings movement in villages was one which was worth all the encouragement which could be given to it. I have one question about wireless telegraphy. I understand that India is soon to have broadcast stations?—Yes, Mr. Edmunds, the Director of Wireless, has mentioned that in his note. The agreement between the Secretary of State and the Company was signed last month.

2228. Do you think wireless telegraphy may develop into something very important in India in the next 10 or 15 years?—Yes, I certainly think it will. Its possibilities are simply enormous.

2229. There is the possibility of education?—Yes.

2230. And of increasing the amenities of rural life in remote villages?—Yes, if the transmitting station can reach the remote villages and they can afford to have a receiver or if some organisation can provide a receiver, I think it will make a tremendous difference to their lives, as it has in England.

2231. I agree?—It will require a great deal of organisation. At present, I imagine, this company only intends to provide a certain amount of entertainment. If it comes to education the matter will have to be very carefully considered, but I too think that the possibilities are enormous.

2232. How about the difficulty of the multiplicity of vernaculars? Is that a very formidable one?—I do not think so, if there are enough transmitting stations. If there were a station at Lahore, for instance, Punjabi would be generally understood within its radius. I do not know exactly how the transmitting organisation would do it, but they would presumably devote certain times to vernacular and others to English transmission. I do not think that the vernacular difficulty comes in very much.

2233. You agree that there are immense possibilities before broadcasting?—Immense.

2234. If I may take you back to the subject of savings banks for a moment, I would like to take you one stage further. If you as a service are not prepared to develop a system of canvassers, do you think something in the nature of co-operative organisations for the encouragement of investment might meet the point? Do you know that they exist in India?—I do not know of them specially.

2235. The co-operative people are not investing in savings banks?

Mr. Calvert: We are in opposition to them.

2236. *The Chairman:* I was only at the moment concerned to see whether the service was inclined to advertise in the press their own savings system?—We have not considered the question at all. It is rather difficult to say. We try to supply a service for which we are asked; we have not so far gone in very much for propaganda work. We manage the savings bank on behalf of the Government of India generally, and particularly of the Finance Department. Similarly with cash certificates; we sell them for the benefit of the Government of India generally and on behalf of the Finance Department.

2237. *Mr. Kamat:* You have given us some comparative figures of the number of post offices during the last 20 years?—Yes.

2238. I see during the last 20 years about 4,000 new post offices have been opened. Is that correct?—Whatever is put down in the answer to the Questionnaire is correct; it is taken from published reports.

2239. Instead of 15,000 in 1904 there are now 19,652, an increase of about 4,000 in 20 years?—Yes.

2240. Is that a very satisfactory increase, in your view?—I think it is very satisfactory. During the last decade we have had the War and retrenchment, which has somewhat cramped our style; but since then, we have been making very rapid strides indeed, and we propose to go on making those strides.

2241. I believe Government raised the postal rates recently?—Yes.

2242. In 1922, I think?—Yes.

2243. When the postal rates were enhanced, there was a sort of assurance given that the increase in the revenue would go towards an increase of facilities in the way of the opening of new post offices in villages and rural areas?—Yes.

2244. Has that been carried out?—Yes, it is being carried out.

2245. I should like to know how much of that increase in revenue has gone towards the improvement of the pay and prospects of postal employees and how much towards the opening of new post offices?—I cannot say that.

2246. Are you satisfied that a fair share goes towards the opening of new post offices?—Certainly. The figures I have given you will show what that increase has been.

2247. I do not see the percentage?—I have not given that, but you can see how many post offices have been opened. In paragraph 3 there is a comparison between 1904 and 1925, and later on I have shown that on the 31st March 1925 there were 19,652. There has been a further increase up to the 1st August last to 20,891, which is rather a marked increase.

2248. Have you got a definite programme that during the next 5 or 10 years you will open so many new post offices?—Not at present. We have asked the Postmaster General to submit such a programme and it is in course of submission now, but we have not received it yet.

2249. Since 1922 you have not been working to a definite programme in the matter of opening new post offices?—No. It has been done as funds have been available. It has depended chiefly on the provision of funds.

2250. Would it not be a good system to work to a definite programme, that during the next 5 or 10 years so many new post offices should be opened?—Certainly. Instructions have been given to the Postmaster General to that effect. We have asked them to submit their programme.

2251. Can you give us any rough idea of how many new post offices you think it may be possible to open in villages during the next 5 years?—I should think at a rough estimate we ought to open something like 500 a year.

2252. You would regard 500 a year as the normal rate of increase?—Yes. I think that would be quite a fair estimate. It depends, of course, on whether there is actually a demand for them. We cannot open them simply

for the sake of doing so; we must feel there is likely to be some kind of demand for them.

2253. Have you any idea how many villages there are in the whole of India?—I have no idea.

2254. I should say something like 700,000?—Would you?

2255. If the rate of opening new post offices is about 500 a year, it will be a very long process indeed to instal a post office in every village?—It is almost impossible, and probably unnecessary.

2256. *Sir Ganga Ram:* There are 685,000 villages.

The Witness: Do you aim at having a post office in every single village?

2257. *Mr. Kamat:* No, because some of them are very small. My point is that 500 a year is not a fair rate of increase?—I think it would be a very fair rate of increase, considering the illiteracy of India.

2258. You have given us an interesting note about the spreading of literacy in villages?—I have done so with great diffidence.

2259. Through the instrumentality of priests and Moulvis?—Yes.

2260. That is based on the analogy of Burma?—Yes.

2261. May I know whether these priests in Burma derive sufficient emoluments from the charity of the people to have a decent living in the villages?—As far as I know (Sir James MacKenna could tell you better) they have no emoluments whatever. The Buddhist *hpyoongyi* is not allowed to touch money; it is against his religion to look at women or to touch money. He gets his residence at the *hpyoongyi kyaung* and goes round every day with a large black bowl, into which the villagers throw whatever they can spare in the way of rice, bananas and vegetables. It is a common sight every day in a Burmese village. They are literally boarded and lodged by the villagers.

2262. The same sort of system prevailed in ancient India; the priests, the Brahmins, went round with a bowl and derived enough for their living from the village people?—I was only dealing with modern India.

2263. If in modern India the Hindu priests in the villages could not make a decent living out of charity, do you think Government should support them or supplement their earnings by giving a sort of honorarium?—Certainly not.

2264. You would therefore be content simply to give the priest a title, with no supplementary or subsistence allowance?—I always assumed the priest or the Moulvi was able to subsist; I did not suspect otherwise.

Professor Gangulee: Quite. He is quite well-fed.

2265. *Mr. Kamat:* If they require more, would you advocate that Government should give some supplementary allowance in addition to this title? Would you suggest Government should pay something in cash?—I doubt whether Government could afford to do it.

2266. You would not go so far as that in your suggestion?—No. I merely suggested that to encourage the Brahmin and the Moulvi to take an interest in primary education they should be given by Government some honorific title.

2267. Do you think a mere title would suffice to get people to do this work in the villages?—Mere titles attract people to do quite a lot of things.

2268. *Mr. Calvert:* Do these figures you have given us refer to all-India or to British India alone?—If you refer to the figures relating to Post Offices, they refer to that part of India where the department operates.

2269. The attitude of your department towards co-operation might be referred to as distinctly helpful?—Yes, I hope so.

2270. Where we have tried to organise co-operative post offices you are always prepared to assist?—Yes.

2271. And you are usually prepared to take them over if they prove a paying proposition?—Do you organise post offices?

2272. We organise them and if you see they pay, you take them over?—Have you done so?

2273. Yes?—I do not know anything about these co-operative post offices.

2274. You have taken them all over. The moment we started them you took them over?—Was that in the Punjab?

2275. Yes. In Bombay the same thing has occurred?—I do not remember it in Bombay.

2276. You informed the Chairman that the post office savings business is done on behalf of the Finance Department. It is really not your work; it is Finance Department work?—Well, it must be the Finance Department's; it is done for the Government of India.

2277. So that really any difficulties found by co-operative societies from the existence of your post office savings bank should be addressed to the Finance Department and not to you?—Certainly not; we are the managers of the savings banks, and any difficulties should be put before us.

2278. You do not levy any stamp duty on withdrawals from the post office savings bank?—No.

2279. Would you be prepared to levy that duty in order to remove this concession in your favour?—I do not think so.

2280. It is not enjoyed by co-operative societies. A depositor in a co-operative society who withdraws more than 20 rupees has to get an anna stamp from the post office?—Would it not be better to get the Finance Department to agree to forego the stamp duty in your case? It is very difficult to deprive a man of a privilege once you have given it to him.

2281. I do not know whether they would do that. As far as your department is concerned, is there any opposition to the thrift movement in co-operative societies?—None that I am aware of. I have never heard of it.

2282. There used to be?—I have never heard of it.

2283. The post office or the Finance Department, one of the two, attempted to prevent co-operative societies from undertaking this savings movement?—I cannot say whether that is a fact or not.

2284. Opposition, there definitely was. That has now disappeared?—We have always tried to help, to the best of my knowledge. Wherever I have been as Postmaster General I have never in any way opposed the co-operative movement; in fact, I have always tried to help as far as I could.

2285. You actually do help?—To the best of my knowledge, the policy of the department is in no way opposed to the co-operative movement.

2286. Actually your savings branch does help co-operative societies by taking their accounts as public accounts. You give them some privileges in that way, but there was opposition to our taking deposits from non-members or paying higher interest than you pay?—There may have been some technical objection. I cannot remember the case sufficiently. To the best of my knowledge, our policy has never been against co-operative societies. There may have been, as I say, technical objections of some kind to various points in the co-operative thrift movement.

2287. We have always found you extremely helpful, but the situation in the last few years has changed; *i.e.*, the co-operative thrift movement is now a bigger thing than the post office savings bank. Your present attitude of helpfulness is likely to continue?—Yes.

2288. Do you charge the same money order commission irrespective of the distance of remittance?—We charge a flat rate.

2289. Is it quite impossible for you to charge a lower rate for remittances inside a district?—I should not say it was impossible; the matter would have to be carefully considered. We try as far as possible in the post office to avoid complications. We have a flat rate of postage for the whole of the Indian Empire and a flat rate of money order commission. We have found that such a system is better for us than having variations.

2290. You know, of course, that in several Provinces money is being remitted between co-operative societies at 4 annas per cent, instead of 1 Rupee, the balance being paid by the Provincial Governments?—No. I am not aware of it.

2291. That is spreading. Would not you yourself like to consider undertaking this remitting of money orders in the district?—I cannot say. If it is put to us as a recommendation we shall be glad to consider it, but what the result will be I cannot possibly foresee.

2292. *Professor Gangulee:* Can you give us an idea of the parcels of seeds carried by the post office, the number of such parcels?—No. We have no statistics specially for seeds.

2293. You are aware of the way such packages are packed. Some people are not at all careful in the way they pack seeds for transport?—I cannot say.

2294. You do not take any special precautions against damage?—No. Each person is responsible for the packing of his own parcels, and if he packs them badly it is his own lookout. The only instance where we insist on security is in the case of insured articles, so that they shall not be liable to tampering. If, for instance, a lady posts a hat in a flimsy cardboard box and it is smashed, that is her affair.

2295. I understand that, but we are concerned here with the supply of seed to the agriculturists?—We do do that. The seed traffic, as far as I know, is not very important from our point of view; in fact, we have no statistics of it. We cannot tell what is in an inland parcel; the contents are not declared.

2296. You agree the post office could be utilised for the distribution of better seeds?—Certainly, if they are put into envelopes or boxes and posted.

2297. In that case would the post office be prepared to take precautions against damage?—No, certainly not. The onus is on the sender, not on us.

2298. I am anxious to get this point quite clear, because for the village agriculturist this question of parcels of seeds is most important and the service you can render him is great. Suppose the seed trade in this country develops and suppose a great many seed packages go through the post office, would you be prepared to make special arrangements and take special precautions against damage?—Certainly not. I have told you the post office does not take precautions; it is for the sender to take precautions himself. A parcel is handed to us; we do not know what is inside it; we are asked to take it and deliver it somewhere, and that is what we do.

2299. Suppose you know it contains seed?—Even then the onus of packing is on the sender and not the post office. We would never undertake that responsibility.

2300. You would not give any special rates for a parcel of seeds if you knew they contained seeds?—No.

2301. Is the V. P. P. system popular among the rural population?—I do not imagine it is. Do you mean as receivers of V. P. P. articles or senders?

2302. Both?—No, the bulk of the retailing is done in the bigger towns and with better class people who order things V. P. P.

2303. And so far as the rural population is concerned, your V. P. P. system does not concern them?—Not much, but it is there if they want to use it.

2304. Is there no possibility of increasing the rate of interest in the savings bank with a view to encouraging depositors?—That is a question the Finance Department must answer; they fix the rate.

2305. In which Provinces are savings banks most popular?—The average number of depositors in the bank is highest in the Punjab, 275; then comes Bengal.

2306. Can you explain this difference?—No, the Punjab is more literate than Bengal I think.

2307. Do you explain this difference on the ground of literacy?—No, not altogether. The Punjabi is, I think, an enterprising kind of man; he has a lot of sound common sense.

2308. Has the growth of the co-operative movement in any way interfered with your savings bank?—No, it has not.

2309. Is it likely to?—I do not think so; we do quite a different class of business; we take very small deposits. The savings bank is not intended to be used as a current account. We find our figures are going up steadily every year.

2310. So that you think the co-operative credit movement will not interfere with your savings bank?—No, I do not think it will.

2311. Following up the Chairman's suggestion as to disseminating news through the post office, is it possible to organise the post office as a community centre, *i.e.*, connecting the post office with the village schools or the village hall, and thus making the post office a means by which you not only serve the population as you do at the present moment by giving them parcels of seeds and things of that sort, but also by giving them news, and perhaps, when broadcasting is popular, having a little hall in the post office utilised for that purpose as a communal centre?—If you have seen a village post office, you will appreciate that there is not much room for it to become a social centre.

2312. No, but could it be developed in that way?—I do not think it is for us to do it. If the district authorities like to do it, it is for them to do it and not us.

2313. Do you think such a movement would make your post office more popular in the village area?—I do not think so. We are always ready to help any movement that we are required to help, but I do not think it is for us to start social centre movements.

2314. No, but supposing a movement like that is started, you agree that the post office then would be a very suitable agency for the dissemination of such knowledge as is suggested by the Chairman?—No, I do not say that at all. In many post offices the Postmaster would simply not have time to devote to social culture. In the smaller *i.e.*, in the branch post offices he would not have the education to do it. In small branch post offices the Postmasters are promoted postmen; they have not the education of a *patwari*.

2315. You have in some cases combined the offices of village postmaster and village schoolmaster?—Yes, that is where the village schoolmaster undertakes to do the postmaster's work; but he is a schoolmaster first and afterwards a postal official.

2316. Do you take any steps to encourage the use of quinine?—Not specially, we have it for sale and the villagers know perfectly well that they can get the best quinine at the post office, and they buy it.

2317. I see that in the Central Provinces and the United Provinces you adopt the policy of utilising the post office for the receipt of the salt revenue? Do you think that the policy is a sound one?—Certainly; it is about the only vehicle by which the salt can get to the people. So far as I know, the dealer who wants to get salt gets the permit from the post office, pays the tax on it, and then gets it from the Government; that is a convenient way of doing it.

2318. *The Raja of Parlakimedi:* Upon what principle do you promote the different grades of postal offices?—We have no absolute rule. Directly a branch office, for instance, is doing a considerable amount of work, the Superintendent of the division recommends that it shall be turned into a sub-office, so as to be of more use to the people of the locality. A head office simply means that the accounts work of a certain area is done in that office. So far as the public is concerned a head office does not do any more nor any less postal work than a sub-office, but it is the accounts centre of an area. Very often people make that mistake; they say: "We are a very important place and we ought to have a head office." That is nothing to do with it; a sub-office does exactly the same work as a head office.

2319. Does it not depend upon the business it has to carry on?—Not in the case of a head office. As I say, we usually have a head office in the chief town of a district chiefly because the treasury is there. Other offices are subordinate to it and send their accounts in to that head office; but as regards the postal work itself the head office and the sub-office are on an equality as regards the public. The public can get the same attention from the sub-office as from the head office: they do the same work.

2320. What do you think of the idea of entrusting savings bank business to headmen who are members of local bodies who are prepared to give a certain amount of security?—That is a thing we have never even contemplated so far. I cannot say that it would be impossible, but I would not like to say off-hand that it is possible. The savings bank system is part of the post office system. I think that it would perhaps be impossible to give the powers to the headman of a village.

2321. If he is able to produce a certain amount of security?—Of course he must do that; but I would not like to say "yes" or "no" to that question.

2322. Do you not think the postal office should adopt some concession rates for circulation of agricultural bulletins?—No, I do not think so. We give concession rates to newspapers; that is to say, a Press can send a newspaper weighing up to 8 tolas for 3 pies. If the bulletin can be brought within the description of a registered newspaper, then of course it can go for quarter of an anna.

2323. *Sir Ganga Ram:* Do many people take advantage of your system when remitting their revenue?—In certain Provinces, not in all Provinces.

2324. Altogether in India do you do much business in revenue money orders?—No, not very much as far as I know.

2325. You charge them the same rates as ordinary money orders?—Yes, I think so.

2326. Do you not think it would pay you to reduce it?—I do not think we could reduce it below 1 per cent.

2327. Has there been a substantial diminution in your work in the rural areas since postal rates were increased for postcards and so on?—I cannot say how far it was in the rural areas. There was of course some reduction in the traffic as a whole, but I cannot say whether it was specially in the rural areas. Probably not, because the bulk of the traffic comes from the large towns, and as I have pointed out in my reply to the Questionnaire there is only an average of 4 postal articles per head of the whole population. In the rural areas it probably would not be as much as 4 in actual fact; it would probably be 3 or 2. I really doubt therefore whether the enhancement of the postage has made much difference to the rural population.

2328. *Dr. Hyder:* You have given us a very interesting table of these postal cash certificates. You know that hoarding is a great evil in India?—Yes, I suppose it is.

2329. The only agencies provided by the Government so far have been the savings banks, these postal cash certificates and the co-operative society; is not that so?—No, there are the various Government loans; people can invest in the Government issues.

2330. Take the case of Burma, the cost price realised on all these certificates is Rs. 10,63,000?—Yes.

2331. The various shares are 773 pieces of the face value of Rs. 1,000, and so on?—Yes.

2332. Analysing these figures, I find that the bulk goes to people with larger means; is not that so?—Looking at the figures, it appears to be the case.

2333. I mean out of this total of 10 lakhs realised, Rs. 5,79,000 are held by people of larger means. So would it be right to say that the bulk of this investment is by the comparatively larger men and not the smaller men?—Looking at the figures I should say it was the case, because the favoured

amount seems to be Rs. 100; the next biggest is Rs. 500, and after that Rs. 1,000. The lower dimensions do not seem to be so popular. I think the inference is that the bigger people invest in this.

2334. The educated people and people living in the towns?—Yes, people who have got the money to do it.

2335. You have no figures in your possession as to the investment made by the rural people in these postal cash certificates?—No; I could get them; I have not got them here with me. It would however be difficult unless we know how many cash certificates were bought, say, in the more or less rural sub-offices. It would be very difficult to say when a man comes to a head office whether he is an agriculturist or whether he is a shop-keeper.

2336. I was wondering whether such figures were available in order to throw some light on the question whether the rural population is giving up this ancient practice of hoarding, so that more money is available for agricultural improvements?—I do not know.

2337. *The Chairman:* Is there anything else you wish to say?—No.

(The witness withdrew.)

The Commission then adjourned till 10 a.m. on Monday, the 18th October, 1926.



Monday, October 18th, 1926.

SIMLA.

PRESENT:

THE MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Raja SRI KRISHNA CHANDRA GAJAPATI NARAYANA DEO of Parlakimedi.
Professor N. GANGULEE.
Dr. L. K. HYDER.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Sir CLEMENT HINDLEY, Kt., Chief Commissioner of Railways.

Memorandum by the Railway Board.

(1) *Refrigerator Vans.*

The question of the use of refrigerator vans on Indian Railways first received attention in the year 1908 when Captain Freeland, an Indian Railway Officer, was deputed to attend a Conference on the subject at Paris and submitted a report. The possible methods of reducing the temperature in railway vans are:—

(*a*) the use of refrigerating machinery in the van, worked either by a small engine or off the axle,

(*b*) the use of insulated vans which are cooled either in a cold storage shed or by the introduction of ice, and the low temperature maintained by ice bunkers.

In this note the term "refrigerating van" is used to describe the former type and "insulated van" to denote the latter.

Conditions in India were at the time considered unfavourable for the introduction of either description of van. Three years later, in 1911, the Railway Board were approached by the Bengal Fisheries Company in connection with the conveyance of fish in refrigerator vans. Designs were got out by the Eastern Bengal and the Bengal Nagpur Railways, but the Company failed to develop the proposal.

2. Inquiries as to the possibilities of fruit traffic such as would require refrigeration, made in 1912, showed that from one of the most promising localities—the Frontier at Peshawar—only some 30 tons of fruit per day would be available for 3 months in the year and out of the 3 months only during one month would actual refrigeration or cooling be required.

3. Inquiries were, however, continued with a view to seeing whether the fruit traffic could be developed and what was required and the assistance of Mr. A. Howard, Imperial Economic Botanist, was sought. Mr. Howard favoured the railways with a memorandum on the subject the substance of which was as follows:—

The special conditions attaching to India were that the fruit had to be carried considerable distances through hot and humid regions; that the trade was in the hands of small traders who

did not combine, with the consequence that the packages of fruit booked were small and in miscellaneous shapes and sizes, while the method of packing was primitive. No large business existed and cheapness was essential. No market for high class fruit existed, as for example, in the United States. The results of experiments carried out at Pusa and Calcutta had shown that Bihar peaches, if properly packed, would last 72 hours in the hottest season without damage, though no ice was used. It may be noted that the conditions described by Mr. Howard probably continue very much the same as when he wrote in 1913. A special enquiry, however, regarding the amount of traffic offering and facilities for the transport of fruit on Indian railways is being made and will be the subject of a separate memorandum.

4. The question of refrigeration was discussed by the Railway Conference in 1913 and they came to the conclusion that there was no demand at present in India for refrigerator vans, but that railways should experiment with special fruit vans. Certain suggestions put forward by Mr. Howard for the improvement of the fruit traffic were carried out, namely, the free return of improved types of boxes used in packing, and charging consignees on the collective weight instead of for individual packages.

5. The North Western Railway was meanwhile experimenting with a form of insulated van, and inquiries were instituted from the Consulting Engineers in England and firms in India as regards the design of refrigerator cars and machinery. The opinions received were all adverse to refrigerator cars owing to loss of space, haulage of extra dead weight, difficulties of examining running machinery *en route*, difficulties of keeping the temperature low while the van was stationary, if the alternative of working machinery from an axle was adopted.

6. In the meantime the Great Indian Peninsula Railway had introduced a special refrigerator car, intended to keep consignment cool and fitted with an apparatus for cooling carriages on trains. In 1916 the Great Indian Peninsula Railway car and the North Western Railway insulated vans were transferred to the Eastern Bengal Railway with a view to carrying out further experiments. The result showed that the Great Indian Peninsula Railway car was a failure and that the North Western Railway vans were not sufficiently insulated.

7. The Eastern Bengal Railway were then instructed to build new types of insulated vans and a successful van was constructed. The result of the experiment on the Eastern Bengal Railway was set out in a press communiqué, dated 6th October 1917, a copy of which will be found at page 303.

8. At the same time all railways were addressed by the Railway Board to consider sympathetically any reasonable proposals to provide an experimental service of insulated vans and were encouraged to provide cooling rooms at the points at which traffic might originate. Local Governments were also addressed asking for their co-operation and for meetings to be arranged with railways with a view to ascertaining what measures could be taken to promote such traffic. The Local Governments were practically unanimous in their opinion that the proposals could not be made remunerative and that there was at present no demand for refrigeration. Interest, however, on the subject was displayed at Bombay and Karachi and further endeavours were, therefore, made to establish a service between certain particular points—Bombay to Ahmedabad, Bombay to Poona, Karachi to Lahore, Karachi to Delhi—but nothing developed.

9. In this connection the conclusions of the Honorary Director of Madras Fisheries on the subject may be quoted:—

"(1) I am not certain that, except for the shoal fish of the West Coast and northern parts of the East Coast, fish are really abundant in our seas, specially fish of the better classes;

(2) Even if abundant they will not be caught abundantly for many years to come by reason of the conditions of the fisher-folk, the want and cost of bigger boats, etc., motors, etc., and want of harbours and artificers;

(3) If caught they would on reaching shore often be of questionable or worse condition unless we have large boats, ice, motors, etc.;

(4) Capital and enterprise will hardly be found to establish an ice factory without an assurance of a large and sound fish supply, or a fishing fleet without a prior ice factory; even if point (1) is established, capital would require to start an ice factory and fishing fleet in co-operation;

(5) The expenses of fleet and factory in this climate would be very heavy owing to climate, cost of ice and superintendence, etc., so also the cost of transport, distribution, etc.;

(6) Hence the cost of fish would prohibit the fish in question from reaching the masses;

(7) Nevertheless it may be possible, in certain exceptional areas, to freeze and chill masses of the frequent surpluses of shoal fish so that they may reach a larger market than at present and in better condition, at quite moderate rates;

(8) But for the 'masses' properly so-called, who consider one anna per pound of dried fish a quite sufficiently high price, iced or fresh fish is out of the question for many years."

10. In the meantime the Eastern Bengal Railway endeavoured to popularise the use of the new type of insulated vans, ice cooled, for the fish traffic between Goalundo and Calcutta; but this failed owing to the fact of the traffic being widely distributed, and no cold storage being available at destination even at Calcutta. These vans were subsequently transferred to the North Western Railway for the carriage of fruit.

Particulars had also been obtained of types of vans used on the L. and S. W. Railway in England and in Australia and it was ascertained that only insulated vans were used in England and Australia and no attempts made with cars containing refrigerating machinery.

11. In 1919 endeavours were again made to establish refrigerated traffic in consultation with the Lightfoot Refrigeration Company who were called on to prepare schemes for fish traffic between Goalundo and Calcutta, Bombay and Poona, Karachi and Delhi and for fruit traffic between Peshawar and Delhi. But this only resulted in an offer from the Company for the sale of oil-driven refrigerating vans.

12. Ice cooled insulated vans were, however, introduced on the B., B. and C. I. Railway and on the East Indian Railway, but though private cold storage existed to a limited extent local bodies could not be got to take up the subject.

13. In 1921 Major Sir Edward Every approached the railways with a view to the formation of a Company for the construction of coastal depôts and the introduction of an inland service. The railways agreed to allow the Company the privilege of owning cold storage vans subject to the right of the Railway Board to take them over at a valuation at the end of 5 years. The Company then endeavoured to obtain, from the Secretary of State, sanction to the issue of a prospectus which implied that they were being given special privileges in the shape of sites of military and railway land and that fish rations were to be issued for troops. This could not be agreed to and nothing more was heard from the Company.

14. It will be seen that speaking generally the results so far have therefore been limited to the use of ice cooled insulated vans for the carriage of more delicate kinds of fruit, chiefly on the North Western Railway. The extensive use of refrigerator or cold storage vans depends entirely on the creation of a suitable traffic and the establishment of cold storage depôts at suitable market points. Such cold storage depôts have to be run on

commercial lines and involve setting up a regular business which depends on supply and demand and constant touch with marketing. For this reason the railways have not undertaken the establishment of cold storage depôts, though, as already stated, they were prepared to establish such depôts at the points of origin of the traffic. To a small extent private cold storage depôts exist at Calcutta and Bombay but until railways are satisfied that there are cold storage depôts established up-country they cannot undertake to provide refrigerator or cold storage vans. If the demand arises there will be no difficulty in providing and running such vans and it may be added that the railways are anxious to undertake any form of transportation work if it can be shown that a demand exists and can be developed into a commercial success. It should, however, be noted that it is open to question whether State-managed railways would be justified financially or as a matter of policy in undertaking the whole enterprise of the cold storage business.

Communiqué, dated 6th October 1917.

A commencement was made with a refrigerating van which had been in use for the short time on the Great Indian Peninsula Railway together with a number of insulated vans which had been built and placed in traffic by the North Western Railway. The Great Indian Peninsula Railway van was a self-contained freezing plant with, in addition, a compartment for the carriage of perishable articles in cold storage. The North Western Railway vans had no freezing apparatus. They were provided with a measure of insulation with the object of maintaining the vans at an even temperature and with compartments for the reception of ice to produce a suitable low temperature.

Soon after the commencement of the experiments it became evident that a system which called for the provision of freezing machinery in a vehicle could not be expected to be satisfactory or remunerative having regard to the large number of installations which would be required to deal with any considerable volume of traffic, the loss of space, the difficulties and cost of maintenance and the large amount of additional dead weight which must be hauled. Moreover, experiments with the North Western Railway insulated vans proved conclusively that the method of insulation adopted for these was not the most suitable for the Indian climate and could not be depended upon to maintain the vans at a low temperature. It was decided therefore to build a number of new experimental insulated vans cooled by chambers filled with ice. To determine their efficiency and ascertain their financial possibilities, the considerable fish traffic, which moves from Sara and Goalundo to Calcutta, was selected as being suitable for the trials of these vehicles.

At the same time the carriage of fruit in cold storage was considered. There are prospects of a considerable demand arising for this class of accommodation but a different type of vehicle is required, as, apart from temperature, the carbon dioxide given off by fruit hastens its decomposition. Provision has, therefore, to be made for adequate ventilation, and, for the trials, certain of the North Western Railway insulated vans were rebuilt to a modified design fitted with ventilating appliances.

The first step in the experiments was to ascertain the best form of insulation. Many substances have been and are used for this purpose, and it is generally considered that cork slab is one of the most efficient insulating materials. This, and many other insulators were tried with varying results, but it was found that having regard to the three factors—weight, non-conductivity and cost—none could be considered entirely satisfactory. Moreover, there was the further disadvantage that cork slab was difficult to obtain in sufficient quantities. Investigations were made, therefore, as to the possibility of obtaining some substance which is indigenous to India and at the same time an efficient insulator. After experiment, the choice fell on the variety of cotton tree known as *Simul* (*Bombax Malabaricum*) which is common in India and which proved a more efficient

insulator even than cork. It is cheap, light in weight, and can be procured in large quantities. Further, and an important point, it is only slightly absorbent of moisture, the exclusion of which is necessary to efficient insulation.

Four types of cold storage vans were constructed and one was later modified to a fifth type. The insulation generally consisted of some 12 to 8 inches of non-conducting material. Ice compartments were provided at one or both ends of the vehicles and both in the stationary trial, before the vans were put into traffic, and in the actual traffic trials, the circulation of air over the ice and through the van was induced by electric fans. The fourth type was constructed with *Simul* as an insulating material, and in the trial prior to the vehicle being brought into traffic, the temperature of the van was reduced from 90° F. to 48° F., *i.e.*, 42° F. in 24 hours; the "heat leakage" or rate at which the temperature of the van increased on the exhaustion of the ice supply was 1° in practically 4 hours.

The type of van now evolved is thoroughly insulated and suitable for the carriage of fish and other perishable commodities which do not require ventilation in cold storage. For long distance traffic it is considered that electric fans may be omitted, the natural circulation of the cooled air being sufficient.

The present method of despatching fish by rail from Goalundo to Calcutta in the hot weather is to pack fish mixed with ice into baskets or boxes, the ice required being obtained from Calcutta. This entails considerable loss *en route*, and in addition to the wastage of ice a proportion of the fish may arrive at destination in a stale condition. The consignments of fish booked in the experimental vans reached Calcutta in excellent condition and, in one case, in which fish was kept in the van for a trip from Goalundo to Calcutta and back again to Goalundo, a period of about 40 hours, it was found to be still in fresh condition and fit for human consumption.

The cold storage fruit vans referred to above have also been put under trial both in the railway shops and under actual traffic conditions. In the stationary trials two selections of mangoes, peaches and plantains in a thoroughly ripe condition were subjected to trial in the insulated fruit van and in a ventilated box, respectively.

The conditions to which the fruit in the box was exposed were made as nearly as possible similar to those under which fruit travels in louvred vans. The trial ran for 4 days when the fruit in the van was found to be in excellent condition while that in the box had rotted. A trial consignment of peaches and grapes was then consigned in this van from Peshawar to Howrah. The full consignment arrived in excellent condition, none of the fruit being lost through damage or decomposition. The experience of the fruit dealers with their consignment of the previous day in ordinary vans in which 73 per cent of the fruit despatched decomposed and rotted *en route* may be quoted by comparison. Under ordinary circumstances the loss of fruit in transit by deterioration amounts to from 12½ to 50 per cent of the consignment according to the speed of the train by which it is booked. The experiments with these fruit vans are continuing.

The question of providing facilities which will make available in increasing quantities throughout the country perishable products, such as fruit from the North-West Frontier and fish from the coasts of India, is an important one. Experience in other countries shows that improvements are always being made and that the last word has not yet been said on the subject, but so far as transport over the railways is concerned, it can be claimed, as the result of the experiments detailed, that the matter has now been put on a sound practical footing. What remains is to improve the methods of dealing with such products at the despatching and receiving points. To take the fish traffic, for instance, under present arrangements, the fish after removal from the boats may be left in a hot atmosphere for some hours, and it is desirable to provide some form of cooling room into which the fish can be taken direct from the boats. It is

proposed to provide a place of this kind at Sara for the fish traffic over the Eastern Bengal Railway to Calcutta, and similar facilities will no doubt be provided by railways at other points where they are found to be necessary. As regards the points of destination, it is desirable also that cold storage rooms should be set up in the markets themselves or other convenient places, and it is the intention that this matter should be taken up with the local authorities concerned.

(2) *Grain Elevators.*

The question of grain elevators was taken up in 1908 and extensive enquiries made as to the possibility of their introduction in India. The possible use thereof is chiefly connected in India with that of the transport and storage of wheat, and it was in connection with the export traffic of wheat from the Port of Karachi that the question has received particular attention.

2. The construction and use of elevators was investigated on the North Western Railway by an informal committee appointed in 1909, and the main difficulty experienced on the railway in connection with the export traffic at the time was the concentration of the traffic over a short period and the consequent difficulty in providing sufficient accommodation and rolling stock. In this connection the committee found that the establishment of elevators would undoubtedly tend to the quicker turn round of railway rolling stock (and this applies to ships also) but that, owing to the particular conditions of the trade, no hope could be entertained of spreading the traffic more evenly over the year. This was due to market demands necessitating the export of Indian wheat during 3 months, from about the middle of May to the middle of August. As regards the local movement of wheat the committee found the traffic less concentrated, that for storage purposes wheat owners were satisfied with the arrangements existing and that there was no prospect of the use of elevators.

3. The proposal also, to erect elevators, received no encouragement from the exporters interested in the export of wheat. Under existing conditions such exporters have a virtual monopoly as, without the facilities which such exporters have created for themselves, smaller firms cannot intervene as they might with a system of elevators. But undoubtedly the objection, or rather the indifference, of the exporters to the subject of erection of elevators is mainly an economical one. Under the climatic conditions prevailing at Karachi wheat can, without serious damage, be stored and dealt with in the open very cheaply for certain months in the year. Little capital is involved comparative to the capital necessary for an elevator system and this small lock up of capital is an important factor, in consideration of the fluctuating nature of the traffic year by year.

4. As regards the Karachi Port Trust, who are intimately concerned with any proposal regarding the establishment of elevators in connection with the export trade, the attitude of the Port Trust is stated in a note of the Chairman written in October 1917, which reads:—

> "Then, again, we have the elevator question to consider. We have practically bound ourselves to introduce this when the demand comes. We are telling His Excellency the Viceroy so in the Address we are to present on the 30th of this month, and we have repeatedly stated that we recognise the obligation."

In the absence of demand no experimental action has been taken by the Port Trust, but they have expressed their willingness to grant facilities to any private company which will undertake the construction of elevators; no such company has, however, come forward.

5. This question of whether grain elevators are required or would be beneficial is interlinked with questions of marketing, and the difficulties in the past have, probably, been the number of divergent interests concerned. The wholesale dealers, the growers, the railways, the ports and local business interests are all involved. So far the only result of previous

consideration of the problem has been the abortive construction of an elevator at Lyallpur and the decision of the Karachi Port Commissioners, already quoted, that they would be prepared to erect elevators "when the demand comes".

6. From the railway point of view the introduction of elevators would tend to economy in working by the introduction of transport in bulk, quicker turn round of wagons and possibly a better distribution of the traffic throughout the year. The railways would, therefore, welcome and assist, in every reasonable manner, the introduction of such a system, but it is obvious that they are not in a position to do anything without the co-ordination of the other interests concerned.

7. Before elevators can be introduced it must be determined what form of elevator is suitable to the country. Grave objections have been raised to any proposal for public elevators owing to doubts as to the suitability of Indian wheat for grading purposes, and as to the possibility of the introduction of any system of grading and issue of certificates which would not be liable to serious abuses. It must also be borne in mind that even if railways were to build public elevators they must either hire them out to a company or enter into commercial undertaking outside the ordinary scope of railway work.

8. The Punjab Government suggested a meeting to discuss the question with the North Western Railway Administration and the Karachi Port Trust in the cold weather of 1924-25. The latter body, however, considered that no useful purpose would be served by such a meeting on the grounds that no new developments had arisen since the matter had been last discussed as there had been no demand from the trade for the erection of elevators at Karachi.

9. The North Western Railway are, however, considering the possible developments that may arise as regards the wheat traffic on account of the Sutlej Valley and Sukkur Barrage schemes of irrigation now in process of construction. In anticipation of such developments a special officer has been deputed by the North Western Railway to look into the question of improving railway facilities generally and in the port areas at Karachi in particular. In this connection particular attention is being paid to the question of the possibilities of the handling of the Punjab wheat traffic, through elevators, at the principal market stations and at Karachi port and endeavours are again being made to enlist the assistance of the Punjab Government and the Karachi Port Trust.

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Oral Evidence.

2338. *The Chairman:* Sir Clement Hindley, you have been good enough to prepare some material which is before the Commission and for which we are greatly obliged. Would you care to make a statement of a general nature before we proceed to ask you any questions?—I thought it might be useful to the Commission if I gave a short indication of the scope of the Indian railways, their geographical position and their principal business. I can with a map give a rough idea of the lie of the railways.

2339. I think that would be most useful?—I wanted to explain how the railways of India have grown up and why they are in the position in which they are at present. The main trunk lines have been gradually built up roughly in accordance with a note which Lord Dalhousie wrote in 1853 when he was studying the question of railway communications in India generally. He suggested that what was required was trunk lines to connect up the various Provinces amongst themselves and with the ports. On the basis of that formula he indicated that the future trunk lines of India would probably be, first of all, between Calcutta and the north-west of India along the Ganges valley, between Madras and Bombay and between Madras and the Malabar Coast. These were the three principal lines he looked upon as being necessary, and further a line from Bombay to the North-West of India. That skeleton which he laid down is really the basis on which the railways at present are built up. The most important one from the traffic point of view. The one that was mainly constructed before most of the others, is the East Indian Railway, which runs along the Ganges valley. It was originally constructed practically parallel to the river right away up, touching Benares and Allahabad, eventually reaching Delhi. That followed one of the most ancient trade routes of the world, through the Khyber Pass to the sea down to the neighbourhood of Calcutta. Of course, the Ganges valley, being very thickly populated, provided a great deal of opportunities for small connections and branches, but an interesting fact which I would just like to mention is that whereas the railway originally ran by a somewhat circuitous route along the river, it has by successive short circuits been brought into this route which runs direct from Calcutta almost in a straight line to Delhi. Not more than 20 years ago the final chord line was made. That is rather interesting historically. The first chord was from Asansol to a point called Lukhiserai; that was done about 1870. The second line ran from the same point, which is in the coal-fields, Asansol, through Gaya practically to Benares, reducing the distance again by about 50 miles. The present chord line we are building is primarily to serve certain coal properties in Central India and will eventually form a shorter route to Bombay. I have mentioned the main axis of this great trunk line, the East Indian Railway, running south of the Ganges to Delhi and connecting with the later lines which were built in the Punjab from Delhi to Peshawar. Then about the same time as construction was started on this side, construction was started from Bombay on the line which now runs to the cities of the Gangetic plain from Bombay. In the recent reorganisation which we have made of the limits of certain railways we adopted the principle that the larger towns in the Gangetic plain beginning with Allahabad and Delhi should all have direct connection with Bombay. We have now given the Great Indian Peninsula Railway, which is based on Bombay, jurisdiction right up to those towns; those towns therefore enjoy direct communication with Bombay and Calcutta, the two big import centres. Then take the North-West of India, the Punjab and the North-West Provinces. Lines were started in continuation of the East Indian Railway, to connect Lahore and later on to connect Peshawar. That network of railways on the frontier was built very largely for strategic reasons in the first instance, but some of these railways are gradually becoming commercial railways. The line was connected up across the Punjab to connect up with Sind and Karachi. That is the origin of that route, which gives Lahore the advantage of proximity to the port of Karachi somewhat similar to its distance from Calcutta. Then later on, partly for strategic and partly for administrative reasons, these

lines were built into Quetta, and quite recently, during the War, this line was built across the Baluchistan Desert to Persia. You see the great network of lines running down towards Karachi. Those lines lie in that direction because they lie between the five rivers of the Punjab; they are practically on the watersheds of five great rivers which connect up with the Indus. They have mostly been put through Canal Colonies where irrigation has been introduced for improving crops. These railways all form links which bring the crops, wheat mainly, down towards the great ports. Incidentally I may say that the Sukkur Barrage which is now under construction in Sind will improve the crops and agriculture generally in this area, and we are arranging for the construction of certain feeder lines to serve that part of the country. For many years the main connection between Calcutta and Madras lay across this route: it was only in comparatively recent times, 25 or 30 years ago, that this East Coast railway was built down the coast of Orissa; that is a subsequent main trunk line. The lines in Southern India depend primarily on the connection between Bombay and Madras, that is the main trunk line. There have been subsequent lines built from Madras down to the Malabar coast as predicated by Lord Dalhousie. The process, as I have tried to indicate, is, primarily, building up main trunk railways along the trade routes, and then filling in the interstices as has been found possible under traffic conditions where profitable business could be done. I should mention that on the northern side of the Ganges there is a great system which has grown up mainly on the metre gauge, called the Bengal North-Western, which serves the area between the mountains of Nepal and the Ganges. Another area which is interesting is the Eastern Bengal and Assam area. We have the Eastern Bengal Railway running due north and south serving the whole of this country. Further to the east we have the Assam-Bengal Railway which roughly follows the line of the river Brahmaputra, but it has this cross-connecting piece of line through the hills to connect up the two main valleys. Burma has an entirely separate railway system based on the port of Rangoon and a main trunk road between Rangoon and Mandalay. That was the original line; there have been various branches put in. We are now projecting a line down the coast here which we hope will eventually connect up with the Siamese State Railways and give direct connection on the metre gauge between Rangoon and Penang and the Malay States. I should like to indicate an interesting thing: we are hoping to connect up on the one side with Penang and Singapore, and we have already a railway on the Persia side, so that there is the making of a great transcontinental route.

2340. I did not catch the link between India and Burma?—There is none at present; surveys are being made at the present moment. There are no insuperable difficulties, but there is no trade at present.

2341. Is that being projected now?—One of those connections is actually under survey and has been under survey during the last cold weather. There have been 4 or 5 surveys made. A line was surveyed hurriedly when the "Emden" was in the Bay during the War. But that is a very expensive route with a very small population, and the possibilities may be more in favour of the other route.

I want to explain now in a few words the system of administration. There are four main systems which are worked direct by the State under the control of the Railway Board. They are the East Indian Railway running from Calcutta to Delhi with its branches, the Great Indian Peninsula Railway running from Bombay to Delhi through the Central Provinces, the North Western Railway which is the largest system of all, based on Lahore and covering practically the whole of the Punjab, Sind and Baluchistan. The fourth is the Eastern Bengal Railway running up from Eastern Bengal on to the borders of Assam. Those are the four railways which are controlled directly by the Railway Board. The North Western Railway has a mileage of 6,200 route miles; the East Indian just under 4,000, the Great Indian Peninsula Railway about 3,600, and the Eastern Bengal 1,700.

2342. *Mr. Calvert:* Does a double line count once or twice?—I am speaking of route mileage: that is the total distance between destinations. We

have a total of 15,500 miles under direct State management, and a total in India altogether of 38,500. Of those 38,500, roughly 28,000 are State-owned, but in some cases worked by companies. 15,500 are worked direct by the State, and the balance are worked by companies, by Indian States, or by District Boards. Then I might take the other systems in order of importance. The Bombay, Baroda and Central India Railway is based on Bombay; it consists of a trunk broad gauge line running up to Delhi, and a large network of metre gauge lines connecting up the States of Rajputana, and running up north into the Punjab. Then there are railways very largely owned and worked by small Indian States. The next big railway is the Madras and Southern Mahratta based on Madras, running half way up the East coast, running half way to Bombay on the trunk route between Bombay and Madras, covering the Southern Mahratta country. The next big system is the South Indian Railway based on Trichinopoly which takes the whole of the balance of the Peninsula here.

2343. *The Chairman:* Is there any break in gauge so far as the main railway system is concerned?—Unfortunately we have two gauges: we have about half and half broad gauge and metre gauge. There are some areas which have been developed almost entirely on the metre gauge. Burma is one. The area covered by the South Indian Railway is practically all metre gauge, and the Rajputana lines are metre gauge. The Bengal and North-Western, north of the Ganges, is also metre gauge. There are consequently a great many transhipment points. Our present policy is to develop as far as possible metre gauge in the metre gauge areas and broad gauge in the broad gauge areas, but wherever possible we are reducing the number of transhipment points. That I think gives the general outline of the railway system.

I might just mention perhaps the principal commodities, that we consider of importance, carried by the different railways. Of course, the North Western Railway is primarily a wheat railway: most of its traffic is derived from wheat in the Canal Colonies. The East Indian Railway carries a great variety of traffic: coal between the coalfields and Calcutta, oil and other seeds between North Bihar and the other Provinces, moving to the port and moving internally, and wheat in the United Provinces. In Assam and Eastern Bengal we have the great jute traffic, and tea from Assam. In Burma we have timber and rice and paddy. The Madras and Southern Mahratta Railway has oil-seeds, cotton and various other crops. The Great Indian Peninsula and the Bombay, Baroda and Central India both move cotton in large quantities, and a certain amount of wheat and other seeds to Bombay. The cotton traffic has recently increased from the Punjab and is finding its way to Karachi. Karachi is the great wheat port. The South Indian Railway deals largely with oil-seeds, rice, ground-nuts, and things of that kind. From the agricultural point of view I mention these commodities. I think that is a rough outline of the position.

2344. Now could you give the Commission some indication of the basis upon which freight rates are fixed in India?—I had better explain the position of the Railway Board and the Government in relation to these railways. As I have just said, 15,500 miles of four big State Railway systems are controlled directly by the Railway Board. The other railways are managed by companies whose Boards of Directors are in London. Under their contracts, the Government of India have the right to fix maxima and minima rates for the carriage of traffic, and we have always applied the same system as we do to control of company railways to the control of our own State Railway systems. The position then is that as a matter of contract, the Government of India prescribe maxima and minima rates for the carriage of goods and passengers on company railways, and, as a matter of administration, on the State Railways.

2345. That is to say the same maxima and minima apply throughout India?—Throughout India, yes. Within those maxima and minima the railway administrations, both Company and State, are left to fix the rates for individual goods; but a classification of goods has been arranged which is

uniform over the whole of the railways; that is to say, all goods are arranged in 10 classes and a maximum and minimum rate is prescribed for each of these classes. Then each company and each State Railway Administration is free to fix any rate it likes within the maximum and minimum prescribed by us, within the general classification. The railways are permitted to put any commodity to a lower class if they wish, but they may not put a commodity into a higher class. If they do take the action of putting a commodity into a lower class, they are still subject to the minimum laid down for the class in which it was originally placed. That is the general basis on which these rates are made. Then, of course, each railway has to study its own business and fix its rates according to the tendency of trade generally. The general principle, I think, adopted is that rates are fixed so as to cause the maximum movement of traffic, subject to the consideration that it is carried at a profit. As I have said, that is the control we exercise from here, and beyond that we do not interfere with the fixing of rates at all; it is a matter which is left entirely to the discretion of the local administration. We have given in our memorandum the classification of agricultural commodities and materials; I do not think I need go into that.

2346. I agree. Would you tell the Commission on what services the terminal charges are based?—The terminal charges, of course, vary a good deal on various railways. There is no general basis I think for the exact fixing of the terminal charges; they are considered to be payment for terminal services rendered, but they are also considered to be legitimate sources of revenue, just in the same way as the mileage rates are considered to be. The whole question of the basis of these terminal rates is at present being looked into and investigated by the Indian Railway Conference Association. They have grown up, of course, locally, possibly on a different basis, but, generally speaking, they are supposed to cover the cost of terminal services.

2347. Do they vary as between various kinds of produce?—Generally speaking they are uniform; there are some cases, I think, where they vary.

2348. Some kinds of produce involve more service at terminal points than others, do they not?—That is so. Take the case, for instance, of minerals; coal is handled in an entirely different way from things like eggs, for instance. The list of terminal charges actually made is on page 7 of our memorandum.*

2349. Do you think it is possible that these terminal charges are a little inequitable as between producers of different kinds of agricultural produce?—I am not aware of any cases of that sort.

2350. You do not think that some forms of produce involve more expensive services than other forms of produce?—Yes, I think they do; I was thinking of it from the point of view of the man who would be likely to complain, and, as far as I know, we have not had any complaints of that kind.

2351. You have mentioned the word "complaints"; I wonder whether you would tell me the position: how do complaints reach the higher branches of the administration?—We have recently established a Rates Advisory Committee which is somewhat on the lines of the Rates Tribunal arranged for in England. That Committee was constituted last May and is at present sitting in Calcutta; it consists of a President who is a legal gentleman, a Railway member, and we have provision for the appointment of a commercial member from panels nominated by the various commercial bodies throughout India. The commercial member was to be nominated for any particular cases which might be brought before the Committee. The Committee has been sitting for the last 4 or 5 months and we have advertised it extensively, but so far, only one case of complaint has been brought before it. The procedure for bringing cases before the Committee is that the complaint must be submitted to the Agent of the railway on which the complaint arises. The Agent of the railway then investigates the case and submits his statement of the case and the original complaint to the Committee for their investigation. He is bound to do so within 3 months. There is an intermediate stage in which both the

*Not printed. Note on "The existing methods of transporting agricultural produce, machinery, manures, etc., and the rates charged on railways" in Central Government Memoranda.

original complaint and the Agent's answer come before the Railway Board, before the Government of India, for decision whether there is a case for reference to the Committee. That was arranged for because it was thought that there might be cases that might be settled without having to come to the Committee, if they came before Government. Then when the Committee makes its finding it is in the form of a recommendation to the Government of India. The Government of India pass Orders on the findings and those Orders in the case of State railways are binding, and in the case of Company railways, by agreement they will be binding. That is the machinery which we have set up, and I would like to bring to the Commissioners' notice that though these facilities for complaint before an entirely unprejudiced tribunal exist, only one very small complaint has so far been brought before it.

2352. I think you have a rule by which a deposit of Rs. 100 has to be made?—Yes, I had not mentioned that; Rs. 100 has to be deposited.

2353. That is as a protection against frivolous complaints?—Yes.

2354. If the complaint is withdrawn within 3 months, the Rs. 100 is returned?—Yes.

2355. What happens to the Rs. 100 if the complaint is adjudged to be frivolous?—We have not had any cases.

2356. You have not made up your mind what you are to do with the money?—I think the intention is that it is to go towards the expenses of the Committee; obviously for cases brought before the Committee it is reasonable that a certain fee should be paid.

2357. Have you through this Rates Advisory Committee had any representations from the Department of Agriculture?—No.

2358. Then, as I understand it, the Rates Advisory Committee has no touch with the Local Advisory Councils; that is quite a different matter, is it not?—They are quite a different concern; the Local Advisory Councils which have been constituted at the headquarters of each railway are to advise the agent in regard to public conveniences and matters affecting the public generally on the railway.

2359. So that a complainant comes straight to the Central Rates Advisory Committee with his grievance; is that the position?—As a matter of form he has to submit them to the Agent of the railway; that is to enable the Agent either to settle the matter direct with him, which might often happen, or to prepare his case and submit it to the tribunal.

2360. It occurs to me that in a very large country like India, a Central Advisory Rates Committee is a very remote object so far as a group of cultivators in any part of the country is concerned?—Of course, any group of people concerned with public traffic have direct access to the local railway officials in the first instance; and if they cannot get a satisfactory hearing there, it is always possible for them to approach the Agent; then if they cannot get satisfaction from him, they can go to the Rates Advisory Committee. It is proposed that the Rates Advisory Committee should hold their sessions in various parts of the country as occasion arises, either in Bombay, Calcutta, Karachi, and so on.

2361. In the matter of facilities for special classes of produce and so forth, how are representations made in that matter?—They are the concern very largely of the local railway officials who are very closely in touch with the people from whom they get their business.

2362. But I presume the policy of all the railways is to develop and encourage new forms of agricultural activity so far as possible?—Yes, I think I can endorse that entirely; we consider that any possible improvements which may be made in agricultural methods which may produce more traffic for us are to be encouraged as far as we can. I think that has always been the policy of the railways.

2363. I have examined the figures so far as they have been laid before us, and I see that a very important proportion of your total business is in agricultural produce?—Yes.

2364. I notice also that your freight rates for grain, for instance, have remained in many cases almost constant since 1913, whereas the prices of

produce have, of course, in that period risen very considerably to the peak of 1919, and have not yet declined to the point at which they stood in 1913, before the War?—Yes, there has been practically no increase in the freight rates of food grains and agricultural produce. It has to be remembered that our expenses have gone up more in proportion to the cost of commodities during that period, and we have had times when it has been very difficult to make our required profit; but we have endeavoured to put the incidence of our necessary revenue on to other things than agricultural produce.

2365. Has it never been represented to you that the facilities granted are in fact difficult to obtain owing to the obstinacy of minor officials or some other causes?—Facilities for booking and sending traffic?

2366. Yes?—Well, I suppose there have been a good many rather general complaints of that kind, but where any definite complaint comes up to us, we always have it investigated very carefully, and I do not think there is any widespread feeling of that kind. It is a matter of course with which the railway administrations themselves are very largely concerned, and I do not think they would allow conditions of that sort to have remained for very long without investigating them. The touch between the railway administration and its clients is a very close one. I do not know that any complaint of that sort would be allowed to go without any investigation.

2367. I suppose the position is that a considerable part of the goods carried by the railways are carried for important concerns which would be perfectly capable and ready to make representations and complaints, and not on behalf of small individual cultivators who might not be able to represent their grievances?—I should think the vast proportion of our traffic is carried for small people, except that the main movements of grain are on account of big buyers very often; but an enormous mass of goods is carried for small merchants.

2368. So that a sensitive and sympathetic organisation for receiving and attending to complaints is very necessary?—Yes, that is so; I think it is extremely sensitive. We have our commercial traffic offices frequently moving about at the principal booking centres, and, what is more, they watch the movement of traffic very closely from headquarters. The local administrators have much greater and closer control over, for instance, the supply of wagons for moving goods, than we used to have, because we have installed telephone communication with practically all the small stations. In the course of what we call train control or traffic control we have now over most of the trunk lines got telephone communications between the district headquarters and every individual outlying station; and on most railways they have introduced the system that all the small stations report every day the quantity of goods lying for despatch which have been received that day; arrangements are then made by headquarters for sending out wagons on the next day for loading these consignments. That has been I think a definite check on the difficulties perhaps experienced by merchants in the past in getting wagons and getting transport for their goods. The position at the divisional headquarters so far as the State railways are concerned, where we have introduced the divisional system, is that each divisional headquarters knows day by day the exact position at each of the outlying stations as regards goods awaiting despatch and the requirements for wagons.

2369. Do you not think that in the case of a small cultivator who wishes to make a complaint, that deposit of Rs. 100 is a very considerable discouragement?—I suppose it would be in the case of a small individual cultivator; but I think we had to protect ourselves against a flood of more or less frivolous complaints. Our feeling generally is that the cultivator can get into close touch with the people who are definitely concerned with moving his traffic, and it is not likely that he will have any serious complaint to bring before this Committee. We were looking rather to complaints of, perhaps, widespread importance; I do not think we ever contemplated that an individual cultivator would have a particular complaint about rates which would be necessary to bring before a Committee of this kind. A group of cultivators might, or the Local Government, or the people who are concerned in agriculture locally.

2370. How do you suggest that a group of cultivators should be made vocal in matters of this sort? They have no organisation, have they?--Well, that is hardly for us.

2371. No, but if I may say so, it is important in relation to your insisting on having a deposit of Rs. 100 in the initial stages of the complaint. Would it not be possible to examine the complaints locally in the first stage, and then perhaps claim a deposit if it is to go to higher authority? I am thinking of the psychological effect?—In actual practice there is no fee for the man who wants to make a complaint locally: he can walk into the Divisional Office and make his complaint there, or go to the Station Master or go to the Traffic Superintendent when he is making his tour. There is no bar, there is every possible means of access for his complaint to be heard, and I think you will find the local officials generally are only too pleased to try and encourage traffic; they have no object in restricting traffic, or making difficulties.

2372. The cultivator is more likely to have complaints about delays in transit and lack of truck facilities?—Well, I do not think there is anybody in India who has got any valid complaint against lack of wagon facilities, certainly during the last two years. I have not heard of any and I should be very glad if we do hear of any to have it investigated.

2373. Are there many complaints of pilfering on the lines?—Yes, we have had a great deal of complaints about pilfering. Pilfering, thefts and damage to goods reached a very high level about three years ago. We have taken intensive measures to protect goods and to look after them better during transit. Various methods have been adopted: we have gone in, in some cases, for walling in our goods yards and marshalling yards where thefts might take place. We have also reorganised very largely our watch and ward staff, and we believe we have made considerable improvement in that direction during the last two or three years. The reason why we have that belief is that our payments for compensation in the case of damages and losses have been very, very heavily reduced. We reached a very large figure indeed in 1921; it has now been reduced to a comparatively small amount.

2374. May I take you back a stage and ask you a question about the constitution of the Local Advisory Committees. I take it the purpose of these Local Advisory Committees is to be a link between the public and the railway administration?—Yes.

2375. Who represents rural interests on the Local Advisory Committees?—The Local Advisory Committees are variously constituted. I am afraid I have not the actual constitutions with me. The Local Government has the right to nominate two members, I think; the Provincial Council nominates two members, and certain corporations and municipalities nominate members. Then I think there are one or two nominations left for Government to make.

2376. I understand that five members representing commerce and trade is the usual number?—I think there is no exact limitation; there is a certain amount of local variation allowed.

2377. So far as I could gather, rural interests were to be entrusted to three members of the Local Legislative Council?—The Local Government also has the power to nominate people.

2378. From outside?—Yes, I cannot say exactly how many; I know in some cases it is two, but we have only laid down general rules for these Advisory Committees and the local railway administrations work within those general rules.

2379. So that you think rural interests are adequately represented on these local councils?—I think so.

2380. The opportunity exists?—Yes, rural interests can be represented under the general rules laid down by Government.

2381. Do you think the facilities for storage at terminal points are adequate so far as agricultural produce goes?—I think so, on the whole, yes. Of course, there is a tendency for the public to assume that it is part of the railway's business to do warehousing; it is always a moot point how far that

is legitimate business of the railway. Generally speaking, I suppose it may be said that we have provided warehouse accommodation where private enterprise has not come forward to fulfil the demand.

2382. Facilities such as shade from the sun for highly perishable produce?—Generally speaking, goods sheds are provided where the weather conditions warrant, that is to say, at the despatch stations and receiving stations. At the big terminal places like Bombay, Karachi, Calcutta, and so on, I think it may be said that very effective arrangements have been provided for housing goods on arrival. Our great difficulty there in most of these places, as I have said before, is that the public assumes it is our business to warehouse their goods, and we have a good deal of difficulty sometimes in deciding to what extent we should provide a covered area to enable merchants and others to leave their goods with us until such time as it suits them under market conditions to take them away: that is a very definite difficulty in regard to the jute business on arrival in Calcutta.

2383. *Dr. Hyder:* Do you not charge demurrage rates?—Yes, they are charged after a certain period of free time. Of course the warehousing business is a very profitable business if we like to undertake it. A great deal is done by private enterprise in these big cities; I have no doubt we could make it a very paying business; but it is not essentially part of our railway business.

2384. *The Chairman:* That is a problem which faces railways all over the world?—Yes.

2385. Is it not the case that it is very often difficult, if not impossible, for concerns other than the railways, willing to undertake storage to get land in close proximity to important railway stations and centres?—That I think is very likely the case.

2386. That has an important bearing on the issue, has it not?—Our land of course is very valuable.

2387. You would be prepared to sell it, but at a price?—Of course, the increment in value of land round about railway properties is a natural phenomenon which occurs everywhere I think; our own property rises in value as well.

2388. Before I ask my colleagues to put to you any questions, I should like to know whether you think that the change in policy in the matter of the financing and construction of branch and feeder lines is likely to have any important effect upon the proportion of branch and feeder lines constructed as compared with main line construction?—Our hope in effecting this change of policy was that there would be a great stimulus to the construction of branch and feeder lines. Under the old policy, where Government guaranteed interest to small companies and District Boards who were constructing lines, in a period of 30 years the total capital raised by companies for building branch lines was a matter of just over 10 crores. At the present time, since we have been able to start a new construction policy based to some extent on this change, we have under investigation at the present time a large programme which we hope will enable us to construct 6,000 miles of new railway during the next 5 years, and at the end of that time we shall have probably 3,000 miles under construction.

2389. Can you give the Commission any indication as to what proportion of that 6,000 miles will be branch and feeder lines, and what proportion main lines?—I am afraid I have not got that; I can get the information.

2390. Can you give it us in the most general way?—I can only say that India is generally very well provided with trunk lines and main and branch lines, and a great many of the lines we are proposing to build now are branch and feeder lines. We have provided the Commission with a map showing the lines that we have under construction at the present time. There are very few main trunk lines that we are considering at all; we are building one from the Central Provinces to the new harbour of Vizagapatam, and we are building the new coalfield lines in Central India; but apart from that I think nearly all these railways are in the nature of branch and feeder lines.

2391. So that it is definitely your view that this change in policy will not involve a reduction in the mileage of branch and feeder lines constructed?—We have already constructed since we made this change, I think, more mileage than the branch lines had built in the previous 10 years. The reasons for this change of policy were set out in a Resolution which was issued in February 1925. I daresay I can give the Royal Commission a copy of that if they have not got it. Briefly speaking, what happened was that although we had effected in some cases the raising of capital which might not otherwise have come, generally speaking we were incurring very serious loss to the State by means of these branch line companies. We had first of all to meet losses in case the net revenue did not reach the required amount for interest, but a further difficulty was that they were mostly built under contract with the main lines whereby the main line had to work them at a very low percentage of the gross earnings, which, with the rise of prices and rise of cost generally in recent years, has meant a steady loss to the main line concerns working the branch lines. Most of them are worked by the main lines, the trunk lines. So that we had to stand a double loss which was not perhaps a loss to the community, because it went into the shareholders' pockets, but it did not seem to us to be a sound financial thing from the point of view of the State.

2392. It was certainly a very complicated arrangement. Then is it the case that you have relaxed in some measure the strictness of your rules about the construction, on the technical side, of branch and feeder lines?—Well, that perhaps is rather too wide a way of stating it; what we have done is to make a classification of the different classes of lines that may be constructed; we have, for instance, the standard A line which is to be built up to the standard of an important trunk line. Within that standard we have fixed the weight of rails, the standard of bridges, and the weight on the axle loads of rolling stock and locomotives, all scientifically co-ordinated together. Then we have standard B which includes lines suitable for branch lines; there we have a lower weight of rail, a lower standard for bridges and the facilities at stations and so on, they are all on the reduced scale. Standard C is for light railways with a minimum of equipment at stations, light rails and light bridge standards. Then we get down to standard D which includes all other kinds of feeder lines, narrow gauge lines and road rails, all built to a very low standard indeed. With these standards laid down now we are enabled first of all to assess the probable traffic which is going to be carried over the projected line, and then fix the standard to which it is to be built in such a way that we hope to obtain proper financial return on the outlay. In connection with that re-classification, we have made certain relaxations in connection with the axle loads of rolling stock which may be carried on certain sections of rails, but beyond that we have not relaxed standards to any great extent. It has enabled us to consider lines where the expected traffic is very low, and to fix a standard which will conform with the financial outlay which would be remunerative under those circumstances. Have I made myself clear?

2393. Perfectly clear. I understand that Provincial Governments or District Boards who may desire to see constructed tramways or railway lines are in a position to come to you and say: Build this line and we will guarantee the necessary funds to provide interest and amortisation?—Yes.

2394. But you in your turn, though you are at liberty to accept such proposals, are not bound to accept them?—The procedure is as follows: the Local Governments have been asked to send to the different railway administrations every year by a certain date their requirements in the matter of railway communications. In some cases that forms the basis of a consultation or a conference between the railway administration and the Local Governments. In other cases the proposals are practically accepted as a basis of the programme of work. Then within that programme of requirements of the Local Government the railway administration sends up to us its programme for construction for the following year. Actually we are working on a 5-year programme which is revised from year to year in accordance as far as we possibly can with the requirements of the Local Government. The

programme is on the assumption that the projects asked for by the Local Governments will be investigated by the railway. The investigation takes place, and if it is found that we cannot build a remunerative railway as required by the Local Government, we work out for them what guarantee, as we call it, we should require from Local Government or local body, and they are then informed that if they put up this guarantee we will carry on construction. That is the procedure we are working on. Where (a rather improbable event) we have found that it would be an unremunerative line and we do not wish for some reason to take up the matter under a guarantee, we should have no objection to the railway being built by the district authority; but we have a certain amount of confidence that the position will not arise, that we shall always be in a position to meet the requirements of the local authority or Local Government.

2395. Then I take it that eventually the only factor which would persuade you to turn down a Provincial or District Board's scheme for which you had an adequate guarantee, would be that such scheme would in fact short-circuit existing lines?—It might be a case of short-circuiting or it might be a case of affecting the traffic or financial returns on lines which we had already built. Of course, we have to remember that the State has 675 crores invested, and we owe a certain amount of duty to the general taxpayer that his interests are not going to be seriously affected by local propositions. But, as I say, none of those cases have actually arisen yet and we do not expect any such cases.

2396. At the same time it is not maintained, I take it, that in a country such as India it is right or necessary to wait until there is either an active vocal demand locally or the prospect of immediate financial return before a branch line is constructed? Is it not a first and essential stage in development in many cases?—We have taken rather a long view of that and in our estimates of the financial return of projects which we have under investigation we are generally satisfied if we find that the necessary return on capital is going to be produced within 5 or 6 years; we are quite willing to take a certain amount of risk on that.

2397. Do you feel very bold when you take a risk of 5 or 6 years in a country of this sort?—There are some railways which of course have not paid their way for considerably more than 5 or 6 years. The Assam-Bengal Railway made its first surplus profits over its interest last year after being in existence for 26 or 27 years; it is now beginning to pay its way, but the State took a very big risk in that way; we have been paying the interest on that railway for many years.

2398. So that the railway in question took a very progressive view when they constructed the line?—I think so. The existence of railway reserves, which we are now building up under the system of railway finance, we hope, will enable us to take risks of that kind. We do not think those cases of railways which are required by local authorities, and which would be unremunerative, will be very many in the future.

2399. The capacity to build up these reserves for future construction has of course only been possible since the railway finance was separated from the general revenue?—Yes, there were no reserves before.

2400. *Dr. Hyder:* You have got on these railways, you said just now, these class rates. Besides these class rates you have got those scheduled rates and station to station rates. I ask you whether you carry agricultural stuff at these class rates or at these reduced rates?—I should have explained when I said that the local railway administrations have complete power to quote rates within the maxima and minima, that the procedure which they generally adopt is to quote rates either by what are called scheduled rates or station to station rates; I do not know that I need explain to this Commission how they are worked; but generally speaking the schedules are either on a flat rate of so many pies per maund per mile or at a telescopic rate. Station to station rates are lump sum charges which are quoted as between two stations but still remain between the maxima and minima prescribed.

2401. You carry the bulk of agricultural produce at these reduced rates?—Yes, that is so.

2402. The Acworth Committee mentioned something about block rates and I wonder if that evil still exists?—The Acworth Committee investigated the matter very fully and I do not think they were able to find any basis for the general complaint about block rates as far as I remember.

2403. Coming to a small matter perhaps from your point of view but which may be very important from another point of view, suppose we had a scheme like this; that we selected one or two farmers in each tahsil in every district in a Province and sent them in the vacation when the boys are not attending their agricultural colleges to an agricultural college for a course of training with the object of letting them see how things are done at an agricultural college, would you be prepared to carry these farmers free or carry them at concession rates?—That is a matter we might consider. I understand there is a concession at present for students going to agricultural colleges.

2404. I was not thinking of students: I know they get concessions, but I was thinking of these cultivators?—Would you not call them students?

2405. From that point of view yes, they would be students?—We should not inquire too closely into their origin or whether they were capable of assimilating the course given in these colleges.

2406. I pass on to another matter. What would your attitude be towards the development of motor transport? Would you look upon it with the eye of a friend or with a hostile eye?—That is a practical question before us in a great many places in India now. Where motor transport acts as feeders to the railways we welcome it; where it comes into competition with the railways we shall do our best with God's help to fight it.

2407. Do you not think that even where they act as competitors they are possible agencies for stimulating traffic and travel? Even though they might at first appear to you are rivals, they might act as stimulators of potential railway traffic?—Speaking very broadly, we should look with favour on anything which encourages the movement of goods and passengers within the country. That is the sort of general policy we have. Anything which will encourage people to move about and to move goods more easily, we would encourage to the best of our ability; but I think we are quite right where definite active competition comes in, to try and meet it either by reducing our rates or by introducing better service or by such means as motor coaches or some kind of self-propelled coaches running on the rails, I think it is perfectly legitimate for us to meet competition of that sort. Where we can we are trying to enter into arrangements with people who are working motor transport as feeders, trying to enter into direct traffic arrangements with them to effect some kind of through booking. It is not always easy because this motor transport is at present rather in a nascent stage, very largely in the hands of small owners who are working for an immediate profit and have very little capital behind them and no particular stability. We have had that matter under consideration recently and have no doubt it will become more important in certain localities. There are some places where we have competition in the nature of short-circuiting, where we cannot hope to compete and where we do not expect to be able to cut them out; but wherever there is parallelling, that is to say, motor transport running on roads parallel to the railways, where we can, our method of competition will be to give a better service to the public than the local people with their motor transport can give. Where we can do so we shall get the business. But it is not an active policy with us to kill any kind of motor transport that may be existing.

2408. I was going to ask you whether you think the railway administration pay sufficient attention to this business of finding out whether their rates show elasticity so that your revenue may increase. You will know from your experience whether the rates are rigid over a long period of time or whether they show sufficient elasticity?—Each railway administration has its own organisation for dealing with rates and my impression is, from what I know of it, that they do actively follow up any cases where rates are found

to be restricting the traffic; they look upon it as the primary business of the railway to secure the maximum amount of traffic and they have complete flexibility in arranging their rates to suit any particular local conditions.

2409. So that in your view sufficient attention is paid to the development of traffic on the part of these administrations?—I would not like to say that the system is as perfect as it can be, and I should like, if I was speaking to railway administrations and not to this Commission, to ask them to pursue their efforts in this respect; but I do think there is an honest attempt to make the rates in such a way as to produce the maximum amount of traffic.

2410. It is alleged that since the introduction of this divisional scheme your rates officer at the headquarters does not know what quantities of stuff are sent to what destinations every day; that is to say, he is not in possession of statistical facts: is that so?—I do not think that is the case; there has been no change in that respect. In fact the Divisional Superintendent who is the authority now practically on the spot is in complete touch with all statistics relating to the movement of traffic over his division.

2411. But the rates man at the headquarters attached to the Agent does not know what quantities of stuff are sent from each station and to what destination?—He can if he wants to, because he has got all the statistics in the office. All the statistics are handled at headquarters; they are produced primarily in the divisions and then collated and collected at headquarters and they are available to the branches in the head office so that he has complete information; in fact under our new system of statistics we have very much more complete information available of movement as between stations than we ever had before. With the introduction of our compiling machines it is possible to produce now in a very short period of time complete and accurate figures of all commodities moving between different stations. It is only a question of punching a certain number of cards, putting them through the machine and getting a tabulated statement of all commodities like cotton, wheat or seeds, as between one station and another anywhere on the railway.

2412. I was wondering whether I could put any question to the witness about grain elevators?

The Chairman: Certainly.

2413. *Dr. Hyder:* Coming to this question of grain elevators, am I right in saying that these grain elevators would be cheap in the cost of handling but dear in the cost of storage?—Our memorandum on wheat elevators contains, I think, the sum total of our present knowledge on the subject. I really would not like to commit myself to any expression of opinion about their utility. We have put one of our officers, an expert officer, on special duty in order to study the whole subject in the Punjab and the neighbouring Provinces and he has been at work for the last two months. We hope very shortly to have a complete record on the subject which will be placed before the Royal Commission. At the present moment I am not conversant with the subject and I would not like to express an opinion.

2414. It is mentioned here that you are going into the subject. I was going to ask you a general question so as to find out whether these really would serve a very useful purpose in India. At present the arrangement, I think, is this, that when grain leaves the hands of the cultivator, it goes into a number of other hands. If we have an elevator company, though it will replace all these small traders, so far as it affects the welfare of the cultivator, one sort of agency will be replaced by another. Would that be so?—I should imagine that the logic of your question could not be controverted, but I would not like to endorse all your assumptions.

(The Chairman then said that it occurred to him that as Sir Clement Hindley had said that the whole matter was under investigation and had promised to send them a report and as the Commission would have to ask Sir Clement Hindley to appear before them at a later stage, the question of grain elevators might be reserved for the present.)

2415. *Sir Thomas Middleton:* Since 1890 I find that the mileage on Indian Railways has increased from about 15,000 to about 38,000 or 39,000, that is to

say, about 150 per cent or about 4·3 per cent per annum. The question I wanted to put you is whether that increase has been approximately uniform or whether there have been periods?—I am sorry I have not brought with me the diagram which would explain this matter. Would there be time for me to send for this?

The Chairman: Yes. *(The witness sent for the diagram from his office.)*

The Witness: It is an interesting diagram. Of course there have been periods when there has been a great stimulus given to railway construction. Lord Curzon's Viceroyalty was one of the periods when the construction was more rapidly extended.

2416. *Sir Thomas Middleton:* I drew a straight line between the two points and I asked myself what were the fluctuations in this period; I find that while the average increase is about 4·3 per cent, your programme for the next five years which is 6,000 miles of construction means a very great acceleration over the 35-year average?—I hope so. The maximum we ever got to before as a result of Lord Curzon's activity was 700 or 800 miles per annum.

2417. Even if you only carry out 5,000 miles, you will reach a thousand miles per annum?—Roughly speaking, yes.

2418. So that, a definite acceleration in construction is contemplated?—Yes.

2419. I assume that the five-year programme is as far as you have gone at present, or has a further programme been contemplated?—We have really a larger programme than that under consideration, but the programme which I have mentioned of 6,000 miles is one which we have definitely laid down for investigation and probable construction during the next five years. If that is carried through, at the end of that time, we shall have approximately 3,000 miles under construction. Assuming that the railway takes 3 years, generally it takes between 2 and 3 years, to construct, you can take it quite safely that we have at present about 9,000 miles of projected lines under consideration. As we work in five-year periods I have mentioned 6,000 as the amount which we hope to produce during the next five years. That covers 150 different projects. Of course, there always has to be a period of one year in investigation; that is, survey and investigation generally.

2420. Am I right in assuming that in these 6,000 miles there would be a greater proportion of metre gauge than there has been in the construction of the past 30 years?—Not necessarily metre gauge.

2421. Less than broad gauge?—We build now a species of broad gauge light railway which will carry the main line stock but on lighter rails and lighter bridges. A good part of these will be lines of that type. We do not adopt the metre gauge as feeder to the broad gauge but the 2 ft. 6 in. gauge is an appropriate feeder line to the broad gauge. That is to say, if the traffic does not warrant an additional broad gauge, the next step is a feeder line of the 2 ft. 6 in. gauge.

2422. You were questioned some minutes ago on the subject of motor lorries, and the competition of motor lorries. Do any of the Indian railways use motor lorries extensively for feeder purposes? In Great Britain, for example, one of our railways, at a very early period began to use motor transport, for feeder purposes. I was wondering whether any of the Indian railways has adopted this policy?—For passenger traffic we have not actually adopted that yet. I believe the Nizam's Railway, which is to some extent independent of our control, is contemplating regular feeder service, in some parts of the Nizam's territory, of motor busses. For delivering and collecting parcels in the big towns we have used motor lorries, and in some cases we have entered into arrangements with contractors to carry the stuff by motor lorry.

2423. I was thinking of rural areas where there may be highways which are not parallel to the railway. I wish to know whether in any part of India the motor lorry has been used?—So far, we have left that to private enterprise. We have an open mind on the subject.

The Chairman: My colleague Sir Ganga Ram is absent to-day. He has asked me to put one or two questions to you, which I think I had better read out from the typescript which he has provided me with.

2424. "What is the present railway freight of moving grain and oil-seeds to Calcutta, taking the starting point as Lyallpur? Give distances from Lyallpur to Ambala, Delhi, Cawnpore, Benares, Lucknow, Patna and Calcutta, and compare the same with the freights from Lyallpur to Karachi. The object of my asking this question is with reference to the complaint received from the traders of the United Provinces, that the *inter*-provincial freights are much higher than the rates to seaports, and therefore, when it does not pay a zamindar to export wheat, the higher *inter*-provincial rates prevent him from getting good prices if he sends his produce to Calcutta, wheat and oil-seeds chiefly?"—I do not know whether you want these figures. We can hand them in. On the general question I would like to refer to the investigation which was made on this particular subject by the Acworth Committee. They went into the question thoroughly and in paragraphs 150 and 151 of their report they answer the complaints in this way. May I read from that report? They said:

> "Unquestionably, low exceptional rates exist for traffic to and from ports, especially the great ports of Calcutta and Bombay. But exceptional rates such as these exist in every country, and are there justified on the ordinary grounds, not only of the economy of handling goods in large volume, but also of competition between railway systems serving the same distributing or consuming area. In one respect, at least, the Indian railways have refrained from following the accepted railway practice in other countries. It is usual in most countries to concede for export traffic through a seaport, rates which are not available to that seaport for local traffic; and *vice versâ*, in countries which adopt a Free Trade policy, to fix lower rates for the carriage inwards of goods imported through a port than for goods produced locally at the port town. This practice is not, so far as we have been able to ascertain, followed in India. Bombay receives from up-country large quantities of raw cotton, part of which is worked up on the spot and part exported. Similarly, Bombay distributes to up-country points large quantities of cotton cloth, part of it locally manufactured and part imported. The raw cotton rates down to Bombay port and to Bombay town are the same, and so are the manufactured cotton rates upwards. The same principle, we understand, is applied elsewhere, in the case, for instance, of the great Calcutta jute trade."

The Acworth Committee investigated the matter very closely and that was their opinion. We have not changed our policy since then.

Sir Ganga Ram, I take it, is concerned with the principle and not the illustration that he gives, I think we will assume that he does not require the detailed information asked for.

2425. "The Railway Company being a chief carrier of the public, and its interest being to earn as much as possible and to stimulate trade, is it not possible to give a little latitude in reducing the rates and giving the power to the local District Traffic Superintendents, in case of wheat and oil-seeds?"—I have explained the general provision of fixing rates. It is quite obvious, I think, that they must be fixed with regard to the railway administration as a whole and not locally. It would be quite impossible to give a local official the power to vary rates to suit the particular conditions of trade in his district. There are many obvious objections to that and I think it must be ruled out as an impracticable suggestion.

2426. "The borrow pits on both sides of the railway produce mosquitoes and cause malaria in the country. Do you not think that a system can be devised to put water-courses properly designed on the extreme limits of the railway into which the borrow pits might be drained and these outlets might

ulminate here and there into suitable sumps on which zamindars of adjoining ands may be allowed to put *Jhallars* to take the water on to their fields or umps in the way?"—Borrow pits, especially in Sir Ganga Ram's country are lry for a longer period than they are wet. They do hold a certain amount of water during the rains, but so does the whole countryside as Mr. Calvert will probably know better than I, though the water is not usually available for much in the way of irrigation. One of the difficulties which I think Sir Ganga Ram has overlooked is that when we dig borrow pits for the construction of a railway, we are very careful to leave *bandhs* or dykes between them, because in many cases the railway is working along the drainage of the country, and if the borrow pits get connected up and there is a free flow of water between them you will very likely cause a river alongside the railway which will cause very serious damage to the embankment. Therefore we are very particular to isolate these borrow pits. Any such system as he suggests of a canal connecting them with the outside, in some cases would be a serious danger to the railway. Actually the water of course is used by the cultivator fairly freely. There is hardly anywhere, where water lies beyond the wet season where you do not find these people making some arrangement to tip the water on to their fields. I do not think there is any restriction or charge in regard to that.

2427. "The zamindars' great complaints are that they do not get moving facilities from the end of the district to the district courts to attend court work. Therefore is it not possible to introduce charabancs holding about 40 or 50 passengers and to move to and fro and carry passengers who pay Inter class fare?"—This gives me an opportunity of explaining that this particular business of attending to the local requirements of passengers is a matter to which we are giving great consideration at the present time. On many small branch lines running perhaps between outlying towns and a court town we have found by investigation recently that the train services are not entirely suitable. Most of the railway administrations are taking up that matter and in many cases they are introducing self-propelled motor coaches which can work with more flexibility to suit the local requirements of the people. We are paying particular attention to this desire to get to the courts by introducing additional train services where necessary.

2428. "I find that Indian Railways do not give any concession on the class rates charged on the transport of sugarcane, hemp, vegetables and tobacco. Would it not be desirable to give concessions on these agricultural crops also?"—On sugarcane several railways do give concessions. They are shown on page 59 of our memorandum,* and other crops are shown on different pages. On pages 44 to 47 you have concessions on hemp; on page 63, concessions on vegetables; on pages 54 to 57, concessions on onions and potatoes, while on page 62 there are concessions on tobacco.

2429. "You give some concession on *ghi* for owners' risk rates; why do you not give concession railway risk also for this commodity? Have you got any special reason for this?"—I understand that there are both owners' risk and railway rates quoted for *ghi*. Of course the rates are naturally lower where the owner takes the risk than where the railway takes the risk.

2430. "On the Bombay, Baroda and Central India and Great Indian Peninsula Railways you charge actually higher rates than class rates fixed for cotton and on Assam-Bengal and Eastern Bengal Railways charge high rates than class rates on jute: why is that so? You charge six pies less on cotton on the North Western Railway when it is exported to Karachi and on East Indian Railway when it is transported to Calcutta. Does not this mean that you give greater facilities to exporters of cotton than to the cotton mill-owners in the country?"—This difference on different railways, of course, is a matter which has grown up under their powers to fix rates for themselves to suit their business. Originally each railway had its own separate classification and when a general classification was adopted it was found that particular railways had higher classifications, for example, on commodities such as cotton and jute, on which they were principally dependent for their traffic, while

*Not printed. For reference, see page 310.

other railways had lower classifications because they were not appreciably interested in that particular traffic. Instead of raising these lower classifications, after carefully considering each case to see whether the rate was restrictive or not, it was decided to allow the railways with higher classifications to retain them rather than to raise the classification generally. I might explain here that where a railway depends very largely for its earnings on a particular commodity it would be simply throwing away money to lower the classification there, whereas the lower classification on some other railway was probably best suited to the particular local conditions. We should have lost revenue on the railways where the commodity was an important factor.

2431. *Dr. Hyder:* Is not the mill industry concentrated at certain particular points, so that the rates for cotton are the same when it is exported as when it is consumed in the local mills?—That is so in Bombay. Rates are the same in both cases.

2432. *The Chairman:* The next question is: "I find that you give no concession in freights on the transport of fresh fruits on the North Western Railway and East Indian Railway. May I know what are the reasons for this?"—The East Indian Railway do quote special rates for fruit in the form of special station to station rates. They are shown on page 34 of our memorandum.

2433. "I find that except on the Great Indian Peninsula Railway, no concessions are given on the carriage of agricultural implements and agricultural machinery; may I know what is the reason for this?"—Page 19 of our memorandum shows the concession given in the form of station to station rates on several railways. It was not possible to put into our memorandum all the special rates, because it would have been too voluminous.

2434. May I ask on my own behalf whether it is the case that these preferential rates do exist on all railways?—I would not like to say all of them, but on a good many of them there are special rates for agricultural implements and machinery.

2435. **Sir Ganga Ram's** next question is: "In your memorandum you tell us that it would be better if grain is stored in elevators. Do you know what proportion of the exportable grain is exported within the first three months of the harvest? If almost the whole of the exportable grain is exported within the first three months, then do you require elevators to any great extent?" As Sir Ganga Ram's representative on the occasion I shall allow myself to be persuaded by what I said as Chairman a moment or two ago, and ask you to defer your answer?—May I just make a short answer. Sir Ganga Ram very kindly gave us a copy of these questions and I should like to say a word on the next six questions, including the one you have just read. Sir Ganga Ram has unfortunately read the memorandum by Messrs. Govan Brothers Limited as a production of the Railway Board, so that in any case I would not be able to reply because the questions refer to a memorandum which we have not prepared ourselves.

2436. *Sir Henry Lawrence:* You told us you have in view an extension of some six thousand miles of railway in the next few years. Can you tell us whether the majority of this new construction is for agricultural purposes or commercial or strategic? Can you divide it up at all?—I can rule out the strategic straight away. We have only a very small construction on the frontier in the Zhob Valley in Baluchistan. Apart from that all these extensions are of a commercial nature, and I think I may say that practically all of them will serve agricultural districts.

2437. Are they primarily for minerals (coal, manganese and the like) or do they open up agricultural areas?—A certain number of the lines, perhaps about 300 or 400 miles, are for the coal fields. The line which we are building from the Central Provinces, from Raipur to Vizianagram, will carry a certain amount of manganese traffic, but it will be very much more an agricultural line. Apart from that I may say all these lines are to serve agricultural districts.

2438. Then you have certain areas served by metre gauge and certain by broad gauge. Are these self-contained or is there any policy to make metre

gauge connected over very large areas?—We are trying to confine metre gauge development as much as possible within metre gauge areas. The metre gauge, of course, has proved itself to be very valuable in certain parts of the country; for instance, in Burma, where you have a combination of plains and hills sections. There the metre gauge is particularly suitable. And similarly in the south of India, where these lines run continually into the hills, the metre gauge is not at all unsuitable. Other parts of the country where the metre gauge has been found suitable are those where the population is thin and there is very little traffic, such as Rajputana. Generally speaking, we do not wish to extend the metre gauge section beyond its natural limits of that kind.

2439. Ordinarily there would be a break of gauge before you get produce down to a port?—We want to avoid breaks of gauges as much as possible.

2440. Would you have a metre gauge railway running down into harbours like Karachi, Bombay or Calcutta?—I hope we shall never have the metre gauge running into Karachi, Bombay or Calcutta. Chittagong, of course, is a natural metre gauge port. The only port about which I am doubtful whether we shall be able to avoid the double gauge is Cochin. Apart from that we have single gauges in all the ports except Madras.

2441. Your extension of railways, say in Sind will be on the metre gauge system and there will have to be a break of gauge to get the stuff on the broad gauge and thus to the ports?—I do not think we are expecting to build much metre gauge in Sind. We shall have either broad gauge or the 2′—6″, which is the natural feeder to a broad gauge line. As far as I can remember we do not intend to build any more metre gauge in Sind.

2442. To turn to another point, you told us that your officers are now in close touch with delays in regard to the clearing of wagons through the introduction of a system of commercial traffic officers and telephones. Since when has this system been introduced? Is it of long standing?—We have had commercial traffic officers for a great many years as a part of the old Traffic Department. The system of telephone train control was introduced in 1916 when I think the first one was put down, and it has been extended fairly rapidly over most of the trunk systems.

2443. Then there is considerable hope that the complaints, which were rife in former years, of delay and difficulties caused by local officers are now very much more under control than formerly?—I think that is so. We installed the train-control system primarily with the object of facilitating the movement of trains; that is to say, the movements of trains were reported to headquarters and recorded on a diagram throughout the 24 hours. We have subsequently found many extended uses of this, one being the getting of complete information from stations about consignments ready for despatch and the distribution of wagons to those stations.

2444. Then you said there had been a great improvement in regard to pilfering. You mentioned the period 1921-25. Can you give us the figures roughly?—I am afraid I have not got the figures here, but I can supply them to the Commission.

2445. The actual amount of compensation paid by Railways is very much less than it was?—I cannot give you any exact figure, but there has been an enormous reduction. We were paying out over a crore of rupees in compensation for claims in one year. We have got that down to something very much smaller than that.

2446. And that also represents the decrease in pilfering?—We hope so. In fact, it must be so, because if a man's goods are pilfered, he puts in a claim.

2447. You gave us the personnel of the Advisory Committees. I did not catch whether on those committees there is any representation of the Department of Agriculture?—As far as I know there is none, but it rests with the Local Government to nominate a representative if they wish to.

2448. And would you welcome the nomination of officers specially interested in agriculture?—I think so, subject to the general consideration that these

committees if they are very large become useless. Their numbers have to be limited to some extent. It is quite impossible to work with a large committee.

2449. Have you any difficulty with regard to the octroi arrangements of cities? Do they cause any delay in the movement of produce from the villages into the big towns?—As far as I know there are no serious complaints about that, but I am afraid my knowledge does not extend in great detail to these localities. Octroi duties have been very largely got rid of in some of the Provinces at any rate and replaced by terminal taxes which are collected with the railway freights, and in those cases, of course, there is no greater delay in getting delivery than there is in the case of ordinary goods anywhere else.

2450. From the point of view of avoiding delay, do you regard terminal taxes as more satisfactory than octroi?—From that point of view I should say so. From our point of view we look upon them as encroachment on our revenue.

2451. For the benefit of the agriculturist, probably it is a more satisfactory system?—I should say so, from what I remember of the old octroi administration when I was in the districts myself.

2452. *The Raja of Parlakimedi:* Are seasonal special trains run in different areas to expedite export of agricultural products?—Special trains would be run where the need arose in order to clear traffic offering, but it is difficult to answer that question in general terms.

2453. Are any concession rates given if there is any necessity?—I do not think rates are varied to suit special occasions of that sort.

2454. Is there any concession shown for transport of material to build private lines on trunk lines?—What do you mean by private lines?

2455. Private-owned lines?—I do not recall that there are any cases of private lines being built.

2456. I am building one, that is Parlakimedi estate is taking up one?—Are you getting any concession?

2457. I am in correspondence. Is there anything on record to show that such concessions are given?—I am afraid I cannot answer that straight off. I shall have to make investigations. But it is always open to anyone to ask for a concession.

2458. It is a feeder line to the trunk east coast line?—I am afraid I cannot answer. I will find out, if you like, what has been done in the past. When one railway is building a feeder or a branch line it gets a lower rate for its materials carried over the railways over which it has to bring its materials. That is what we know as foreign railway material rates, that is to say, the East Indian Railway would give concession to the Great Indian Peninsula Railway for carrying railway materials.

2459. Is it a fact that the special curing system adopted in Dehra Dun for inferior varieties of timber has been successful in making them durable like any other first class wood?—I understand that the Imperial Research Institute at Dehra Dun has been making experiments for some years past on the treatment of timber. We are in close touch with those experiments.

2460. Those cured sleepers have not been tried on any line?—They are being tried on every railway, as far as I know, under very careful supervision by the forest officers of Dehra Dun.

2461. And you have no information whether they last as well as first class wood?—*Deodar* or *sal* sleeper lasts from 12 to 15 years and until you have had a treated sleeper on the line for that period you would not be in a position to say whether it would last as long as the other. But we have had very satisfactory results so far and we hope we shall find some of these varieties of timber very useful indeed for sleepers. We have our own sleeper-treating plant installed, we have had it now for two or three years at Dilwan. We are treating three lakhs of sleepers annually of various forest woods. We hope to put in another sleeper-treating plant in Assam where there is possi-

bility of getting suitable timber and wherever we can we shall adopt that method.

2462. In India what sleepers are more durable: iron or wood?—The most durable sleepers are *deodar*, *sal* and *teak*.

2463. Are they more durable than iron?—Steel sleepers last twice or three times as long as wooden sleepers. The average life of a steel or cast iron sleeper is something like 35 years as compared with the 12 or 15 years of wooden sleepers.

2464. Are any concessions shown to private individuals to put up sheds for storing their own goods on railway land?—I do not think so. We do not encourage the use of railway land for that purpose. Railway land is, of course, acquired definitely for railway purposes under the Land Acquisition Act and it would not be in accordance with the underlying principle of that Act to acquire land and then give it to private individuals.

2465. It saves the railway putting up larger sheds for storing purposes?—We should run the risk of being charged under section 42 of the Railway Act relating to undue preference in a case like that.

2466. *Sir James MacKenna:* In undeveloped tracts like Burma or Assam where roads are few, would you regard the expansion of a railway as more important than the construction of roads from the point of view of agricultural development?—I think the primary necessity is for the construction of railways in many districts in Burma, but they will not attain their full use until the Government of Burma sets about making roads.

2467. You think that roads should precede railways?—As a matter of actual fact, railways are preceding roads.

2468. I know they are; that is the point of my question?—I should like to see some more feeder roads in Burma.

2469. Feeder roads rather than roads parallel to the railway, I suppose?—Of course, there are people who prefer to travel by motor when they are going long distances and I have no doubt they will get their way in the matter of parallel roads. We are building 1,300 miles of railway in Burma. I have not seen very many hundred miles of road projected in Burma yet.

2470. *Professor Gangulee:* From the trend of your evidence, do I gather that you are satisfied that the cost of distributed services is reasonable in this country?—Of course we should like to see the possibility of lower rates, but having regard to our financial obligations, the amount of capital that has been invested and so on, I think that we are not unreasonable in our rates at present.

2471. Taking into consideration the fact that the margin of cultivation in India is comparatively low?—I do not understand what is meant by the margin of cultivation.

2472. Let me put it this way. The cost of producing wheat in this country per acre is lower than in other countries. Taking into consideration the cost of production and the margin of cultivation, *i.e.*, taking into consideration the general situation of agriculture as a whole, I want to know whether the rates bear any disproportion or proportion to that. Do you not think that the cost of transport is out of proportion to the price the producer receives?—I am afraid I have not studied the question from that point of view. It may be so. I do not know whether it is so or not.

2473. You said that railway companies are anxious to serve small growers. Do you not think that the traffic rates on small consignments are too high, say on consignments of 5 or 10 seers of fruit?—All these rates, you must remember, are based on the cost of the services rendered, and it is naturally more expensive to handle small consignments than large. They require more care and watching, identification and so on.

2474. Therefore the small grower is compelled to consign his produce to large dealers. He cannot sell direct; there is no chance of his selling things direct to the consumer or to the retailer in view of the fact that your charges

on small consignments are higher?—I do not see why that follows. There is no bar, as far as I can see, to his selling anywhere he can.

2475. If under the existing system the rates on small consignments are too high, then he is compelled to ask for the help of intermediaries?—Are you referring to grain and seeds?

2476. I refer to small consignments of vegetables or fruits, or things of that sort?—You have got to separate these things. If it is for grain and seeds the rate per weight is the same for small consignments and big ones. There are special rates quoted for small consignments of vegetables. Vegetables will always go in small consignments, I presume. They go at half the usual parcel rates on some railways.

2477. You do not think that the present rate is really a hindrance to the direct sale of small consignments of things like vegetables and fruit from the producer to the retailer direct?—I do not think so. If the distance between the producer and the consumer is so great that they cannot really afford to pay transit, the trade cannot go on. There is no doubt about that. But there is a limit below which we cannot quote rates for the carriage of the stuff.

2478. You do not make any distinction between the rates for produce in bulk and the rates on small consignments?—Not for grain and seeds and things like that.

2479. *The Chairman:* You have truck rates, I suppose?—Not for grain and seeds. The charge is on the actual weight.

2480. But for fruit, for instance, you would have a truck rate?—I think fruit is nearly always sent as parcels at the rates applicable to parcels. Some railways charge half the usual parcels rate for it.

2481. May we have an exact statement in the matter?—It is in the memorandum. I must admit that it is rather difficult to find one's way about the memorandum. It is all there but if you wish it to be supplemented, we can do so.

2482. *Professor Gangulee:* You do not think that the existing rates lead to the multiplication of intermediaries?—I cannot think that railway rates have any connection with that at all.

2483. You do not think that these rates compel small growers to stick to the existing chain of intermediaries?—I have no doubt the existing chain of intermediaries has a very large influence over them, with which we have nothing to do. The main fact is that we consider these rates to be the very lowest possible that could be charged. There may be cases where the rates might be reduced to some extent, but what has got to be remembered is that somebody has got to pay for the cost of transport, either the producer or the consumer, and the cost of transport, we believe, we have got down, if not to the absolutely lowest limit, at any rate to a very low figure indeed.

2484. In the event of depression in the price of agricultural produce, do you make any reduction in rates?—I do not think so. Our rates, as I have said, are based very largely on the cost of handling.

2485. Irrespective of the trend of prices?—Wherever we find that our rates are restricting traffic, the matter is investigated and if possible an adjustment is made. But there is no machinery for definitely connecting railway rates with prices.

2486. I was rather interested in your note on fruit traffic. Have you any suggestion for enforcing better methods of packing fruits and vegetables?—Of course the best pressure, I suppose, will be the economic pressure. If a man does not pack his goods well they do not get through and he does not sell them. If someone interested in the matter, perhaps the Agricultural Department, would take up the subject of better packing, the railways would be very pleased indeed and the traffic would increase.

2487. It is also to your interest that the packing should be standardised and done well?—Undoubtedly. We do our best to impress that upon consignees and we hope to do a certain amount of publicity in that direction

with our travelling cinemas, about which we have told you. One of the things we shall probably take up there will be pictures showing how fruit should be packed and how it should not be packed.

2488. And the resultant wastage due to bad packing?—Yes. That would be very useful.

2489. Are you doing anything in that direction now?—I cannot assert that a film is being actually prepared for it. Certainly it is one of the things we have in mind. There are a good many subjects which we have got to tackle first.

2490. *The Chairman:* May we take it that you would encourage the use of returnable empties by free transit back to the consignor whenever possible; you have in some cases allowed that already?—We do quote a rate for returned empties, I believe, but it is not used to any great extent. Most packing which is used in this country is of a very perishable nature. It does not find its way back.

2491. You would welcome any improvement?—We should welcome any improvement that could be made.

2492. *Professor Gangulee:* Is there any scope for the standardisation of packing in this country?—Yes, I think there is. That is a subject that might very well be taken up by the Agricultural Department, I think.

2493. And you would co-operate with the Agricultural Department in the matter?—Certainly. A certain amount of work has been done in that direction.

2494. The difficulty I suppose lies in the fact that the ordinary grower is not organised. There is no organisation on the part of the growers to bring pressure on you in these matters?—I do not know about pressure being brought to bear on us. If they had an organisation it would be easier to influence them in the direction of better packing. It is not primarily a railway concern. We carry what is handed to us.

2495. Would you encourage co-operative marketing, and the co-operative movement for this purpose?—I know very little about the co-operative movement and co-operative marketing, but I think it would be an excellent thing. That is entirely my own private opinion.

2496. I am rather anxious to know what would be the attitude of the railway companies towards organisations for co-operative marketing?—I am afraid I should have to ask for some explanation of what co-operative marketing means, before I can give an answer to that question. We are anxious to encourage every form of traffic. We would only be too glad to do anything to encourage the marketing of agricultural produce.

2497. It would be to the interest of the railway companies to encourage co-operative marketing because then the produce can be collected in bulk, and bulk transport is much more convenient to the railway companies than small consignments?—I would rather hesitate to commit myself to a direct answer to your question, because I do not quite know what you mean by co-operative marketing. I would not like to bless an unknown scheme. Anything which would increase and encourage traffic we are ready to assist.

2498. Co-operative marketing means the handling of produce in bulk?—What kind of traffic?

2499. Say fruit?—How can you handle fruit in bulk?

2500. Supposing in different distributing centres we had co-operative organisations. Now you deal with an individual. When we have the co-operative marketing organisation, you will be dealing with that?—It is a matter of indifference to us who the consignee is; whether it is A or B, as it is the stuff does come in bulk. In the mango season we carry 30 or 40 wagon loads a day from Bihar to Calcutta. From Quetta we carry 25 to 30 wagon loads of fruit daily. That is handling the stuff in bulk.

2501. That is what you mean by bulk handling?—Yes. It is a matter of complete indifference to us whether there is one consignee or fifty. We should

prefer, of course, to deal with one rather than fifty, but it is a matter for local organisation rather than for us.

2502. It would greatly facilitate your transactions to have dealings with a co-operative organisation rather than so many individuals?—Probably it would.

2503. In reply to the Chairman, you remarked that railway authorities could not undertake warehouse arrangements. Do you not think that the concentration of produce is advantageous from the point of view of transport facilities?—I did not say that we would not undertake warehousing. We do already to some extent. We have to be careful that we do not trench on private enterprise in that direction, however.

2504. *The Chairman:* If I may interrupt for one moment, I think Professor Gangulee was thinking about an organisation amongst consignors and I think you were dealing with consignees?—I thought possibly there would have to be some organisation of consignees too. We do not want to turn our stations into a fruit market. I rather thought he assumed that there would be an organisation at each end. We should be only too glad to see that kind of thing in being. I quite agree with that.

2505. *Professor Gangulee:* That is what I wanted to get at. With regard to the wastage of fresh fruits and vegetables, is there any scope for cold storage depôts at market points?—We have given the Commission a memorandum on the subject of cold storage, which contains most of my knowledge. I think there is undoubtedly scope for it, but I think it is a question really of arranging a chain of cold storage depôts at suitable places throughout the country before it could be a profitable railway undertaking.

2506. Would you leave it in the hands of private enterprise?—At present we feel that private enterprise ought to have a chance of dealing with it, if it is going to. If a chain of cold storage depôts was once established, we should immediately come forward with the necessary refrigerator vans to carry the stuff between them.

2507. Are refrigerator or insulated vans successful now?—We have insulated vans so arranged that they are kept at a very low temperature. As far as I know they are successful. We get the so-called "Quetta Fruit" which really comes from Afghanistan and it is carried in them quite conveniently and safely to Calcutta. In that case I believe they are successful.

2508. Referring to the question of roads, do you agree that the existing condition of roads feeding railway centres in India is a handicap to the development of better transport facilities?—In some Provinces, it is a distinct handicap. We should like to see better and more feeder roads.

2509. Then you are of the opinion that extensive road improvement would effect substantial savings in transport?—I do not know. I am doubtful on that point, but the extension of roads and feeder roads in the country would undoubtedly improve general conditions of transport and increase our business. One of the great difficulties at the present time is (and railway engineers and officers generally have a great deal of knowledge about it) the deplorable state of many of the roads maintained, or rather not maintained, by the local authorities. There has been a progressive deterioration of roads maintained by local authorities practically all over the country in the last few years, and certainly in the last ten years, in my view.

2510. The Government of India, I understand, is considering the question of forming a Central Road Board?—I have no direct knowledge of that myself.

2511. Railway companies could not take any initiative in this work of the development of road improvement?—There we come up against an important constitutional question. The construction and maintenance of roads under the present constitution is a provincial subject on which the Central Government is prohibited from expending any funds.

2512. *Mr. Calvert:* On that question of roads, I understand you are prepared to consider the construction of railways even though you calculate that they will not pay, provided that the Local Government will guarantee to you the difference?—Yes.

2513. So that really Local Governments have now the option of either bearing the whole burden of constructing new roads or giving you a guarantee for any loss of revenue?—That is so.

2514. I had a series of questions to ask you and it may be that you would prefer to give a written note rather than answer verbally?—You very kindly sent me a copy of that list last night, but I am afraid I have mislaid it. If you will read them out, I will do my best to answer.

2515. The first question is this: In other countries such as Denmark, Germany and Belgium, railways are used as a means of subsidising agriculture through the freight rates. What is the effect of the separation of railway finance upon such proposals to utilise the railway rates to off-set the loss to agriculture arising from the policy of protection? Will the Railway Board be able to accept such proposals for lower rates if the Central or Provincial Governments credit them with the difference?—I do not think that the separation of railway finance has had any very definite effect upon this important question. The railways have always in theory been considered self-supporting. Individual railway administrations have had to meet their own interest charges and make their own profits, and I think there has always been a feeling, if not a definite policy, that railway rates should not be used as a means of effecting subsidies to industries or to agriculture; so that that answers the first part of your question. No essential change has been caused by separation. For instance, it has been the custom for many years past, in times of famine, for special rates to be quoted for fodder, I think half rates. Anyhow, a special rate is quoted by the railway, the difference between that and the normal rate being made good by the Local Government who asked for the concession. As a general principle, of course, I think I would rather hesitate to commit the Railway Board or the Government to the proposal as it stands, because in this are involved much larger questions of finance than I am able to deal with. The whole basis of a protection policy where bounties are given or duties are imposed is a matter which is really outside my Province. For that reason it would be difficult for me to say that the Government would be prepared to use railway rates as a means of offsetting the results of protection.

2516. A recent committee in England has recommended that Government should take the responsibility of a reduction of rates, not less than 25 per cent in existing rates, for agricultural produce. You will find that in the Second Interim Report of the Agricultural Committee in 1923, paragraph 24. In Germany there are special preferential rates on manures, and fodder is carried 50 per cent below the regular rates. The point is, am I right in thinking that you can work in any such recommendation without breaking your policy, of which you are strongly in favour, of separate railway finance?—From the point of view of constituting an accounting machinery for an operation of that sort, there would be no difficulty. As regards the larger implications of the policy, I would hesitate to give an opinion at the moment. Where you have got a policy of protection, which in effect may cause higher prices to be paid by local people for implements or something of that sort, I could not say straight off whether the effect of that policy would be nullified if they were subsidised to meet the difference. I am not sufficient of an economist to say what would happen in a case of that sort. So far as railways are concerned, if you look upon us as a commercial concern, I think we should have no objection to a proposal of that sort, but the implications of it and the results of it I have not really thought out.

2517. With regard to the question of concessions for fodder, I believe you debit Local Governments with the difference between your normal rate and the special concession rate?—That is so.

2518. So that if, for instance, later on a proposal were made that similar concessions should be extended to pure seed and manures and agricultural implements, a similar adjustment could be made?—There is no accounting difficulty, certainly.

2519. So that we should not be debarred by the separation of railway finance?—Subject to higher financial considerations, we see no objection.

2520. The third question I wish to put to you concerns your general policy towards light rural railways, rural tramways and ropeways. Would you prefer to put in a note on that?—I have explained this morning, I think, the policy with regard to feeder lines and branch lines, and that applies equally to these methods of transport. We are already building what you might call a light railway or tramway in the Punjab between Shahdara and Narhwal.

2521. You would call it a tramway?—There is very little difference between that and a tramway. I might give a rough description of our lowest conception of a light railway: it is a light railway carrying daylight traffic only with practically no facilities for stations, the train stopping at suitable intervals to pick up passengers or goods, with booking arrangements on the train. That is our lowest conception of a light railway and that corresponds closely to a rural tramway. We are quite prepared to build those.

2522. Is there in India anything which would militate against the construction of these light tramways by, say, local bodies?—Generally speaking, we prefer to build them ourselves.

2523. It is rather trenching on your preserves?—There is a good deal of benevolence about it. The general feeling is that we can build them better and work them cheaper than local bodies can do. It is in the interests of the country generally that we should build them. I think that is the general feeling. I might say that the Punjab Communications Board have definitely accepted that.

We did, yes.

2524. Then I put a question down on a complaint handed in to us. It is a very general complaint that the railway freight is high and acts as a great hindrance to marketing produce. I gather that is not the case. You are carrying at the lowest possible rate?—I think, generally speaking, we are carrying at the lowset possible rate. In cases where a specific complaint like that is made, we investigate it and see whether we can come down with the object of helping marketing.

2525. Then the sixth question was: What is the policy as regards the encouragement of local fairs and shows, ploughing competitions, etc.? Are railways willing to grant concessions to competitors, their bullocks, etc.?—I think nearly all railway administrations make special concessions when there is any local show on. This is a matter which we leave to the railway administrations to effect. But generally speaking, I think these concessions are nearly always given where the thing is brought to notice. I understand that on most railways there are permanently established concessions for recognised fairs and exhibitions.

2526. The seventh question is more contentious: To what extent does the zone system prevent the opening of cross lines connecting points on different systems?—May I ask a question in return? What do you mean by the zone system?

2527. There is considerable difficulty, for instance, in having that line linking up the Delhi-Umbala-Kalka Railway with a point in the southern Punjab?—Of course it is but natural to allot certain spheres of influence to certain railway administrations, and when a question of short-circuiting comes up, it is not really so much a question of the rival interests of the two concerns as the fact that the short-circuiting may effect very wide-spread changes in the rating systems on other adjoining railways and affect the whole rating structure. For that reason there has been generally in the past, I think, some reluctance to make these short-circuiting lines; but the Government of India's policy now is that wherever a line can be built to improve local communications such considerations as short-circuiting should not be too seriously taken into account. We have naturally to think of the interests of the people who have put money in these existing railways. There is the State, the largest shareholder, with its 675 crores, which has got to consider its own interests. But we take a rather broader view, and are at the present moment considering the construction of several lines which would under the past regime have been considered short-circuiting lines. We take the view that if you can

shorten distances, more goods will travel and in the long run the main lines will benefit by the increased traffic.

2528. We may take it, then, that the agricultural development of a tract is not being hampered in any way by considerations of zones?—I think that is so except in a very few instances. I think there are perhaps three or four cases where lines might have been constructed some years ago which have not yet been built, but we are hoping to build them.

2529. In regard to the question of the protection of goods on railway platforms from weather conditions, I understand from your answer to the Chairman that you are now doing all you can to protect goods from weather conditions?—I think the railways have generally taken a good deal of trouble about that. Where the amount of traffic makes it necessary, I think goods-sheds have been erected at the stations. Where there are small quantities of traffic, other special measures of protection are taken, such as the provision of tarpaulins. But if there is any serious bulk of traffic, goods-sheds are erected. There may be instances of districts which have rapidly developed in the agricultural way where the railway facilities are not up to requirements. These we are taking in hand as fast as we can, as fast as funds permit.

2530. You have told Sir Henry Lawrence that octrois are being replaced by a terminal tax, and I understand that you are collecting this termina tax on behalf of local bodies. Some local bodies are inclined to propose terminal export taxes, a very different thing. Have you any policy on that?—I do not think we have got any policy in regard to that, because I do not think any such case has arisen yet. I do not think we have got any export terminal taxes so far, at any rate I have not heard of them before. I may be wrong.

2531. On the last committee there were several very dangerous proposals for levying taxes on agricultural produce and on salt from districts?—We do not like these terminal taxes in any shape or form because we consider them theoretically at any rate an encroachment on our margin of charge; that is to say, if a man can afford to pay his railway freight *plus* the terminal tax, he can equally afford to pay a higher railway rate.

2532. *Professor Gangulee:* Is not there a terminal tax on jute?—That is a Local Government affair. We do not collect that. That is excise or customs.

2533. *Dr. Hyder:* Was not there a flagrant case at Nagina?—Yes. It is a very dangerous power to put in the hands of a local body, because apart from anything else it means imposing a tax on transport, which, I think, is a thing everybody reprobates.

2534. *Mr. Calvert:* Any Indian import tax is a tax on consumption?—It is a tax on transport, at any rate.

2535. The proposals now coming up for an export tax from municipal areas are very serious?—They are just as bad as the other, and perhaps worse. I think economically they are unsound, because one thing we have tried to resist throughout the history of railways has been a direct tax on transport.

2536. I presume we may take it that the railway authorities are making the maximum effort to deal with pilfering?—I hope so. To the best of our ability we are endeavouring to stop it.

2537. I think it is only fair to the railway authorities that I should give you an opportunity of commenting on a passage placed before us. It is to the effect that "complaints relate principally to the shortage of wagons. Many traders say the number of vehicles in use on the railways is too small to carry the normal traffic of the country and that consignments of produce are frequently detained for days or even weeks at roadside stations for want of wagons?"—What is the date of that complaint?

Mr. Calvert: 1926.

2538. *Dr. Hyder:* Is that in the United Provinces report?*

*Not published: Report on Agriculture in the United Provinces (1926) prepared for the use of the commission.

Mr. Calvert: Yes.

2539. *The Chairman:* May I say that although this memorandum has been provided by the United Provinces Government they are not responsible for the remarks contained in it.

The Witness: As a matter of history, up to a few years ago that complaint would have had a great deal of foundation, but for the last 24 months we have had a surplus of wagons on all the railways of India. For the last three or four months we have had 30,000 wagons standing idle and these we have had great difficulty in finding room for. Standing on the rails they occupy something like 130 miles of track in various parts of the country.

2540. *Professor Gangulee:* Is that the condition in the harvesting season? —There are various harvests which come at different times. There are cotton, wheat and oil-seeds, and what we call the "peak" of the traffic occurs at different times, and under the system which we have now of pooling wagons, all wagons are available for all railways and we have been able to meet the maximum peak and still have wagons in hand. During one of the heaviest peaks of traffic we had still three or four thousand wagons in hand not used. In the early part of this year, we had something like 10,000 wagons. Year by year we are getting our wagons moving more rapidly. We have been able to effect great improvement in the speed of trains and the time taken in marshalling, shunting, loading and unloading, and that is having its effect, and we now have, instead of a shortage, a surplus of wagons, all over the country, so I do not think there can be any strength in a complaint of a shortage of wagons for carrying the produce of the country at the present time, nor do I think there is likely to be any complaint for a good many years to come.

2541. I thought the opportunity should be given to you to deal with that? —I am much obliged to you for the opportunity of making that statement, because the old cry of the shortage of wagons used to get on our nerves, and I think we have been able to get over that difficulty altogether. I do not think there is any part of India where there is a shortage of wagons now. May I add that under the system of pooling all wagons we have a central office established at Allahabad under a Director of Wagon Interchange, who receives daily reports from all the railways regarding the state of the traffic on their lines, and he has complete power to adjust the balance of wagons on all the railways according to traffic requirements. So that from day to day when there is heavy traffic, he disposes of the surplus wagons by sending them to one railway or another to meet local requirements. But in the last year his business has been mainly to find room or stable wagons, and this is becoming a somewhat serious difficulty.

A similar complaint has been put before us by one official from Bengal, who says:—

> "The producers of jute in Rampur and Jalpaiguri often suffer greatly because the railways cannot supply sufficient transport facilities at the proper time. They divert their wagons to places where there is competition with the steamer companies for goods traffic."

The jute traffic is peculiar and a thing worth study. It is extremely complicated. The requirements for wagons for bringing jute down to Calcutta or Chittagong vary from day to day in accordance with the state of the market and the continual day to day business which goes on of trying to anticipate what the market is going to be in order to bring down large consignments of jute or hold them up up-country, so that the railway is put to great difficulty in supplying wagons to suit the actual needs of the moment and there may be occasions when the demand is greater than the supply. But I think, on the whole, there is no great difficulty in getting the jute crop through to time. We have the same difficulty in Calcutta on arrival. The jute is brought down and put into railway goods-sheds and in many cases the market may have changed a point or two and the man does not find it convenient to take delivery and he leaves the jute there for his full free time, which I think is 48 hours. In some cases the goods-sheds get full and it is essential to stop the traffic coming down, and then some restriction has to be placed on the book-

ings of jute up-country until the sheds are cleared. The only device we have is to shorten the free time and charge wharfage on the jute in the sheds. That action has to be taken sometimes and there are complaints of the want of facilities at the goods-sheds. The jute traffic is in a state of surge throughout. Either people are holding up taking deliveries or they are holding up bookings, or they are wanting to rush the stuff down and take delivery promptly, and it is extremely difficult for the railways to meet all these requirements and naturally complaints are made. Difficulties must arise at times but on the whole I think the facilities and the wagons are sufficient to get the crop down within reasonable time.

2542. You consider these difficulties chiefly due to the work of speculators?—I should imagine speculation plays some small part in this matter, but I should not like to charge the jute trade with being speculators wholesale.

2543. *Mr. Calvert:* In a note on the rural prosperity of Burma the complaint is made of the high cost of marketing produce owing to insufficiency of railways. I understand that you are giving full consideration to that question?—We have a very large construction programme in Burma being undertaken by the Burma Railway Company and it is based on very close collaboration with the Local Government. The programme of construction there is endorsed by the Local Government and I think goes as far as we can afford to do at the present time. We shall be nearly doubling the mileage of railways in Burma. I quite agree that there is a need for further railway extension in Burma and I think we shall be able to meet that very largely in the future.

2544. We have had a certain amount of evidence before us about the shortage of fuel and grass. May I ask what you do with the fuel and grass on the railway embankments?—The grass is sold locally by the engineers in charge of the sections, generally by auction, I think. The practice varies all over the country, just as the grass does; so it is difficult to generalise, but the general principle is that the grass on a certain length of railway, so many miles, is sold by auction to the local people and they are allowed to cut it. We have great difficulties with people who want to graze it instead of cutting it, but generally speaking it is sold to the highest bidder.

2545. The fuel is sold locally too?—There is not much in the way of fuel. We have plantations in some places, and any firewood which may be available is no doubt sold in the same way.

2546. *The Chairman:* Have the railways as such considered building ropeways in mountain areas as feeders?—I do not think we have considered a definite proposal of that kind as a railway undertaking.

2547. In answer to my colleague, the Raja of Parlakimedi, I understood you to say that there can be no question of the railway companies selling a part of the land they acquire under statute for the construction by private persons of storage facilities. Is it the case that there have in fact been no such sales?—We have a system which I might mention in that connection of leasing or letting out land on a license for oil depôts at certain stations. The reason for that is that these oil depôts up-country are on the bulk system very largely and it is convenient to have the depôt close to the railway so that piping can be arranged. I should not like to say definitely that no such facilities have been given anywhere but it is no part of our policy to use railway land for the benefit of private people in that way.

2548. But if you yourselves are not inclined to undertake to provide increased storage and if corporations or private persons have difficulty in obtaining land sufficiently near your important railway junctions and stations to make storage useful, would it not be to the public advantage that such corporations or individuals should be able to lease land from you so as to give the public this service?—The difficulty is that we have generally got no land available. Most of the land, having been acquired for the purpose of constructing buildings and railways, is used to the full for that purpose, in the big towns especially. I think I am right in saying that if a local body wished to undertake that kind of work, it could secure the land under the

Land Acquisition Act. A *mandi* (a kind of local warehouse) has been built by many towns or local authorities in the Punjab, and I think they probably acquired the land under the Land Acquisition Act.

2549. *Mr. Calvert:* You are prohibited from selling to individuals land required for railway construction purposes?—Yes. We cannot sell land to private individuals; all we can do is to relinquish the land to the Government to do what it likes with.

2550. *Professor Gangulee:* You cannot lease out land?—We can under certain conditions.

2551. *The Raja of Parlakimedi:* It is only for the storage of oil you lease out land?—Generally speaking, at up-country stations we lease it out for oil storage, and in some places we lease accommodation for storing coal.

2552. Is not salt included?—I do not know if we lease out any land for storing salt. We do lease out some of our goods-shed accommodation in big cities, portions of it to particular firms, but that is in the ordinary course of business.

2553. *The Chairman:* A question on quite a different matter. I take it that railway companies are responsible for and carry out the disinfecting of wagons used for the carriage of livestock?—Yes.

2554. Is the occurrence of contagious disease notified to you?—I think the Local Governments and the local authorities would certainly do that. I do not know the exact procedure, but it must be the case. The local traffic officer would be notified by the local authority concerned with the outbreak.

2555. In the case of any restrictions in the matter of moving livestock from district to district and Province to Province, if such restrictions are in force, are you given early information about it?—I do not know the procedure exactly, but I am sure we are bound to obey any orders issued by Local Governments in the matter of restrictions.

2556. Now, a more general question which will make plain to you a matter, which I am sure is already clear to you, why as a Commission we are so closely concerned with freight rates. You would probably agree that a slight difference in freight charges which any concession might be likely to amount to would not mean much, if anything at all, when translated in terms of retail prices to consumers?—Yes.

2557. But you would probably also agree that measured over the whole volume of producers' output for the year, a slight difference in freight rates might be of very considerable advantage to the producer?—Yes.

2558. *Sir Henry Lawrence:* Can you give us in general terms some idea of how your general rates, both for passengers and goods, compare with the rates charged in other countries?—I am afraid I have not got the information here. I have got a note on that which, I could send to the Commission later.

2559. Generally speaking, are your railways run more cheaply than in other countries? Do you carry goods traffic at a cheaper rate than railways on the continent of Europe or in England?—Yes; I shall probably be up against Dr. Hyder and Professor Gangulee on this subject, I am afraid, because it is a question of what basis you take for the cost of living and standard of wages and so on; but I can give you just one or two figures which will show what they amount to. For instance, the average rate for carrying a ton of goods per mile last year was 6·21 pies, that is about half-a-penny.

2560. How does that compare with rates in other countries?—I am afraid I have not got the figures with me. I can put them in in the form of a note if you like. The average rate for carrying a passenger per mile was 3·47 pies. Translated into English money, the rate for goods works out to roughly 5 shillings per ton for every hundred miles on Indian railways; and the average passenger rate (we carry 600 million passengers annually) is 3·47 pies per mile. I think that in actual money, both these rates are cheaper than on any other railway in the world; and of course the cost of equipment and materials is practically the same or higher for Indian Railways than in the case of railways of other countries.

2561. *Professor Gangulee:* When you talk about the goods rate, do you speak about the rate at owners' risk or the rate at companies' risk?—I am giving the average amount we received for every ton of goods we carried on all railways in India.

2562. *Sir Thomas Middleton:* If the comparative figures are easily available it would be very interesting to get similar figures for Italy and for Great Britain?—I could give you some comparative figures; they were prepared for the Honourable Sir Charles Innes for his recent speech at the Indian Railway Conference Association and appeared in the papers. I will certainly send them in.

2563. *Dr. Hyder:* Have you any figures for Japanese railways?—Yes, I think so.

2564. *Mr. P. C. Sheridan:** I think the Japanese are the next highest.

Dr. Hyder: Because that is an oriental country and conditions for comparison are easier.

Professor Gangulee: Not always.

(The witness withdrew.)

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* He is a Member of the Railway Board and was present at the meeting.



APPENDIX A.

Statement showing the amount of claims paid on Class I Railways from 1920-21 to 1925-26.

(In thousands of Rupees.)

Name of Railway.	1920-21.	1921-22	1922-23.	1923-24.	1924-25.	1925-26.
Assam-Bengal .	13	15	28	17	17	22
Bengal and North-Western.	84	88	1,71	1,63	81	93
Bengal Nagpur .	2,01	2,64	1,99	2,64	2,02	80
Bombay, Baroda and Central India.	34,65	22,69	15,69	6,45	6,03	4,40
Burma . .	43	51	45	29	34	31
Eastern Bengal .	1,79	1,89	1,99	1,77	1,68	1,87
East Indian . .	24,92	31,78	57,99	42,73	30,61	11,73
Great Indian Peninsula.	25,42	28,11	19,68	16,17	6,64	3,41
Madras and Southern Mahratta.	2,59	2,89	2,21	1,54	86	91
Nizam's guaranteed State.	40	41	38	24	17	18
North Western .	17,83	23,40	16,90	4,73	6,84	3,90
Rohilkhund and Kumaon.	24	41	45	17	22	17
South Indian .	96	79	64	45	32	49
Jodhpur Bikaner .	29	41	97	12	16	8
TOTAL .	1,12,50	1,16,96	1,21,28	79,10	56,87	29,40

APPENDIX B.

Memorandum regarding Local Railway Advisory Committees.

I. *Title.*—The new bodies to be known on each line as "Railway Advisory Committee."

II. *Constitution.*—A separate main committee to be constituted for each administration, the number of members being decided by circumstances subject to a maximum of 12. The Agent to be *ex-officio* Chairman. The remaining members to consist of—

two Local Government members nominated by the Local Government in whose jurisdiction the headquarters of the railway in question is situated;

three representatives of the Legislative Council of the Government in whose jurisdiction the headquarters of the railway in question is situated. These members should be selected to represent rural interests and the travelling public;

one member from the local municipality or corporation at the railway headquarters;

five members representing industries, commerce and trade.

The heads of departments of railways may be called in merely to advise on subjects under discussion which may affect their department and on which their technical expert advice would be useful to the committee.

The method of selection of the non-official members to be left largely to local discretion. The representatives of the Legislative Council need not necessarily be members of the Council. Members of the Central Advisory Council are not debarred from membership of Local Advisory Committees. The five members representing industries, commerce and trade would ordinarily be drawn from important local bodies representing predominant trade interests; the actual selection of such bodies should be made in consultation with the Local Government, and once the selection is made it should be left to them to nominate or elect their representatives. The tenure of office of the members to be left to the electing or nominating bodies to decide.

Agents will consider whether it is desirable to form separate branch local committees at large centres, and in case of doubt they may consult their main committee in this matter.

III. *Scope of duties.*—The functions of the committee to be purely advisory. The sort of subjects which might suitably be placed before the committees are:—

(*a*) alterations in time-tables and passenger services;

(*b*) alterations of rates and fares and changes of goods classifications;

(*c*) proposals in regard to new projects and extensions;

(*d*) proposals in regard to new rolling stock;

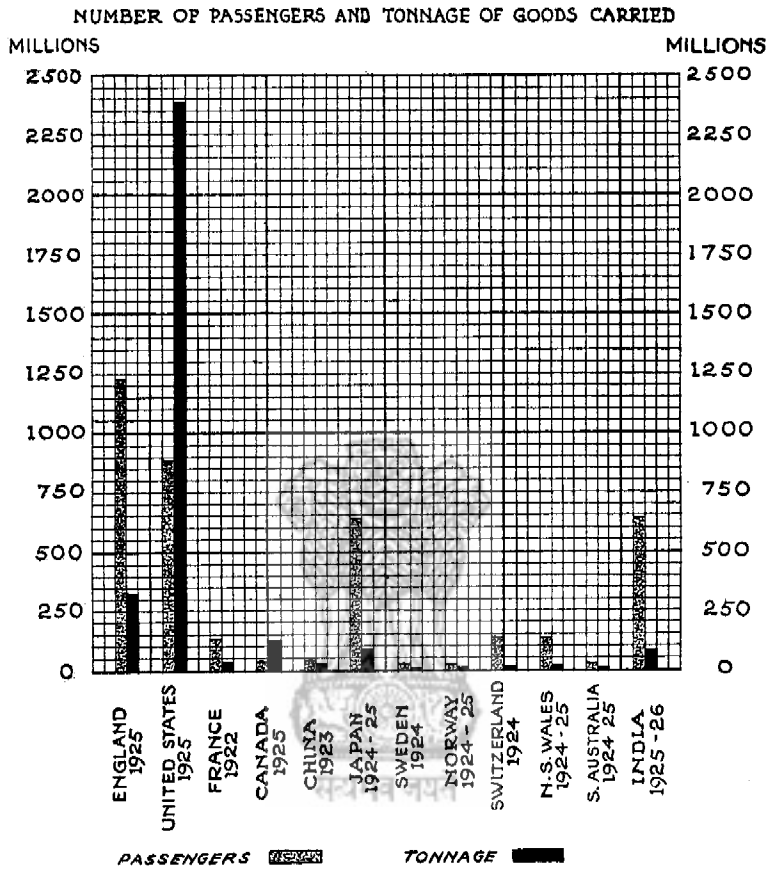
(*e*) any matters affecting the general public interest or convenience.

Questions of personnel, discipline and appointments will not be brought before the committee; subject to this condition any member may suggest a subject for discussion, but the Agent may rule out any subject for reasons which should be explained at the first meeting after the ruling has been given.

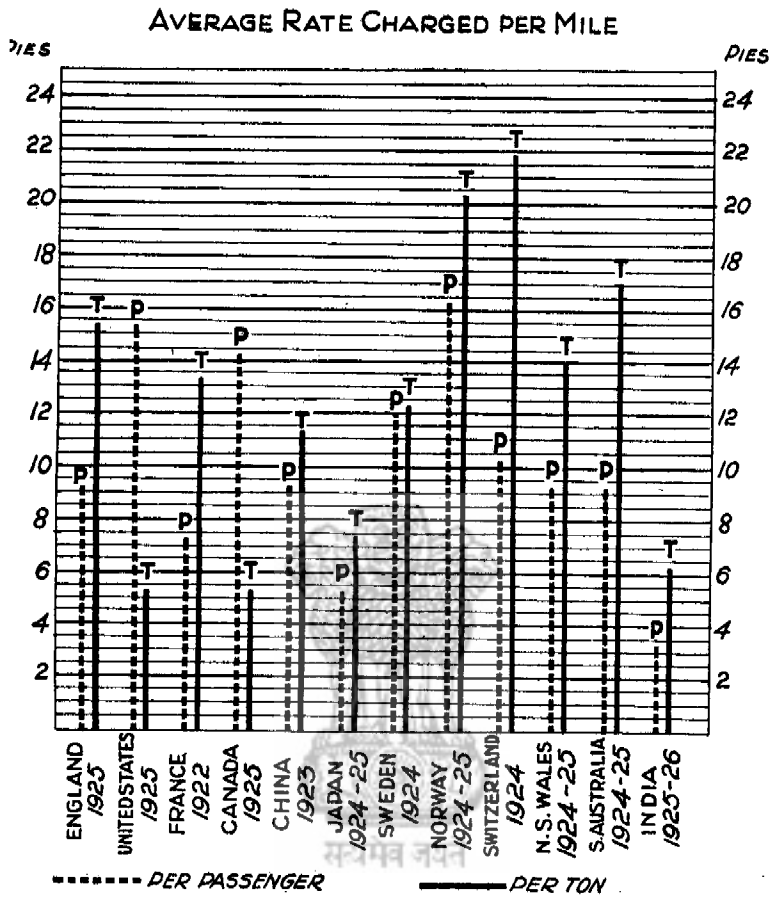
IV. *Remuneration.*—Non-railway members may be paid Rs. 32 for each meeting attended.

V. *Proceedings.*—The committee to meet once a month if there are matters to be discussed. A copy of the minutes of meetings to be furnished to each member and to the Railway Board. If in any case the Agent decides that he is unable to follow the advice given by the majority of the committee, he must bring the matter to the notice of the Railway Board in forwarding the minutes of the meeting for their perusal.

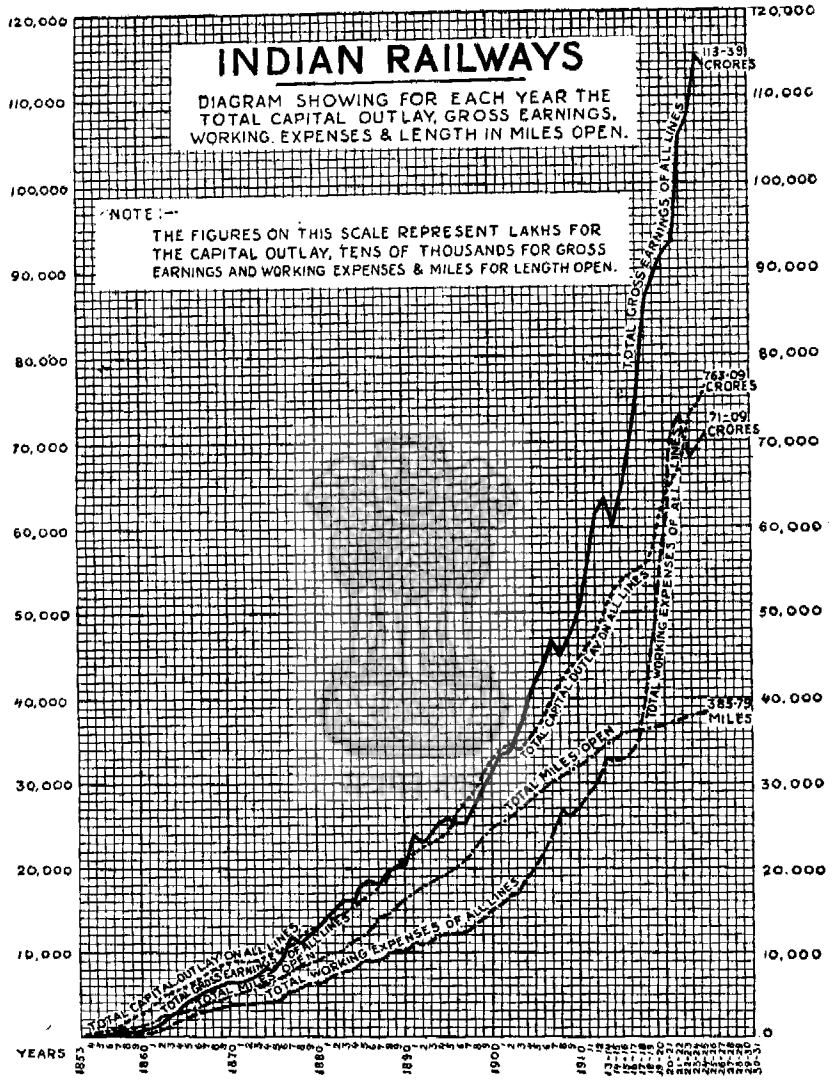
APPENDIX C.


NUMBER OF PASSENGERS AND TONNAGE OF GOODS CARRIED
MILLIONS
MILLIONS
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
ENGLAND 1925
UNITED STATES 1925
FRANCE 1922
CANADA 1925
CHINA 1923
JAPAN 1924-25
SWEDEN 1924
NORWAY 1924-25
SWITZERLAND 1924
N.S.WALES 1924-25
S.AUSTRALIA 1924 25
INDIA 1925-26
PASSENGERS
TONNAGE

APPENDIX D.


AVERAGE RATE CHARGED PER MILE
PIES
PIES
24
22
20
18
16
14
12
10
8
6
4
2
T
P
ENGLAND 1925
UNITED STATES 1925
FRANCE 1922
CANADA 1925
CHINA 1923
JAPAN 1924-25
SWEDEN 1924
NORWAY 1924-25
SWITZERLAND 1924
N.S.WALES 1924-25
S.AUSTRALIA 1924-25
INDIA 1925-26
PER PASSENGER
PER TON

APPENDIX E.


INDIAN RAILWAYS
DIAGRAM SHOWING FOR EACH YEAR THE TOTAL CAPITAL OUTLAY, GROSS EARNINGS, WORKING EXPENSES & LENGTH IN MILES OPEN.
NOTE:—
THE FIGURES ON THIS SCALE REPRESENT LAKHS FOR THE CAPITAL OUTLAY, TENS OF THOUSANDS FOR GROSS EARNINGS AND WORKING EXPENSES & MILES FOR LENGTH OPEN.
TOTAL GROSS EARNINGS OF ALL LINES
113-39 CRORES
76-09 CRORES
71-09 CRORES
TOTAL CAPITAL OUTLAY ON ALL LINES
TOTAL MILES OPEN
TOTAL WORKING EXPENSES OF ALL LINES
38579 MILES
TOTAL CAPITAL OUTLAY ON ALL LINES
TOTAL GROSS EARNINGS OF ALL LINES
TOTAL MILES OPEN
TOTAL WORKING EXPENSES OF ALL LINES
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
YEARS
1853
1860
1870
1880
1890
1900
1910

Lieutenant-Colonel A. S. MARRIOTT, Director of Farms, Master General of Supplies Branch.

Memorandum on the work of the Military Farms in India.

1.—Military Dairy Farms.

Object of Dairies.—Military dairy farms in India have been established by Government since 1889, and for the purpose of providing a safe and reliable supply of pure milk, butter and cream to military hospitals and troops in cantonments, private enterprise having entirely failed to meet the requirements of the situation.

Prior to the institution of Government dairies, there was no branch of the dairy industry in India that was in any way organised. The supplies made to British troops may be said to have been in the hands of the Indian cow-keeper, who maintained a number of cows and buffaloes in a more or less half-starved condition, housed them in filthy houses, fed them mainly on garbage and milked them into vessels that were " cleansed " in the nearest puddle. There was no guarantee that the *gowala* or his animals were free from disease.

Present day conditions show no very marked improvement and the insanitary and very often filthy conditions under which milk is produced and retailed and butter manufactured in many of the so-called Indian dairies is well known, and in most Provinces there is no law fixing a standard of quality for milk and butter or enforcing the purity of dairy produce offered for public sale.

Danger of Bazar Supplies or supplies from uncontrolled sources.—The Cattle-Breeding Committee appointed by the Bombay Government and consisting of five Indian gentlemen, one of whom was chairman of the committee, with two European officials, reported as late as 1923 in the following terms on the conditions of the dairy trade in India :—

> " At present it is impossible for private persons to establish the opening of up-to-date scientific milk producing and selling owing to the want of regulation. The present unscrupulous milk producer is able to adulterate his milk in many ways. This is particularly noticeable in Poona, Bombay and Ahmedabad. A considerable supply of milk is exported to Bombay and other places from Anand. This milk contains boric acid and formalin, added as preservatives in such quantities as to be highly injurious.
>
> " Scientific dairies are under supervision necessarily entailing expense. The produce, however, is superior; but in a country like India where cleanliness is at a discount such produce is unable to compete with a filthy and more cheaply manufactured article.
>
> " Milk in India to-day is anything from 2 to 6 times dearer than in any other country in the world. This is due to the poor milk-producing qualities of the indigenous cattle. The evidence before the committee proves that the price of milk is rising rapidly every year. A number of enterprising people have started dairies but all, almost without exception, have failed, firstly, owing to the poor milk-producing qualities of the cattle; secondly, for want of protection by legislation, and thirdly, for want of encouragement by Government.
>
> The committee whilst touring in Gujrat took the opportunity of visiting some of the so-called dairies in Ahmedabad where the bulk of the butter and other dairy produce is manufactured for the whole of India. The committee were surprised to find that this industry is carried out under the most filthy and dirty conditions imaginable. These so-called dairies are situated in the most insanitary by-lanes of the city. The butter produced under these conditions is sold all over India and a certain amount is exported (even to

Great Britain). It is a well-known fact that milk and its products are the best medium possible in which injurious bacteria and germs of typhoid, diptheria, cholera, etc., thrive and in which they are carried and spread over the whole of India. It is essential for the public health that production on honest and scientific lines should be made a financial success, so that the public at large will get a safe and sure supply of milk and its several products."

The fact that these conditions are prevalent all over India justifies the continuance of the Military dairies.

Lack of technical advisers and experts.—The lack of experience was a great handicap to the pioneers of the Military dairies, who had no real idea of what a technical business dairying is or how much there was to learn about it. A start was made without even the advice of such experts as were available. The advice of an expert fully versed in the technicalities of dairying on a high European standard combined with a knowledge of Indian conditions was not available, for the simple reason that there was no person who possessed knowledge of both sets of conditions.

In 1906, 17 years after the opening of the first Government dairy in India, the services of a diary expert were obtained from England (Mr. W. Smith, now Imperial Dairy Expert). The dairy expert himself would be the first to admit what an immense amount he had to learn as regards the modifications Indian conditions impose upon European methods, many of which could only be ascertained by repeated experiments, and the most careful observation. Dairy farming in India was a new industry and Government was paying for experience.

Organisation.—Under the original organisation farms were grouped in divisions in charge of a Farms officer who was required to administer both the grass and dairy farms of a division. The general organisation and administration of military grass and dairy farms in India was fully enquired into by Lt.-Col. T. H. Henderson, Military Accounts Department, and Mr. S. H. Fremantle, I.C.S., in 1910. The scope of enquiry included also the financial aspect of military farm operations and the consideration whether the maintenance of farms generally was justified by the results of their operations. The finding of the committee was favourable to the continuance of dairy farms.

The result of this committee's recommendations was the separation of the dairy from the grass farms branch of the Farms Department. As regards personnel, two administrative circles were established with two Assistant Directors of Dairy Farms. This organisation has continued and is still in vogue with the exception of the period April 1921 to March 1923, when a third circle was formed.

Distribution.—The distribution of dairy farms at present is :—

Northern Circle.	*Southern Circle.*
Peshawar—Cherat.	Lucknow.
Rawalpindi and Murree.	Cawnpore.
Sialkot.	Allahabad.
Lahore Cant.	Agra.
Dalhousie.	Jubbulpore.
Jullundur.	Mhow.
Ferozepore.	Deolali.
Ambala.	Kirkee.
Simla Hills (Kasauli, Dagshai, Subathu and Jutogh).	Belgaum.
Quetta.	Aden.
Bannu—with Razmak, D. I. Khan and Manzai.	

Young stock farms at Jalloo—Sargodha—Malakwal—Gambar and Sitapur.

NOTE.—Under the recommendations of the Inchcape Committee, the farms at Karnal, Bangalore and Wellington together with the permanent establishments employed on these farms were transferred to the Civil Department from 1st July 1923.

Staff.—The British staff (present strength 24) were recruited from selected men of British Corps or Army Departments, and had to undergo training for two years, when, if successful in their examination, they were appointed on a year's probation. In 1912, the new entrants into the department took their discharge from the Army and became civilians. The option to do so was extended to existing incumbents. The Reform scheme for India has extended to the Military dairies and the scheme for Indianisation was sanctioned from 1st April 1922. This scheme allows for the replacement of Europeans by Indians in the managing personnel of the Military dairies in India—(sanctioned complement 182). Candidates for appointment have been plentiful, on the other hand resignations and discharges have been heavy. The duties of an Indian supervisor entail long and trying hours and experience has so far shown that men with high education and good connections are not altogether suited for the onerous and practical duties an Indian supervisor is called upon to perform. They show a tendency to play the rôle of superintendent rather than act as a practical manager.

Defects.—When the new organisation was imposed in 1912-13, the administrative officers were confronted with a very difficult task. Mistakes had to be remedied and defects made good. The extent to which dairying in India was to profit by the progress of western and temperate countries, and the modified methods to be adopted had to be learnt and many problems existed, peculiarly its own, that India alone could solve.

The main defects that existed were :—(*i*) Poor milking herds. (*ii*) Bad young stock. (*iii*) Insufficient and badly designed cattle sheds. (*iv*) Insufficient buildings of other descriptions. (*v*) Inadequate lands for grazing and cultivation.

Herds and Breeding Policy.—In regard to (*i*), the main factor of success or failure of any dairy from a financial point of view lies in the quality of the herd.

The poor milk yield of the country-bred cow is notorious. This is mostly due to the deterioration and the hard conditions of life of various breeds of cattle, which, under favourable conditions, are of high milking value. The climatic conditions of India entail, unless special provision is made, an entire lack of succulent fodder necessary for milking cattle during a long period in each year, the same conditions impose the absence of cheap fodder of any kind for the same periods. The cattle are owned by a class of people who lead a hand-to-mouth existence, men with no capital, and therefore when fodder is scarce and dear the cattle go short of food. The average Indian cow may be said to be sufficiently fed during, and for some time subsequent to, the monsoon, and to suffer in varying degrees from semi-starvation till the advent of the next monsoon. In these circumstances, Nature has, as a protective measure, imposed restrictions on the natural breeding proclivities of the animal which thus starts breeding later in life and subsequently breeds less often than would otherwise be the case, a reduced outturn of milk also places a lessened demand on the vitality of the animal. Where, in the case of the Indian owner, the cow costs practically nothing to keep, and what milk is produced is mostly gain, the conditions described above to some extent, to a very unsatisfactory extent perhaps, suit the circumstances of the country. When, however, dairying on the scale and standard of military dairies is attempted, the conditions impose a most severe handicap on financial success, so severe indeed that success is impossible unless they can be altered. The cow in the military dairies cannot be kept for nothing, the food bill is in fact the most important item on the expenditure side of the account. The disadvantage, therefore, of an animal that has to be kept an unusual time before she starts to breed, and that breeds subsequently at irregular intervals and gives a poor yield of milk, is obvious. There is but one remedy and that is for the military dairies to breed their own herds,

and by careful selection of bulls and cows, and by good feeding, to breed out the disadvantageous characteristics engendered by generations of starvation. This is the more necessary as the experience of recent years has proved beyond doubt that from one cause or another the milking breeds of the country are rapidly deteriorating, and it is becoming increasingly more difficult to purchase cattle that might be called good milkers judged even from the Indian standard. It is necessary to recognise that any improvement that is to be made to the herds of military dairies must come from within, and that such dairies must breed and rear the herds of the future. "Feed and Breed" must be the motto of every military dairy if success is to be gained. This policy has been inaugurated since the commencement of 1912-13 but there was little to work upon. Rinderpest had played havoc with the half-breds, and the numbers of these valuable milkers was also reduced on account of the unfortunate hiatus that took place in the importation of English bulls between 1908 and 1912. The dairy-bred country cattle, with notable exceptions in the case of one or two dairies, were little, if any, better than what could be purchased, a fact which was mainly due to the non-recognition of the importance of good feeding when young, and lastly there were few farm-bred bulls of any value from which to breed. The last item is perhaps the most important of all. The influence of a bull of a good milking strain on his progeny, besides being recognised throughout the world where dairying is carried on on scientific lines, has been most unmistakeably shown by the use of English bulls with country-bred cows; the resulting half-bred heifers have yielded 100, 200 and sometimes 300 per cent. more milk than their dams. Had the necessity for breeding country bulls from selected stock been recognised from the start, the year 1912-13 would have found dairies with a stock of bulls infinitely better than anything that was to be purchased. When puchasing a bull in India it is seldom that there is more to go upon than the looks of the animal, there is no pedigree and so far as inherited milk-producing qualities are concerned appearances go for little or nothing, the real value of a dairy stud bull lies in the milk yields of his female ancestry.

At the present date it may be confidently stated that in the case of cows the best milkers in the herd are home-bred animals; the major proportion of which are half-bred animals. To wait for the improvement of the Indian cow to obtain a milch animal with a greater yield of milk, was recognised as a long, tedious and expensive process.

This has, however, been carried out at the Ferozepore farm which has maintained a pure country-bred herd of Montgomery (Sahiwal) cows and by selection and grading and careful breeding this herd is an example of what can be accomplished with knowledge and means and time at disposal. A number of pedigree bulls of this pure-bred Montgomery herd were auctioned at Forezepore in 1922 and 1923 and though good prices were obtained, they were bought almost entirely for Government Institutions and farms. There is no real demand at present by the small farmer for pedigree cow bulls. He would appear to place greater importance on draught qualifications and to rely on the buffalo for milk. A short cut had to be resorted to and an improved animal was found by the introduction of bulls of European breeds of well established milking qualities. The result of crossing country-bred cows with these bulls has been most successful in the case of first cows or half-bred. The milk yields of these half-breds have shown marked increases and in several instances are comparable with cows of Western countries. The animals have retained their constitution and stamina and proved good doers.

The crossing process when extended to $\frac{3}{4}$ and $\frac{7}{8}$ European animals has not proved a success, the proportion of failures was large and the animals were generally wanting in constitution and possessed a smaller degree of immunity.

The importation of bulls commenced in 1907. The measure was regarded as an experiment only and very few were imported. At first it was considered that bulls imported from Australia would be more likely to withstand the Indian climate than bulls from the United Kingdom. The idea proved to be fallacious and the stock was distinctly inferior, price for price, to what was available in the home market upon which reliance is now entirely placed.

The bulls imported have been mostly Ayrshires, but recently British Friesians have been obtained. The above remarks in connection with the crossing of country cows with European bulls refer to the Ayrshire breed.

Indications have also seemed to show that the failure of further cross was due to two reasons, namely, the heavy hair of the European strains and the necessity in India of a dark pigmentation of the skin.

If exotic breeds with short hair and dark pigmentation were used, good results might be obtained. Such success as had been obtained was only where the exotic had dark skin and short hair. Holstein crosses ½ and ⅞ have given good results, but not equal to the first cross. The present policy is to maintain sufficient country cows of the best milking types to mate with imported bulls to produce the half-bred high milk-yielding cow, and to supplement the demands with buffaloes.

The buffalo continues to be indispensable to every large herd and though replacements can generally be more economically made by purchase in the open market, it has been found successful and profitable to breed and rear a number from selected dams, specially selected male calves being kept for stud purposes. The buffalo has peculiarities of its own that handicap it as a milch animal. When young it is delicate and more difficult to rear than the cow. The conditions of a large dairy herd seem more inimical to it than to the cow. It commences to breed later, the difference being approximately 12 months, and it subsequently breeds less regularly than the cow. It needs a larger ration and is therefore the more expensive animal to feed. The male calf of the buffalo, if not required for the stud, is of considerably less value than that of he cow. The buffalo has the advantage of yielding milk containing more butter fat than the cow, but as by far the greater quantity of butter sold by military dairies is obtained from military established creameries, which obtain milk for the purpose of butter making by purchase, this quality is to a considerable extent discounted

The following table showing the classification by yields of cows for the years 1912-13 and 1924-25 is indicative of the improved yields obtained :—

——	1912-13.		1924-25.	
	Cows.	Buffaloes.	Cows.	Buffaloes.
Over 10,000 lbs. . . .	...	...	1	...
9,000 to 10,000 „ . . .	...	...	4	..
8,000 „ 9,000 „ . . .	..	1	30	...
7,000 „ 8,000 „ . . .	5	2	35	...
6,000 „ 7,000 „ . . .	4	10	81	25
5,000 „ 6,000 „ . . .	19	15	158	95
4,000 „ 5,000 „ . . .	65	102	280	259
3,000 „ 4,000 „ . .	248	276	375	386
2,000 „ 3,000 „ . . .	586	502	310	219
1,000 „ 2,000 „ . .	708	549	140	76
Under 1,000 „ . .	549	310	93	48
Total .	2,184	1,767	1,507	1,108

Young Stock Farms.—The general inadequacy of lands for grazing and cultivation in cantonments rendered the rearing of young stock very expensive and to overcome this handicap young stock farms have been established at Gambar, Malakwal, Sargodha and Jalloo, and act the rôle of foster-mother to the parent farms, and by commercial farming maintain both dry and young stock, free of cost. Young stocks are transferred at about six months of age and kept until mature and when in calf they are drafted off to the parent farms to replace casualties. The dry stocks are kept until about to calve again.

Lands.—Another difficulty has been that of the provision of adequate areas of grazing and arable land, and as these dairies are intended for the use of troops, they have to be located in cantonments where troops are stationed, an excellent arrangement for the convenience and health of the Army, but in many instances a great disadvantage to the farms, and several have been established with insufficient land and at times inadequate water-supply. The area of lands held at present are :—

In cantonments 5,633 acres.

Outside cantonments 1,515 acres.

Area of Young Stock Farms 7,260 acres.

All milk issued as fresh milk (new milk) is produced from milch cattle which are the property of Government, housed, fed, watered and milked on Government premises by Government servants. The feeding and milking is always carried out in the presence and under the direct supervision of a specially trained staff.

Butter sold is made from pasteurised cream properly ripened and safe from a hygienic point of view. It is not for the most part made from milk of Government-owned cattle.

All employees of a Military dairy are protected from enteric, small-pox, etc., by inoculation and tested to ensure that none of them are carriers of the enteric group of diseases.

Sales of dairy produce and rates.—The trade of the dairies is restricted to the supply of produce to troops, Army departments and establishments; civilian non-military Government officials and their families may be supplied only when a surplus exists. Sales are made to Government hospitals, officers and their families, troops and their families exclusively, and it is significant that the price is beyond the means of the Indian soldier.

There are three sale rates for dairy produce :—

(*i*) One rate for officers, Government institutions and the general public.

(*ii*) One rate for British troops.

(*iii*) A concessional rate for the families of British troops.

In practice every endeavour is being made to establish a flat rate for each farm, a special concessional rate for soldiers' families to continue. A copy of the latest sale rates is attached (Appendix).

Pasteurisation and cold storage.—Pasteurising plants have been installed chiefly for the purpose of pasteurising milk and cream bought from outside sources for the manufacture of butter. If specially requested by the medical authorities, milk for drinking purposes is pasteurised, but this adds considerably to the cost. This is, however, invariably carried out when milk is sent by rail or road, *i.e.*, Kirkee to Bombay and Peshawar to the Khyber Pass outposts. For the better preservation of milk and cream it has been found necessary to establish cold stores at the larger dairies, *i.e.*, Peshawar, Rawalpindi, Kirkee, Lucknow. The running of these plants which are very desirable in this country with high temperatures adds so considerably to the expense that their extension to and use on smaller farms is prohibitive.

Trade.—The quantities of dairy produce sold during 1924-25 compared with the three previous years and average sale rates were :—

Years.	Milk.		Butter.	
	Quantities.	Average sale rate per lb.	Quantities.	Average sale rate per lb.
	Tons.	Rs. A. P.	Tons.	Rs. A. P.
1921-22	5,910	0-3-10·4	509	1-11-8·5
1922-23	4,519	0-3-6·5	450	1-9-10·5
1923-24	3,839	0-3-4·2	343	1-9-8·4
1924-25 . . .	3,572	0-2-11·5	341	1-8-8·4

Finance and trading results.—A cost-accounting system of accounts is in vogue and audited locally.

The following accounts are prepared annually :—Trading Account, Capital Account, Profit and Loss Account, Balance Sheet (Government Account).

The consolidated balance sheet of the military dairies as at 31st March 1925 from 1st April 1912, shows a loss of Rs. 55,46,580 which includes Rs. 12,74,607 the amount written off and which represents the difference between the residuary capital value of the assets arrived at by the revaluation of the farms capital on 1st April 1925, and the closing balance on 31st March 1925. The Government account on 1st April 1925 was Rs. 24,22,443 bearing interest at 6·1 and 3·3 per cent. The revaluations were the outcome of the recommendations of the Inchcape Committee. Owing to the abnormal prices and purchases during the War, whereby farms were overburdened with capital which was not all incurred as a requirement of their ordinary activities, but rather to meet the capital demands of the late War, and with a view to restarting the farms with the capital actually required, the Government of India decided that the capital assets of each farm should be revalued and this was carried out with the above results.

These farms have, as a whole, since April 1925 worked at a profit, and this has been achieved partly by the relief enjoyed on the revaluation of capital assets and by drastic retrenchments and economies effected in all departments and centralised financial control.

The Government of India have approved of the proposal to open a departmental *pro forma* Reserve Fund account subsidiary to the accounts of the military dairy farms to meet losses in famine years and from other unforeseen causes and to prevent violent fluctuations in prices.

Sanction has also been accorded to the formation of a depreciation reserve fund.

Epizootic diseases.—It would be difficult to compute the heavy losses farms have suffered from cattle diseases in the past. Hæmorrhagic septicæmia and rinderpest have proved the most serious. Vaccines and serums supplied by the Research Institute, Muktesar, have given very satisfactory results and the immunisation against rinderpest by the so-called serum-simultaneous method has given very good results.

The following is a detail of specific diseases amongst dairy farm cattle during 1924-25.

1. Anthrax	1
2. Biliary fever	2
3. Contagious abortion	69
4. Foot and mouth diseases	681
5. Hæmorrhagic septicæmia	6
6. Jhone's disease	39
7. Rinderpest	113

Total strength of herds on 31st March 1925 :—

Adult stock	3,345
Young stocks	872
Calves	401

Piggery.—It was recognised over 25 years ago that pig-keeping, breeding, etc., was very backward in India. Following the example of Denmark, the establishment of piggeries as adjuncts to dairy farms was proposed. It was understood that success could not be attained until a very marked improvement had been made in the quality of the country pig.

A start was made at Allahabad and Lucknow, and the pigs experimented with were (1) the Berkshire (2) Large white (3) Mid-white (4) Small white (5) China—and all helped to improve the stock.

So long as large quantities of separated butter and milk were available for feeding and cheap grains obtainable, the results were profitable. The produce—fresh pork, sausages, bacon and pork pies—was greatly appreciated by the troops. Owing to a severe outbreak of swine fever in 1906, the pigs at Allahabad were slaughtered and this piggery was closed down.

A piggery was established at Karnal also in 1906 in conjunction with the Karnal creamery. The pigs were bred and reared at Karnal and sent to Ambala during the winter months to be slaughtered, and the produce manufactured and retailed.

Conditions have changed since the War and pig-keeping has not proved profitable and bacon can now be imported at approximately the same price as retailed by a military piggery.

There is no real market for pigs in India and large numbers cannot be disposed of without the expense of manufacturing bacon and pork products, and due to climatic conditions this can only be carried on for 7 to 8 months only. In consequence pig-keeping is not a paying proposition and has been discontinued.

2.—Military Grass Farms.

Grass Farms.—Up to about 40 years ago, the fodder supply of the Army in India was met by allotting grass-cutters to the various units, except in the Bombay Presidency and certain stations in Madras where it was obtained by contract. The grass-cutter system had many disadvantages, the principal being that it entailed heavy expenses in maintaining and moving about a large army of camp followers, who constantly got into conflict with the civil population through stealing grass off village or other lands. The grass brought in was often obtained from low lying swamps, and caused frequent cases of anthrax. Many of the grass-cutters were women and their presence in the cantonments largely increased the amount of venereal disease among the troops. The system, moreover, admitted of practically no variation of the feeds. A committee which was assembled to consider the forage question in 1887 made the following remarks :—" The condition of the country is now so entirely different to what it was when possibly the evils of the grass-cutter system were less felt, that, whether the matter be viewed as a measure of mere justice to the agricultural

classes, or a question effecting the dignity of the State, the necessity for providing land where grass may be obtained, or of paying for the right of cutting it in particular localities, must be accepted." In the Bombay Presidency it was the practice for the Forest Department to hand over such lands as were necessary to meet the fodder requirements of British and Indian mounted corps. The harvesting was done by contract, which for many years in succession was held by a Parsee family who adopted the patronymic of " Grasswala " and who, having the entire monopoly, amassed large fortunes. In the case of the Indian Cavalry, there was constant collusion between the Indian ranks and the contractors resulting in enormous claims for compensation.

As cultivation increased in the vicinity of cantonments the difficulty of obtaining grass-cutters became more and more acute, and in 1882 the late Sir Herbert Macpherson, when commanding at Allahabad, conceived the idea of utilising the spare lands in cantonments which up till then had either been lying waste and unremunerative, or had been let out to zamindars for the cultivation of high crops. The latter system necessitated the presence of large numbers of undesirables inside cantonment areas, and was objectionable on military and sanitary grounds. The result of this experiment was entirely successful from every point of view. The cantonment revenues were increased by the payment of moderate rentals, the bare and dusty plains were shown with grass thus conducing greatly to improved sanitation, a variety of fodders was introduced, and the cost of the production compared very favourably with that of the old methods. Government, therefore, decided in 1888 to extend the system in the late Punjab and Bengal Commands, and gradually nearly every cantonment in those areas had its own grass farm. Indian Cavalry regiments were also allotted lands either within or outside cantonments, which they were expected to harvest themselves, State aid being given when necessary. The operations of the military farms were confined to meeting the requirements of British mounted units to the extent the lands sufficed, the balance, the mobilisation reserves and the supplies to Government transport animals, being met by contract. One of the chief advantages of the new system was the enormous hold it gave Government over the contractors, as it was recognised that there was very little demand for properly made hay in India outside military requirements, and once the contractors got hold of all the available fodder areas, they could, in many stations, make their own terms. The farms were administered by the (then) Commissariat Department, an officer being appointed in each of the two Commands to supervise the operations. The local grass farms were worked by station committees with a regimental officer as Secretary.

This system continued for some years, but it was found that owing to the constant changes of officers and their want of technical knowledge the fullest value was not got out of the lands. It was therefore decided to train selected officers and subordinates at the parent farm at Allahabad, and in 1899 the control of the farms was taken away from the Supply and Transport Corps and placed under the Quartermaster-General in India and a Farming Department was formed.

Policy.—The policy of Military Grass Farms is :—(*i*) To provide fodder for all Government animals in cantonments, both camping and marching. (*ii*) To supply and maintain fodder for War reserves according to sanctioned scales. (*iii*) To accumulate gradually in good years when fodder is cheap and abundant, a reserve of hay up to a limit approved by Government.

The conditions at present prevailing in regard to fodder are still the same as they were twelve years ago and the reasons why it is still necessary that Government should continue the actual production of fodder are broadly :—

(*i*) The production by Government of a portion of the fodder required by it enables it to maintain an effective control on the fodder markets of India and to obtain at cheap rates the fodder required by it to supplement farm produce.

(*ii*) The farms produce the best classes of fodder and in many stations without a farm it would be impossible to obtain the hay requirements.

Administration.—The general administration of military grass farms by the Director of Farms at Army Headquarters, under the Master General of Supply in India.

Organisation.—The present organisation comprises 10 circles :—Peshawar, Rawalpindi, Lahore, Quetta, Meerut, Lucknow, Bannu, Jubbulpore, Poona, and Bangalore.

Total number of farms 48.

Staff.—Officers are recruited from the Indian Army and must have less than 10 years' service—(strength 19).

European subordinates are military men transferred from British Units—(strength 49).

Indian overseers are obtained from Indian Units or may be civilians specially recruited—(strength 100).

Lands and Cultivation.—Lands are held permanently and temporarily leased and are situated both in and out of cantonments.

The areas for 1924-25 were :—

Permanent.		Temporary leased lands.
Within cantonments.	Outside cantonments.	
29,610 acres.	99,669 acres.	112,783 acres.

The chief aim and object of the cultivation of grass farm lands is the production of green grass and hay. The cultivation of fodder crops is justified and economical in order to clear and clean land; and when canal irrigation is available, also to provide green fodder for units when green grass is not available, or is insufficient.

Outside these limits it is preferable to purchase direct from the cultivators.

The chief fodder crops cultivated are :—

Kharif season .	. Jowar, maize, Rhodes grass and Guinea grass.
Rabi season	. Lucerne, oats, barley, shaftal and berseem.

Special success has attended the cultivation of *berseem* and five to six cuttings are frequently obtained giving an outturn of 20 tons of green fodder per acre.

Machinery and Implements.—*Steam Baling Presses* are used all over India for compressing fodder. The two types of plant in use are :—

Jessop's hydraulic press.

Howard's Dreadnought Continuous press.

The standard weight of a bale is 80 lbs. net.

Mowing machines are extensively used for cutting grass on lands level and suitable and to supplement cutting by hand. The types in use are Wallace's Thistle, and the Albion and Nerbuda mowers. One machine can deal with about 8 acres per diem.

The *Reaper* is also used for white straw crops and to expedite the harvest and will cut 5 acres in one day. Like the mowing machine they are subject to rough usage necessitating constant repairs. Allowing for depreciation, wages, repairs and lubricants they pay their way.

The reaper is not popular with the tenant, but it is recognised that their employment is necessary to supplement labour and that by cutting in time the loss of grain is minimised.

Threshing machines have been tried, but the imported type is not altogether suited to Indian conditions and although the grain is clean, the disadvantages are low daily outturn and clipped gram—the latter demands an allowance on the price and is unsuitable for seed, a serious handicap.

For cultivation the following implements are used :—

Barani land.	*Irrigated land.*
Sabul or Disc plough.	Rajah—Victory—Ceres or Meston ploughs.
Rajah or Disc plough.	Country plough.
Disc harrow.	Spring tine harrow.
Roller or cultipacker.	Peg or lever tooth harrow.
Spring tine harrow.	Plank (Sohaga).
Peg tooth or lever tooth harrow.	Seed drill.
Seed drill.	

The mould board plough is used for the initial ploughing.

The Spring tine harrow is used for fallow land during the hot weather to break up clods and conserve moisture after showers of rain.

The Lever tooth harrow—breaks up the soil and leaves a fine seed bed—of modern implements this is the most popular.

Quantities of fodder dealt with and cost.—

Year.	Produce.		Cost per ton.
	Tons.	Cost.	Rs.
1921-22	1,01,812	33,49,131	32·9
1922-23	1,06,104	33,60,633	31·6
1923-24	1,03,957	32,59,225	31·16
1924-25	1,03,230	31,13,960	30·16
Purchased.			
1921-22	166,304	90,07,898	54·16
1922-23	158,380	77,77,788	49
1923-24	103,041	47,86,049	46·44
1924-25	95,378	40,09,589	42

Total.

Year.	Tons.	Cost. Rs.	General supply rate per ton.
1921-22	268,116	1,23,57,029	46·1
1922-23	264,484	1,11,38,421	42
1923-24	206,998	80,45,274	38·85
1924-25	198,608	71,23,279	35·86

Conservation.—The large quantities of fodder required for annual consumption are stacked in specially appointed stack yards and thatched. In addition the fodder required on mobilisation has to be baled and is stacked in readiness at places where required. To minimise deterioration, baled fodder is stored as far as possible in corrugated iron sheds.

Silage.—Ensilage is extensively practised specially on dairy farms.

Green grass and fodder crops, large millet and maize are cut and chaffed during the monsoon period and put into pits or towers. The former is, in practice, as good as the latter and involves no initial expenditure. Horses do not, as a rule, care very much for silage, but they have been fed on it (part ration) with good results. It is, however, very much relished by horned cattle.

It is specially valuable in India for milch cattle and consumed chiefly during the hot weather months when no succulent fodder is available. The use of silage is essential to the economic working of a dairy farm. It can be stored for a considerable period and so can be preserved for consumption during seasons of drought.



APPENDIX.

Revised sale rates of dairy produce on Government Military Dairies, from 1st July 1926.

Dairy.	Milk per lb.			Butter per lb.		
	Government Institutions and Officers.	Troops.	Families.	Government Institutions and Officers.	Troops.	Families.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Northern Circle.						
1. Peshawar	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
2. Cherat	0 2 9	0 2 9	0 2 3	1 8 0	1 8 0	1 6 0
3. Khyber	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 8 0
4. Rawalpindi	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
5. Muree, Barain	0 3 0	0 3 0	0 2 3	1 8 0	1 8 0	1 6 0
6. Quetta	0 3 0	0 3 0	0 2 9	1 8 0	1 8 0	1 8 0
7. Sialkot	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
8. Bannu	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 8 0
9. D. I. Khan	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 8 0
10. Manzai	0 3 0	0 3 0	0 2 6	1 10 0	1 10 0	1 8 0
11. Razmak	0 4 0	0 4 0	0 3 6	1 10 0	1 10 0	1 8 0
12. Dalhousie	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
13. Kasauli	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
14. Dagshai	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
15. Subathu	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
16. Jutogh	6 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 8 0
17. Ferozepore	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
18. Lahore Cantt.	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
19. Jullundur	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
20. Ambala	9 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
21. Gamber, Sargodha, Jallo & Matsonabad.	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
Southern Circle.						
1. Lucknow	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
2. Cawnpore	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0

Revised sale rates of dairy produce on Government Military Dairies, from 1st July 1926—contd.

Dairy.	Milk per lb.			Butter per lb.		
	Government Institutions and Officers.	Troops.	Families.	Government Institutions and Officers.	Troops.	Families.
Southern Circle—contd.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
3. Agra	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
4. Allahabad	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
5. Jubullpore	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
6. Mhow	0 2 6	0 2 6	0 2 0	1 8 0	1 8 0	1 6 0
7. Deolali	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
8. Kirkee	0 3 0	0 3 0	0 2 6	1 8 0	1 8 0	1 6 0
Bombay Depôt	0 4 0	0 4 0	0 3 6	1 8 0	1 8 0	1 6 0
9. Belgaum	0 2 6	0 2 6	0 2 3	1 8 0	1 8 0	1 6 0
10. Aden	0 3 6	0 3 0	0 2 6	1 10 0	1 8 0	1 6 0

2. Cream at Rs. 1-8-0 per lb. to all at all dairy farms.

3. Prices for separated milk to be fixed locally by administrative officers. Cash sales to be at one rate only, which must be the higher rate or officers' rate.

4. Discount up to a maximum of 10 per cent may be allowed at the discretion of administrative officers in the case of bulk supplies of milk and butter to troops.

5. The sale rates for dairy produce charged to hospitals at Nowshera and Mardan with effect from 1st April 1925 are as follows :—

	Rs. A. P.
Milk	0-2-6 per lb.
Butter	1-8-0 ,,
Cream	1-8-0 ,,

Oral Evidence.

2565. *The Chairman:* Lieutenant-Colonel Marriott, you are Director of Farms of the Master General of Supplies Branch?—That is so.

2566. The memoranda which you have provided are before the Commission, and we are greatly obliged to you for the clear statement you have given us. I notice on page 339 of your memorandum on the Work of Military Farms in India you say that as a result of a certain committee's recommendations there is now a division as between the dairy farms and the fodder farms?—That is so. About 1910 the Government of India was not altogether satisfied with the organisation and the general economic working of these grass and dairy farms, and a committee, composed of Mr. Fremantle, who was then in the I. C. S., and Colonel Henderson, a military accountant, toured India, and as a result of their recommendations a separation was made, and we now work in two sections. One section deals entirely with dairy farms and the other entirely with fodder farms. We work throughout India in "circles," and before the time of this committee one officer had charge of a circle including both grass and dairy farms.

2567. I understand you are prepared to-day to speak for both portions of the work?—I am. I am, so to speak, the managing director of this fodder production and this big dairy business. It is a wholesale and retail business; that is what it comes to. So far as anything technical is concerned, I would ask you to be good enough to visit one or two of our more important farms.

2568. I notice you are strongly in favour of the Commission making such a visit if possible?—Very strongly. You would see more in an hour than I could tell you in a day.

2569. Would you care to make any statement in addition to what you have said in writing, or would you rather proceed now by way of question and answer?—I am not clear what impression the Members of the Commission have gained from this memorandum. As you will realise, we cater entirely for the needs of the army, but it is economic; the Government of India would never have sanctioned the Farms Department otherwise. In the case of the dairy farms, it is entirely lack of private enterprise which compelled the Government to initiate them all over India. They have been very costly in the past; we have had to pay for our experience.

2570. I think you make the whole position very plain in your memorandum. You plainly show there that owing to the absence of a steady demand for first class dairy produce there has hitherto been no sign of the production by commercial undertakings of such produce?—That is so. That is the crux of the whole matter. We have bought our experience rather dearly, but at the same time it had to be done. Since the War we have put our house in order, and the dairy farms are now on a commercially sound basis. We are actually paying a small profit and interest to Government on the capital invested in these farms. I should like to hand in copies of our last report for 1924 and 1925. There may be some statements in them which may interest the Commission.

2571. You have handed in copies of a document entitled "General Administration Report on the Working of the Military Dairy Farms and Dairy Farms Department, 1924-25"?—Just as a company would, I publish for the information of the Military Department a statement of the year's working of the farms. I am sorry last year's figures are not yet to hand, but this report gives you the main figures, more or less. Our trading account is shown on pages 36 and 37. That is the consolidated trading account for all our farms in India, which shows you under the different headings given on the one side our main items of expenditure and on the other side particulars of receipts.

2572. We shall have an opportunity of looking into those, and we are obliged to you for handing them in. There are one or two questions of a

somewhat more general character which I wish to put to you. Would you like to express any opinion about a recommendation of the Inchcape Committee of 1922, to the effect that the dairy farms at Karnal, Wellington and Bangalore should be transferred from the Military to the Agricultural Department, which recommendations were given effect to in July 1923?—I do not think they wished to rob us of any farms, but the Civil side was very short of money at the time, and Bangalore was a very well-organised farm which afforded every facility for initiating a school for students of dairying and agriculture. There seemed, therefore, to be no alternative but to hand it over. The handing over of these farms did not affect us so far as our department is concerned; they were handed over on the specific condition that demands for milk for hospitals and for officers and men and their families should be met and no change made in the rates without reference to the Military Department.

2573. So far as the supply of dairy produce to the troops goes, the position has not been affected?—No. They are getting their produce. They are not supplying it so cheaply as we are in other places, however. We can now sell dairy produce cheaper than they can, and that is a rather important point.

2574. Does that mean the army is paying more for dairy produce from these farms which have been handed over to the Agricultural Department?—They have not increased their rates, but we have decreased our rates on other farms. The Bangalore farm is the most expensive by comparison and sells its produce at the highest rates.

2575. How many farms have you still in your hands?—I have at the present moment about 24 dairy farms, and we have a certain number of young stock farms.

2576. Is there any touch maintained between yourselves and the Agricultural Department with regard to the results of your breeding experiments, so far as the farms still in your hands are concerned?—Yes. We met last year at the Agricultural Conference at Pusa, and there we were asked our experiences of cattle-breeding and what had been the result of our experiments in the importation of bulls. The results are more or less embodied in this memorandum on Herds and Breeding Policy. One of our greatest handicaps, as you will probably realise, has been the impossibility of going into the open market and buying a pedigree cow. That difficulty existed when we started thirty odd years ago, and it still exists. That is why we have had to resort to breeding on such a large scale.

2577. Is it possible, in the state of efficiency at which you have arrived, to sell dairy produce to the public at a profit?—We are not allowed to. I am afraid that would be a difficult question to answer. To start with, it is very significant we have not had a demand for an ounce of milk from a single soldier in the Indian Army. It is beyond his price. We cater entirely for Government institutions, hospitals, institutions in barracks and officers and soldiers and their families. The only indication we have had of a demand from the public is at Lahore. Last winter we had to send a cart from Lahore Cantonment to Lahore, and we had several letters afterwards from Indian gentlemen of the standing of barristers and so on, civilians of that class, asking if we were prepared to sell to them.

2578. *Professor Gangulee:* Do you give concession rates to the families of British troops.—Yes. We have three rates.

2579. *The Chairman:* They are in the memorandum?—Yes. When you see one of our dairy farms you will realise at once that doing things in that style you cannot expect to sell your produce at the same price as a man in the bazar who has no capital expenses. Delivery at a man's doorstep twice a day is impossible, but unless you can bring the rate down to the bazar rate you get the hawker coming round who is prepared to sell to them. That is the real reason why we have to continue this concession to the families of married soldiers; people of that class are always prepared to take a risk if they can save a rupee or two a month.

2580. Has there been any proposal or suggestion to transfer those dairy farms which are under military control at present to the Civil Agricultural Department?—There has been no serious proposal that I am aware of.

2581. There has been no substantial proposal of that sort?—No, it has not come up. The matter has been mooted. As a matter of fact, the Imperial Dairy Expert did demi-officially put up a proposal to that effect 3 or 4 years ago.

2582. Is it your view that under present conditions the whole potential value of the dairy farms under military control in the matter of experiment, research, demonstration and propaganda can be made available for the public benefit?—They are open to the public at any time without restriction. We are only too glad to welcome anybody, whether an official or a private person.

2583. Have you any view which you would like to express as to the advisability of the transfer of some or all of the military farms to the Civil Agricultural Department?—I cannot see any particular object to be gained by it. I should certainly never recommend it to my own authorities. We have spent a great deal of money on organising our farms and buying our experience, and we know we can work our farms economically and sell our produce at a reasonable price. The farms are open to inspection, as I have said, by officials or private persons at any time.

2584. If it were possible by leaving the farms under military control to make further and wider use of them for the purpose of experiment, research or demonstration, and even perhaps for the purpose of attempting to encourage a public demand for a higher quality of dairy produce, would you look with favour on such a scheme?—You mentioned experiments. In my experience, that means money; you cannot make experiments without money. If, as Government insists, these dairy farms have got to attain financial equilibrium, we cannot indulge in experiments without losing money and so the private soldier will have to pay for it. There must therefore be a grant for experiments, but there is no reason why any of our farms should not be used. I should strongly recommend placing any one of them at the disposal of the Civil Agricultural Department, if they were prepared to pay for a particular experiment.

2585. You have described the circumstances in which certain of the dairy farms under military control were handed over to the Civil Agricultural Department. Can you tell me how it was those particular farms were chosen?—We chose Bangalore because it was rather out of our beat. It is situated in the south of India. Our next nearest dairy farm was Belgaum, so we thought if we had to give one up we might as well give up Bangalore. It suited the civil requirements exactly, and we thought it would be both gracious and generous to do so. Bangalore and Wellington went together. As regards the farms in the north, they first of all asked for Lahore. We opposed that, because Lahore is a very central farm. We have now a chain of these dairy farms from Lucknow to the frontier, and if one of the best in India were taken away it would break that chain. These farms are co-operative; they transfer cattle and produce; and to take the most important of them all away would have interfered with our organisation.

2586. What do you mean when you say they transfer produce?—If one farm happens to be short of butter it wires to the next for, say, 100 lbs. Lahore might get a sudden demand for milk from a hospital and be unable to supply it all; it would then wire to the next farm for milk. That does not often occur, but it happens sometimes. In the end we offered them Karnal, which suited them and which is not really a dairy farm but more a cattle-breeding farm.

2587. I asked you this morning about demonstration and research in relation to the taking over of the military farms by the Civil Agricultural Department, and my question was directed to get from you whether you thought that more use might be made of the military farms for the purpose of research and demonstration without their being transferred from military to civil control?—These farms are now part and parcel of the organisation

of the army in India. The medical authorities are very strongly in their favour; even if we were to propose giving up any which were not paying, they would oppose it strongly. We should be only too pleased to co-operate in the carrying out of any experiments; only if they were costly we should expect a grant to cover the cost.

2588. You have made that plain, I think?—Were you not also referring to the possibility of expanding our trade?

2589. I alluded to the possibility of your expanding your sales to cover demands from the civilian population where a demand could be created, with a view to attempting to encourage a demand for high-class dairy produce for the good of agriculture generally?—Yes. That, of course, is opposed to the present policy. When these dairy farms were initiated it was distinctly understood there was to be no direct interference with private enterprise, and it was ruled that where we had surplus produce we could sell to a member of the I. C. S. or any other Government servant, but that was all. We were not allowed deliberately to go into the open market and open a depôt. Take Lahore, where there was an indication of a demand from the better-class Indian public for a guaranteed supply of dairy produce; I could not open a depôt at Lahore. If I did, I am convinced I could sell a lot of dairy produce. Again, our dairy farms are not designed to expand so very appreciably as that. All these dairy farms have been designed and built so as to produce a certain amount of produce for a particular garrison.

2590. I understand that. I do not know if you would care to add for the benefit of the Commission any views on the breeding policy that you have adopted, in addition to what you have set down in your very clear paragraphs dealing with that?—I do not think I have anything to add. What I have set down in my memorandum is what I stated at the Agricultural Conference at Pusa last year, and it was backed up by the Imperial Dairy Expert, Mr. Smith, who will probably give you evidence on the same subject later on. There is just one point I would like to explain. We have been rather forced to this breeding of half-breds or cross-breds. We only look on it really as a short cut to milk. We have discovered our most economical animal is undoubtedly the cross-bred, the product of an imported bull and a pure-bred country cow. We have proved conclusively by records that such a cow produces the best milk, keeps conformation and stamina, is a good doer and a really economical animal. As we have to produce milk for the army in India as cheaply as we can, we naturally go for what is considered the most economical animal. To keep up this strength of half-breds, however, we have naturally to keep up a large number of country-bred cows, and as we cannot buy a country-bred cow in the open market with any pedigree we have to breed both. From the last page of the Administration Report you will see that at the end of 1924 and 1925 we had 1,139 cross-bred cows and 1,214 country-bred cows. We have practically half and half.

2591. Are all those 1,139 first crosses?—No; we have still a fair number of three-quarters; we have not been able to eliminate them, and as a matter of fact what we have is really the residue of a large number which we had to cast.

2592. All your experience goes to show that the first cross is the best animal?—She is a really economical animal.

2593. As regards your military grass farms, is all the fodder that you handle grown on the land that you control?—No. Our policy is to produce where it is economical or where we have the facilities, and to buy the remainder. Our total requirements of fodder for the army in India in 1924-25 were 212,809 tons. We produced 103,000 tons and purchased 95,000 tons. It is approximately half and half. There are, of course, many places where we cannot produce. We have very large issues of fodder on the frontier. At frontier posts like Quetta, Fort Sandeman, Razmak and even Peshawar, if we wanted land we could not get it without being unfair to the local zamindars,

and to dispossess them in any of these places where land is so valuable and scarce would be to cause an outcry.

2594. What I was really concerned to discover was whether you made any hay or ensilage of bought grass?—No. We might make, in places, ensilage of bought crops such as millet, the common *juar*, which grows so well in the monsoon. If we were short on our own land we might go into the market and buy a few tons of it, chaff it and put it into a silo pit, but ordinarily we make our own silage from our own produce.

2595. Have you found that the practice of ensilage making and hay making that you carry on on your own farms has interested local cultivators in the neighbourhood?—No, I cannot say it has. Hay making is entirely foreign to the Indian and does not appeal to him at all.

2596. What I was concerned to discover was whether the fact you were prepared to buy and were daily demonstrating what you were doing did not encourage local cultivators to copy your methods and sell the result to you?—No, I cannot say it has had that effect. Even during the War, when our demands went up to such huge proportions, we had in the end to fall back on the Forest Department as an agency to get our stuff. What little local grass is available they either cut green and sell, or graze it for choice.

2597. What is your experience as between hay and ensilage as food-stuffs?—Ensilage we use entirely as a substitute for green fodder in the hot weather. This being such a dry country in the hot months, it is very expensive to cultivate crops. We have to irrigate constantly, and we are short of land in many places. The only way we have of getting a green ration for the cow is resorting to ensilage. We do not, of course, feed a full ration of ensilages probably in the hottest months we feed them half and half, or two-thirds ensilage and one-third hay. They always get a proportion of hay with the ensilage.

2598. Which type of food do the animals go for first?—They are very fond of ensilage. There is no doubt about it; in the hot weather they appreciate anything green, but they eat the hay too.

2599. Is there anything you wish to say about the quality of forage made from grass grown in forest areas? Have you any experience of that?—We only resort to the forest areas in case of emergency or heavy demand. During the War, for instance, without the help of the Forest Department we would never have got the quantities of hay we wanted; but under normal peace conditions we are independent of them. Of course, their hay is naturally rather coarse on the whole, but when you are forced to get something it does all right.

2600. *Mr. Calvert:* I have heard the complaint (I cannot tell you its source now) that you buy some of the highest yielding cows, and by crossing you take them away from the country's stock of good cows. Your cross-bred cow in time ceases to be in milk?—There is truth in that statement, but so far as robbing the country goes it may interest you to know that in the last two years we bought exactly 8 cows, so I cannot see how we have affected the Indian market in any way. We have worked up our herds so that we breed sufficient country cows for our own stock to cross with the English bull.

2601. So you are not interfering with the attempts to establish these pure herds of cows?—No; I do not think the purchase of 8 cows would affect India in any way. This year I am going to buy a few more, 40, in fact, but I do not think that will affect the position either.

2602. In answer to the Chairman, I think, you said you welcomed visitors to these dairies?—Very much.

2603. We have to thank you for your very great courtesy in allowing our co-operative staff to visit you?—We are only too pleased.

2604. Does that apply to any visitors?—As far as I am concerned as Director I should welcome anyone, and I think our managers would too.

2605. *Professor Gangulee:* These military farms are considered to be the first organised attempt in India to run the dairy industry on a large scale?—Yes; I think the answer is certainly in the affirmative.

2606. Having in mind, therefore, the pioneer nature of the work undertaken by the military dairies, can you tell us what assistance you have obtained in the past from the Department of Agriculture?—I think we have been working independently, because until they started their Pusa dairy I do not think they had ever treated the subject seriously.

2607. It has been asserted by the Agricultural Adviser that cattle-breeding operations in India were started about 25 years ago?—I think our first dairy was started about 1890, 36 years ago.

2608. In planning out your farming operations, do you receive any useful help and suggestions from the results of experimental researches being conducted in India?—I think we are going to get some useful help from the chemist working on nutrition values of foods at Bangalore. We have had enormous assistance from the Muktesar laboratory; as I told the conference at Pusa last year, what used to be an absolute nightmare to us is now nothing; we do not mind rinderpest at all now that simultaneous inoculation has been introduced.

2609. Then you have got help from veterinary research?—Great help.

2610. But not from the Agricultural Department?—I would not say that. Anything we refer to them they are only too glad to help us about. If we want to know anything about a particular fodder crop we write to Pusa or Lyallpur. They have always assisted us.

2611. Is that of recent origin?—We have been dealing only with the simple, staple fodder crops of India. As far as crops go, we have not had any deep questions of research.

2612. It is not only with reference to the fodder crop but to cattle-breeding, I want to know what assistance you received from the Department of Agriculture?—Since the Pusa herd has been established we have interchanged bulls, and things of that sort, and both my Assistant Controllers of Dairy Farms have visited Pusa and seen the herd and learnt certain lessons from seeing their methods there.

2613. Do you conduct any experiments or trials on your own farms?—Beyond breeding experiments, I do not think we have. We have merely worked straightforwardly, our object being to produce milk and butter as cheaply as we can.

2614. You have attained this stage of efficiency or excellence without any experimentation either on farms or in laboratories?—You must remember the dairy farms have cost Government a quarter of a million pounds, and a lot of that has been spent in experimenting in cattle, crops, buildings and so on. We have bought our experience in the last 35 years.

2615. Through a definite series of experiments?—We have spent a lot in reclaiming land, cropping it and so on.

2616. Has the management of the farms been in your hands since the start?—I have been administrator of these farms for the last four years.

2617. Are the men at the head of these farms trained men?—I have 3 whom I may call expert dairy farmers, we call them Dairy Experts. One has been with us for a long time; he started life in the colonies, and came to us with a certain amount of knowledge. The second is a younger officer who came from Australia armed with diplomas; he has a lot of technical knowledge. The third has worked his way up; he has served his apprenticeship in the Farms Department itself.

2618. With regard to your breeding work, I was greatly pleased with your short summary in the memorandum you placed before the Commission. You have dairy farms in various centres. Do you follow a clear-cut policy as to the classes of stock maintained and breeds kept?—Yes. Every farm has a breeding policy of its own. Some farms do not breed at all; Kirkee does not breed an animal. I keep nothing there but half-breds and cross-breds. It

was so costly in the past it did not pay, so now ... draw entirely on some other farm.

2619. Have you a herd register?—Yes, for our pedigree animals.

2620. After all these years of experience of dairy management, could you indicate the direction for realising your motto "Feed and breed" in other dairy farms of the country?—When it comes to breeding, I think if you could only get some of the big landlords and Princes to take an interest in it it would spread, but until you do that I do not see how you are going to get pedigree herds in this country, unless Government are prepared to come into it and buy huge blocks of land.

2621. I entirely agree. Do you employ a large number of agricultural labourers on your farms?—A large number.

2622. Do they all come from the neighbouring villages?—In the harvest season we have to import a large number. That is one of our most difficult times, October to December. We have to import large numbers on our grass farms from the United Provinces, where labour is generally most plentiful. Otherwise, we always have the minimum number housed on the premises. That is for everyday work.

2623. They do not all come from the neighbouring villages?—A certain number do; the practice varies on different farms. The number varies according to the size of the farm. We give them quarters and they live on the premises and are detailed each morning for specific jobs.

2624. Do they possess any land themselves?—I should very much doubt it, judging from their standard of living.

2625. Do you notice any change in the matter of fodder cultivation and dairy management amongst the farming population in the neighbourhood of your farms through your example?—No, I cannot say I have.

2626. You would agree with me, I take it, that good farming in a sense is infectious, just as bad farming is contagious? The point is this. One would imagine that a farm carrying on the dairy business and doing it well and growing good fodder would infect the people in the neighbourhood. Is that your experience?—No, I cannot say it is. Most of our farms are cantonment farms, and taking it all round, especially in the north, the standard of cultivation is very high in the neighbourhood of cantonments.

2627. In some farms you are trying to grow lucerne. I am interested in that particular crop. What success do you have with lucerne?—We do not grow a tremendous lot of it; we find it rather an expensive crop. We find we get more bulk out of other fodder crops. We like lucerne on our grass farms because it is a fodder relished more by horses than any other.

2628. It has more nutritive value?—The crop we have had most success with is Egyptian clover, especially in northern India. It is a common average to get 20 tons an acre.

2629. Do you practise intensive manuring?—Yes, certain plots are always down to intensive cultivation, and those are always heavily manured.

2630. With cattle dung?—Yes.

2631. What quantity of fodder do you buy from the Forest Department?—In ordinary times, nothing. Dehra Dun is the only farm I can think of where we lease a few forest blocks from them. We do the cutting and the harvesting.

2632. With regard to cattle diseases and young stock, I notice in your list of diseases you do not mention blackquarter. It your young stock susceptible to blackquarter?—No; we have never had any cases. The list you see here is taken from the veterinary statistics of all-India, because of course any disease we have is at once reported to the local officer of the Royal Army Veterinary Corps, and he takes the whole thing in hand.

2633. I find foot and mouth disease is bad?—That is always with us; there is hardly a month in the year without it.

2634. What do you do with cattle affected with that disease?—They are isolated and their mouths are washed and they go through a bath. They recover in about a fortnight; it is an exception to get a death.

2635. You do not slaughter them?—Never. It is exceptional to have a death. We look on it as a matter of course; it is always with us; you cannot stamp it out. As long as it is rife throughout India little can be done; cattle must pass our farms from the districts, and our bullocks must go out at times; they probably bring it in as a rule from the public roads.

2636. Are you aware of the intensive measures taken in Great Britain to stamp out this disease?—Yes, but I think the conditions in Great Britain and India are different.

2637. *Sir James MacKenna:* What is your experience of second crosses? —Do you mean half-bred and half-bred?

2638. A half-bred heifer and a pure-bred bull?—We have had a certain number, and what we find is this: the percentage of failures is greater than with the half-bred. With the half-bred we can count on 99 per centum being economical animals, and so we have rested content with that.

2639. It looks like a predominance of the father?—Yes.

2640. It rather peters out in the second generation?—Yes.

2641. Are all your herds inoculated on the simultaneous inoculation method?—Yes. Every year on every farm the veterinary officer of that particular district arranges with the local farms officer for animals that have not been inoculated to be inoculated.

2642. Simultaneously?—Yes, always.

2643. Do you find any difficulty in the application? Have you any bad reactions amongst the cattle?—In the list to which I have already referred to it is shown that we have had 113 cases of rinderpest. That is abnormally high, and for 1925-26 I do not think it would be 20. That was entirely due to cases of pyroplasmosis resulting.

2644. Do you carry out any systematic investigation of fodder crops?— With regard to their nutritive value?

2645. Yes, and the introduction of new varieties and so on?—This year, as a matter of fact, I have imported a number of varieties of heavy-yielding fodder oats from England. One of my officers has been to Reading for a course of six months, and we have got him interested in this subject and are experimenting with this. We have been doing this sort of thing in a mild way for the last few years, but this time we are going to go about it a little more seriously.

2646. The results of these experiments will be valuable to the agriculturist? —I believe those we are going to do now will be. There is an officer in charge of it and everything will be recorded properly. In the past experiments have been a little too haphazard to justify publication.

2647. To that extent, of course, your results would be transmitted to the Agricultural Department and probably save duplication?—Yes.

2648. *Sir Henry Lawrence:* Is it the policy of your department to supply all the milk requirements of the Army, or what proportion do you suppose you are now supplying?—Are you talking of dairy produce or fodder?

2649. I mean dairy produce, milk?—No, we certainly do not, only in certain stations where it has really been found necessary to establish a military dairy. We probably should have had more, but the dairy farms were losing such a lot a few years ago that they absolutely refused to go on with them until we had really obtained financial equilibrium.

2650. About what proportion of the necessary supply are you able to provide in those stations where you have these dairy farms?—We do everything; where a Government dairy farm is established, the troops have to deal with the farm.

2651. And you supply the whole of the milk that they drink?—The whole of the milk and butter. I am talking of British troops; the Indian troops are independent.

2652. Then you do not propose to extend your operations further?—I will not go so far as to say that; we opened a dairy farm in Norshera last year, but the policy is rather, if we extend, to extend in the north rather than the south.

2653. At the present moment you are running them at a profit?—We are making a profit now.

2654. Apart from capital depreciation?—We have a depreciation reserve fund from which we meet our requirements and casualties. The Government have now allowed us a reserve fund. We have a *pro formâ* account with the Government in which we put our profits, so that in the event of a bad year we do not have to advance our prices.

2655. Then in addition to giving pure milk to the army in these places, you are carrying out certain experiments and showing the value of selective breeding?—We have one herd which I think you will be very interested to see; we have the Ferozepore country-bred herd which has been going now for the last 16 or 18 years; that is a pure country-bred herd and the records are very interesting; they are very economical animals.

2656. From this very interesting table of yours on page 9 of this report I see that with a much smaller herd you have been able to increase the cows that give over 4,000 lbs. of milk per annum nearly five-fold, and, over 5,000 lbs. nearly ten-fold, over 6,000 nearly twenty-fold?—I put that in purposely to show what progress had been made since 1912-13 with our breeding experiments.

2657. It is very striking progress indeed?—I think it speaks for itself; that is one of the reasons, of course, why we were able to work financially so much more successfully.

2658. I think we may congratulate you on this table. Now take your best animals, how do they compare with the milk-yield of good milkers in the United Kingdom? What do you hope to rise up to?—Well, of course, what we hope to do is to get our largest number between 4,000 and 5,000. At present if you notice, in 1912-13 our largest number of animals was between 1,000 and 2,000 lbs. If you look at that table you will see how we went to work; I think myself in another few years we ought to predominate in the 4,000 to 5,000 lbs. grade. At present we predominate in 3,000 to 4,000 lbs.

2659. That is I think the result of cross-breeding and selection?—Yes. We are now practically breeding all our country cows for these cross-breds; we have to keep a large number of country cows, of course, milked in the ordinary way.

2660. For this herd of 1,500 cows how many English bulls do you maintain?—We had 48 pure-bred bulls last year. We had 18 casualties; we had rather a bad year; a lot had come out all together and had got useless, so we had a big condemnation. 6 have just come out now. We are getting British Friesian at present.

2661. You selected Ayrshire and Friesian?—We are buying entirely Friesian at present.

2662. Have you experimented with other breeds?—In the past we experimented with Shorthorns but we found the Friesian stock in Lucknow are the best.

2663. Have you enough data to compare over a period of years to show that the Friesian is really the best mate for cows in India?—I will not say that because we have not been going long enough, but I think the Lucknow experiments justify our going in for them rather more extensively. We shall in a few years be able to compare the two.

2664. What about other breeds at home?—We stuck to the Ayrshire for so many years, and in the past we had such a conglomeration of mixtures of breeds that we do not want to add to them.

2665. The selection of the Ayrshire in the first instance was an accident, was not it?—No, it was on the direct recommendation of Mr. Smith whom we originally got out as a Dairy Expert of the department; he was a Scots-

man, he had had a good deal to do with Ayrshire, and I think his recommendation was a very sound one. The first two or three lots we got out were remarkably good; they gave us very good results.

2666. But before Mr. Smith's day were there any experiments to show which were the best?—No, they were never kept.

2667. How long has he been out?—I think he must have come out about 17 or 18 years ago.

2668. Then on page 345 you mention the outbreak of rinderpest, 113 animals; were those animals which you lost?—I am sorry to say the veterinary report did not give the number of deaths; but looking back, as far as I can remember, the percentage of deaths was about 25 or something of that sort.

2669. Is that in spite of the application of the serum-simultaneous method? —Well, as I was telling you, something went wrong with the brew that came down from Muktesar; but we have had practically no cases in the last 18 months.

2670. *The Chairman:* Was there any suggestion that the outbreak of rinderpest was produced by the inoculation?—Yes, that was the whole trouble; there was something wrong with the brew. You must have an accident occasionally; it was the only big one we have had.

2671. *Professor Gangulee:* Have you gone into that carefully and traced the origin?—It was dealt with by the Director of Veterinary Services, because his officers were concerned in respect of their professional reputation. They went into it very carefully. Of course, a lot of it was between themselves, and we did not ask any questions.

2672. *Sir Henry Lawrence:* The expenditure of your Department is roughly 30 lakhs on dairy farms?—Yes. I think we were nearer 35 lakhs this year. The turn-over for our dairy farms is about 35 lakhs.

2673. You get that all back with a little profit now?—Yes, as things are going at present we are working at a profit of about a lakh after paying interest to Government.

2674. *Sir Thomas Middleton:* In answer to Sir James MacKenna you indicated that the three-parts bred animals were not satisfactory. I think you were referring to three-parts Ayrshire: that is to say, the Ayrshire bull on the half-bred Ayrshire heifer?—These three-quarters and seven-eighths were all the Ayrshire bull again on the half-bred and the three-quarters, and so on; it was the re-introduction of further English blood.

2675. They were unsatisfactory, I understand mainly because the constitution was bad; they could not stand the climate?—That was the chief reason, yes.

2676. You have not yet had experience with the Friesians sufficiently long to enable you to determine whether the three-quarter bred in that case is also constitutionally weak?—The answer is No, because when all is said and done, we have got a few in Lucknow which I hope you will see later. It was not quite fair to judge the experiment on them alone.

2677. Is the climate in which many of your farms are situated very different from the climate in South Africa in which the Friesians do so well?—I have never been to South Africa. In the Punjab and United Provinces the temperature is up to 115 and 118 for certain weeks of the year; I know these English bulls got rather tucked up during the first year or so.

2678. Your Friesians have come direct from England, not from South Africa?—We got them from the British Friesian Society.

2679. There are a number of technical points which we shall be able to go into when we visit the farms; I do not think I will take them up now. You have given us the area, the produce and the cost per ton of fodder. Am I right in thinking that these costs refer to baled hay in every case, that ensilage is not included at all there?—I have got the statement you want; "Quantities of fodder dealt with and cost." That includes everything.

2680. Ensilage as well as baled and dry fodder?—Everything we produce, and in the cost of production is included a share of overhead charges.

2681. I wanted to get the cost of the hay, it is mixed hay and ensilage?—On our grass farms I suppose the percentage of ensilage is not 2 per cent.; we make very little ensilage on our grass farms, because it is entirely for Government horses, and we have not yet educated the Government horse up to eating it in any quantities; it is negligible compared with 100,000 tons.

The answer is that this refers to dried fodder really; the ensilage is negligible.

2682. *The Chairman:* There is no green fodder in those figures?—If you look at statement 8 on page 20 of the Administration Report, you will see the actual quantities and varieties of fodder issued. The quantity issued in 1924-25 is only 1,100 tons, hay was 110,000 tons, and green grass was 24,000 tons.

2683. That is all in the figure mentioned by Sir Thomas Middleton?—Yes, we have to bring everything down to a common basis, and everything is to a scale; we have a scale of equivalents for every class of fodder for the different times of the year.

2684. *Sir Thomas Middleton:* Because there is shown here the quantity of dried material?—That is all.

2685. It does not include ensilage?—No, it includes the equivalent. It includes every class of fodder brought down to what we call a hay basis. If you want to find out the cost of ensilage on any farm, you have to go to that farm's particular accounts, because from the administrative point of view the Government are quite satisfied with this, and I do not know that it would help them much to say that ensilage had cost so much.

2686. I do not question the method of setting it out; I only wanted to know exactly what it was.—Everything is brought down to a common denominator or basis.

2687. *Dr. Hyder:* Have you ever been in command of Indian troops?—I have been in an Indian Regiment.

2688. Do they drink milk?—They are great milk drinkers, they drink all they can afford to buy as far as I can see; but they keep their own buffaloes as far as I can make out; it is a regimental concern entirely.

2689. Not in the lines?—Well, they buy it from the bazar.

2690. At present you do not supply any milk to the Indian units?—No; I should be very pleased to.

2691. I cannot see the reason for your statement that there is no demand on the part of Indian troops. Look at your table giving the prices per lb. of milk. If I take Peshawar as being the most important, your rate for the troops is annas 2 and pies 6 and the same rate at Allahabad and Lahore?—Those plain stations are practically all the same; those are flat rates.

2692. A pound is equal to one-half seer, is not it?—That is annas 5 a seer.

2693. What price does an Indian pay when he buys milk from outside? He must pay annas 5 or more?—I cannot tell you; but even on the frontier where they have not got the local *gowala* to resort to, they will only take milk from us when we reduce the price and have it surplus; I do not know why it is.

2694. Does the Indian soldier buy it at annas 3?—I do not know what the explanation is, but they make regimental arrangements for their milk supply; I presume the men are satisfied and I presume they get it cheaper. There is certainly no demand on our military dairies.

2695. *Mr. Calvert:* Up to quite recently the Indian soldier was not given rations and the British soldier was. It is only recently you have been giving rations to the Indian soldier, and if the rations given to the Indian soldier do not include milk, it does not come from you?—But the British soldier pays for his milk.

2696. Is it not included in rations as well?—No, he has to pay hard cash for it; he gets no milk in his ration.

2697. *Dr. Hyder:* I find from the Administration Report of your military grass farms that the price per ton of the fodder which you produce is Rs. 30, whereas the cost per ton of the supplies you purchase is about Rs. 40. There is a difference of Rs. 10. Do you not think that is an important matter? What obstacles are there as regards extension of your military farms?—It is a question we have gone into and it is a question which the Braithwaite Committee took up. That was the Committee that preceded the Inchcape Committee. The remarks of the Braithwaite Committee were accepted by the Inchcape Committee. They said: "We are satisfied that fodder is produced economically on the Government grass farms, but we are not prepared to recommend such extension of their operations as would more nearly meet the fodder requirements of the army. Our reasons for this opinion are that in most places where extension is economically possible the demand is at present adequately met, and where extended operations might be desirable it is impossible to obtain the land required." Now that applies largely in the north of India where we have very large demands all along the frontier.

2698. It is perfectly true that perhaps you could not acquire land in such insecure areas, but what difficulty would there be in having your farms in the canal colony areas, where your best depôts are?—But if you can buy the same class of fodder locally, you save all the cost of baling and handling. The moment we start to handle it, up leaps the price.

2699. Freight would be Rs. 10 from Lahore or any other military grass farm you have to any point on the frontier?—It would cost far more. Rs. 10 a ton, at 28 maunds to the ton, would only be about annas 6 a maund. To bale fodder alone costs you annas 10, because you have to wrap it, and for hay it is annas 4 a maund.

2700. *The Chairman:* Do you have to wrap it?—Yes, it is chaffed straw; it is threshed on the ground in the old fashioned manner. If you have to handle it and send it a long way, all the corners and edges go and you have lost 15 per cent. by the time you can issue it.

2701. *Dr. Hyder:* I find from your Administration Report that in the Orders of the Government of India prescribing the rates for the sale of your produce you have certain rates for officers and Government institutions and also for the general public. In reply, I think, to the Chairman, you said there was no demand on the part of the general public in urban areas?—Are the words "general public" mentioned in these reports?

2702. Yes, if you look at page 11, the appendix, paragraph 2?—Of course that was put in because I will not say we have not sold a little where we have a surplus; but it is not the practice to do it, and it is only done where there is no question of anyone engaged in private enterprise taking exception to it. For instance, I will give you a case in point; we were supplying Falletti's Hotel in Lahore. Granted, a large number of military officers were living there, but the majority were the public. Mr. Falletti came to me the other day and said: "Mr. Keventer is opening in Lahore, we must drop your trade." I said: "Certainly, of course you must." In that case we should have been interfering with a man like Mr. Keventer who does conform to a standard more or less like ours. If we had tried to induce Mr. Falletti to continue patronising us it would have been a direct infraction of this principle.

2703. Are his rates the same as your rates?—We can generally undersell him, but then he has to make a bigger profit.

2704. *The Chairman:* I will put these questions on behalf of Sir Ganga Ram. At present you destroy or give away the fresh-born calves. Is it possible for you to keep them for one month, so that zamindars could take them away; you may charge them annas 8 per day and zamindars would be glad to take them? This will improve the general breeding of the cattle throughout the country?—As far as destroying calves is concerned, we destroy no calves; we give them away and a certain percentage die, but the

majority are given away. As regards rearing a certain number of animals at annas 8 per diem for zamindars, I should be very pleased to do so, provided you guarantee that the particular zamindars will take them away when they are ready to go.

2705. Do you give salt to the cows? How much salt do you consider necessary for them?—We do, a quarter of an ounce per diem is the ration.

2706. *Dr. Hyder:* Every day?—Yes, it is mixed up with the ration.

2707. *The Chairman:* In the Military Department you keep a reserve stock of pressed *bhoosa*. Is it possible to make use of the scientific method of ensilage for keeping the stock of *bhoosa*? Have you ever tried the Agriculture Department to show you the method of ensilage?—The Military Department keep up a very large stock of what we call mobilisation reserves of fodder. I am not quite sure whether Sir Ganga Ram is referring to that. It is 12,664 tons. That is compress of hay and white *bhoosa*. That is kept, of course, for war purposes; it must be baled, it must be ready to be moved about at a moment's notice. Any question of putting it in an immobile state would be impossible.

2708. There is a question I wish to ask. Can you give us the cost of inoculation by the serum-simultaneous method;* does it happen to be included in those figures?—This is a copy of the standing orders. I rather think it is in this. We pay the price fixed by the Government of India to the Muktesar Research Institute for so many doses which we indent for, and the rest is practically done free by our own staff and an officer of the Royal Army Veterinary Corps. May I ask if you could arrange to visit two or three of our more important farms?

2709. I could not commit myself to-day; I think you may take it we will do so if possible?—May I suggest three stations, Jubbulpore, Lucknow and Lahore. Jubbulpore is the centre of the administration. At Lucknow you could see some of these very interesting half-breds and three-quarter breds which I think Sir Thomas Middleton would like to see. Lahore is one of our best farms. I should very much like to take down two or three Commissioners to Ferozepore to see the pure-bred country herd.

(The witness withdrew.)

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* Annexure.

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ANNEXURE.

Cost of inoculation of cattle against rinderpest by the serum simultaneous method.

1. The cost of serum is 3 annas per dose of 5 c.c. at Muktesar. *Add* 5 per cent for bottling, packing and freight, the cost per dose is 3 annas 2 pies.

2. Doses of serum for different classes of animals and cost are:—

Class of animals.	Doses of serum in c. c. per 600 lbs. body weight.	Cost per animal.
		Rs. A. P.
Pure Ayrshire and Holstein	250—300	11 14 0
Half-breds	125—150	5 15 0
Country-bred Sindhi	60	2 6 0
„ „ Sahiwal	40	1 9 4
„ „ Hariana	30	1 3 0
Buffaloes	60	2 6 0

सत्यमेव जयते

Mr. D. G. HARRIS, C.I.E., Deputy Secretary to the Government of India, Department of Industries and Labour, Public Works Branch.

Memorandum on Irrigation in India by Mr. W. Roche, Offg. Deputy Secretary to the Government of India, Department of Industries and Labour (P. W. Branch).

Irrigation Statistics.

The growth of irrigation in India can be best illustrated by the following figures showing the area irrigated from Government works for each of the trienniums 1901-04, 1911-14, and 1921-24:—

Average 1901-1904, 20·41 million acres.
" 1911-1914, 24·24 " "
" 1921-1924, 27·47 " "

The maximum area recorded was in 1922-23 when 28¼ million acres were irrigated. Statistics are available up to the end of the year 1923-24 and show that the total length of main and branch canals and distributaries then in operation amounted to some 67,000 miles. The total capital outlay (direct and indirect) on productive and unproductive irrigation works amounted to Rs. 8,385 lakhs. The working expenses during the year 1923-24 amounted to Rs. 355 lakhs while the estimated value of canal irrigated crops in that year was Rs. 147½ crores.

Relations of the Central Government with Local Governments.—" Water-supplies, irrigation and canals, drainage and embankments, water storage and water power " are reserved provincial subjects: they occupy, however, a unique position amongst the reserved provincial subjects in that the powers of Local Governments are limited, and the sanction of the Secretary of State is necessary to capital expenditure upon irrigation and navigation works, etc., in any of the following cases, namely:—

(*a*) where the project concerned materially affects the interests of more than one Local Government;

(*b*) where the original estimate exceeds 50 lakhs of rupees;

(*c*) where a revised estimate exceeds by 15 per cent. an original estimate sanctioned by the Secretary of State in Council;

(*d*) where a further revised estimate is proposed after one revised estimate has already been sanctioned by the Secretary of State in Council.

The effect of the imposition of the above financial limits is to tighten the control of the higher authorities in those cases in which the amounts prescribed are exceeded and to transform the control from a general to a detailed and technical one. Nominally, this control rests with the Secretary of State in Council, as it is his sanction which is required to the projects in question, but, actually, he maintains no regular technical advisers in irrigation matters and consequently he exercises it through the Government of India. The objects of the limitation imposed upon the powers of Provincial Governments may be generally stated as follows.

In the first place, in a subject so technical as irrigation, there are only limited means available for the exercise by the Government of India of the powers of superintendence, direction and control vested in them by the Government of India Act, apart from the scrutiny of major projects before and after sanction which the limitation entails. Secondly, it ensures that all large schemes are submitted to the technical scrutiny of an expert engineer other than those entrusted with the framing of the proposals before sanction to them is accorded. Thirdly, it has the effect that no Province

can be committed to heavy and recurring expenditure on an irrigation project until the Secretary of State and the Government of India, upon whom the ultimate responsibility to Parliament lies, have had an opportunity to satisfy themselves, as far as may be possible, that the investment is, from all points of view, a sound and justifiable one.

Research Work by the Central Government.—The Board of Agriculture in India at a meeting held in 1917 recommended *inter alia* " That a special Imperial officer of agricultural experience with a suitable staff be appointed to investigate the water requirements of crops and that an experimental station or stations be selected for this research work by the staff after it has been appointed." The Government of India were in full accord with the Board of Agriculture in regard to the importance of this problem, but before committing themselves to the detailed scheme recommended by the Board they thought it desirable to hold a preliminary enquiry. For this purpose they decided to place two officers on special duty to consider and advise on what lines the main scheme should proceed, and in particular how far experimental research into the water requirements of crops should be centralised and how far it could be carried out through Provincial Departments of Agriculture. The scheme, however, did not materialise owing to the necessary staff not being available owing to the War.

Subsequently the Government of India had under consideration the necessity for the appointment, under the Inspector General of Irrigation, of a technical officer with a suitable staff for the collection, collation and dissemination, throughout India, of technical information and statistics in connection with irrigation works. They were convinced that it would be of the greatest benefit to all Local Governments if the information and statistics that were available only to the officers in individual Provinces or were stored in the archives of the local Secretariats could be made available for general use throughout India. Further they considered that there was great scope for new investigation and that it was essential that direction and continuity should be ensured and that a central collecting and distributing agency should be established in connection with any investigations that might be made. Local Governments were accordingly addressed in the matter, and their co-operation was sought. The proposals of the Government of India had, however, to be dropped as some Local Governments could not spare the necessary staff.

A considerable amount of useful work has, however, been done in the past by the Government of India by the collection and dissemination of technical information and statistics relating to irrigation—

(*i*) by the publication of technical papers, and

(*ii*) by holding engineering conferences, *e.g.*, the Irrigation Conference of 1904 and the Engineering Conference of 1913.

2710. *The Chairman:* Mr. Harris, I think you are relying on the memorandum prepared by Mr. Roche, are you not?—Yes, he was doing my work while I was on leave; I have only just returned from leave.

2711. Would you like to make anything in the nature of a statement to the Commission before we proceed to ask you one or two questions?—I do not think so; Mr. Roche's memorandum is merely a statement of facts.

2712. Could you give me an idea of the scope of your duties?—At the moment I am doing the work of two posts, both that of Deputy Secretary and that of Consulting Engineer. As Deputy Secretary I deal generally with the administrative side of irrigation works, with the whole of the establishment of the Public Works Department, and with what are known as Central Works, that is to say, buildings and so forth, undertaken by the Central Government for their own purposes. As Consulting Engineer I am responsible for advising the Government of India on all projects which come before them.

2713. Are you the only officer advising the Government of India in matters touching irrigation?—Yes.

2714. Some alteration in the office charged with the responsibility for advising the Government of India in matters of irrigation has been contemplated, has it not?—Yes, the matter is at present under discussion.

2715. How long has it been under discussion?—For rather over 18 months. We addressed the Secretary of State last year; the India Office held the matter up for a very long time, and then sent us back a reply which necessitated a reconsideration of the whole position.

2716. Have you held this post for 18 months?—Since April last year.

2717. Does the fact that the matter is under discussion and consideration make it difficult for you to answer our questions on the matter of posts and responsibility, do you think?—It might possibly be easier if I did so in private, as then I could refer to official correspondence on a subject on which a decision has not yet been reached; but if you would sooner it were done in public, I do not think there is really any very grave objection to it.

2718. I would sooner it were done in public, if you will agree to give us your views. If, on the other hand, you wish to be heard *in camera*, I shall clear the room?—I suggest that I describe the position generally, and if there are any detailed points you would like to ask about, perhaps I could answer those questions in private. I can tell you generally how the situation stands.

2719. Yes, I wish you would?—Well, the position is this. My predecessor, Sir Frederick Gebbie, who held the post of Consulting Engineer for about 3½ years, found great difficulty in discharging the responsibilities which the post involved. The position had changed completely with the introduction of the Reforms. Prior to the Reforms, all major irrigation works were constructed from funds provided by the Government of India; that is to say, the works really belonged to the Government of India, and the Provincial Governments acted as agents of the Government of India in regard to them. The Government of India took, in some cases all, in some cases a share, of the revenue from them. In such circumstances the Consulting Engineer, or the Inspector General as he was then called, was actually the representative of the owners of the works. With the Reforms there came a complete change in the whole position. Under the new system, the money was found by the Provincial Governments; the revenue from the works belonged to the Provincial Governments, and the Provincial Governments were not willing to accept the same detailed control as in the past. The Inspector General in the past was a super Chief Engineer; he said "Do this" or "Alter this" and Local Governments had to obey. That position became quite impossible with the introduction of the Reforms and many Local Governments became impatient of control by a touring headquarters officer. My predecessor pointed out the difficulties of his position, that in many cases the Local Governments did

not require his services, that he only visited them because he had to, and that he was never quite sure that he was getting the full information necessary to enable him to discharge his duties properly. In one case he certainly did not get it, and the Government of India were let in. In those circumstances he could not take the responsibility which his predecessors had taken before the Reforms. Provincial Governments were addressed on the subject, and the general consensus of opinion was that, while it was very desirable that they should be able to get a second opinion on irrigation projects, they did not want any interference once the project was sanctioned. The Government of India then proposed that in place of the Consulting Engineer there should be constituted a Central Irrigation Board. They suggested that all the Chief Engineers in India should be members of this Board, and that when a new project came up for sanction (and all projects costing more than 50 lakhs of rupees have to be submitted to the Secretary of State for sanction) the Government of India should convene a sub-committee of this Board, consisting of 3 Chief Engineers with recent experience of the type of work involved, and that the project should be reported on by this sub-committee. It was not anticipated that the Board would have to sit very often; these big projects do not come up frequently. It was also contemplated that the services of the Board would be available to Local Governments who wanted advice on any provincial matter; they would be able to lay it before a sub-committee of the Board. That scheme is now under discussion; we have addressed all Local Governments about it, and they have all agreed to the formation of the Board with the exception of one Government, the reply from which is still awaited. I believe that it will come in during the course of this week.

2720. Was the proposal to make that body responsible for research?—The actual details have not yet been worked out, but I think it will probably eventually become a general co-ordinating body for research in the Provinces.

2721. If a scheme arises which touches the interests of more than one Province, would this body you have been talking about adjudicate as between two Provinces?—Yes; that is to say, it would advise the Government of India on the subject.

2722. It would be a purely advisory body, of course?—Yes. It is now proposed to refer the difficulties which have arisen between Bombay and the Punjab to a sub-committee of this body consisting of 3 Chief Engineers who have no connection whatever with either Province.

2723. Is it proposed to alter the nature of the post held by the officer who is mainly responsible for advising the Government of India?—That is still under discussion. There are two proposals; one is to retain a Consulting Engineer who will be responsible to the Government of India for provincial schemes; the other is to reduce his duties so that he will only be responsible to the Government of India for their own works, Local Governments being left to apply for a sub-committee of the Board when they are in difficulties, want advice or have a new project to send up. The Government of India have a large amount of irrigation work of their own in the North-West Frontier Province, and their Consulting Engineer will in any case have to accept responsibility for this. The Government of India are at present considering whether, if the Board comes into operation, it is necessary to retain a whole-time officer to advise Local Governments.

2724. I suppose you are really never concerned in your present post with the details of irrigation; it is only the bigger schemes that concern you?—Yes. For example, I have just returned from Madras. I was asked to go down there by the Government of Madras, in order to inspect the site of a reservoir which they propose to build. They had selected a site, but for various technical reasons wanted to change it. They have to get the Government of India's approval to the change, and they asked me to go down and see the place so that I should be in a position to advise the Government of India when the question came up.

2725. Who pays the cost of a visit of that sort?—The Government of India.

2726. Is any research being carried on at the moment in matters touching irrigation?—There is a good deal being carried on by the various Provinces.

2727. Are you in touch with that?—Not very much.

2728. At all?—No, except when I happen to be on tour and see what is being done.

2729. You do not consider yourself as responsible for co-ordinating that or for attempting to make available in one Province information gleaned by the experiments of another?—No.

2730. Nothing of that sort?—No, but I think that when the new Board is established it will probably function in that capacity. It is probable that there will be a meeting of the full Board every year to see that research in the various Provinces is not overlapping and generally to settle the programme on which the various Provinces should proceed.

2731. Do you think that at the moment there is either overlapping or lack of intercommunication in these matters?—No, not very much. The main lack is of research as a whole. Very few Provinces are really doing anything serious.

2732. Would you care to express any opinion as to whether a firm decision on matters where there is a conflict of interest between Province and Province is likely to be given by a Board consisting of members of services in various Provinces, as compared with an officer advising the Government of India?—I think so. In the case of an officer advising the Government of India there is always the difficulty that he may belong to one of the two Provinces concerned.

2733. May have belonged, that is?—Yes, and may even have prepared the scheme that is in dispute.

2734. I quite appreciate that. Are you responsible for any other branches of engineering which touch agriculture at any point?—No.

2735. You do not do the hydro-electric work of the Government of India?—No.

2736. Who does that?—The Department of Industries and Labour. We have two sides, the public works side and the industries side; but I think I am correct in saying that hydro-electric development is almost entirely provincialised. I do not think such schemes come to the Government of India at all.

2737. You probably know the history of the control of hydro-electrical development in other federal countries. Do you know a single instance of a country where there is a great potential supply of power and in which no attempt is made to regulate schemes with a view to the future?—No.

2738. *Dr. Hyder:* In answering the Chairman with regard to the effect of the Reforms you mentioned conflicts between Provincial Governments and the Government of India. Were there not conflicts between Provincial Governments and the Government of India in the past as regards irrigation matters?—There have been from time to time.

2739. Since their revenues were entangled (the irrigation revenue went to the Central Government and a portion of the land revenue went to the Provincial Governments) the Provincial Governments tried to swell the land revenue share so as to have an increase in their budget, and put down the share of the Government of India?—That has occurred.

2740. Since the introduction of the Reforms that difficulty has gone?—That has gone, yes.

2741. So what you require now is a scheme of co-ordination as regards irrigation matters?—Yes.

2742. At present is there any research not on the irrigation but on the agricultural side being carried on as regards the requirements of various crops in the matter of water?—Yes; such research is being undertaken in some Provinces, though not to the extent one would like to see. Probably in

Poona you will see the Hadapsar farm where the Bombay Irrigation Branch are growing sugarcane, with various intervals between the waterings, various manures and so on, to see which is actually most beneficial to the crop. I was there ten days ago. They are getting most wonderful results from it.

2743. Is anything of that sort being done in the Punjab as regards wheat?—Not so far as I know.

2744. *Sir Thomas Middleton:* You express the view in answer to the Chairman that not nearly enough research was being done. What type of research had you in mind? Was it the type Dr. Hyder has been asking you about experimental work as regards crops?—Yes.

2745. Had you anything else in view?—Such questions as the reclamation of soil, and the discovery of a remedy for water-logging.

2746. That is what I wanted to get at. Is there any work being done by the Irrigation Department on alkali soils, or is that being done entirely by the Agricultural Department at present?—I think it is being done by the Agricultural Department in all Provinces except Bombay, where I believe the Irrigation Branch has been doing work on it.

(The witness withdrew.)

The Commission then adjourned till 2-30 P.M. *on Friday, the 22nd October, 1926, at Poona.*

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PITKEATHLY, Mr. J. S., C.I.E., C.V O., C.B.E., D.S.O., Chief Controller, Indian Stores Department, 1851-1905 (239, 240).

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RODGER, Mr. A., O.B.E., Officiating Inspector General of Forests, Dehra Dun 1906-2204 (246-255).

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GLOSSARY

Bakhar .. .. Blade harrows.
Batai .. .. Payment of rent in kind, by division of produce between landlord and tenant.

Cheetal .. .. The spotted deer (*Cervus axis*).

Dal .. .. Generic term for various pulses.
Deshi .. .. Native to the country, indigenous.
Durries .. .. Carpets.

Gowalas .. .. Milkmen.

Hakim (Vaid) .. A practitioner of one of the Indian systems of medicine.

Jagirdars .. .. Large holders of land granted on special terms for services rendered.
Jemadars (Kamdars, Maistris). Petty officers.
Jhuming .. .. Temporary cultivation in jungle clearings.
Juar .. .. The large millet (*Sorghum vulgare*).

Kaerez .. .. A system of irrigation used where sharp slopes make it possible to bring subsoil water to the surface by horizontal shafts.
Kamdars (Jemadars, Maistris). Petty officers.
Kapas .. .. Cotton with cotton seed still adhering.
Kharif .. .. Summer sown (crops).
Kheddah .. .. Properly a stockaded trap used for capturing wild elephants. Term is also used of a trap for catching wild animals

Kumri .. .. Temporary cultivation in jungle clearings.

Lungees .. .. Turbans.

Maistris (Kamdars, Jemadars). Petty Officers.
Malguzars .. Lit: Revenue payer. A term applied in the Central Provinces to a co-sharer in a village held in ordinary proprietary tenure.

Nagar .. .. Plough.
Nala (nullah) .. A water course.
Neem .. .. Margosa tree (*Media azadiracta*).
Nilgai .. .. Blue buck (*Boselaphus tragocamelus*).

Panchayet .. .. Literally a Committee of five. Used to describe an association of any number of persons instituted for objects of an administrative or judicial nature.
Patel .. .. Headman of a village.
Patwari .. .. Village accountant or registrar.

Rabi .. .. Winter-sown (crops).

Sambar .. .. A large kind of deer (*Cervus unicolor*).
Sanad .. .. A charter. A certificate of honour.
Sir .. .. The "home farm" of a cultivator.

Taccavi .. .. Advances made by Government to cultivators for agricultural purposes.
Tahsil .. .. The Revenue sub-division of a district.
Tahsildar .. The subordinate officer who is in charge of such a district.
Taungya .. .. Temporary cultivation in jungle clearings.
Thana .. A police station. Also the circle attached to it.

Vaid (Hakim) .. A practitioner of one of the Indian systems of Medicine.

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