

*Empire Cotton Growing Committee.*

# REPORT

TO THE

## BOARD OF TRADE

OF THE

## EMPIRE COTTON GROWING COMMITTEE.

---

Presented to Parliament by Command of His Majesty.

---



LONDON:

PRINTED AND PUBLISHED BY  
HIS MAJESTY'S STATIONERY OFFICE.

To be purchased through any Bookseller or directly from  
H.M. STATIONERY OFFICE at the following addresses:  
PARLIAMENTARY HOUSE, KINGSWAY, LONDON, W.C.2, and 28, ABINGDON STREET, LONDON, S.W.1;  
37, PETER STREET, MANCHESTER; 1, ST. ANDREW'S CRESCENT, CARDIFF;  
23, FORTH STREET, EDINBURGH;  
or from E. PONSONBY, LTD., 116, GRAFTON STREET, DUBLIN.

1920.

523.] *Price 1s. 6d. Net.*

## TABLE OF CONTENTS.

		I
MINUTES OF APPOINTMENT	...	1
PREFATORY REMARKS	...	2
PART I.—THE PROBLEM AND ITS SOLUTION	...	3
Question I.—The Acquisition of Necessary Knowledge and the Supply of men to apply it	...	7
Question II.—Efficient arrangements for (A) The Control of Cotton Growing and (B) The Marketing of Cotton Crops	...	9
Question III.—The Provision of the Necessary Funds	...	11
General Conclusions and Recommendations	...	14
PART II.—SURVEY OF THE COTTON GROWING AREAS OF THE EMPIRE	...	16
West Indies	...	17
Egypt	...	20
The Sudan	...	26
Mesopotamia	...	28
Uganda	...	29
East Africa	...	33
Nyasaland	...	34
Rhodesia	...	35
The Union of South Africa	...	36
Nigeria	...	38
India	...	42
Queensland and Oceania	...	47
Special Conclusions and Recommendations	...	48
APPENDIX I.—Extract from Recommendations of the Textiles Committee	...	50
APPENDIX II.—Memorandum to the Prime Minister	...	51
APPENDIX III.—Terms of Reference and Constitution of the Indian Cotton Committee	...	56
APPENDIX IV.—Circular to Colonial Governors	...	57
APPENDIX V.—Memorandum as to the Work of the Imperial Institute in connection with British Cotton Cultivation	...	57
APPENDIX VI.—Reports and Letters to the President of the Board of Trade	...	60
APPENDIX VII.—Sub-Committees of the Empire Cotton Growing Committee	...	68
APPENDIX VIII.—Witnesses	...	69
APPENDIX IX.—Statistical Tables	...	70
TABLE OF PARAGRAPH HEADINGS	...	72
MAPS—		
1. The World.		
2. West Indies.		
3. Egypt.		
4. Mesopotamia.		
5. South Africa.		
6. Nigeria.		
7. India.		

## MINUTES OF APPOINTMENT.

AT THE COUNCIL CHAMBER, WHITEHALL, THIS TWENTY-FIFTH DAY OF JULY, 1917.

PRESENT,

THE RIGHT HONOURABLE SIR ALBERT HENRY STANLEY, M.P.

The Board of Trade are pleased to appoint the following gentlemen, viz.:

Sir HENRY BIRCHENOUGH, K.C.M.G. (*Chairman*),  
 Mr. JAMES STANLEY ADDISON,  
 Mr. WILLIAM CECIL BOTTOMLEY,  
 Dr. W. LAWRENCE BALLS,  
 Mr. PETER BULLOUGH,  
 Mr. DAVID THOMAS CHADWICK,  
 Mr. JOSEPH CROSS,  
 The Right Honourable ANDREW FISHER,  
 Sir RONALD GRAHAM, K.C.M.G., C.B.,  
 Mr. JAMES ARTHUR HUTTON,  
 Mr. RICHARD H. JACKSON,  
 Mr. LOUIS JAMES KERSHAW, C.I.E.,  
 Mr. JOHN W. McCONNEL,  
 Mr. WILLIAM MULLIN,  
 Mr. CHARLES MELLOR WOLSTENHOLME,

to be a Committee to investigate the best means of developing the growing of cotton within the Empire and to advise the Government as to the necessary measures to be taken for this purpose.

The Board are further pleased to appoint Mr. Thomas M. Ainscough to be Secretary to the Committee.

The following gentlemen have since been appointed additional members of the Committee on the dates stated:—

Mr. C. du P. Chiappini—29th August, 1917.  
 Prof. Wyndham R. Dunstan, C.M.G., F.R.S.—21st December, 1917.  
 Mr. N. S. Glazebrook—26th June, 1918.  
 Mr. Frederick Hodgkinson—26th June, 1918.  
 Mr. N. N. Wadia, C.I.E.—26th June, 1918.  
 Mr. W. H. Himbury—16th January, 1919.

Of the above members of the Committee, the following were, at the request of the President of the Board of Trade, nominated by Government Departments, Trade Associations, or other public bodies, as their representatives:—

Mr. J. S. Addison, Cotton Spinners and Manufacturers' Association.  
 Mr. W. C. Bottomley, Colonial Office.  
 Mr. Peter Bullough, Amalgamated Association of Operative Cotton Spinners.  
 Mr. D. T. Chadwick, India Office.  
 Mr. C. du P. Chiappini, Government of the Union of South Africa.  
 Mr. J. Cross, Amalgamated Weavers' Association.  
 Prof. W. R. Dunstan, C.M.G., F.R.S., Imperial Institute.  
 Rt. Hon. Andrew Fisher, Government of Australia.  
 Mr. N. S. Glazebrook, Bombay Chamber of Commerce.  
 Sir Ronald Graham, K.C.M.G., C.B., Foreign Office.  
 Mr. J. A. Hutton, British Cotton Growing Association.  
 Mr. R. H. Jackson, Federation of Master Cotton Spinners' Associations, Ltd.  
 Mr. L. J. Kershaw, C.I.E., Government of India.  
 Mr. J. W. McConnell, Federation of Master Cotton Spinners' Associations, Ltd.  
 Mr. W. Mullin, Amalgamated Association of Card and Blowing Room Operatives.  
 Mr. N. N. Wadia, C.I.E., Bombay Millowners' Association and Ahmedahad Millowners' Association.  
 Mr. C. M. Wolstenholme, Liverpool Cotton Association.

On 19th September, 1918, Mr. A. Canham was appointed to succeed Mr. C. du P. Chiappini, retired; and on 3rd September, 1919, Mr. J. Murray succeeded Sir Ronald Graham, K.C.M.G., C.B., who resigned on becoming British Minister at the Hague.

Mr. J. A. Todd was appointed Secretary to the Committee vice Mr. Ainscough on 21st December, 1917. On 28th August, 1919, Captain C. R. Eddison was appointed Acting Secretary during the absence of Mr. Todd.

The names of members co-opted to serve on the various sub-committees will be found in Appendix VII.

# REPORT

## TO THE BOARD OF TRADE OF THE EMPIRE COTTON GROWING COMMITTEE.

TO THE RIGHT HON. SIR AUCKLAND GEDDES, K.C.B., M.P., PRESIDENT OF THE BOARD OF TRADE.

SIR,

WE have the honour to refer to the Minute of the Board of Trade dated 25th July, 1917, by virtue of which we were appointed a Committee "to investigate the best means of developing the growing of cotton within the Empire, and to advise the Government as to the necessary measures to be taken for this purpose."

### PREFATORY REMARKS.

(1.) **Introductory.**—The Committee was appointed in accordance with a recommendation\* by the Departmental Committee appointed by the Board of Trade in 1916 to consider the position of the Textile Trades after the war. This recommendation was supported by representations made to the Prime Minister by the British Cotton Growing Association and other bodies, including the Liverpool and Manchester Cotton Associations, and all the Associations of Employers and Employed in the Cotton Industry.

In the Memorandum† which was submitted to the Prime Minister in July, 1917, the following propositions (among others) were formulated:—

- A. That the present situation as to the supply of cotton is most serious and requires the immediate attention of His Majesty's Government.
- B. That it is essential, for the future prosperity of this country and for the welfare of the Colonies, that cotton growing should be developed as rapidly as possible in all suitable parts of the Empire.

It was pointed out:—

That the shortage of cotton affected the whole world.

That the British Empire was especially affected.

That the Cotton Industry was, in many respects, the most important British industry.

That the shortage of cotton was most marked in those finer kinds which, for reasons explained, constituted the chief requirement of the British mills.

That the British Cotton Industry drew four-fifths of its supplies of cotton from the United States, and that it was dangerous to be so largely dependent on the climatic vagaries of one portion of the world. It was also noted that the United States were year by year requiring for their own consumption an increasing proportion of their own crops.

That experience showed that in many parts of the Empire the growing of cotton is or could be made exceedingly profitable to the country growing it. Egypt, the Sudan, Uganda and some of the West Indian Islands were named.

That it was believed to be possible to grow within the Empire the quantities and qualities of cotton that it requires.

It was also suggested that there was a wide sphere of work which needed to be done by someone, and which could only be done quickly with Government assistance.

It was argued that it was the business of each Colony or Protectorate to decide for itself whether its climate, soil, population and means of access to markets were suitable for cotton; also, that it was the business of each Colony to decide what kind of cotton it was most profitable to grow, to try experiments, to control the industry, and to provide the necessary transport and other facilities when cotton was shown to be profitable to the Colony.

Finally, it was suggested that great advantages would arise from the creation of some kind of Central Committee or Department in the Imperial Government to advise and assist in connection with all measures which had to be taken, and, in particular, to bring all the resources of science into play to promote the extension and improvement of cotton growing.

(2.) **The Cotton Situation.**—All the investigations we have made tend to confirm the statements made in this Memorandum.

There is no doubt about the shortage of cotton nor as to its importance to Great Britain and the British Empire. Since July, 1917, the situation has become decidedly worse. Owing in part to the necessity for growing more food stuffs to meet the needs of the war the cotton crops in the United States, in Egypt and in India have been curtailed. Moreover, the seasons have

\* See Appendix I.

† See Appendix II.



been unfavourable and the present season is giving rise to fears that the crops both in the United States and in Egypt will again be deficient. The advent of peace has in no way improved the situation. There is evidence of a world shortage of cotton goods, and there is no prospect whatever of there being a full supply of cotton for some years to come. Prices of cotton are already at levels far in excess of anything recorded since the cotton famine in the sixties.

We also find ourselves able to endorse generally the opinions expressed in the Memorandum. We are confident that if proper measures are taken, it should be possible to grow within the Empire at any rate a very large proportion of the cotton it requires. We are convinced that in many parts of the Empire, cotton growing will greatly increase the prosperity of the colonies which grow it. As will be seen in Part II, this has already happened in St. Vincent and in Montserrat, and is taking place to a remarkable degree in Uganda.

Further, we concur generally in the suggestions made in the Memorandum. We think it very necessary that we should be empowered to advise and assist in all measures to be taken for the promotion of cotton growing.

**(3.) The Constitution and Work of the Empire Cotton Growing Committee.**—The Empire Cotton Growing Committee, which consists of twenty-one members, includes representatives of India, Australia, South Africa and Egypt, as well as of the Foreign Office, the Colonial Office, the India Office, and the Board of Trade. There are also on the Committee nominees of the British Cotton Growing Association, the Imperial Institute, the Liverpool Cotton Association, and the principal Associations of Employers and Employed in the industry.

So far we have held 28 meetings and have examined 35 witnesses. These witnesses have included Government officials and others familiar with the cotton-growing industry in practically every part of the Empire, as well as representatives of various organisations in this country interested in the cotton supply, such as the British Cotton Growing Association.

**(4.) Indian Cotton Committee.**—Our attention was first drawn to India, which appeared to offer the best opportunity for a considerable increase of supply in the near future. Any direct investigation on our part was, however, rendered unnecessary by the appointment by the Indian Government on 27th September, 1917, of a committee to enquire into the whole situation with regard to the possibilities of extending the cultivation of long staple cotton in India. Our efforts were, therefore, for the time being, confined to assisting in the selection of a suitable representative of the Lancashire industry to join the Indian Cotton Committee. The Indian Cotton Committee has now completed its enquiries, and its Report, which has been published, will be dealt with in Part II of this Report.

**(5.) Circular to Colonial Governors.**—With regard to the Colonies and Dependencies generally, it was agreed that the first step should be the issue of a circular or questionnaire by the Colonial Office to the Governors or Administrators of all the Colonies and Protectorates, which possessed possibilities for cotton growing. The terms of this circular were settled with the Colonial Office,\* and it was despatched on 31st August, 1917. Replies have now been received from all the Colonies and Protectorates as follows:—

*Africa.*—Nigeria, Gold Coast, Sierra Leone, Gambia, Nyasaland, Uganda, Rhodesia, British East Africa.

*West Indies.*—Leeward Islands (Virgin Islands, Antigua, Montserrat, St. Kitts, Nevis), Windward Islands (St. Lucia, Grenada, St. Vincent), Dominica, Jamaica, Barbados, Trinidad, Bahamas, Bermuda, British Guiana, British Honduras.

Reports have also been received as to the possibilities of Queensland and the Union of South Africa, and enquiries have been initiated into the prospects of cotton growing in Mesopotamia.

We have also had the great advantage of hearing the evidence of a deputation from the Sudan, and of officers of high position in Egypt.

**(6.) Previous Reports.**—On the 16th May, 1918, we presented to your predecessor, the Rt. Hon. Sir Albert Stanley, M.P., a brief Interim Report† on the work done from our appointment up to that date. We understand that this was laid before the Imperial War Conference in the following month.

On the 22nd October, 1918, we presented, also to your predecessor, a further Report‡ on the question of the internal organisation of the Committee, in which it was pointed out that we had always understood it was not the intention of the Board of Trade that we should merely present a report and should then cease to exist. On the contrary, it was understood that we should become a Standing Committee in connection with cotton growing within the Empire, and that we should be competent to make recommendations from time to time with regard to our own constitution and activities.

**(7.) Sub-Committees.**—Accordingly, we suggested the formation of a series of Sub-Committees, to consist partly of members of the Main Committee and partly of additional members appointed *ad hoc* by the President of the Board of Trade upon the nomination of the Main Committee. These additional members were in each case to be chosen for special knowledge and experience in connection with the work of such Sub-Committees.

♢ See Appendix III. \* See Appendix IV. † See Appendix VI. (a). ‡ See Appendix VI. (b).

The following is a list of the Sub-Committees which were then suggested :—

Finance.

Commerce.

Research and Education.

Information (including both its collection and dissemination).

India.

Egypt and the Sudan.

The Dominions, Colonies and Protectorates.

All these Sub-Committees have since been formed; and a full list of the membership of each will be found in Appendix VII. Many of them have already done a great deal of useful work, and all have justified their formation.

(8.) **Preliminary Financial Requirements.**—On 25th November, 1918, we submitted (again to your predecessor) a preliminary estimate\* of the Committee's financial requirements, which fell under two heads :—

- (1) Immediate requirements for running expenses upon establishment; for grants to allied bodies; for enquiries, missions, etc.
- (2) Ultimate requirements for definite schemes in connection with development, research and education, information, etc.

With regard to (1), we pointed out that it was necessary to ask for immediate provision to be made, and estimates amounting in all to £5,000 per annum were submitted.

With regard to (2), we pointed out the alternative sources from which the funds required for definite schemes might be obtained, *e.g.*—

- (a) entirely out of the funds of the local Government in whose territory the area to be developed is situated;
- (b) partly out of such funds, and partly by a grant or guarantee from the Imperial Government, where local funds were insufficient, or where the general interests of the Colony or Protectorate were not so entirely coincident with the interests of cotton growing as to justify the local Government in meeting the whole expenditure out of local funds;
- (c) partly from the funds of private corporations, and partly by a grant or guarantee upon terms from the Imperial Government.

In connection with such schemes as were contemplated in (b) and (c), we pointed out that we might either make a specific recommendation for submission to the Treasury in each individual case, or might be entrusted with the administration of a block grant out of which we should ourselves make allocations, subject to the approval of the President of the Board of Trade. We asked which of these two methods of procedure was likely to be adopted, and, if it were to be the former method, we asked for some assurance that it was the intention of the Government to give most favourable consideration to schemes approved of and recommended by the Committee, so that real and speedy progress might be made in the development of cotton growing within the Empire.

The letter then proceeded to outline certain of the schemes which were in view, and concluded by reviewing briefly the possible development of the work of the other Sub-Committees, namely, those on Commerce, Research and Education, and Information in reference to their probable financial requirements.

(9.) **Plan of this Report.**—We consider that the time has now come when it is our duty to present to you a fuller report for publication, so that the cotton industry and the general public may be authoritatively informed of the progress made by the Committee in the study of the Empire's resources for cotton growing, and of our general plans and proposals for their development. This constitutes Part I of the Report.

Part II contains a detailed survey of the position both present and prospective in the various territories of the Empire which are considered suitable for the cultivation of cotton.

---

\* See Appendix VI. (c).

## PART I.

### THE PROBLEM AND ITS SOLUTION.

(10.) **The Problem.**—The problem before us is the adequate development of the Empire's resources for the production of cotton. Its solution appears to depend on the proper handling of three main questions.

- I. The acquisition of necessary knowledge, and the supply of men to apply that knowledge.
- II. The establishment of efficient arrangements for (A) controlling the growing of cotton crops, and (B) marketing the crops, when grown, so as to secure the best possible results for the growers.
- III. The provision of the necessary funds.

#### QUESTION I.—THE ACQUISITION OF NECESSARY KNOWLEDGE AND THE SUPPLY OF MEN TO APPLY IT.

##### *A. Acquisition of Knowledge.*

(11.) **Need for Research.**—It is, we believe, generally recognised in the present day that the foundation of all agricultural progress must be based on science. This appears to be at least as true in regard to cotton as in regard to anything else. There is very little accurate knowledge, capable of being stated in precise terminology, of the different characteristics of the cotton fibre or lint, which contribute to the production of desired results in cotton yarns or in the finished articles manufactured from them. For this reason we welcome the recent establishment in Lancashire of the British Cotton Industry Research Association, and trust that it will spare no efforts to discover the true relation between the characteristics of lint and the qualities of the finished article. Apart, however, from that branch of study, there is an immense field of Research to be worked in regard to the actual growing of cotton. The essential character of the cotton plant, and the temporary modifications of its lint brought about by the various local conditions under which it may be grown, have so far been little more than indicated as requiring investigation by the workers who have been engaged on the subject in different parts of the world. The evidence before us shows that there are two main lines of investigation. There are the effects of heredity by which the constitution of the cotton plant is determined and can be controlled. There are also the effects and limitations of environment, such as the seasonal period available for growth, the temperature, the rainfall and humidity, and the characteristics of the soil. Bacterial, fungoid and insect organisms are also among the many factors calling for study. Again it is clear that the Research required should be undertaken in two separate divisions. Some of the conditions to be studied are purely local and should be investigated by each locality itself. Others involve first principles of universal truth, which, however, are sometimes of less immediate practical benefit.

(12.) **Proposed Central Research Institute.**—We consider that at the earliest possible date a Central Institute should be established to undertake the study of the life of the cotton plant and the development of its lint, from all possible aspects except such as are of merely local interest and profit. By linking the work of the Institute with that of our Information Sub-Committee, it is hoped that all scientific research upon the cotton plant, together with such other research as has any bearing upon cotton-growing problems, may be codified and made easily available to students of cotton. At present the composite nature of the problems involved leads to the publication of many serviceable results of research in journals of very diverse types, so that no student can easily keep himself informed of them all.

We are also advised that there is need for a carefully compiled seed index. In the breeding of pure strains, many are obtained which do not appear to be immediately suitable for the country of origin. Some of these may, however, be valuable at a later date, or in some other country, and it should be possible for the Central Institute to make arrangements for keeping alive all potentially valuable strains of cotton and for indexing their agricultural and commercial properties.

We have given some attention to the details of this Institute, but have not felt ourselves authorised, nor have we sufficient funds in sight, to make any definite proposals. For many reasons our general impression is that Egypt would be the most convenient place in which to locate the Institute, but before this could be decided it would be necessary to consult the Egyptian Government and to ascertain that it would welcome such an Institute. We may say here that the recent appointment of the Cotton Board of Research in Egypt to deal with the local cotton crop in no way conflicts with this proposal. On the contrary it will make it very much easier to carry out the plans we have in view, and we feel sure that our proposals may justifiably be welcomed by the new Board. The Institute should also be linked up with the work which is being done or may be done in other cotton

areas—for instance the West Indies. It might indeed often ask for special work to be done for it in particular places, and no doubt some grant for such work might properly be made by this Committee.

**(13.) Co-operation with British Cotton Industry Research Association.—**

The British Cotton Industry Research Association has taken powers for research in connection with the growing of cotton and we are already in consultation with the Association as to the best method of co-operating with it. A Joint Committee of the two bodies has been appointed. If research work in cotton growing is to be made practically efficient, it must be linked at every point with research upon cotton in use. The question as to the provision of funds is discussed under the heading Finance, QUESTION III.

*B. Application of Knowledge.*

**(14.) Agricultural Departments need strengthening.—**

Those who have had experience in previous efforts to develop cotton, and others who are qualified to advise, are, we find, unanimous in recommending that there should be very great additions to the Agricultural Departments of practically every British Colony and Dependency. Everywhere more of what we may call *ad hoc* investigation is needed, more experiments, more demonstration, more teaching and training of those who engage in cotton growing as a commercial industry. This is no doubt true of all agriculture, particularly in new countries inhabited by primitive and backward peoples. It is pre-eminently true of cotton. Cotton of any value nowhere grows naturally; if left to nature, it rapidly deteriorates. Again since cotton, when grown, is simply a raw material which acquires its utility in subsequent processes of manufacture, it is impossible for growers—particularly for beginners—to discriminate without expert assistance between the values of different kinds of cotton. For these and many other reasons we feel it to be our duty to put forward, as one of our principal recommendations, the importance of strengthening the Agricultural Departments of all parts of the Empire in which cotton is or can be grown. We recognise that such strengthening is needed for the development of other crops, even if it may not in every case increase the growing of cotton in particular; but we feel that it is vital to the general prosperity of the Colonial Empire of Great Britain. Under the heading of Finance in QUESTION III we shall indicate our views as regards the share of the necessary expense which should be borne by those interested in cotton.

**(15.) Suggested enquiry by the Colonial Office.—**

We gladly acknowledge that in the years immediately before the war there appears to have arisen a general recognition of the practical value of Agricultural Departments. Great efforts have been made and much valuable work has been achieved during the war by a small band of enthusiastic scientists and officers of the Agricultural Departments, working under adverse conditions of lack of staff and money. We consider, however, that in the reorganisation following the re-establishment of peace, this is, perhaps, one of the most urgent matters for consideration by those responsible for the development of Imperial resources. As to the scale of enlargement that is necessary, we find it impossible to speak with precision. There are two striking examples which may be cited: a large-scale one in the United States of America, which finds it worth while to employ many thousands of assistants in its Agricultural Department, and a small but intensive one in the Windward and Leeward Islands of the British West Indies, where the joint efforts of the Imperial Department of Agriculture, inaugurated by Mr. Joseph Chamberlain, and of the excellent local Departments of Agriculture established in each island have produced the most encouraging results. Remembering moreover that all other agricultural interests, as well as cotton, are concerned in this matter, and that there are few places where cotton is the only or even the main product, we have ventured to recommend\* to the Colonial Office that it should at an early date appoint a small Committee (1) to consider the question of Agricultural Departments in the territories for which it is responsible, and (2) to draw up a general scale of numbers of men and of suitable salaries, which could be adopted as an ideal to be worked up to as finances permit and as the men can be found. The Indian Government has recently had its own Committee,† and will naturally decide for itself as to its Agricultural Staff. We are of opinion that the Agricultural Departments of new areas, such as Mesopotamia, which may come under the control of the British Government, will require the same consideration when their administration is regularised.

**(16.) Pioneer Work.—**

In 1902 when the British Cotton Growing Association was founded in recognition of the need for increasing the areas of cotton supply, it speedily became evident that pioneer work on a large scale would be necessary. Very little knowledge was then available as to the conditions, whether physical or economic, under which cotton can be grown with commercial success. During the fifteen years which have since elapsed much progress has been made. Cotton has been more scientifically studied in Egypt and India and elsewhere. Moreover, the British Cotton Growing Association has learnt by practical experience that there are large areas in which cotton cannot, for one reason or another, be grown commercially, and others in which prospects are extremely favourable. It must, however, be admitted that there is still much to be learnt, and we are of opinion that provision should be made for the continuation of what must be called pioneer work in contradistinction to the normal work of Agricultural Departments. The time is past when it is necessary to try experiments blindfold. Sufficient knowledge has now been acquired to make it possible for pioneer work to be

\* The Secretary of State for the Colonies has now appointed this Committee, and at his invitation we have nominated our Chairman, Sir Henry Birchenough, K.C.M.G., as one of its members.

† See Appendix III.

scientifically limited and controlled. But for many years to come it will be necessary to make investigations in fresh districts of the immense areas included in the British Empire, and afterwards to conduct experiments in cotton growing in the more promising localities. For this purpose men will be needed in addition to those employed in the regular Agricultural Departments of Colonies and Dependencies where cotton has become a recognised crop.

(17.) **The Supply of Men.**—The evidence before us shows that it will not be easy to make rapid progress in engaging the staffs necessary for the adequate promotion of cotton growing. There are at least three classes of men required. There are the highly-trained men of outstanding ability needed for pure research into principles. There are men with good scientific qualifications required for the direct investigations, which must be done in each locality. Thirdly, there are the practical men without whom it will be impossible to do effective pioneer work or to bring influence to bear on ordinary agriculturists. Apart from these classes there will also be required, either by the Agricultural Departments or by some other Department of Government, administrative and executive officers on whom will depend the enforcing of regulations necessary for the proper control of the growers. This will be dealt with later as part of our second QUESTION. With regard to the provision of scientific men, we are most strongly advised by the highly-qualified witnesses whom we have consulted, that there is a preliminary need which must be supplied, and without which the provision of a scientific staff will never be possible. We are told that it is necessary that there should be more pure research done at British Universities and other places in such subjects as Plant Physiology, Plant Genetics, Mycology and Entomology. At least one Professorship or Readership in each of these sciences should be provided. In addition, provision ought to be made for a number of post-graduate studentships attached to these and other chairs, by means of which promising men can be trained in methods of Research before being drafted to the Central Institute for Research, or to the scientific posts in the different local Departments of Agriculture. We are glad to have made a small beginning in this last-named direction by having arranged with the British Cotton Industry Research Association to co-operate with us in offering five such studentships to be held during the coming year. This is, however, obviously insufficient, and we recommend that this question of improved and enlarged arrangements for research and teaching in the Natural Sciences, upon which depend the future of all agricultural work and of the supply of raw material for many important industries, be taken into serious consideration by His Majesty's Government in consultation with the industries themselves. As will be found in our financial section, we recommend that contributions on a liberal scale for this purpose should be recognised as part of the expense of increasing the cotton supply.

(18.) **Bureau of Information.**—There is one subordinate but yet very important matter that should be referred to here. We find that there is need for what may be called a Central Bureau of Information to collect and disseminate the knowledge of all matters of interest to scientific and other cotton growers. We hope before long to be able to make arrangements to publish a quarterly Review of Cotton Growing. We also find that there is and will be an urgent need for the appointment of a committee qualified, in consultation with spinners, to advise on the kinds and types of cotton to which it is desirable that investigators into cotton should give their attention. For many years the Imperial Institute has been ready at all times to give assistance to Governments and to individuals desirous of promoting the growing of cotton. The Institute has, however, had many difficulties in its way. By its constitution its purview covers an immense variety of products, and it has neither the resources nor the staff to enable it to deal with all branches of cotton investigation on a scale which we consider now to be desirable. We have had before us a valuable memorandum (*see* Appendix V) from Professor Wyndham Dunstan, C.M.G., F.R.S., containing full information with regard to the Imperial Institute and we have every reason to hope that the Empire Cotton Growing Committee will be able to work in harmonious and fruitful co-operation with the Institute. The detailed arrangements for such co-operation have still to be considered.

## QUESTION II.—EFFICIENT ARRANGEMENTS FOR (A) THE CONTROL OF COTTON GROWING, AND (B) THE MARKETING OF COTTON CROPS.

### A. *The Control of Cotton Growing.*

(19.) **Control of Seed.**—The salient feature of modern progress in cotton growing is the maintenance of pure strains. There may, perhaps, be still differences of opinion as to the best methods for securing purity of strain and the degree to which it should be attempted under given local conditions. Improvement by elimination of "rogue" plants, by general selection of field types, by special selection of plants and consequent purification of strains, or by intentional hybridisation and subsequent purification, may, perhaps, all have their spheres of usefulness, and it would, at any rate, be premature if we were to express any opinion, as a Committee, on points of this kind. But it is, we believe, now a matter beyond the region of controversy that if cotton is to be grown anywhere successfully and profitably, all possible steps must be taken to prevent the mixing of different kinds (until the cotton undergoes the controlled blending which usually takes place in the cotton-spinning mill), and that the distribution of seed for sowing should be under strict Government control. It appears that this mixing can be brought about in several ways. First, there can be mixing, whether by fraudulent intention or by carelessness, of two or more different kinds of cotton in ginning or baling. Again, cotton may become mixed through the fraudulent or careless mixing at the

ginners or afterwards of seeds to be subsequently used for planting. Or, again, there is the natural danger of mixing resulting from hybridisation by insects of one kind of cotton with the pollen from another. Each of these causes of evil has its appropriate remedy, but in each case, Government control in some form is absolutely essential.

(20.) **Compulsory Measures against Cotton Pests.**—There are other directions in which control is necessary. By far the greater area in the British Empire in which cotton growing is contemplated is in the tropical zone. Hitherto, however, the greatest development of cotton has been in sub-tropical regions and the principal studies of its needs and difficulties have been carried out under sub-tropical conditions. The cotton growing districts of the United States are entirely sub-tropical. The cotton plant there is an annual which is killed by the frosts of winter. The death of the cotton plant destroys insect and fungoid pests, or at least limits their survival. In the tropics, however, where there are practically no frosts, it is essential, according to our present knowledge, to fix arbitrarily a period during which the cotton plant shall not be in existence; in other words, it is necessary to secure the destruction of the old plants. This, of course, can only be done by regulations made and enforced under Government authority.

(21.) **Methods of Control must be adapted to Local Conditions.**—It may be remarked here that in the greater part of the areas most immediately available for cotton in the Empire the industry will probably depend on native growers. Naturally in each country the Government will decide on the most suitable objects and methods of control. It may be purely autocratic, or it may be exercised through native chiefs, or it may be administered by community systems. Where again plantations owned or directed by white men are possible, it seems to us that it will be eminently desirable to establish as soon as possible a local Association of cotton growers with whom the Government can consult in all matters affecting the industry.

*B. The Marketing of Cotton Crops so as to secure the best possible results for the growers.*

(22.) **Complexity of Cotton Values.**—It has to be recognised in connection with marketing that cotton is not an article having only one value at any particular time. It is not even an article the value of which depends only on its degree of ripeness or soundness or perfection of any kind. The fact is that there are many kinds of cotton, differing in many ways such as in fineness, length, strength, colour, &c. Each kind has its own eventual use, and to some extent spinning machinery specially adapted for one kind of cotton cannot deal satisfactorily with other kinds. It is necessary to point out here that while the distinctions of quality referred to are of very great importance, yet they are so minute as not to be readily discernable by the ordinary uninstructed grower. The relative value of the different kinds of cotton is always a somewhat complex matter, simple in that it depends upon the laws of supply and demand, but complex in that for each kind of cotton the supply and demand may vary separately and may affect in varying degrees the supply and demand for some other kind. At the same time the supply and demand for the whole world's cotton crops has always an over-riding influence on price.

(23.) **Necessity for Good Marketing.**—It follows from this that, within the limits of quality, which climate and other conditions make possible to any country, there is always some kind of cotton which pays better to grow than any other. The first condition is, of course, productivity. The cotton that gives the largest out-turn of lint per acre or per man is the best to grow, if other things are equal. But other things may be far from equal. 100 lbs. per acre at 9d. per lb. are better for the grower than 120 lbs. at 6d., though it must not be forgotten that it costs more to grow and pick clean cotton than to deliver dirty cotton. Everything depends on whether the arrangements for marketing are such as to secure that the grower does really get the better price for the more valuable cotton. It follows, therefore, that special arrangements should be made in the interests of the grower to secure good marketing. Since then, good marketing is a necessary condition of successful cotton growing, it seems to us to be a matter of great importance where cotton is a comparatively new product, that there should be some disinterested buying agency available to nurse the infant industry in matters of commerce.

(24.) **Fixed Prices.**—Again, there are other possibilities to be faced. We are satisfied that it will be necessary in many districts to fix somewhat in advance the prices to be paid for the cotton grown. A fixed price or a minimum price for a term of years has been recommended by one witness of great eminence. While we doubt if this is necessary or indeed financially possible, we feel sure that it will often be desirable to fix a price at the time of sowing or even before, and this obviously must involve taking the considerable risk of what the market conditions will be, nine or twelve months later, when the cotton reaches the mills. Similarly there are times when it may be advisable to make advances against growing crops to European planters who are experimenting with cotton.

(25.) **Marketing Agency.**—For all such purposes as these it seems necessary that there should be available an agency independent of the Government, whether local or imperial, which will be willing to conduct this kind of business and able to do so efficiently. It may be that so long as cotton is merely an experiment made on a Government farm, the Government will prefer to deal direct with the consumer. Eventually, if cotton growing becomes firmly established in any district, the marketing must undoubtedly fall into ordinary commercial channels. But in the midway period when the production is too large for the Government officer in charge to



handle, and before the necessary commercial machinery is available, we are convinced that an independent agency is required. In view of the evidence placed before us we consider it a necessary condition to be attached to such an agency that it shall forego commercial profits for itself. A large capital, however, must be available in some form. The marketing of even the comparatively small quantity of 100,000 bales would at present prices require at least £3,500,000, and interest at market rates must necessarily be paid to the Banks and other agencies which find the money. Moreover some of the responsibilities, which it is suggested should devolve on this agency, will inevitably result in losses, which may be relatively large at times. The consideration of how these are to be met will be resumed in our third QUESTION, under the heading of Finance.

(26.) **British Cotton Growing Association.**—We have on our Committee two members directly representing the British Cotton Growing Association. Several other members nominated by other bodies have also been associated for many years with the Cotton Growing Association. We have also had the advantage of receiving very full information direct from the Association, and we have had evidence about their work from various parts of the Empire. It would be presumptuous on our part to criticise or adjudicate on the work done in the past by the British Cotton Growing Association. We wish, however, to make the definite recommendation that terms should be negotiated between ourselves and the Association, subject to the Association agreeing to the condition of forgoing commercial profits, whereby the latter would be generally employed as the agents of the Committee and perform duties of the kind which are indicated in § 25. Friendly discussions have already taken place on the subject.

### QUESTION III.—THE PROVISION OF THE NECESSARY FUNDS.

(27.) **Large Capital Expenditure.**—It will, we think, be obvious from what has so far been written, that the promotion of cotton growing will involve the expenditure of a good deal of money, apart from the large sums which will be required every year to finance and market the crop. It is, however, necessary to point out that there are many other matters, often of the most pressing importance, beyond those already mentioned for which money, and indeed a very large amount of money, will eventually be required. The great need in almost every Colony or Protectorate which has come under our notice is for better facilities for transport. Roads, railways, water communications and harbour works are almost everywhere urgently demanded. There are also, in many cases, present or prospective needs for schemes for irrigation and drainage. With regard to matters of this kind we desire to make a few observations.

(28.) **Allocation of Financial Responsibility between Government and the Cotton Industry.**—In the first place we wish to record our opinion that expenditure on general development of this character is and should be primarily the business of the local Government with or without the assistance of the Imperial Government. On the other hand we venture to suggest, as a guiding principle, that all expenditure incurred with the object of promoting the growing of cotton in particular, or still more the promotion of the growing of cotton instead of some other competitive crop, should be recognised as primarily a charge on the Cotton Industry. In saying this we do not ignore the claim which the Cotton Industry, as much as any other great industry, has to receive some degree of financial as well as moral support from the British Government. We welcome the readiness which has been shown by the Government in recent years to help those industries which are in need of assistance, and we feel that there will be no difficulty in presenting a strong case for support from the Treasury, to be given in some proportion to the efforts made by the Cotton Industry itself, to pay for the unremunerative work which will be necessary to secure the satisfactory supply of its raw material. This is a matter on which we feel that consultation and conference between the accredited representatives of the industry and the Treasury will be necessary. At present our object is to distinguish between the responsibilities for expenditure on the part of the cotton growing colonies, and the cotton using industries, and to establish the principle that *while expenditure which directly benefits the general interests of a colony should be borne by the colony itself, the cost of promoting the cultivation of cotton in preference to other crops should be recognised as a charge on the Cotton Industry.* We hope that this broad principle may find general acceptance in Lancashire and other cotton using districts. There will, of course, be many cases in which the exact application of a principle of this kind may be in doubt. In some countries, cotton is the most paying produce it is possible to grow; in others it is barely able to compete with other crops. Some colonies are better able to finance their own developments than others. In the poorer colonies, if cotton is to be developed at all, assistance must be given from the outside. Further, if the principle we have enunciated is accepted, we feel that it will be fair to urge that wherever the Cotton Industry is willing to make special efforts to promote cotton growing with the approval of this Committee, the local Government concerned should upon its side do all that it possibly can to provide sufficient means of transport and communication and other necessary adjuncts.

(29.) **Financial Requirements of the Empire Cotton Growing Committee.**—The amount of money which will be required annually for the promotion of cotton growing by this Committee cannot as yet be estimated with any degree of accuracy. Apart from the modest annual sum asked for in our letter to your predecessor for establishment expenses and a small amount of preliminary work, money will be required in the near future

for the various enterprises suggested in this Report. The circumstances of each Colony and Dependency will need to be examined separately, and it will only become possible to make particular estimates when we are put in control of such funds as will enable us to open definite negotiations. It is clear, however, that the following forms of enterprise will call for expenditure. They have been to some extent discussed in the earlier paragraphs of the Report.

(i) *Research Work*.—The establishment of a Central Institute for Research into the general principles underlying the growth of cotton. The minimum staff suggested for this is four men of science, with the necessary European and native assistants, and in addition at least four younger men qualified for carrying on independent research under supervision. This is suggested only as the minimum staff necessary to begin with. It is to be expected that, before long, enlargement on a considerable scale would be called for. At any rate it is certain that it would be desirable (as mentioned in § 12) to be able to arrange for subsidiary work to be done in other cotton growing areas, in continuation and extension of the work of the Central Institute. In this connection reference has already been made (§ 13) to the British Cotton Industry Research Association. In regard to the financing of Research into cotton in growth, it does not matter whether the funds required are provided by the British Cotton Industry Research Association or are a charge upon the general fund, which we are asking to be provided for the promotion of cotton growing. The Research Association and this Committee are both in the early stages of their development, and we prefer to leave open for discussion the question as to which body should bear the responsibility of providing the funds necessary for Research into cotton in growth. It is sufficient for our present purpose to point out that very considerable expenditure is required, and that it will certainly bear fruit in largely increasing the wealth of the Empire.

(ii) *Readerships and Studentships*.—There is also required, as mentioned in § 17, either by the aid of grants from this Committee or from other sources, the creation of several Readerships in Natural Science concerned with the living plant, and connected therewith the provision of several studentships in which men may be trained in methods of research. It is obvious that the provision of funds to secure this extension of Scientific study and teaching ought not to rest exclusively upon this Committee nor upon the Cotton Industry alone. Most of the other textile trades are also concerned, as indeed are many other important industries, such as sugar, rubber, cocoa, &c., which depend on the living plant. At the same time it has been represented to us with great force that the future development of cotton growing absolutely depends on the provision of increased facilities for the study and teaching of Natural Science at British Universities and other places. In these circumstances we feel it is our duty to advise the Cotton Industry to include this form of expenditure in its provision of funds for cotton growing.

(iii) *Practical Agricultural Work*.—It is probable that in many of the Colonies and Dependencies, when the enlargement of their Agricultural Departments is taken in hand, it may be necessary for the Cotton Industry to finance wholly or in part the men who are employed in the special promotion of cotton growing. This will be particularly the case when it is thought advisable to employ men in the kinds of research or experimental work which ought to be done locally, but which do not appear to be immediately profitable to the local community.

(iv) *Pioneer Work*.—The need for the continuation of work of this kind has been explained in § 16. It seems to us clear that the cost of this ought to be a charge on the Cotton Industry rather than an obligation on any Colony or Dependency.

(v) *Commercial Handling*.—It will be evident, from what is said under QUESTION II. B. above, that considerable sums may be wanted in this connection. The fixing in advance of a price to be paid for cotton must involve losses in some years. Advances to planters, however carefully watched, may sometimes be lost owing to crop failures. Propaganda work whether conducted by the local Government or by the commercial agency must cost money.

(vi) *Information*.—The Bureau of Information contemplated is not expected to be unduly expensive, and the suggested Review ought to have some earning power. Provision will, however, have to be made for covering all expenditure under this head.

(30.) **Raising of Required Funds**.—A very important question in regard to Finance is how it is proposed to raise the money required. We are of opinion that it is impossible to raise it by appealing for gifts and voluntary subscriptions. It is equally impossible to raise money for the purposes named with the promise or expectation of ultimate profits. Profitable results are indeed to be expected, but they will accrue to the cotton growing and cotton using communities generally and not to individuals. It has already been remarked that, to a very large extent, cotton growing in the British Empire will be carried out by native growers working for themselves. It may well be that in some districts there will, in time to come, be opportunities for the investment of British capital subscribed by spinners and manufacturers on a profit-earning basis; but we are convinced for many reasons that such companies are neither practicable nor to be desired at the present stage.

(31.) **Levy on the Cotton Industry suggested**.—There remains one other method of raising money, and that is the creation of a fund to be raised upon the basis of some kind of contribution or levy from the Cotton Industry. The levy of so small a sum as 6d. per bale of 500 lbs. upon raw cotton imported into the United Kingdom would raise annually the sum of £100,000. Without committing ourselves at this stage to recommending that this particular method of raising funds should be adopted, we wish to point out that *prima facie* it presents



certain advantages, such as simplicity, ease of collection and difficulty of evasion. It would certainly not in practice be noticed as a burden on the industry. Before, however, any definite plan of making a levy can be proposed it is necessary to lay the general principle before the public, in the hope and belief that when our Report has been studied it will meet with general acceptance.

(32.) **Amount of Funds needed, and their control.**—Whatever method of raising the money is decided upon, two conditions are essential. In the first place, there must be elasticity in the arrangements, so that the amount raised may correspond with the expenditure which can from time to time be justified. In the second place, the granting of the money, so far as it comes from the industry, must be under the direct control of representatives of the bodies which agree to co-operate in providing the money. The amount of money required will be considerable, if efforts on an adequate scale are to be made to extend seriously the growth of cotton in the Empire, but whatever the amount proves to be, it will be trifling in comparison with the interests involved. Great Britain uses annually about 4,000,000 bales of cotton of an annual value at pre-war prices of £50,000,000, at present prices £150,000,000 or upwards.

(33.) **Future Prospects.**—In conclusion we desire to emphasize the opinions we have endeavoured to express in this Report. The problem of increasing the World's supply of cotton from the natural resources available in the British Empire is in no way insoluble. Good beginnings have already been made. Future developments may be confidently expected, if our proposals are found to be acceptable, and if adequate funds are provided by the Imperial Government, the Colonial Governments and the British Cotton Industry. Except in a few places, no phenomenal increase in the cotton supply can be looked for. Progress, though it may as a whole be great, will be gradual, and will depend on patient and persevering work in every suitable locality. We recognise that, if our present recommendations and plans are approved, and if funds are provided as suggested, it will be our duty so to develop our own organisation and staff, as to make provision for carrying out in every detail the plans we have broadly sketched in this Report. Knowledge must be increased and men must be found to apply it. The preliminary survey of the Empire's resources presented in the second part of the Report must be followed by a permanent system of close and sympathetic intercourse with all who, whether in Government service or for their own private benefit, are engaged in developing or growing cotton throughout the Empire. It is no small task that is suggested, but we shall take it up with confidence that our efforts will meet with success.



## GENERAL CONCLUSIONS AND RECOMMENDATIONS.

---

(34.) In putting forward our conclusions and recommendations, we have to admit that they are to a large extent provisional in their character. We are convinced that it is possible for the British Empire to make good the world's shortage of cotton, but the one conclusion that stands out plainly and definitely, as the result of our work during the past two years, is that this achievement is beyond the powers of this or indeed of any Committee. It can only be accomplished by the united efforts of the Imperial Government and the Governments of the cotton-growing Dominions, Colonies, and Protectorates, supported by the active interest and cordial co-operation of all who are engaged in the Cotton Industry in this country.

Our general recommendations are as follows:—

- (1) That the Empire Cotton Growing Committee be authorised to continue its work on the general lines of the present Report, and that a grant be made to it by the Treasury of a sum of not less than £10,000 per annum for five years to pay for its secretarial and other current expenses and for any outlay that proves to be necessary for initiatory work in directions connected with the objects of the Committee.
- (2) That the immediate importance of greatly enlarging and strengthening the Agricultural Departments of British Colonies and Protectorates be recognised as a preliminary step essential to any rapid progress, and that the Colonial Office be respectfully recommended to appoint a committee to advise on the scale of numbers, salaries and general expenditure, which should be aimed at for adoption as and where circumstances permit.
- (3) That, in order to supplement the present knowledge of scientific principles underlying cotton growing, a Central Research Institute be established as soon as possible for their investigation.
- (4) That, in order to increase the supply and improve the training of scientific men, financial provision be made for at least four Readerships at British Universities in Plant Physiology, Plant Genetics, Mycology, and Entomology; that funds be provided for the awarding of Research Studentships to be held for one or for two years by graduates, who are selected for training in methods of research in these and other sciences concerned with the study of the living plant; the number of these to be five to begin with, but to be gradually and considerably increased before long.
- (5) That we should establish a Bureau for the interchange of knowledge of cotton growing and should arrange for the publication of a Quarterly Review devoted to this subject.
- (6) That the Governments of all cotton growing areas in the Empire, be advised to take full powers for exercising strict control over all essential matters connected with cotton-growing.
- (7) That, where it is possible and seems desirable, such Governments be recommended to establish local Associations of cotton growers to advise their Government upon matters of general interest to the industry.
- (8) That an agreement should be negotiated with the British Cotton Growing Association in accordance with which that body will act as agent for the Empire Cotton Growing Committee for marketing crops where this is desired by the local Government; that it should be a condition of this agreement that the British Cotton Growing Association shall forego the appropriation of any profits made in the business carried on under the agreement, provided that the Association is guaranteed against permanent loss arising therefrom.
- (9) Finance.—That funds for the promotion of cotton growing in the Empire should be provided from the following sources:—
  - (a) The British Treasury.
  - (b) The local revenues of cotton-growing areas.
  - (c) The Cotton Industry.

That the following general principles be accepted as a guide in discussion and in negotiations as to the allocation of financial responsibility to each of the above sources.

- (a) That the British Treasury may fairly be looked to :
    - (1) To provide for the secretarial and establishment charges of the Empire Cotton Growing Committee, and for outlay for initiatory work in directions connected with the objects of the Committee.
    - (2) To contribute—in some proportion to be agreed—towards expenditure upon schemes approved by this Committee which have for their object the provision of the raw material upon which the great national industry of cotton manufacture depends.
    - (3) To assist the Governments of Colonies and Protectorates—either by grants or more probably by guarantees—to provide funds for public works, such as railways, waterways, irrigation and harbour works, necessary for the development of their resources.
  - (b) That where developments, although in their inception they may be connected with cotton growing, are calculated to extend the general prosperity of a Colony or Protectorate they should as a rule be financed by the Colonial or Protectorate Government.
  - (c) That where the growing of cotton is promoted in preference to other profitable crops, and where pioneer work is undertaken in order to ascertain whether cotton can be grown profitably, the consequential expenditure should be at the charge of the Cotton Industry.
- (10) That the Committee be authorised to ascertain the opinion of the Cotton Trade of this country in regard to these recommendations, and in particular upon what lines effective co-operation in raising the necessary money may be expected from the organisations in which the trade is grouped.

NOTE.—*Special Conclusions and Recommendations with regard to different parts of the Empire will be found at the end of Part II, page 48.*

सत्यमेव जयते

## PART II.

### SURVEY OF THE COTTON GROWING AREAS OF THE EMPIRE.

(35.) **Wide variety in quality of Cotton.**—In the following survey of the cotton growing districts of the Empire it is necessary to keep in view the fact, already noticed in Part I., § 22, that cotton is not a simple article with a homogeneous market. There are many different varieties of cotton, which differ from each other so widely in quality and value as to be in effect almost different commodities. The uses to which these different cottons are put by the industry also vary so widely as almost to constitute different trades. It is not possible, therefore, to discuss the supply of or the demand for cotton as a whole, and some method of classification must be adopted which differentiates between the different kinds and qualities of cotton, their sources of supply, and the uses to which they are put. The most convenient basis for such a classification is the length of staple, on which as a rule the value of any cotton and the uses to which it can be put mainly depend. Thus, cotton may vary in staple from  $2\frac{1}{2}$  inches in the case of the finest Sea Island to  $\frac{3}{8}$  of an inch in the lowest grades of Indian, and the values of these different grades varied before the war from 40*d.* per lb. down to 3*d.* In the following table an attempt is made to carry out this principle of classification in five main grades of cotton from the longest down to the shortest staple. It must be made clear, however, that this classification does not correspond with any existing trade classification, and that there is a considerable margin of uncertainty as to the place of particular cottons in the various grades. This table also gives the principal sources of supply of each grade, and indicates in particular the portion of each which was produced in the British Empire before the war. It must be remembered that conditions have so changed since the war that the quantities of cotton obtained in each district are now very different.

TABLE A.—The World's Cotton Supply and the British Empire's share in it  
(Based on pre-War figures\*).

Grade and Quality.	Where grown.	World's crop, bales of 500 lbs.	Empire's share bales.	Per cent.
I. Best Sea Island ... ..	Islands, South Carolina ... ..	8,000	4,000	33
	West Indies ... ..	4,000		
		12,000		
II. Sea Islands ... ..	Florida and Georgia ... ..	70,000	552,000	89
	West Indies ... ..	2,000		
	Best Egyptian (Sakel, &c.) Egypt ... ..	550,000		
		622,000		
III. Egyptian ... ..	Egypt ... ..	700,000	760,000	70
	Sudan ... ..	20,000		
	Staple American ... ..	Mississippi delta, &c. ... ..		
	Peruvian ... ..	Nyasaland, Uganda and E. & S. Africa		
		Peru ... ..		
		125,000		
IV. American ... ..		1,085,000	415,000	2.5
	United States of America ... ..	15,000,000		
	Mexico ... ..	150,000		
	Brazil ... ..	300,000		
	Russia ... ..	500,000		
	West Africa ... ..	15,000		
	Levant ... ..	100,000		
	India ... ..	400,000		
	China and Corea ... ..	250,000		
		16,715,000		
V. Indian, &c. ... ..	India ... ..	4,500,000	4,500,000	64
	Russia ... ..	750,000		
	China ... ..	1,800,000		
		7,050,000		
		25,484,000	6,231,000	24.5

\*Note.—In the case of Egypt, the allocation between Grades II and III is based on the figures of the 1917 crop.

The above system of classification has been followed as nearly as possible in the subsequent survey of the British Empire's sources of supply.

(36.) **Consumption of the various grades of Cotton.**—On a basis of 500 lbs. bales the pre-war consumption of cotton of these various grades within the Empire may be taken approximately as follows. Great Britain used annually some 700,000 to 800,000 bales of Grades I., II. and III., from 3,200,000 to 3,300,000 bales of Grade IV., and very little of Grade V. Indian mills used chiefly Grades V. and IV., and Canadian mills mostly Grade IV. Thus, the large bulk of the cotton spun in Lancashire falls in that particular grade (*viz.*, Grade IV), of which the smallest percentage is grown within the Empire. There is no doubt that the cottons now being grown in Uganda, Nigeria, &c., will, as their quantities increase, be readily accepted by British mills in substitution for American.

(37) **The supply of Fine Cotton.**—Apart from this general aspect of the cotton position the first three grades—which constitute the raw material of the fine section of the cotton trade—are of special interest to the United Kingdom, as for many years the tendency in Lancashire has been to specialise in the finer and more valuable branches of the Cotton Industry. The position of this section of the industry with regard to its supply of raw cotton has latterly been more unfavourable than the figures in the table given above would suggest, and the prospects of the supply of this grade of cotton deserve special consideration, particularly in view of the great importance which fine cotton has acquired during the war. It will be seen from the above table that the aggregate supply of these fine cottons is comparatively small, forming a total of barely  $1\frac{1}{2}$  million bales out of a world's total of over 25 million bales. It is derived mainly from three sources; the West Indies, the Sea Island districts of South Carolina, Florida and Georgia, and Egypt. All these three sources of supply have suffered severely during the war, owing to causes which will be fully considered in each of their appropriate sections.

## WEST INDIES.

*Maximum production, 1908—approximately 6,869 bales (400 lbs.).*

*Actual production, 1918—approximately 5,350 bales (400 lbs.).*

(38.) **Sea Island Cotton.**—Sea Island cotton is a distinct variety. Its exact origin is unknown and though its name, “Barbadense,” indicates that it was originally brought from Barbados, yet it is probable that at least some elements of its character were derived from plants indigenous in Brazil.\* Whatever may have been its origin the outstanding fact is that it has for more than a century been the only cotton suitable for spinning the very finest counts and qualities of yarn. It is of very long staple, ranging from  $1\frac{1}{2}$ " up to  $2\frac{1}{2}$ "; it is extremely fine, and it has a silky appearance. The qualities, however, which render it specially suitable for spinning very fine yarns also make it exceptionally difficult to handle in the mill. It has, moreover, certain defects, for it is very irregular in length of staple, with the result that its preparation for spinning involves the extraction of a large percentage of “waste,” and, unless it is very skilfully manipulated, the yarn made from it is liable to show many imperfections. Its use was for many years confined to a comparatively small number of spinners, most of whom until lately were either in this country or in Lille; but a few years ago it became a common practice for spinners in the United States to use a large proportion of the lower qualities of Sea Island cotton for spinning comparatively coarse yarns for special purposes.

(39.) **United States Sea-Island Crop.**—The production of Sea Island cotton during the nineteenth century was almost confined to the United States. Moderate quantities of rather inferior cotton were sometimes grown in Peru, and occasional efforts have been made from time to time in many other places, *e.g.*, Fiji and Tahiti, but practically until the end of the century the whole regular supply came from the United States. In the United States the home of this cotton was from an early date and is still the “Islands” of the coast of South Carolina, James, Edisto, John’s and others. It was only in these Islands that the quality could be maintained, and seed fit for replanting secured. The size of the crop varied very greatly from year to year, but averaged from 10,000 to 12,000 bales, and of this about 4,000 bales were known as ‘crop-lots.’ These were produced with immense care and personal attention by individual planters of great experience whose crops had each their own identity, and often commanded a high premium for their name, which was accepted as a proof of quality. A greater quantity, however, of Sea Island cotton was grown in Florida and Georgia more than one hundred miles from the sea. Here again the quality was very variable but until 1917-18 these crops have averaged about 80,000 bales of 400 lbs. These cottons were often sounder in character than

\* An interesting account of the origin of Sea Islands in the United States is given in a letter to the *Charleston Courier* which was reproduced in a paper read to the Manchester Literary and Philosophical Society on February 20th, 1839. It appears that after the Declaration of Independence, partisans of Great Britain were provided with homes in the Bahamas and there took up the growing of the Sea Island variety of cotton. It is said that they obtained the seed from the island of Anguilla in the British West Indies. In 1886, seed was sent from the Bahamas to planters in Georgia, one parcel to Governor Tatnall of Georgia which was planted by Nicholas Turnbull, another sent by Col. Roger Kelsall, of Exuma, to James Spalding, father of the writer, who planted it on St. Simon’s Island, Georgia. The plants resulting failed to fruit on account of the cutting off of the crop by winter frosts. Some plants, however, were ratooned or survived the winter and bore fruit in the following year. Mr. Spalding says that all the Sea Island cotton of Georgia and South Carolina descended from these plants.

the poorer qualities of the Carolina cotton, but as a whole they ranked, in price and for spinning purposes, on a distinctly lower level than the true Sea Islands. Small supplies of good cotton similar to these Florida and Georgia cottons were occasionally grown in Texas and elsewhere, but nothing ever appeared equal in quality to the produce of the Carolina Islands. Also it was never found possible to maintain the quality for more than a very few years without having recourse to fresh seed from the Islands. It is, of course, arguable in the light of modern knowledge that the deterioration of the seed was simply due to contamination by means of insects from neighbouring crops of short stapled cotton. But the belief was firmly held in the United States that it was only in the Islands that seed fit for planting could be produced.

(40.) **Boll Weevil.**—To complete the story of the United States it must be mentioned that the Boll Weevil which for nearly thirty years has been spreading from West to East through the American cotton belt has recently reached the long stapled region of Florida and Georgia. This pest, which ordinarily reduces the production of short stapled cotton by a quarter or a third, is much more severe in its effect upon Sea Island cotton, which takes much longer to mature. It is not expected that the Florida and Georgia crop will this year exceed 25,000 bales and the general opinion is that the growing of these cottons will be largely reduced or even abandoned. Further it is stated that the Sea Island district of South Carolina has this year been reached by the boll weevil. There is therefore cause to fear that the production of Sea Island cotton in the United States may be in danger of extinction. The importance of finding a substitute can hardly be exaggerated, and it is almost a miracle that in this century a substitute has been found in the British West Indies.

(41.) **The West Indian Islands.**—The West Indies (*see Map*) extend over a large area and may be roughly divided into the following groups. (1) The Bahamas which lie to the North of Cuba and extend to near the Florida Coast, (2) the Greater Antilles including Cuba and Jamaica which lie to the South of it, the Republics of Haiti and San Domingo and Porto Rico which latter now belongs to the United States. Further East the Lesser Antilles are divided into two groups, namely: (3) the Leeward Islands of which the chief from the point of view of cotton growing are St. Kitts, Nevis and Anguilla, Montserrat, and Antigua. There are also the French Islands of Guadeloupe, Marie Galante and Martinique; St. Croix recently bought from Denmark by the United States; and the Dutch Colonies of St. Martin's and St. Eustatius. (4) The Windward Islands including St. Lucia, St. Vincent and Grenada, with Barbados lying about 60 miles further East. (5) Tobago and Trinidad, the Southernmost of the Islands, lie close to the coast of Venezuela on the South American mainland. The British Colony of Guiana is often included in references to the British West Indies. Out of this long list the only foreign territories which are concerned with cotton are Haiti and San Domingo, which grow about 10,000 bales of inferior quality, not to be included in the Sea Island class; Porto Rico, where the Americans have done some experimental work; St. Croix, which under the Danes was worked as regards cotton in close conference with the Imperial Department of Agriculture for the British West Indies and grew about 500 bales of good Sea Islands; and the two Dutch Islands which have produced annually about 200 bales.

(42.) **History of Cotton Growing in British West Indies.**—As regards the British West Indies there is no doubt that in many of the Islands cotton has been grown spasmodically from the time when they were first visited by Columbus. Cotton of the Sea Island type appears to grow naturally in many places. Whatever industry, however, there may have been in the early part of the nineteenth century, it had become almost extinct, and it was only at the opening of the present century that a fresh beginning was made. In its earliest years the Imperial Department of Agriculture for the West Indies was brought into existence as one of the measures of relief for the distressed sugar growers, whose position had been rendered almost desperate, owing to the competition of German and Austrian sugar which flooded the British markets under a disastrous system of bounties and cartels. The growing of cotton was suggested as an alternative to sugar. The first commercial attempt at cotton growing was made by a planter in St. Kitts in 1901 who, stimulated by certain experiments carried on in the Government Experimental Station, planted a small area and reaped a promising crop. In the following year this same planter, in addition to carrying on the cultivation in St. Kitts, was instrumental in causing a fairly large area to be planted in Montserrat.

(43.) **Introduction of Sea Island Cotton.**—In 1901 the Imperial Commissioner, Sir Daniel Morris, K.C.M.G., accompanied by Mr. Bovell, of the Agricultural Department in Barbados, visited the United States to study cotton growing. They decided that the most promising cotton for the West Indies was the high priced Sea Island variety, and they had the courage to buy the available seed supply of Colonel Elias B. Rivers, whose cotton, though not of the very finest type, had the reputation of being the best selected and soundest strain available. This seed has formed the basis from which almost the whole of the Sea Island cotton grown in the West Indies has since been developed. There are exceptions in the case of certain types grown respectively in St. Vincent and Montserrat, while some of the cotton grown in Antigua may be traced to prior importations of seed known as the Seabrook type. The exception in St. Vincent occurs in respect of a type of extreme length and fineness developed from another of the "crop-lots" of South Carolina. In this case the seeds were obtained through the resourcefulness of a British spinner, who collected the few seeds which had escaped the gin and were found in his purchase of this almost unique cotton. Some of the Montserrat types of cotton may be traced to very small quantities of seed furnished by a British spinner, which were carefully cultivated and a valuable type of cotton obtained by rigorous selection from the resultant plants. It may be said here that in each case, under the care and attention that

has been given by those responsible, and favoured by the fertile soils of the West Indian Islands, the cottons now grown have in no respect deteriorated, but, on the contrary, have in the matter of strength of yarn come to excel those from which they were derived. The total quantity of Sea Island cotton produced in the British West Indies is small, but we consider it worthy of this somewhat extended notice for two reasons. First, because of its very high intrinsic value. Its best is at least equal to the best cottons of Carolina, and in its general gradation it corresponds very closely with the range of cottons grown in the best periods of Carolina cultivation. About 6,500 bales of 400 lbs. are produced in the British West Indies, of which perhaps 1,500 bales are equal to the "crop-lots" of Carolina, about 4,000 may be considered equal to the graded Carolinas, and the remainder are equal to the Florida and Georgia cotton. From what has been said about the menace of the boll weevil to Carolina, it will be seen that the future of the fine cotton supply of the world absolutely depends on the maintenance of the crop of the British West Indies.

(44.) **Excellence of the Crop Maintained by Concerted Effort on the part of all Interests.**—Our other reason for giving so much attention to a crop quantitatively so small is that the history of the modern development of cotton in the British West Indies affords in many ways a very valuable example of what ought to be done to develop cotton in other places. There have been in fruitful combination the persevering and intelligent efforts of planters, the science and organisation of Agricultural Departments in each island, assisted and co-ordinated by the Imperial Department for Agriculture, the co-operation of British spinners, and the advice and practical help in marketing rendered by the British Cotton Growing Association and its brokers. As regards the individual planters, much of the cotton is grown on plantations privately owned by Europeans, some of whom are resident, and others entrust their estates to responsible managers. Much originality has been shown in meeting the difficulties of growing a delicate crop, and of protecting and drying the cotton in the critical time of harvest. In many islands important additions are made to the total crop by peasant proprietors, who individually grow sometimes only a few plants each, but who are so carefully instructed and guided by the Government officers that their cotton can be graded and marketed in commercially possible quantities, while price adjustments are equitably made after the cotton is sold. The Imperial Department and the local Departments of Agriculture in the separate islands have done remarkably good work. In communities so small the men employed have been necessarily few in number, but have worked most successfully. Endless difficulties from climate and soil have been met, insect pests and fungoid and bacterial diseases have been combated in most cases with great success. Observations of value, not only in the West Indies, but of universal truth and applicable to many other countries, have been carefully made and recorded. Incidentally many men have been so trained in the West Indies, as to be eagerly selected for subsequent employment elsewhere. Further, the commercial assistance of the British Cotton Growing Association has been of value. Cotton growing in the West Indies began contemporaneously with the Association, and it was natural that the West Indies should have been one of its first interests. There is no doubt that in the first years the help the Association was able to render was very valuable. It is also, we understand, widely recognised in the West Indies that those British spinners who use the West Indian cottons have always been anxious to give their help in making the growing of cotton profitable to the growers.

(45.) **Survey of certain Islands.**—It is rather a striking fact that so far success in growing cotton has been confined to a few of the smaller islands.

In *Jamaica* a fairly promising start was checked by hurricanes and though recent efforts have again been fairly successful there does not seem much prospect of cotton being produced on a large scale.

In *Trinidad*, though experimentally cotton grows well enough, yet commercially it does not appear to compete successfully with cocoa, sugar and other tropical products.

In *British Guiana* sugar is preferred. Unsuccessful experiments have been made with Sea Island, Egyptian and American cotton, the failure of which is probably due to the fact that the soil and climate are unsuited to these imported varieties. In these circumstances there does not appear to be any immediate prospect of the production of cotton for export.

Practically speaking cotton is so far only established in the Windward Islands of St. Vincent and the Grenadines, in the Leeward Islands of Antigua, St. Kitts, Nevis, Barbuda, Anguilla, Montserrat and the Virgin Islands, and in Barbados.

In *St. Vincent*, where there is volcanic soil and an exceptional rainfall, the cotton grown is of a very high quality, and the prosperity of the Island now largely depends on the cotton crop. In recent years there have been great losses from certain bacterial and fungoid diseases, but we are informed that the sources of these have now been traced by the Imperial Department of Agriculture and the Department of the Island, and measures have been taken which it is confidently hoped will put an end to the diseases.

In *Grenada* cocoa is much more popular than cotton, but some cotton is grown in the islands adjacent to it.

In *St. Kitts*, which has soil of great fertility and remarkably easy to till, and which has a favourable rainfall, cotton of very good quality is grown. Here it is often grown as an intermediate crop between the harvesting of the ratoon crop of sugar and the replanting of new canes. Thus this happy island is sometimes able to get two crops of sugar and also a fine crop of valuable cotton within the space of two years.

*Nevis*, where the conditions are less favourable for sugar, has found in cotton-growing a great addition to her prosperity. The cotton is of a good and useful kind. In this island there is a large area cultivated by peasant proprietors.

*Montserrat* is another island to which cotton has brought a renewal of prosperity. The cotton at first was, comparatively, not very good; but in recent years the careful work of the Agricultural Department, backed by efficient management of the estates, has raised the standard of quality and much of the cotton is now quite first class.

In *Antigua* cotton has had a chequered career. It suffered at one time from exceptional attacks of pests and diseases, some of which were entirely new to science. In recent years, however, progress has been made and the industry is now firmly established, though it must be recognised that there are considerable tracts in this island where it is probable that sugar will generally be preferred.

*Anguilla*, *Barbuda* and the *Virgin Islands* do not call for any special remark. Cotton is thoroughly established on a small scale.

*Barbados* has had a somewhat unfortunate record in regard to cotton. As the headquarters of the Imperial Department of Agriculture it made great progress with cotton until the years 1907 to 1909, when it was growing about 2,300 bales per annum. Since then the quantity has decreased and it is said that the quality has deteriorated. The conditions on this island are very different from those prevailing in most other West Indian islands. It is flat and has a very shallow soil. There is no doubt that under present conditions sugar presents much greater attractions to the planters of the island, and it is probable that cotton will mainly be grown merely as a rotation crop, the chief object of which will be to purge the soil of certain insects injurious to sugar which do not attack cotton.

(46.) **Future Prospects.**—To sum up, the growing of Sea Island cotton in the British West Indies is now firmly established, and it is possible for it to be increased to a considerable extent as compared with the figures already given. Whether such an increase will actually occur must depend entirely on the demand for this very special cotton. If the present supply of Sea Island cotton from South Carolina were to continue the average annual demand for West Indian Sea Island cotton is not likely for many years to exceed the producing capacity of the West Indies. In such an event we think it may safely be left to the large and progressive firms of spinners, who use this cotton, to do all that is necessary to encourage its growth. We have, however, grave fears, as explained in § 40, that the Carolina crop will fall a prey to the boll weevil before many years are past, and in this case it seems to us probable that there will be some difficulty in increasing the supply of the best Sea Island cotton from the West Indies sufficiently to make up for the loss of the Carolina cotton.

Moreover, it is, we think, certain that there is no immediate prospect of obtaining from those West Indian Islands which at present grow cotton any considerable supply to take the place of the Florida and Georgia crops which, as explained in § 40, are threatened with immediate curtailment and, probably, with extinction.

Thus the whole question of maintaining an adequate supply of cotton of the Sea Island type seems to us to demand serious and early consideration.

#### *Conclusions and Recommendations.*

(47.) The crop, though small, is of world importance. We recommend that means should be provided to secure the continuance and, if possible, some enlargement of the Imperial Department of Agriculture.

We also recommend that careful enquiry be made as to the best means of replacing the Sea Island crop of the United States.

### EGYPT.

*Maximum production, 1914—approximately 1,921,000 bales (400 lbs.) [7,684,000 kantars].*

*Actual production, 1918—approximately 1,205,000 bales (400 lbs.) [4,820,660 kantars].*

(48.) **Importance of the Egyptian Crop.**—Reference has already been made to the serious position of the extra-fine cotton supply, and the probable destruction of the Florida and Georgia Sea Island crop. In view of this probability the supply of Egyptian cotton becomes of peculiar importance, because the fine grades of the best Egyptian variety, namely Sakellarides (or Sakel as it is commonly called) form practically the only substitute at present available for these grades of Sea Island. A similar cotton has recently been developed in Arizona but up to the present time has been almost entirely consumed in the United States.\* The best Sakel had proved before the war to be, for many purposes, as good as all but the best Floridas and Georgias, and for some purposes, where strength is necessary, superior to them. At the same

\* It is alleged that the crop of American Egyptian cotton has reached the following proportions :—

1917-18	...	...	...	...	...	17,000 bales (500 lbs.).
1918-19	...	...	...	...	...	38,000 "
1919-20	...	...	...	...	...	60,000 "

But the Government estimate of the 1919 crop is 45,000 bales.



time, apart from the extra-fine cottons, the Egyptian crop itself has for many years supplied the great bulk of the raw material for the fine spinning industry, which is, as already mentioned, very largely British. It is therefore essential to describe at some length the recent developments of the Egyptian crop, with a view to estimating its future prospects.

(49.) **Limited Area Capable of Growing Cotton.**—It is necessary at the outset to emphasise the fact that although Egypt appears on the map as a large square block, embracing altogether an area of over 350,000 square miles, the great bulk of this territory is desert, and only about one-thirtieth part, or 12,000 square miles, can be cultivated. The climate is practically rainless, the fall varying from a maximum of about eight inches at Alexandria to about one inch at Cairo, and as the Nile has not a single tributary in Egypt, cultivation is restricted within the narrow limits to which the waters of the Nile can be carried. This consists of (1) a strip, about 554 miles in length, but sometimes not much more than a mile in width on either bank, stretching from Assuan to Cairo, and (2) the small fan-shaped Delta of the river from Cairo to the Mediterranean. More than three-fourths of the total cotton crop and all of the best varieties are grown in the Delta, of which the sides measure roughly 120 miles, while the coastline which forms the base of the triangle extends for about 70 miles along the Mediterranean. The cultivable area of the Delta, however, is still further reduced by the large salt lakes near the coast, and at present comprises about 3,100,000 acres. Cultivation throughout the whole area is dependent on irrigation.

(50.) **Irrigation System.**—In order to make the present position clear, it is necessary to understand the history of cotton in Egypt, which in effect means the history of the irrigation system. The outstanding fact is that the Egyptian cotton of to-day is entirely modern. It was not used by the ancient Egyptians, and while a short stapled Asiatic variety was almost certainly brought into the country by the Arabs and there are records of another kind which existed after the Middle Ages, the present production of long staple cotton in Egypt dates only from 1820. In that year a French-Swiss engineer named Monsieur Jumel found growing for ornamental purposes, in the garden of Maho Bey in Cairo, an arborescent plant which he recognised as cotton, and which possessed a staple of good quality. He laid the matter before Mohammed Ali, Pasha of Egypt, who with characteristic energy and foresight at once proceeded to re-organise the whole system of irrigation in the country to suit the new crop. Until then the only irrigation in Egypt had been on what is known as the "Basin" system, under which large areas of land near the Nile and communicating with it by short canals were enclosed by great earthen embankments. When the Nile flood came down about August, the water was turned into these basins and allowed to lie several feet deep until early in October, when the falling level of the Nile made it possible to return the water to the river, and the land was left ready to receive a crop. This system, however, was entirely unsuited to cotton cultivation. Cotton is a summer crop, which, if it did not die from want of water during the long hot summer of Egypt, would be drowned by the arrival of the flood just about the time of picking. To provide for cotton growing it was necessary to introduce a new system of irrigation whereby the flow of water could be controlled, so that instead of its being thrown on the land in bulk once a year, and being allowed to stand for a long period, it could be made available in regulated quantities throughout the year. This entailed the construction of long canals for the distribution of water. Such a system was introduced by Mohammed Ali, and soon a considerable number of main canals had been constructed supplying a large portion of the Delta with perennial irrigation. Cotton cultivation developed on a large scale, the original Jumel stock being mixed with imported Sea Island, Brazilian and Peruvian seed. Many new annual types were established from which have subsequently arisen all the varieties since produced in Egypt. There was, however, one serious drawback to this system. When the Nile rose to flood level it filled the canals to the brim with heavy silt-laden water, but as the flood fell during the autumn the canal beds were found to be choked with silt, while the main river, owing to the greater scour, maintained its original depth. This meant that during the spring and early summer the level of the water in the river fell far below that of the new level of the canals, so that no water could enter them until the silt left by the flood had been removed. This involved an enormous amount of work and greatly increased recourse to the immemorial custom of Egypt, the *corvée*, or forced labour. The evils of the *corvée*, however, rapidly became serious, and in 1833 another French engineer, Linant de Bellefonds, laid before Mohammed Ali an ingenious scheme for doing away with the greater part of the work. His idea was to erect a great barrage (weir or regulator) just below Cairo, at the bifurcation of the river into the Rosetta and Damietta branches, where the principal irrigation canals of the Delta took off from the river. By maintaining at this point an artificial head of water throughout the period of low Nile, it was possible to give a certain supply of water to the main canals, thus greatly reducing the amount of silt deposited. The Cairo, or delta barrage, was begun on this principle in 1842. It was completed in 1861 at a supposed cost of £4,000,000; but almost before it was finished it began to show signs of serious collapse, and in 1867 it was abandoned. After the British occupation in 1882 it was repaired and completed by Sir Colin Scott Moncrieff between 1884 and 1890. Similar barrages have been subsequently provided for Upper Egypt at Esna and Assiut, and at Zifta in Lower Egypt, and another is in contemplation at Nag Hamadi. The barrages have proved a great success, and as will be seen from Table C,\* the area under cotton, and consequently the crop, has increased rapidly. In fact, so rapid was the increase of area, that very soon the demand for water became larger than the available supply, and means had to be sought for increasing it. While the barrage system enabled full advantage to be

\* See Appendix IX.

taken of the supply in the Nile, there were frequently years when the low Nile in spring and early summer gave an insufficient supply, and large areas received little or no water. In order to meet these difficulties the great dam was built at Assuan, situated to the south of all the cultivable land of Egypt. Its purpose differs from that of the Delta barrage, which is intended to raise the level of the river, while the Assuan dam is a storage reservoir which is filled from the tail end of the flood and then kept full throughout the autumn and winter until the period of scarcity begins about March or April in the following year. As the river falls the sluices at Assuan are gradually raised, and the supply is thus maintained; while the Delta barrage still serves the function of keeping the level sufficiently high to fill the distributing canals.

(51.) **Drainage and Land Reclamation.**—With the completion of the Assuan dam in 1902 it might have seemed that the work of the irrigation authorities was finished, but it very soon became apparent that this was by no means the case. For some time it had been noticeable that the average yield of the crop per acre had been diminishing, and there was much speculation and enquiry as to the cause. One theory, which at first received very little support, was that the damage was due to the new conditions of water supply which had been produced by the modern irrigation system. It was pointed out that whereas in the early days large expenditure had been incurred on drainage as well as on irrigation, in later years, owing to the very heavy capital expenditure upon engineering works, the improvement of drainage had not kept pace with the increase of the water supply. It must be remembered that under the former system of basin irrigation, and even in the early stages of perennial irrigation, the whole country was subjected every summer to a prolonged period of more or less complete drought, which dried the land and prevented any possibility of the soil becoming waterlogged through lack of drainage. Under the new system, this natural period of drying had almost ceased to exist, except in years when the water supply was abnormally low. The problem of water supply each summer depends on two factors, namely, the height and date of the previous flood from which the stored supply is drawn, and the date of arrival of the following flood. The maximum quantity stored in Assuan is practically constant, and the period of scarcity over which it must be spread varies according to these two factors. Thus, if the Nile in one autumn is low or falls early (and these two conditions need not coincide), the period of scarcity will begin earlier in the following spring, and if this is followed by a late Nile the next summer, the period of scarcity is prolonged. If, on the other hand, the previous Nile is late and the following summer's flood comes early, the period of scarcity is reduced. The water is distributed under a system of rotations by which each canal is divided into three sections and the water level in each section is controlled in such a way that only one section is full at a time, the water in the other two being kept so low as not to allow free flow irrigation on to the adjoining land; thus, in effect, the land is only watered during its rotation period, which in a normal year would be about seven days out of twenty-one. If, however, the water supply is scarce, the period of the rotation may be lengthened, while, on the other hand, if the supply is ample, it may be shortened.

(52.) **Over-supply of Water.**—In 1909, by an unusual combination of events, the water supply was the most plentiful that had ever been available. The 1908 flood was late and high, and early in the season it became apparent that the 1909 flood was some weeks in advance of the normal date. The result was that the rotation periods hardly required to be enforced at all. The water supply was ample, and apparently no one realised the danger of an over-supply. Thus, when the flood arrived at the end of June and the cultivators poured it upon the land as usual, the land was so soaked with water that in some cases it lay on the surface and would not sink into the land. Large parts of the country were thus completely waterlogged by overwatering, while in other parts near the canals and the river a similar result was produced by seepage or infiltration during the high level period. The effect on the cotton crop was disastrous. What had promised throughout the summer to be the largest crop on record, amounting to at least  $7\frac{1}{2}$  million kantars\* (or 1,875,000 bales of 400 lbs.), was cut down in a few weeks in autumn to barely 5 million kantars (or 1,250,000 bales of 400 lbs.). The consequent loss in the value of the crop was probably not less than 10 million pounds sterling, and inevitably aroused very keen discussion as to the causes of the trouble. It is not necessary now to enter into this controversy in detail, but in the long run the theory of waterlogging forced its way into general acceptance, and the next problem was to settle upon the best remedy. It was, of course, clear that the remedy was drainage in one form or another, but this again aroused an unfortunate controversy as to the best methods of meeting the problem, which was a peculiarly difficult one.

(53.) **Comprehensive Scheme for Egypt.**—The crux of the difficulty was the provision of an adequate outfall, for it must be realised that most of the land along the coastline of Egypt is below sea level, and any system of drainage must include the provision of an artificial outfall by pumping. The scheme proposed was to provide this outfall near the sea at the tail end of a series of huge main drains, but the expenditure involved was found to be very heavy. Finally, however, a method was suggested of solving the financial problem by extending the scheme still further. It was pointed out that the Delta was divisible from the point of view of drainage into three parallel zones. The upper or south end of the Delta stands fairly high, and it had not suffered much from waterlogging; the middle zone had been the chief sufferer from the recent overwatering, but the northern zone had already been for many centuries in a

\* The kantar = approximately 100 lbs.

hopeless condition as to drainage. There is no doubt that at one time the whole of this northern zone or seaboard of the country was well cultivated and highly prosperous, but since Roman times, either through neglect of drainage or owing to a lowering of the natural levels, it has become an absolute waste, the whole area being so thoroughly salted as to be almost entirely unproductive. All the subsoil of the Delta is still more or less salted, and if at any time the subsoil water-table is even temporarily raised to the surface by overwatering or seepage and insufficient drainage, the surface soil also becomes charged with salt and is more or less permanently damaged. This was probably what happened to the northern zone long ago, and to a modified extent it has now happened also in the middle zone. The method now proposed for handling the whole problem was designed to take advantage of this fact. By creating an artificial outfall at the sea and establishing a new system of drainage throughout the middle and lower zones, it was proposed not only to remedy the damage recently done to the middle zone, but also to reclaim the whole of the northern zone, including the actual area of the salt lakes themselves, thus restoring to cultivation an area of probably about one million acres. The value of this land, when drained and reclaimed, would more than cover the whole cost of the enormous drainage, irrigation and reclamation schemes which these plans involved; for good cotton land in Egypt before the war was worth £100 to £200 per acre. This area is, moreover, the one in which we may anticipate the development of cotton approximating to the Sea Island type, if further supplies of such cotton are needed.

(54.) **Details of the Egyptian Reclamation Scheme.**—The great scheme in which these proposals are to be carried into effect has been described to us by Sir Murdoch MacDonald, K.C.M.G., C.B., Under Secretary of State for the Egyptian Ministry of Public Works. It was explained that there are in the Delta about 2,270,000 feddans\* of land now in cultivation, on which improved drainage would almost certainly permit 1,000,000 kantars to be added to the annual cotton crop. There are also 880,000 feddans now covered with water or too much impregnated with salt to permit of cultivation, and from this, at a moderate estimate and allowing for the rotation usual in Egypt, a further amount of 2,500,000 kantars might be reasonably expected. It was mentioned to us that the cost of the complete scheme—water storage, irrigation and drainage—might be £36,000,000. At present prices the 3,500,000 kantars of resulting cotton would be worth the same amount annually. The whole scheme would take fifteen or twenty years to complete, if it were done in the way most convenient to Egyptian conditions, but it would begin to produce results almost at once. Taking advantage of the configuration of the Delta, the engineers have divided this scheme of drainage into ten or eleven areas, each of which must be considered and treated separately. Work upon two of these, numbered respectively 1 and 6 and containing 411,000 feddans of uncultivated land, had been sanctioned before the war, and some progress had been made. The war caused a practically complete suspension of work. The large pumping plant upon which the whole scheme depended had been ordered from England, but could not be proceeded with after the war began. Much of the earthworks of the main and secondary drains in the two sections had already been completed, and it was at first hoped that it would be possible to carry this work through to such a point as to secure immediately at least part of the benefit to the adjoining land, which would have resulted from its completion. Unfortunately, however, this proved to be impossible as the demands of the Labour Corps in connection with the Palestine Campaign soon began to impose a severe strain on the labour supply in Egypt. Since the cessation of hostilities we are glad to know that work has been resumed, and there is every reason to hope that these two sections will now be completed as rapidly as possible.

(55.) **Need for Increased Water-storage.**—Before, however, this great scheme can be carried into full effect, and indeed before any additional land can be brought into cultivation even in the two sections, where the drainage works are actually in progress, it will, we are informed, be necessary to add to the arrangements for water storage on the Nile. The Assuan dam when built was capable of storing 1,000,000,000 tons of water. In 1912 it was strengthened and enlarged so as to contain 2,400,000,000 tons. This great quantity is, however, insufficient for the full requirements of Egypt even for the areas already under cultivation. It is part of the proposals of the Egyptian Ministry of Public Works to provide fresh storage by building a new dam or barrage on a convenient site on the White Nile just South of Khartoum, at a place named Gebel Aulia. It is calculated that this will practically double the water storage for Egypt. At the same time it has been explained to us that the provision of this barrage will materially assist in the control of unduly high floods and thereby facilitate the work of the engineering staff of Egypt in giving the country adequate flood protection. As will be explained when we come to deal with the Sudan, the subject of water storage for Egypt and for the Sudan has to be considered as a whole. We are glad to note that the subject is receiving close attention.

(56.) **Dense Population.**—In all countries where cotton growing is being considered, the question of population is most material. In Egypt the population is already dense, and it is increasing so rapidly as to be a matter of some anxiety to the Government. We are told that about thirty years ago, when the British occupation began, there was 0·9 of a feddan of crop per person and that to-day the figure is probably only 0·7. The population is increasing by 200,000 every year. It is extremely conservative in habit and very reluctant to emigrate.

\* 1 feddan is roughly 1 acre.

N.B.—3,500,000 K. at 56 Tal. per kantar in Alexandria = 28d. per lb. 350,000,000 lbs. at, say, 2s. = £35,000,000.

It seems, therefore, that schemes by which the products of the soil might in a comparatively short period of years be increased by about fifty per cent. are extremely desirable in the interests of Egypt herself.

(57.) **Insect Pests.**—As in most other cotton-growing countries, insects have in Egypt at various times done great injury to the cotton crop. Before the war Egypt had already had to combat two very serious pests, namely, the cotton-worm and the ordinary boll-worm. The former had been satisfactorily dealt with by legislation, and was well under control; the boll-worm had proved more difficult to deal with, but, except for occasional bad years, it had not seriously diminished the yield of the crop as a whole. In 1913, however, the new pink boll-worm (or seed-worm, as it is called from its habit), which was first found in Egypt in the year 1910, had become widespread throughout the country and was causing very serious damage. Unfortunately, it was not found possible to take immediately the steps which might have gone far to arrest the progress of this pest in its early stages, and by the time appropriate measures had been resolved upon, the outbreak of the war had added greatly to the difficulty of obtaining the accessory appliances. Consequently the laws which had been passed for the adoption of certain preventive measures, could not be fully enforced under war conditions, and there can be little doubt that the pink boll-worm was largely responsible for the serious diminution of the average yield per acre of the Egyptian crop, which, as will be seen from Table B in Appendix IX, has been one of the most serious characteristics of the situation in Egypt during the war. The fact must therefore be faced that, as the combined result of the water logging which had been going on before the war, and which has not yet been entirely cured, and the advent of the pink boll-worm, the average yield in Egypt has been reduced from 5·80 kantars per feddan in 1897 to 3·10 in 1916. Making every allowance for the uncertainty of the maximum yields recorded in the early years, it is clear that the average yield in Egypt has recently suffered very serious diminution.

(58.) **Restriction of Acreage.**—Another factor has, however, contributed to the reduction of the crop, namely, the restriction of acreage during the war. There was inevitably in Egypt, as in every other country, as a result of the temporary collapse of prices, a serious reduction in the acreage under cotton in 1915 as compared with 1914 (*see* Table B), but owing to the subsequent rise of prices, the area in the two following years showed signs of a satisfactory recovery, and in 1917 the actual acreage was 95 per cent. of the record acreage of 1914. At that stage, however, the increasing requirements of Egypt for the production of cereals, both for the maintenance of her own population (in view of the stoppage of overseas supplies) and the enormously increased local demand for the feeding of the Army in Egypt and Palestine, compelled the Egyptian Government to adopt the policy of temporarily restricting the area which might be sown with cotton in 1918. While deeply impressed with the undesirability of such a restriction from the point of view of the cotton industry, we felt that under the abnormal conditions we had no alternative but to admit the necessity of this step. Immediately on the cessation of hostilities we addressed the Egyptian authorities and the restriction was withdrawn, but it is doubtful whether, in view of the disturbances which broke out in Egypt in the spring of 1919, the recovery of the acreage this year will be up to the pre-war standard. It is therefore almost certain that the Egyptian crop of 1919 will be considerably below the record figure of 1914. This means that in Egypt, as in America, we have had during the war a series of crops of which the best can only be described as mediocre in quantity, while three of them have been lower than anything experienced for over twenty years with the exception of the failure of 1909.

(59.) **Maintenance of Quality.**—For some time before the war serious doubts had arisen as to whether the quality of the crop was being maintained. The history of the previous century had shown that one variety after another in Egypt had risen to a commanding position in the market, only to deteriorate gradually and finally disappear. Thus, the older varieties, such as Gallini and Abyad, are now only a memory to the veterans of the trade, and their successors, Jannovitch, Abbassi, Nubari and others, were by 1913 showing the usual deterioration, and even the Mitaffi cotton, of which a few years earlier the bulk of the Delta crop had consisted, was showing serious indications of decline of quality. Ashmuni cotton, which is practically confined to Upper Egypt, has changed but not deteriorated. In 1908 a new variety, Sakellarides, commonly known as Sakel, appeared. Until then the drawback of the specially good varieties, such as Jannovitch and Abbassi, was that they only seemed to grow well under favourable conditions, which could not be found except in certain districts. Sakel, however, besides being in many respects better than the older varieties, showed an unusual adaptability, which led to its becoming the main crop throughout the whole Delta. In 1913, it formed about one-fifth of the total Delta crop, it is now grown there almost to the exclusion of all other cottons. Thus, although there is less cotton, there is more fine cotton, and this has probably gone far to meet the difficulty which might otherwise have been more acutely felt by the spinners of fine counts. On the other hand, economic inconveniences are felt by the great bulk of spinners of Egyptian cotton, arising from the complete substitution of a longer-stapled but more wasteful cotton for the clean fibre of moderate length, which had for many years been the main product of Egypt. In view, however, of the warning of previous experience, it would not be wise to rely on Sakel maintaining its quality permanently, and it is very important that unceasing vigilance be exercised in efforts not only to maintain the purity of existing varieties, but also to have varieties ready to take the place of the older types if, despite all efforts, they still deteriorate. Some work has already been done in this direction in Egypt; and it is satisfactory to note that evidence seems to be accumulating to the effect that the so-called inevitable deterioration of existing varieties is

due to natural crossing in the field and to intermixture of seed, and is therefore largely preventable if proper measures be taken to control the seed supply. By constant attention to seed selection and the adoption of an adequate system to prevent admixture with inferior varieties, it should be possible to maintain permanently a commercial supply of good seed. At the same time, it is very desirable to obtain and hold in reserve for introduction under proper control, if the need arise, a supply of seed of new and improved varieties, resulting either from selection or from systematic hybridisation. The one thing obvious is that the maintenance and improvement of the seed supply is essential in a country like Egypt, where the value of the crop depends so largely on its quality. We note with very great satisfaction that the Egyptian Government has now decided to establish a special Cotton Research Board, which promises to provide much more adequate facilities for following out this line of work, and which will also investigate, by strictly scientific methods, all other problems affecting the production of cotton.

(60.) **Statistics.**—Egypt is in several respects peculiarly favourably placed for the collection of statistics. In the first place, the fact that the whole crop is dependent on irrigation, which is supplied by the Government, makes it essential that the Survey Department and the Direct Taxes Department, which collect the Land Tax, should have intimate knowledge of every plot of cultivated land in the country. Thus it is possible for the "sarrafs" (tax-gatherers) to produce at a comparatively early date fairly reliable returns of the area sown with cotton each season. These returns are the basis of the estimate of the crop area, which is not published at any fixed date, but usually appears in July. Since practically all the crop is sown by the end of April, the possibility of issuing these returns at a fixed date (say 25th June, as in America) might be considered. Earlier information of the area sown would be of great value to the trade. The general accuracy of the sarrafs' returns was verified in 1910, and again on several subsequent occasions by the Survey Department, which made an independent survey. We hope that it may be possible to repeat this check periodically. It is unfortunate that the same claim to accuracy cannot be made for the sarrafs' returns showing the area under each variety of cotton, and this is inevitable, since it is impossible to identify most varieties of Egyptian cotton until the plant is fully matured. At the present time area statistics are the only information available for the purpose of forecasting the probable magnitude of the crop. The crop condition reports which have been published monthly during the season since 1912 by the Department of Agriculture have not been particularly successful. We believe that in such a small and intensively cultivated country as Egypt it ought to be possible to improve the forecasting of the yield, and we recommend that the new Cotton Research Board should be asked to consider the practicability of adopting some system for recording the condition of the crop from which forecasts could be prepared.

(61.) **Continued Development essential.**—To sum up, the position in Egypt cannot be regarded as entirely satisfactory. From the time of the British occupation the Egyptian crop on the whole had developed more or less steadily until the crop failure of 1909. Since then the downward tendency in the average yield which had been evident before 1909 has continued with fluctuations, and we feel that, in view of the crucial importance of the supply of fine cotton, no measures should be neglected and no effort or expenditure spared till the Egyptian crop not only returns to its pre-war records of yield, but substantially surpasses them. We are satisfied that those responsible for the government of Egypt realise the importance of cotton, not only to the Empire, but to Egypt herself; and we are assured that no reasonable expenditure on extending and improving the cotton area will be refused and that the allocation of funds to agriculture will be encouraged. From the evidence given to us, which we have already quoted, it is not only clear that the crops of 7,500,000 kantars (or 1,875,000 bales of 400 lbs.) may be again expected if the proper measures are taken by the Government; there are also grounds for believing that in a comparatively short period of years an additional quantity of 3,500,000 kantars (or about 900,000 bales of 400 lbs.) will be annually produced.

#### CONCLUSIONS AND RECOMMENDATIONS.

(62.) The following are our conclusions and recommendations with regard to Egypt:—

- (a) The Egyptian crop before the war had reached a total of over 7½ million kantars (or 1,875,000 bales of 400 lbs.). It has, however, during the war fallen below five million kantars. Having in mind this fact and the particularly serious reduction in the supply of fine cotton generally, owing to the probable loss of the Florida and Georgia crop, we regard the position in Egypt with peculiar anxiety, and desire to emphasise the necessity of leaving no step untaken to remedy the causes which have led to this decline and to attain the maximum production of which the country is capable.
- (b) As quality is of first importance in fine cottons such as Egyptian, we consider it essential that work should be directed methodically and constantly, not only towards maintaining the quality of the existing varieties, but also towards securing and holding in reserve other varieties for introduction when and as expedient.
- (c) We would especially emphasize the desirability of proceeding without delay with the measures already determined upon before the war, to remedy the unsatisfactory condition of parts of the Delta as regards drainage and the control of excess water.

- (d) Concurrently with the completion of these projects, it is of the utmost importance that water should be available for the reclamation and irrigation of the lands referred to, as well as of those further north which will be restored to cultivation by the new drainage works. An adequate water supply is available in the White Nile, and we trust that no time will be lost before adopting the best measures for its utilisation. Until this is done full advantage of the expenditure already incurred in the Northern Delta cannot be obtained.
- (e) It is estimated that the measures referred to in paragraph (d) would result in an increase of 3,500,000 kantars of cotton, or about 900,000 bales of 400 lbs. The magnitude of such a possible increase in the Egyptian crop overshadows, though it in no way detracts from, the importance of the prospective increase in Uganda or Nigeria, where some such figure as 100,000 bales may be expected as the result of development work.
- (f) Since part of the serious reduction in the average yield of the crop is due to the devastations of the pink boll-worm, we consider it essential that no time should be lost in putting into force the measures decided upon just before the outbreak of war to combat the ravages of this pest.
- (g) We most cordially welcome the appointment of the new Cotton Research Board in Egypt and hope that every assistance will be given to it and to its endeavours to elucidate the problems affecting the Egyptian cotton crop, in particular (i) the environment of the crop, specially with regard to water and to the control of insect pests, and (ii) the maintenance and improvement of the quality of the seed.

## THE SUDAN.

*Maximum production 1915—approximately 24,000 bales (400 lbs.).*

*Actual production 1918—approximately 12,000 bales (400 lbs.).*

(63.) **Irrigated and rain-watered areas.**—The geographical area of the Sudan is larger than that of Egypt. It is about 1,000,000 square miles in extent, or about half as large again as the whole area of the American Cotton belt. The climatic range is much greater than in Egypt, especially with regard to rainfall, so that a larger proportion of the country, though by no means the whole of it, may ultimately prove to be suitable for cotton cultivation. From this point of view the country may be divided into three belts. The most northern, running up to the boundary of Egypt at Wady Halfa, is entirely rainless; the middle belt, running from Port Sudan through Khartoum, has a rainfall of about 4 to 8 inches per annum, which, however, is quite inadequate for cultivation. South of this the Nile lies within the region of tropical rainfall in Central Africa; at Roseires on the Blue Nile near the Abyssinian border the rainfall is about 32 inches, at Gondokoro on the White Nile, on the borders of Uganda, it is about 35 inches, and this rises to 48 inches at the Albert Nyanza. From the point of view of cotton growing, therefore, the country falls into two main divisions—the irrigation district in the north, and the rain-grown cotton district in the south. The former is at present the more important, and includes four entirely separate districts.

(64.) **Tokar.**—At present the largest production is at Tokar near the Red Sea littoral, where irrigation is rendered possible by the annual flood of the river Baraka. The area which can be irrigated each year depends on this flood, which unfortunately is under no control and changes its course in different years to such an extent that it is practically impossible to make any preparation for the crop until it is seen what direction the flood will take. If the flood could be controlled, assured water supply could probably be given to an area of 70,000 or 80,000 acres every year. It is hoped that means may be found for effecting this control in the future. The largest area under cotton so far recorded was about 47,000 acres in 1910-11, which produced a crop of just under 50,000 kantars (of 100 lbs.) of lint. Perhaps the most interesting feature of the Tokar crop is the very stringent Government control which is imposed on the whole system of handling the crop from seed to harvest. The seed supply is entirely in the hands of the Government, which also insists that all inferior cottons are weeded out of the growing crop. The harvesting of the crop is subject to Government inspection to secure clean picking, and the crop passes through Government markets where the Government classifier grades it into four classes. The result is that Tokar cotton has established a reputation in the Liverpool market which is worth a substantial premium. The main difficulty, however, of the Tokar district is the cost of transport. At present the whole crop must be carried about 20 miles by camel to the port of Triunkitat, thence by small native sailing boats to Suakin or Port Sudan. The railway from Tokar to Suakin has been under consideration for some time, and it is understood that funds for this purpose will be available under the new Sudan Loan.

(65.) **Kassala.**—The second area is at Kassala, which is irrigated in a similar way by the river Gash. The conditions resemble those at Tokar, the flood season being from July to September. The rainfall, about 16 inches per annum, is more than at Tokar, but



unfortunately comes at the same time as the flood. The river, however, is more stable than the Baraka at Tokar, and a considerable part of the area is under perennial irrigation from a weir or barrage on the Gash. Other districts are irrigated on a system resembling basin irrigation. Before the war the crop was estimated as about 4,000 kantars of seed cotton, but the district was said to offer much larger possibilities, as much as 120,000 acres of land being available for cotton. The great difficulty again is transport. The district lies on the borders of Eritrea (Italian), and is about a fortnight's journey by camel from the nearest railway station. The projected railway which would open up this district is another of the schemes for which provision may be made out of the new Loan.

(66.) **Pump irrigation areas.**—The third district consists of a number of comparatively small areas along the Nile north of Khartoum, where cotton is grown under pump irrigation, the rainfall again being insufficient. The best known of these is the Sudan Plantations Syndicate's estate at Zeidab, 180 miles north of Khartoum, where over 3,000 acres were under cotton before the war. Difficulties have been met with in this area through the cold night winds which prevail between November and January and occasionally do so much damage as to make the crop vary from four kantars to as low as one kantar per feddan. These conditions make it impossible to cultivate Egyptian cotton successfully. It has been found, however, that Nyasaland Upland cotton (introduced at the suggestion of the British Cotton Growing Association) is suited to the climatic conditions, and gives a better staple than in Nyasaland. The land is worked entirely by small native leaseholders and the syndicate has established an excellent system of control over the whole crop from the seed to the ginning, which, owing to its success, is likely to form the model for other similar areas in the Sudan.

(67.) **The Gezira.**—But the greatest hope of the Sudan, so far as irrigation is concerned, lies in the fourth area, the now well-known Gezira (or island) district between the Blue and White Niles. These two streams, which meet at Khartoum, are the main source of the Nile's supply. Their character is markedly different. The Eastern branch, viz., the Blue (or Muddy) Nile, brings down from the mountains of Abyssinia early in the summer a tremendous torrent of water heavily charged with silt. The White Nile, on the other hand, which comes from the great Lakes Victoria and Albert Nyanza, traverses a long stretch of flat country; its stream is more sluggish, and its flood, besides producing a much smaller change of level, tends to arrive rather later than that of the Blue Nile. The result is that when the Blue Nile flood comes down it practically blocks the mouth of the White Nile at Khartoum for a time and dams the White Nile back. The Gezira plain, which comprises a total area of over 3,000,000 acres, lies in a triangular form to the immediate south of Khartoum, between the two rivers. It slopes slightly from the East towards the West, and, for this and other reasons, it is said that it must obtain its irrigation water from the Blue Nile, while the White Nile will ultimately form a convenient outfall for its main drainage system.

(68.) **Irrigation of the Sudan is stated not to affect Egypt adversely.**—It is obvious that Egypt has the first claim on the waters of the Nile. There would be no advantage in irrigating extensive tracts in the Sudan and attracting to it a population which does not now exist or, at least, does not depend on the Nile, if such a move were to be accompanied by a restriction of the normal development of Egypt where, as has already been pointed out, there is a dense and naturally increasing population. The scheme of operations that has been adopted is based on the belief that if the proper measures are taken, very large areas of the Gezira can be irrigated without depriving Egypt of the water she now needs, or of the water she will need when her delta areas are brought into cultivation. The solution of the problems is said to lie in the recognition of the differences between the two rivers. The White Nile can be of no service to the Sudan, its waters can therefore be made entirely available for Egypt. From the Blue Nile, on the other hand, it is calculated that a considerable amount of water can be spared from the crest of the flood without injury to Egypt. It will, however, be necessary, for technical reasons, to provide the additional barrage at Nag Hamadi, which has already been mentioned.

(69.) **White Nile Reservoir.**—The measures which it is proposed to adopt deal appropriately with the necessities of each river. On the White Nile, as already mentioned in the Egyptian section, it is proposed to form a storage reservoir at Gebel Aulia capable of impounding really stupendous quantities of water. We are told that in the years in which the White Nile has a maximum flood it will be capable of storing as much as 10,000,000,000 (ten thousand million) tons of water, and normally it may be depended on at least to double the 2,400,000,000 tons now stored at Assuan.

(70.) **Blue Nile Barrage.**—On the Blue Nile a barrage is to be erected near Senaar. We understand that a certain amount of storage will be provided by this, but the principal object is to raise the level of the river so that by means of a canal about 36 miles in length the water may flow by gravity on to the land to be irrigated. We were informed by Sir Murdoch MacDonald that when this dam is completed, together with the main canal and the necessary system of distributory canals for irrigation, it will be possible to put about one million acres of land in the Gezira into cultivation, of which, according to the plans at present adopted, one-third would be in cotton. Further extension can be made in subsequent years by other schemes of water storage, or possibly by growing cotton which develops quickly and which can, therefore, be supplied with water during the period of high Nile. While we have no doubt that some of these schemes will be found to be feasible, we do not consider them sufficiently matured to be further described at the present time. Our attention has recently been drawn to criticisms

in regard to both the schemes above-mentioned. It is obviously beyond our province to adjudicate in a matter so intricate and so technical. There is, at any rate, no doubt that the necessary works should be pushed on to completion as rapidly as possible, and we have had great pleasure in noticing that Parliament has passed the Bill which authorises the British guarantee of a loan to be issued by the Sudan Government of six millions sterling. The immediate scheme is confined to irrigating 300,000 acres. This can be extended to 900,000 or 1,000,000 acres without any serious expense. The subsequent development of the whole area of 3,000,000 acres or more will necessitate additional storage, and will require further consideration. In each case it is expected that one-third of the cultivated area will be in cotton, and it is not unlikely that the yield may approach 400 lbs. of lint per acre.

(71.) **Types of Cotton to be Grown in the Gezira.**—Up to the present time cotton of the Egyptian type has been the principal growth, and it appears probable that cotton of this kind will adapt itself very readily to the local conditions. But it has been found that certain strains of the American type also do very well, and we do not consider that it has yet been decided which sort will give the best commercial results. A well-conducted Research Farm is maintained in the Sudan, and has carried out very valuable experiments in cotton. It is, however, located just North of Khartoum and has, apparently, not been very closely in touch with the actual experiments in growing cotton on a large scale. We are glad to hear that different arrangements are now being made. Some difficulties have existed in the past in arranging for experimental work on scientific lines in this area, and we have been glad to hear that it is now proposed to make arrangements to begin such work.

(72.) **War retarded Work in the Gezira.**—The war has interfered with the progress of the Gezira scheme. Work which had just been begun had to be almost entirely suspended. A loan of three millions sterling, which the Sudan Government had arranged to raise under the guarantee of the British Government, could not be proceeded with, but we were glad to be able to render help to the Sudan Government in obtaining from the Treasury an advance of £500,000. This enabled the Public Works Department to carry out certain minor works of a preparatory character, such as the erection of cement works near the site of the proposed dam. This sum has now, we understand, been completely expended.

(73.) **Rain-grown Cotton.**—It remains now to deal with the possibilities of the Southern Sudan for rain-grown cotton. It is unquestionable that these possibilities are large. The cultivable area of the country is enormous, and it has been proved in certain districts that good long staple American cotton can be grown on a commercial scale. But the future of the Southern Sudan involves so many unknown factors that any estimate of its possibilities for cotton production within the next 10 or 15 years would be entirely speculative. Communication and transport are at present confined entirely to the river, for the only extension of the railway south of Khartoum has been westwards towards El Obeid. The navigation of the White Nile itself is uncertain, the channel through the Sudd being only maintained at considerable expense by constant cutting. Future developments in this direction depend largely on the irrigation policy adopted. The construction of the White Nile Dam may make a great difference in the navigability of the river; and it is probable in view of the past history of irrigation in Egypt, that subsequent developments will carry the irrigation control further south to the Lakes, which in turn will have an important effect on the opening up of the country. All this, however, will take many years, and it would be unwise to include in the present estimates of the prospects of the Sudan any substantial amount of cotton from these southern areas.

#### CONCLUSIONS AND RECOMMENDATIONS.

(74.) In our letters to the President of the Board of Trade, dated 29th December, 1917, and 17th February, 1919,\* we referred to the importance to Egypt of the Sudan irrigation and accompanying drainage schemes; and we desire to emphasise once more the fact that the irrigation projects in the Sudan form an inseparable part of the comprehensive scheme for utilising to the fullest extent the water supplied by the Nile.

We have heard very full evidence with regard to the Blue Nile barrage, which would make possible the irrigation of some 300,000 acres of land as a first instalment in the Gezira, with prospects of a further increase to about 1,000,000 acres suitable for cotton growing. We are of opinion that the Gezira is one of the most promising districts for development that we have had to consider; we recognise, however, that, with regard to the utilisation of the Nile, the interests of Egypt have to be considered before those of the Sudan. At the same time, we hope that the possibilities of opening up and developing the Tokar and Kassala areas may be carefully considered.

In the Sudan, as elsewhere, we consider experimental work to be of the greatest importance. We are glad to be informed that this is fully recognised by those responsible for the Government of this important country.

#### MESOPOTAMIA.

(75.) **At Present an Experimental Country for Cotton.**—From ancient Arabic writings it is known that cotton has been cultivated in Mesopotamia from the beginning of the Christian era, and it is not improbable that it was grown by the ancient Babylonians. At the present day it is cultivated spasmodically along the banks of the Tigris and the Euphrates in

\* See Appendix VI. (d) and (e).



small quantities to meet local needs. It is, however, seldom grown as a pure crop. The possibilities of Mesopotamia for cotton growing are said to be very considerable, but its potentialities have yet to be investigated and put to the test. It is only by experimental work and by a thorough examination of the many factors that affect the growing, picking and marketing of the crop, that it can be decided whether cotton growing can be established on a commercial scale.

(76.) **Irrigation.**—The rainfall is so insufficient (about 6-12 inches per annum) that the summer cultivation of the country must depend entirely upon irrigation. Mesopotamia differs from Egypt, however, in many respects, as regards the conditions under which the work of irrigation has been or will have to be carried out. In the first place, the irrigation system is dependent not on a single river with a well defined and permanent course, like the modern Nile, but on two great rivers, the Tigris and the Euphrates, meandering through a wide plain in very ill-defined and frequently changing courses, with many tributary branches and cross connections. In certain areas the rivers again spread out into vast marshes in which their courses are almost lost. In the second place, the flood conditions of these rivers are entirely different from those of the Nile. The flood period is much earlier in the year—March to May (as against July to October in Egypt), and therefore too late for the winter and too early for the summer crops. The floods rise abruptly, and the rivers in their present condition are quite unable to carry them off. Finally, the rivers when in flood carry about five times as much silt as the Nile, which greatly increases the cost of maintenance of canal irrigation. According to Sir William Willcocks, Mesopotamia is the home of perennial irrigation, as Egypt was the home of basin irrigation; and he emphasises strongly the fact that at no period in its history has the whole of Mesopotamia been under irrigation at any one time. The problem of irrigation in Mesopotamia, however, includes a further factor which does not now affect Egypt to anything like the same extent, namely, the absolute necessity for providing means of disposing of excess flood water.

(77.) **Climate.**—Apart from irrigation conditions, the climate of Mesopotamia is not quite so suitable for cotton growing as that of Egypt, as the extremes of temperature in summer and winter are respectively higher and lower. More important still is the disparity between maximum and minimum daily temperatures during the months from April to October. The soil has a high lime content, which should facilitate cultivation, but the water of the rivers carries a proportion of salt. Otherwise most of the natural conditions in Mesopotamia, so far as they are already known, seem to be entirely favourable to a cotton crop.

(78.) **Area capable of Growing Cotton limited.**—A warning is necessary against exaggerated ideas. According to Sir William Willcocks, it does not seem likely that more than about three million acres altogether would ever be available for cotton commanded by summer irrigation. Cotton is a summer crop, and if the rotation adopted is one year's cotton in three, that would mean about 1,000,000 acres under cotton. While the future possibilities of Mesopotamia are thus considerable, the present position is such that their full development will inevitably take many years. The area at present available for early development depends mainly on three sources of water supply. There is, in the first place, an area believed to extend to about 300,000 acres, which could easily be irrigated from the rivers themselves by mechanical appliances. In the second place, there is an area on the Diala River, above Bagdad, which is already irrigated by canal and which would permit of about 80,000 acres of summer crops being irrigated. In the third place, there is a similar tract on the Euphrates below the Hindia barrage, which is believed to command an area of about 120,000 acres for summer irrigation. Assuming that, in view of the necessary rotations, not more than one-third of the summer irrigated area could be sown with cotton in any one year, there is thus a total of about 150,000 to 200,000 acres as the area for which irrigation could be supplied without further very large capital expenditure on irrigation projects. This must be taken as the limit of cotton development at present possible, not only because the planning and execution of the large irrigation works, which will some day be carried out in Mesopotamia, will take time and money; but also because it is very doubtful whether the population at present available in the country can cultivate more than 150,000 acres of summer crops. The total population of the country at present is estimated at only 1,500,000, of which 350,000 are classified as town dwellers.

(79.) **Results of Experimental Work.**—It remains to describe what has already been done in testing the possibilities of this area. In 1917, Captain R. Thomas, who had been working on cotton in Madras, was placed in charge of the experimental work in Mesopotamia, and it appears from his reports that the results of the work in 1918 were most promising. It is unfortunate that the varieties of cotton which could be obtained in time for his varietal experiments did not include any authentic samples of Egyptian cotton, but the results obtained from certain American varieties, of which a small quantity of seed had been supplied by the officials of the Provincial Agricultural Departments of India were exceedingly encouraging. Five of the varieties tested on numerous experimental plots of about one-tenth of an acre each gave an average yield of about 2,000 lbs. of seed cotton per acre. In view of the conditions in Mesopotamia, there is nothing at all impossible in such a figure, as much greater yields have been given on good land in Egypt in the past. It would not, however, be safe to assume that the same average yield will be maintained under field conditions. Another very interesting fact is that a variety known as "Webber 49," which has seldom been known to produce staple of more than  $1\frac{1}{4}$ " in length, either in its original home in South Carolina or in the Punjab, exceeded this when tried in Mesopotamia. This is by no means surprising, for it must be remembered that, both as regards yield and length of staple, cotton responds in a

remarkable way to improvements in the conditions of its environment, and there is no reason why good American cotton, when placed under new conditions, should not produce results much superior to those usually shown in America by the same variety. The further results of these experiments will therefore be awaited with great interest, but enough has been done to show that cotton is likely to be a success in Mesopotamia. This year's (1919) experiments will include more than one variety of Egyptian, and even if Sir William Willcocks's original opinion, that the climate is too extreme for Egyptian cotton, proves correct, the fact that the country can produce a heavy yield per acre of good long-stapled American cotton indicates that the future prospects of Mesopotamia are of the greatest importance to the cotton industry.

(80.) **Government Control of the Cotton Crop essential.**—It is quite certain, judging from the experience of other countries, that in the establishment of cotton cultivation on a large commercial scale, a system of complete Government control from the very beginning over the provision of seed and over the ginning and handling of the crop, is essential. The former need is at present the more urgent. There is reason to believe that as soon as the condition of the country becomes more settled, the Arab cultivators will readily take up cotton cultivation. Unless, however, the seed supply is controlled from the first, the country may within a couple of years be overrun with a mixture of every sort of cotton seed, which might take years to eradicate.

(81.) **Seed Supply.**—If, however, the Government is to prohibit the use of unauthorised seed, it must be in a position to provide an adequate supply of selected and tested seed suitable for the various districts. The immediate problem is how to secure a supply of selected seed in time for the crop of 1921. It would be comparatively easy to import large quantities of similar seed, but such a policy would be dangerous in view of experience elsewhere. The Webber cotton, which has proved so successful, has already been one year in India, and by 1920 will have been two years in Mesopotamia; it does not follow that new Webber seed imported direct from South Carolina would produce the same results as this original strain, and although it is probable that the disadvantages of unacclimatised exotic seeds may have been exaggerated in the past, or may have been due to causes which are now known and are therefore controllable, it is clear that the Government could not take the risk of depending in 1920 or 1921 on freshly-imported seed for general distribution. It is therefore essential that the Department of Agriculture, which is carrying on the experimental work, should be placed in a position to extend its work in 1920, so as to provide a number of seed farms in order to supply a sufficient stock of seed for 1921. We understand that under the present financial stringency the Budget of the Mesopotamian Department of Agriculture for the financial year of 1st April, 1919, to 31st March, 1920, includes no provision for the preliminary work necessary for the establishment of these farms in 1920, and we have already made, through the Board of Trade, a strong recommendation\* that the Mesopotamian Government should at once be given a grant for this purpose, which we understand would amount only to about 75,000 rupees. The failure to supply these seed farms would delay for at least a year the chances of cotton being produced in Mesopotamia on a commercial scale, which at this most-critical period would be little short of a calamity.

(82.) **Plantations and Experimental Farms.**—The Civil Commissioner, realising the need, as well as the desirability, of securing the immediate establishment of plantations throughout the country as large scale demonstration farms, has already approached the British Cotton Growing Association; and the Committee have also discussed the matter with the Association and with the Civil Commissioner's representatives. The British Cotton Growing Association sent out a delegation to Mesopotamia in September of this year. It will, however, be impossible for the delegation to report and for the Association to begin work before the spring of 1920, and the object of the grant recommended is to make preparation, so that a real beginning may be made in the 1920-21 crop and a supply of seed secured suitable for planting in 1921.

#### CONCLUSIONS AND RECOMMENDATIONS.

(83.) We are of opinion that the results obtained by the experimental work of the Department of Agriculture are very promising. These experiments were, however, necessarily carried out on a small scale. It is therefore most important that the work should be continued and extended in order to determine whether cotton can be economically produced on a commercial basis. It is essential for this purpose that arrangements should be made to build up a supply of approved seed for large sowings in 1921, and we have already recommended\* that the funds required to make this possible should be at once provided by a special grant.

#### UGANDA.

*Maximum production, 1914—approximately 42,000 bales (400 lbs.).*

*Actual production, 1918—approximately 23,000 bales (400 lbs.).*

(84.) **Cotton Areas.**—The Uganda Protectorate, through which passes the Victoria Nile, one of the head waters of the White Nile, is bounded on the north by the Anglo-Egyptian Sudan. The climatic conditions are very similar to those of the southern portions of the Sudan. Cotton is solely a rain-grown crop, but the rainfall is not excessive. Some portions of the

\* See Appendix VI. (f).

country are, however, subject to occasional violent thunderstorms, which are apt to damage the crop. The total area of the country is about 100,000 square miles, of which some 16,000 square miles are water. The administered part is divided into four provinces, of which the Eastern Province has so far made the greatest progress in cotton growing. A good deal has also been grown in the old kingdom of Buganda, in which Entebbe, the capital of the Protectorate, is situated. In the Western and Northern Provinces very little cotton development has yet taken place.

(85.) **Cotton a Crop of Recent Origin.**—The systematic cultivation of cotton in Uganda is entirely of recent origin. Though the plant is probably indigenous, and has been grown and used to some extent for native manufactures, it is only during the present century that the industry has developed on a substantial scale. The Church Missionary Society were the first to encourage cotton growing on commercial lines in order to improve the condition of the natives. In 1904 they transferred this work to the Uganda Company, Ltd. Since then a number of other European companies, including the British East Africa Corporation, and subsequently the British Cotton Growing Association, and various European and Indian firms have become interested in the cotton industry, which now provides the principal export of the country. Thus, although the industry is still in its infancy, the exports of cotton from Uganda in 1914 were valued at £318,000 out of total exports valued at £605,000. Uganda may thus be specially named as an instance of the principle laid down in our main Report, that cotton growing will generally increase the prosperity of the country that grows it.

(86.) **Progress and Prospects.**—As will be seen from Table D in Appendix IX, Uganda produces the largest quantity of cotton for export of all the new areas in the British Empire. In 1914 it reached the satisfactory total of 42,000 bales (of 400 lbs.). This result is primarily due to the steady and constant efforts of the Administration in developing first those portions of the country best suited to cotton. The future prospects are good. It has been stated in evidence that in the areas in which cotton is already established the production could be increased to 250,000 bales a year, and that by extending it to new districts in other provinces a yearly total of 1,000,000 bales might be obtained. These estimates are, perhaps, somewhat optimistic, and probably outside the Eastern Province sufficient allowance has not been made for the development of other crops (especially rubber and coffee). The climatic conditions are excellent, the population is large (nearly 3,000,000), though in great part not much disposed to systematic labour, and in a considerable portion of the country farming is mainly a pastoral industry. The main problems, upon the solution of which the future increase of the crop depends, are transport and marketing.

(87.) **Transport.**—The country is unique in the amount of natural transport provided by its waterways. The Protectorate is connected with the outside world by the Uganda Railway, which runs from the Port of Kilindini (Mombasa), through British East Africa to Kisumu, which lies on the East shore of Lake Victoria Nyanza. From this point water transport is maintained to all parts of the lake shore (the southern half of which is in the former territory of German East Africa), the principal ports being Jinja, Kampala (Port Bell) and Entebbe. From Jinja a railway line (61 miles) runs to Namasagali on Lake Kioga, which again provides water communication to a large number of stations round its shores. The main difficulty with regard to water transport on the Lake Kioga system is the constant tendency of the channels to become impassable through the growth of the sudd, the clearing of which involves heavy expenditure. There is also a short line from Port Bell to Kampala, which lies seven miles from the lake, and it has always been intended to extend this line westwards, ultimately to the Lake Albert region. In addition to railway and water transport, a good deal has been done towards providing roads. The country is covered with a network of native roads, some only possible for foot traffic by native porters, others good enough for small native carts. Several main lines of metalled roads suitable for motor wagon traffic have already been constructed, and these have greatly facilitated the extension of cotton growing in the best-developed districts. It has been suggested that many of the main roads are not kept in a sufficiently good condition for heavy motor traffic, and the unofficial interests seem to contend that the motor services should be maintained by the Government. On the whole it appears clear that the Eastern Province is much better supplied with transport facilities than any other part of the pioneer cotton countries in Africa; and it must be recognised that past capital expenditure on communications in Uganda has been applied almost entirely to the development of those areas which had been proved specially suitable to cotton cultivation.

(88.) **Commercial Handling of the Crop.**—Differences of opinion among some of the companies concerned seem to have arisen in Uganda regarding the best system for handling, ginning and marketing the crop; but except for a time, following the outbreak of the Great War, purchasers of cotton were readily forthcoming. We do not propose to enter into this controversy here. Cotton growing in Uganda is entirely a native industry. There are no large plantations owned by Europeans, and the prime duty of the Government must always be to see that the interests of the native growers are adequately protected against exploitation. The work of doing so has in one way been rendered easier by the comparatively large number of European and other firms interested in the commercial side of the industry. This has resulted in the maintenance of competition, which in ordinary times has proved ample to ensure an adequate price being paid for the crop, and it has not, therefore, been found necessary to introduce the system of a fixed minimum price for seed cotton, such as had been adopted in Nigeria. The outstanding exception to this state of affairs seems to have been during the slump in cotton prices immediately after the outbreak of war, and we feel that we ought to express our appre-

ciation of the work of the British Cotton Growing Association, which came forward to support the market and buy the crop at prices which might well have involved considerable financial loss. It is satisfactory to note that owing to the recovery of the market in 1915 no such loss was actually incurred. In spite, however, of the action of the Association, it seems to be established beyond doubt that in certain districts the native growers, seeing no market for their cotton, actually pulled up the plants without attempting to gather the crop and burnt them. It was partly due to this cause that the extension of the crop in Uganda suffered a serious set-back during the war. Other contributing causes were the demands of the military operations in East Africa for native personnel, combatant and other, and the abnormal weather in certain seasons, which affected the cotton crop injuriously and also made the increased cultivation of foodstuffs a matter of urgent importance.

(89.) **Cotton Markets.**—The work of the Government on the commercial side has been confined to the establishment of public markets in the cotton districts, to the promulgation from time to time of Cotton Rules for the management of these markets, and to the control of the traffic in cotton generally. Much criticism was submitted to us with regard to these markets, but on the evidence as a whole, we are satisfied that they were a necessary substitute for indiscriminate buying, that they have fulfilled their object satisfactorily, and that it is not necessary for us to suggest to the Government any substantial change of policy.

(90.) **Cotton Tax.**—In this connection we may refer to the imposition in 1918 of a small export duty on cotton by the Uganda Government. We had grave doubts as to the wisdom of this means of raising revenue, since it might handicap the industry whenever cotton prices fell to a low level. It was at first proposed that this duty should be at the rate of £2 per bale, but we recommended to the Colonial Office that it should be restricted to £1 per bale, that it should be for one year only in the first place, as an experiment, and that it should be regarded as a war measure. It was agreed that the proceeds of the tax should be devoted to expenditure which would ultimately benefit the cotton industry. The tax is levied at the rate of 4 cents of a rupee per pound of lint, and the proceeds in 1919 are expected to reach £29,000. It has been decided that from 1st January, 1920, the tax shall be levied at the rate of 3 cents per lb. for a period of three years. At the present rate of exchange this would amount to rather more than £1 per bale. We suggested that the tax should be remitted if at any time the price of cotton in Liverpool fell below 1s. per lb. This suggestion was not accepted, but the Secretary of State for the Colonies agreed that the matter should be reconsidered at the time, if such a fall in prices should occur.

(91.) **Seed Supply.**—One of the first duties of the Government Department of Agriculture on its formation some years ago was to deal with the situation which had arisen with regard to the seed supply. In the early stages of the industry many different kinds of seed had been imported, with the usual disastrous results arising from the mixing of different kinds of seed, and in 1908 the Government assumed charge of the business of seed distribution. The types selected were the long stapled American varieties of Sunflower and Allen, which have proved very successful, and as a result of the work of the Department the whole seed supply of the country is at present confined to the progeny of these varieties, which are now fully acclimatised. The supply is controlled by the Government, and the system has proved satisfactory. The quality of Uganda cotton is good, and it has for many years commanded a satisfactory premium on the Liverpool market.

(92.) **Destination of Exported Cotton.**—It is interesting to note that, under normal conditions, India takes about 10,000 bales of Uganda cotton, and in the future will probably take more. The opinion has been expressed in some quarters that this cotton should be confined to United Kingdom markets. It must, however, be remembered that much of the capital invested in the Uganda industry has been found from sources outside the United Kingdom, and apart from this it is essential, in the interests of cotton growing itself as well as of the growers, that the best possible price should be obtained for the crop. If India has proved for the time being at least to be the best market, owing to the peculiar conditions of the war (especially high freights and the lack of shipping), we feel that it would be both impossible and undesirable to set up any artificial restriction which would interfere with the natural development of the industry.

(93.) **Agricultural Department.**—We have referred elsewhere in this Report to the importance of increasing the expenditure on Departments of Agriculture, if any substantial progress in cotton growing is to be made, and this applies with special force to Uganda. The excellent work of the staff with regard to seed supply, experimental cultivation, and the supervision of native cotton growing, has contributed in an important degree to the success of the industry. But if the industry is to develop still further it seems essential that the staff should be increased and that the rates of pay should be made sufficient not only to attract but to retain good men in the service of the Department. We are glad to learn that both these considerations are receiving attention, and we are confident that the Government of Uganda is, as in the past, alive to the special importance of the cotton growing industry to the prosperity of the Protectorate.

(94.) **Future Prospects.**—The position in Uganda may then be summed up as on the whole satisfactory. We hope that the severe set back resulting from the war will prove purely temporary and that its pre-war record of steady progress will soon be resumed. The work of development and extension must necessarily be gradual. It will involve considerable expenditure in systematically opening up the country, in developing the means of transport and in

strengthening the Agricultural Department, and we trust that the great interest which we are assured the Government has taken in the extension of cotton growing in the past will not be relaxed. The industry may now be regarded as well established and its systematic development may be expected as the result of continued effort.

#### CONCLUSIONS AND RECOMMENDATIONS.

(95.) We recommend that the Agricultural Department should be enlarged, and that the salaries paid to its officers should be substantially increased, so as to retain those already employed, and to attract men of ability to the service.

Continued attention should be paid to the development of transport facilities, including improved waterways.

We recommend that Government control of the Cotton Industry already established should be maintained.

### BRITISH EAST AFRICA.

*Maximum production, 1913—approximately 1,000 bales (400 lbs.).*

*Actual production, 1918—approximately 200 bales (400 lbs.).*

(96.) **Cotton not yet Established.**—Briefly stated, it may be said that cotton growing in British East Africa has not so far been a substantial success, though there is evidence that under certain conditions it might become so on a large scale in the future. Trials have so far been made in three districts:—(1) At several points on the Uganda Railway, some near the coast, others near Nairobi, and also near Lake Victoria, (2) in the valley of the Tana River and (3) on the British side of the River Juba, which forms the boundary between the northern part of British East Africa and Italian Somaliland. The first of these experiments were carried out by small companies and also by the British Cotton Growing Association. The latter venture was handed over to the British East Africa Corporation on its formation in 1906. The Association had a ginning plant at Mombasa and received at first a Government subsidy of £1,000, to which they were bound to add an equal sum, all of which was to be spent on experimental work. The experiment was begun on the lines of European plantations employing native labour, and several similar plantations were established by other English companies. On these lines, however, cotton growing has nowhere been a success in this part of Africa, and all these plantations were abandoned after a few years' trial. The cotton grown was mainly Egyptian, and the maximum output was about 1,000 bales obtained in 1913. Experiments on a small scale were tried in the Tana Valley, and apparently the climatic conditions here proved unfavourable.

(97.) **German East Africa.**—South of British East Africa lies the territory which was formerly German East Africa, and it may be of interest to note that the Germans had before the war devoted a great deal of attention to the development of cotton growing in this area. The conditions are very diverse, and the experimental areas were therefore widely scattered. The results also varied greatly. In the north, trials had been made in the valley of the Pangani river, and along the southern shores of the Victoria Nyanza. Further south, there were plantations at two points on the railway from Dar-es-Salaam to Lake Tanganyika. A further district had been tried on the eastern shore of the south end of that lake, while three more districts had been tried in the south of the country, two near the coast and one inland in the direction of Lake Nyasa. All these districts seem to have proved more or less suitable for cotton, and the total quantity produced was substantial, nearly 9,000 bales (550 lbs.) in 1913, while the yield in 1914 was estimated at 12,000 bales. Cotton was also grown as a catch-crop on many of the rubber and sisal plantations in order to get a temporary revenue while the permanent crop was maturing. Many kinds of cotton have been tried, e.g., American, Egyptian and Caravonica tree cotton, but the latter was apparently a failure here as elsewhere. Many different systems of cultivation seem also to have been adopted, from small native farms to large European plantations with wage-paid native labour. The latter are reported to have been a success, but the question of how such success was obtained may require further investigation. Labour was reported to be scarce and expensive and the use of ploughs was limited by the presence of the tsetse fly. To meet this difficulty some of the large European companies tried steam and motor ploughs. Most of the cotton was rain-grown, but it is probable that in many districts the conditions would be favourable for the development of irrigation areas.

(98.) **Railways.**—Perhaps the most important contribution of the Germans in East Africa to the development of cotton growing may prove to have been railway construction. There are two railways running inland from the coast. The first, in the north, runs from Tanga into and up the Pangani River valley to Moshi, near the foot of Mount Kilimanjaro, and was at one time intended to go through to the Victoria Nyanza. The longer line runs from Dar-es-Salaam to Kigoma, on Lake Tanganyika, and forms an important part of an intended line of through communication by rail, lake and river right across Africa from east to west, utilising the short Belgian lines which link Tanganyika with the Congo transport system and establishing a complete chain of communication down the Congo to the West Coast.

## N Y A S A L A N D

*Maximum production, 1915—approximately 8,026 bales (400 lbs.).*

*Actual production, 1918—approximately 4,750 bales (400 lbs.).*

(99.) **Possibilities for Cotton.**—From the point of view of cotton growing, Nyasaland may be described as the most promising of our smaller African dependencies. The total area of the country is about 40,000 square miles, and of this some 2,000 square miles are reported to be climatically and agriculturally suited for cotton cultivation. The total area under cotton in 1917 was estimated at 32,850 acres, and over 8,650 bales were exported. It is estimated that, with adequate expenditure on railways, steamers, irrigation, &c., an output of 260,000 bales of 400 lbs. each is possible. The rainfall is sufficient for cotton in most parts of the Protectorate without irrigation. So far cotton has been tried successfully in three areas—the Shire Highlands, the Shire Valley and the Lake Nyasa districts.

(100.) **Shire Highlands.**—The largest development has so far been in the southern part of the Shire Highlands, where more than half the total area under cotton in the Dependency is found. This is due not to any special superiority of the soil, because better soil exists in the northern half of the district, but because the facilities for transport are at present much superior in the south. Plantations in this tract, in which the rainfall averages from 35 to 45 inches per annum, have been developed mainly by European enterprise. Further extensions north towards the Mlanje plain must wait on railway extension.

(101.) **Shire Valley.**—The Shire Valley is the only other district where cotton has been grown on a commercial scale. Here the rainfall is less, from 25 to 30 inches per annum, but the soil is rich and retentive of moisture. In this tract cotton is being grown by European planters and also by Indian settlers, whilst the more intelligent natives are beginning to copy the example set by the Indians. The possibilities of extension in this district depend mainly on native enterprise, though there are large areas which can be developed by European companies with capital. Conditions are not suitable for cotton in the upper Shire Valley south of Liwonde, and north of this town there are few facilities for transport.

(102.) **Lake Nyasa Area.**—In the Lake Nyasa area the actual cultivation of cotton has so far hardly gone beyond the experimental stage, but it is here that the largest possibilities lie. Such extension, however, turns entirely on the provision of transport, upon which, in fact, the full development of Nyasaland as a cotton growing country depends.

(103.) **Transport.**—On the map Nyasaland appears to possess an excellent system of lake and river transport, but the Shire River, which should constitute the middle link, is in part dry or not navigable, and for the remainder of its course only navigable during a portion of the year, while the bar at the mouth of the Zambesi forms a serious obstacle to the handling of cargo. At present there is dry weather communication by road between Lake Nyasa and Zomba, and a motor road thence to Blantyre, the terminus of the railway (174 miles) to Chindio on the Zambesi. We understand that the question of communications in Nyasaland is under active consideration, and we need only indicate what appears to be required for the complete development of the country, namely—

- (1) A railway from Beira to the Zambesi to connect with the Blantyre-Chindio line.
- (2) A railway connecting the latter line with Lake Nyasa (125 miles).
- (3) An increased steamer service on the Lake.
- (4) A system of motor roads.

These measures would open up a very large area for the cultivation not only of cotton but of other crops. We recognise the heavy expenditure which this programme must entail, but we are confident that the importance of developing a valuable Imperial asset is fully realised by the Government.

(104.) **Labour Difficulties and Competing Crops.**—Other factors that militate against the rapid extension of cotton cultivation are—

- (a) labour difficulties;
- (b) the existence of competing crops.

Although in certain parts European plantations have succeeded, yet most of the work thereon, and much of the extension in other districts, must depend upon an adequate supply of local labour. The total native population of Nyasaland is reported to be about 1,200,000, or 30 to the square mile. In the higher lying lands it would seem that tobacco will, on account of the larger profit it affords per acre and its greater value per unit of bulk, attract more attention than cotton. At present tobacco forms the most valuable export from Nyasaland, and as it is cultivated intensively requires much labour and care. It does not, however, grow so freely in the lower lying tracts, where it has been proved that cotton can be cultivated.

(105.) **Cotton of Good Quality.**—Not only has Nyasaland, in proportion to its size, possibilities of a large cotton production, but the cotton that has been grown there has been of very good and useful quality. Both American and Egyptian varieties have been tried. The latter type has been unable to withstand the ravages of disease and the variations in climate and has consequently been abandoned. Much success has attended the development



of an acclimatised variety of American long staple cotton, now known as Nyasaland Upland. That grown in the Blantyre Highlands has for many years measured a full  $1\frac{3}{16}$  inches in length, and, in spite of a slight deterioration during the war, owing to the lack of adequate European supervision, commands a substantial premium on the Liverpool market. The average yield is generally about 100 lbs. of lint per acre though in some cases it has fallen as low as 60 lbs.

(106.) **Agricultural Department.**—The development of the crop has been very largely the result of the efforts of the Agricultural Department of the Protectorate, which, though small, has done most satisfactory work. It has also carried out experimental trials in various localities of the other districts named as suited for cotton. In Nyasaland, as elsewhere, we consider that the most pressing need for the development of cotton growing is the increase of this Department and its remuneration on a scale adequate to secure and retain the services of a larger staff.

#### CONCLUSIONS AND RECOMMENDATIONS.

(107.) We wish to emphasise the necessity here, as elsewhere in Africa, of strengthening the Agricultural Departments and improving transport facilities.

### RHODESIA.

*Maximum production, 1913—approximately 577 bales (400 lbs.).*

*Actual production, 1918—approximately 250 bales (400 lbs.).*

(108.) **Three Districts.**—Rhodesia offers good prospects for the development of cotton growing if the usual preliminary difficulties, especially those connected with transport, can be overcome. The country is very large, and may be divided, from the point of view of cotton growing, into three areas—North-Eastern Rhodesia, North-Western Rhodesia and Southern Rhodesia.

(109.) **North-Eastern Rhodesia.**—In the first of these the development of cotton growing has been largely the result of the work of the North Charterland Exploration Company (1910), Limited, which holds a concession of 10,000 square miles from the British South Africa Company, Limited. The headquarters of the Company are at Fort Jameson on the border of Nyasaland. Parts of the country are somewhat high (say, 3,000 feet and upwards), but we are informed that cotton has been grown successfully at similar altitudes in Rhodesia. To the west the land falls to the level of about 2,000 feet in the neighbourhood of the Loangwa River. The concession comprises some of the finest land in Rhodesia for agricultural purposes, and a large proportion of it is considered suitable for cotton growing. The rainfall is sufficient, about 40 inches, but the available records indicate that it is very variable in its seasonal distribution. Numerous experiments made with different varieties of cotton have proved that the Nyasaland Upland type is suitable for the high parts of the country near Fort Jameson, though small quantities of Egyptian have been grown in the Loangwa country. The highest figure of acreage reached in the past was 4,575 acres in 1911-12, scattered over five different districts, and at that time the average yield per acre was 100 lbs. of lint. Both acreage and yield, however, have apparently been less in later years. The acreage has been seriously reduced by the competition of the tobacco crop, which seems to have the advantage of better financial facilities for the immediate realisation of its value. The Company buys tobacco outright from the planters at Fort Jameson for cash, while cotton has to be exported to Liverpool; and though the British Cotton Growing Association has introduced a system of advances against cotton, the delay in the ultimate settlement has proved a disadvantage. The low yields, which were very marked in 1916 and 1917, were apparently connected with the rainfall conditions of these years. In this connection it may be noted that it has not yet been found possible to provide Agricultural experts for this large district, and this will certainly be one of the essential preliminaries to the development of cotton growing in the area.

(110.) **Transport.**—The limiting factor, however, in the development of cotton growing in North Charterland, as in so many other parts of Africa, is the provision of transport. At present all available transport by wagon southwards from Fort Jameson to Tete on the Zambesi River in Portuguese East Africa (230 miles) is fully taken up by the tobacco traffic, and cotton is taken by head carriage through Nyasaland to be rebaled there. This arrangement, like head carriage everywhere, is wasteful of human labour, and we have been glad to learn of the agreement between the North Charterland Company and the Government of Nyasaland by which wagon transport from Fort Jameson will connect with the railway by motor transport from Dedza to Blantyre. We understand construction has already begun. This will be a dry weather service only, but it will indicate the possibilities of this part of North-Eastern Rhodesia, and so may justify the future construction of direct railway communication.

(111.) **North-Western Rhodesia.**—In North-Western Rhodesia a number of experiments have been made in cotton growing by the Government of Northern Rhodesia in co-operation with the British Cotton Growing Association, which, on the whole, may be written down as unsuccessful, but for reasons which do not necessarily prove that a different result might not be obtained under other conditions. It is possible that the areas chosen were too high above sea level, and that the varieties of cotton tried, especially Egyptian, were unsuited to such an altitude. The experience of these trials seems, however, to show that the rainfall; in these districts at least, was very capricious and badly distributed throughout the cotton growing season. Insect pests were also unusually destructive and contributed largely to the failure. There appears, however, to be reason for the belief that these experiments by no means exhaust the possibilities of North-Western Rhodesia for cotton growing. As a matter of fact, the issue has been largely prejudiced during the war by abnormal conditions with regard to competing crops, especially maize, which have realised very high prices at the copper mines lying to the north on the Rhodesia-Katanga Railway.

(112.) **Southern Rhodesia.**—In Southern Rhodesia, experience has apparently proved that the rainfall in most districts is insufficient, or at least too unreliable for cotton, but it is said that if irrigation works were constructed on several of the rivers which water the country, cotton could be successfully cultivated. At the present juncture, however, our information with regard to these districts and to the cost of the irrigation schemes which they would necessitate, is not sufficient to enable us to express any definite opinion as to the immediate prospects of development along these lines. It may be noted that Southern Rhodesia is well provided with railway facilities direct to the coast, and when the scheme to extend the line from Salisbury to the existing line in Northern Rhodesia is carried out, it will give Northern Rhodesia and the upper part of the Zambesi Valley the advantage of greatly shortened transport to the sea.

#### CONCLUSIONS AND RECOMMENDATIONS.

(113.) We think it desirable that the possibilities of Rhodesia as a whole should be more fully explored, since, although none of the districts where pioneer work has been undertaken can be regarded as likely to produce a large cotton crop in the early future, they apparently possess possibilities for further development, which may prove valuable later on. The addition of cotton experts to the otherwise well equipped Agricultural Department is essential before progress can be expected.

### THE UNION OF SOUTH AFRICA.

*Maximum production, 1918—approximately 640 bales (400 lbs.).*

*Estimated production, 1919—approximately 2,000 bales (400 lbs.).*

(114.) **Interest in Cotton Revived.**—It has long been known that cotton of good quality can be grown successfully in South Africa. During the cotton famine of the 'sixties the industry received an impetus, but as in so many other countries the subsequent period of low prices led to its discontinuance. During the past fifteen years, however, interest in the crop has been revived, and successful trials have been made in many districts.

(115.) **Recent Reports.**—The late Assistant Chief of the Tobacco and Cotton Division, writing under date February, 1918, deals fully with the areas within the Union where cotton can be and is being produced. "At the present time," he states, "cotton is being produced on a commercial scale in the Rustenburg and Waterburg districts of the Transvaal. In the Zoutpansberg and Pietersburg districts cotton has been cultivated for a number of years, but has failed to make proper progress for several reasons, of which the principal one is lack of organisation in ginning and marketing the crop. Marico district has about the same soil and climate as the Rustenburg district, and should be a cotton producing area. In parts of the Lydenburg, Middelburg, and Barberton districts cotton has been tried and found to thrive well. What has been grown in the latter districts has generally not been remunerative on account of no ginning facilities being near at hand. However, in the Lydenburg district, Selati Valley, the Transvaal Estates and Development Company has a fairly large area under cotton, and has established a ginners, so that cotton is being produced in that section of the district as a commercial crop."

"Swaziland has, in the middle and low veldt, splendid soil and an excellent climate for cotton growing. Cotton has been produced in Swaziland, and very high yields have been made of cotton excellent in quality. The lack of transport and ginning facilities has prevented the development of the industry.

"Parts of Zululand and Natal are suitable for cotton growing. During the past few seasons small areas have been planted with cotton in this part of the Union, and the results have been on the whole successful. Along the coastal belt of Natal and Zululand cotton has not in the past been able to compete with the sugar-cane for several reasons, the principal of which is the fiscal and industrial advantages enjoyed by the one crop and not by the other. The results obtained by the Officer in Charge (Tobacco and Cotton Itinerant Work), in Natal and Zululand, indicate that there are large tracts of land not suitable for sugar-cane which



could be made useful for the cultivation of cotton. In case a rotation crop is necessary in the sugar producing area of the coastal belt, cotton is recommended as being the most suitable and remunerative crop, which can be used for the purpose.

"In the Transkei and Pondoland cotton has given excellent results. On account of the existing conditions in these areas, cotton would, no doubt, be produced principally as a native crop. There is, however, no good reason why the natives in these particular areas should not be encouraged to produce cotton, as its cultivation would add very materially to their prosperity. In Nyasaland, Uganda and Nigeria, cotton is produced by native farmers and the quality of the lint is reported to be excellent."

(116.) **Acreage Under Cotton.**—Pending publication of the Agricultural statistics of the Union it is difficult to determine the acreage under cotton cultivation, but from unofficial sources it is gathered that the Transvaal has some 5,000 to 6,000 acres under cultivation, producing approximately 300,000 lbs. of lint, and that Natal (including Zululand and Swaziland) has about 5,000 acres, the production in this case being estimated at 500,000 pounds weight of lint. This indicates a much greater yield per acre than in the case of the Transvaal, and should results confirm the estimate it will be interesting to learn the precise reason for the difference. There would thus be a total crop of a little over 2,000 bales.

(117.) **Yield per Acre.**—The most encouraging feature of cotton growing in South Africa is that it seems probable that large yields will be obtainable. Figures from 350 to 500 lbs. of lint per acre are mentioned. Various types of cotton have been tried, including Sea Island, Egyptian (Mitaffi), ordinary short staple American, and Nyasaland Upland. The last mentioned seems on the whole to have proved most successful, though Sea Island and Egyptian are said to have met with greater success in the coastal districts.

(118.) **Effect of Unreliable Rainfall and Labour Shortage.**—The principal drawback to the success of the crop as a whole, has been the unreliable amount and distribution of the rainfall. The labour supply also varies considerably in different districts, and, if success is to be achieved, these two points must be taken into account in the selection of areas for planting. So far as climate is concerned, the middle and lower veldt areas have proved most promising. The high prices obtainable since the war have, of course, greatly encouraged the development of cotton cultivation and the area planted in the Transvaal has risen from a few hundred acres to over 5,000 acres in 1917, and even that figure has since been exceeded. A still greater ratio of progress has to be recorded in the case of Natal and Zululand. Maize and tobacco are the chief competing crops, and the opinion is apparently gaining ground that under proper conditions cotton should hold its own satisfactorily in this competition.

(119.) **Ginning and Baling.**—Facilities for ginning and baling have been established both in the Transvaal and in Natal. In both cases, arrangements are in operation for marketing the cotton on a co-operative basis. Up to recently, the chief market for South African cotton has been in the United Kingdom, but with the development of the woollen industry in the Union, a fairly large portion of the output has been purchased locally.

(120.) **Cost of Production.**—As regards the cost of production, we are informed that very accurate returns have been kept at the Government Cotton Experiment Station at Rustenburg, and the average for the years 1917-1918 works out at £4 12s. 7½d. per acre, including ginning and baling.

(121.) **Future Prospects.**—The Government Department of Agriculture has taken a great interest in the development of the crop and we hope shortly to have an opportunity of hearing evidence from the head of the Cotton Section. There seems to be every reason for hoping that the industry is now on the way to be well established in South Africa, and it is clear that if the present difficulties can be overcome, the possibilities of the country both as to quantity and quality are very encouraging.

(122.) **German South-West Africa.**—In German South-West Africa, which is now to come under the rule of the Union Government, the Germans had before the war done a good deal of pioneer work in testing the suitability of the country for cotton growing. Those experiments had met with considerable success in the northern portion of the Protectorate, where some exceedingly fine cotton had been grown, almost equal, it is said, to Sea Island. No large results had, however, been obtained, and it appeared that the future of the country lay in irrigation. The transport facilities already provided before the war were relatively good—one line running inland from Swakopmund to Grootfontein and another from Angra Pequena. These two lines were connected by an inland line parallel to the coast, which, before the war, stopped short of the northern boundary of the Union territory at the Orange River, but this has now been linked up with the Union Railways. It may also be of interest to mention the new trans-continental line which was under construction by a British Syndicate before the war in Portuguese West Africa (Angola). This line is to run from Benguela on the coast to join up with the Cape to Cairo line at Kambove, thus forming another important link in the railway communication across Africa.

#### CONCLUSIONS AND RECOMMENDATIONS.

(123.) The cotton growing industry has now emerged from the experimental stage in South Africa. The results obtained indicate that cotton of excellent quality can be grown. We recommend that the valuable work done by the Department of Agriculture should be extended with the object of developing cotton growing on a much larger scale.

## NIGERIA

*Maximum production, Southern Provinces, 1913,—approximately 14,200 bales (400 lbs.).*

*Maximum production, Northern Provinces, 1916,—approximately 10,800 bales (400 lbs.).*

*Actual production, Southern Provinces, 1918,—approximately 3,100 bales (400 lbs.).*

*Actual production, Northern Provinces, 1918,—approximately 3,000 bales (400 lbs.).*

(124.) **General Description.**—Nigeria is one of the largest of the British tropical possessions and its area is estimated at approximately 336,000 square miles, being thus about one-third of the total size of the Sudan or three times that of Uganda. In order, however, to form an idea of the proportion of this area which could be made available for cotton growing, it is necessary to divide the country into various zones or districts according to their principal products. In the first place, along the whole coast line of about 450 miles in length there is a low lying belt of mangrove swamps, 5 to 50 miles in depth, interlaced with a maze of rivers or waterways not many of which, however, are navigable for large vessels. Beyond this region lies a great belt of dense forest full of almost every variety of valuable tropical trees, including oil palms and kola-trees. Beyond this again in the North is a region of more open country in which the principal agricultural crops are grown. Finally in the north-eastern corner of the Protectorate is a large area of more or less cultivated land stretching away towards Lake Chad.

(125.) **Cotton Growing Areas.**—Cotton is cultivated to some extent in the districts near the coast in the oil palm belt, but it is in the drier regions farther north that the expansion of cotton growing on a large scale may be looked for. Even here it is difficult to form any estimate of the probable area, because a large proportion of the land would always be required for food production; but, making allowance for this, it has been suggested that about 25,000,000 acres might be available for cotton. For the Lake Chad region it is impossible to make any estimate, owing to the present lack of surveys of the country or of knowledge of its possibilities for cotton growing. Cotton has hitherto been entirely a rain-grown crop in Nigeria, but there may be possibilities of further development by irrigation in certain parts of the Niger Valley. In the Lake Chad region any development that may take place must probably be under irrigation, which, it is said, could easily be provided by the annual rise of the lake, which inundates a belt of country about five to ten miles deep and 150 miles long. The principal drawback to the climate of Nigeria is the prevalence of the Harmattan, hot, dry winds which blow from the desert interior loaded with clouds of reddish dust. No dew falls while these winds blow, so that vegetation suffers very severely, and unfortunately they are most frequent during December, January and February, the height of the cotton season, which extends in Nigeria from June or July until March. On the other hand, in the southern section trouble is caused by the extreme humidity during the rainy season, which causes the squares and young fruit to be shed.

(126.) **Native Consumption and Export.**—In Nigeria cotton is an indigenous crop which has been cultivated by the natives for their own use for many centuries. It is, unfortunately, impossible to obtain any estimate of the probable amount of the native crop, but the figure of 100,000 bales has been mentioned; and, however inaccurate this may be, it is certain that there is a large native industry, which has been established from time immemorial. Native cloths of all kinds and of remarkably good quality are manufactured in considerable quantities, and these have for centuries found their way all over the interior of the country, and even as far as the Mediterranean. The presence of this native industry is a factor of great importance in the development of an export crop. During the war, for example, the very high prices of imported cotton goods have led to a marked revival of the local industry, which was able to pay higher prices for cotton on the spot than could profitably be paid for export. In these circumstances the margin, which would otherwise be available for export, can at present readily be absorbed in the far greater local consumption. If, however, the total production were doubled, so as to provide 100,000 bales for export, it is clear that the economic position of cotton growing would be radically altered. In the past it has been desirable to secure for export as large a proportion of cotton as can be spared from local requirements; in the future it will become important to avoid a set-back in cotton cultivation by affording an assured market and a satisfactory price for the large excess above those requirements.

(127.) **Low Yield per Acre.**—The indigenous type of cotton is of fairly satisfactory quality, but suffers from two serious drawbacks—a low yield of seed cotton and a low ginning out-turn. The average yield is probably not over 80 lbs. of lint per acre, and is certainly under 100 lbs. Thus, the general conditions in Nigeria are more analogous to those of the Indian than of the American or Egyptian crops. This low yield is largely due to the methods of agriculture employed, such as the absence of intensive cultivation and the limited use of manures, artificial or other—drawbacks consequent upon the present stage of development of the country. In addition to the low yield of seed cotton, the ginning out-turn of the native varieties is low. The average of lint probably does not exceed 27 per cent., as against 30-32 per cent. for the exotic cotton which has been introduced, with the result that it takes nearly  $3\frac{3}{4}$  lbs. of seed cotton to produce 1 lb. of lint. Consequently the price which exporters have been able to pay for seed cotton has been materially lower than it might

otherwise have been, and this fact, coupled with the heavy cost of transport to the coast and thence to European markets, has been one of the chief difficulties in the building up of a large export trade.

(128.) **River Transport.**—The history of the development in Nigeria of cotton growing for export is practically the history of the development of transport. Nigeria is fairly well provided with natural means of transport in the form of navigable rivers, since a large part of the country is traversed by the Niger and its tributaries. The Niger is about 2,600 miles in length, of which nearly 1,000 miles are in Nigeria. It is navigable for shallow-draught boats all the year round for about 400 miles from the mouth; but dredging is required to maintain a depth of even 4 feet through this distance during the dry season. At Lokoja, over 300 miles from the mouth, the Niger is joined by the Benue River from the east, while 30 miles above Baro it is joined by the Kaduna, which comes in from the north.

(129.) **Ports.**—The original ports of the country were Forcados, at one of the mouths of the Niger, and Lagos, but the latter, which is the terminus of the main railway system of the country, was for many years inaccessible to ocean-going steamers owing to the insufficient depth over the bar, so that all heavy traffic had to be discharged into branch steamers at Forcados for transshipment to Lagos. The harbour at Lagos has recently, however, been greatly improved. A further development became possible a few years ago owing to the discovery of a suitable site for a railway terminus about 38 miles up the Bonny River, known as Port Harcourt, which is the starting point for another main line of railway to the interior.

(130.) **Railways.**—The line from Lagos runs northwards till it crosses the Niger at Jebba, and thence north-eastwards through Zungeru, Minna, Kaduna and Zaria to Kano. From Minna a branch line runs southwards again to the Niger at Baro, while from near Zaria a narrow gauge branch line runs off south-east to Bukuru, serving the tin mines of Bauchi Province. The second railway system was originally intended to run northwards from Port Harcourt to cross the Benue River near Abinsi, and thence northwards through Jemaa to join the main line at Kaduna. The southern section of 150 miles to the Udi coalfields has already been completed. Work on the central section from Enugu to the Benue, and on the northern section to Kaduna, was suspended during the war. Recently the plans for the completion of the line have been given further consideration, and various suggestions have been made as to the route north of the Benue. One suggestion is to adopt a more westerly route so as to join the original main line at Minna. A second suggestion is that, as an additional extension, a line should be built to run north-eastwards south of the Benue River, from the new coalfields of Udi, to be continued ultimately to Maidugari near Lake Chad. The construction of a line along this last-mentioned route would certainly be of great importance in developing the eastern part of the Protectorate, and ultimately the Bornu Province, much of which is believed to be very promising for cotton growing. The present position, however, is that none of these lines can be finished for some time, say, three years at least, and the first main line construction to be undertaken is doubtless the completion of the section from Port Harcourt. Though this view may be accepted, we consider that preliminary surveys for main lines in Northern Nigeria, *e.g.*, that from Kano eastwards to Maidugari, should now be undertaken. There is also great need for some new lines of communication from Kano north-westwards to Sokoto, and there are several comparatively small sections of feeder railways which might be built running off the main line, and which would make all the difference in the development of cotton growing in various districts through which they passed.

(131.) **Transport Development essential.**—In the absence of these main lines the country can only be opened up by light railways, tramways or good roads. We understand that motor transport on specially constructed roads has been tried, but the cost of maintenance and therefore the charges (a rate of 1s. per ton mile has been mentioned) are high. Other witnesses have urged the construction of light railways, as involving lower costs of production, and permitting more experimental work. So important is this question of transport in Nigeria that we consider a decision should be arrived at as to the relative advantages of the different systems, and an ordered plan of development be followed.

(132.) **Improvement of Type of Cotton.**—Next to transport, it is probable that the greatest service rendered to the development of cotton growing in Nigeria has been the work done in the introduction of a better variety of cotton than the indigenous types. This work was first taken in hand by the British Cotton Growing Association in Nigeria in 1902, and although the work of propagating acclimatised varieties of seed from foreign sources, mainly American, was subsequently handed over to the newly formed Agricultural Department, the Association has continued to take a large part in the development of the industry, *e.g.*, by providing and distributing seed. It is very satisfactory that the work done on seed improvement has been definitely successful in the production of a variety which apparently suits the local conditions, and at the same time provides a distinctly heavier yield with a higher ginning out-turn. This new type is now rapidly establishing itself, especially in the north, and, judging by the progress made in the distribution of the improved seed for the last two or three years, there seems reason to hope that within a few more years practically the whole of the districts which have been growing cotton for export will be growing the improved variety. If this expectation is realised, it may be hoped that Nigeria will, within measurable distance of time, produce for export 50,000 to 100,000 bales of good cotton of the American type. If the industry can once be thoroughly established on that scale, there is little doubt that the subsequent development will be continuous and cumulative.

(133.) **Agricultural Departments.**—In this connection the work of the Agricultural Departments of both Northern and Southern Nigeria has been invaluable, but we feel that the first and most essential condition of further development must be a very material increase in their staffs. This need had been recognised even before the war, and the shortage was naturally intensified by the demands of military service; so much so that at one period during the war the superior staff in the Northern Provinces was reduced practically to one man. As has already been pointed out elsewhere in this Report, the problem of securing an increased staff is twofold. First, there is the necessity of providing a higher scale of remuneration to attract and retain good men; second, even were such a provision immediately available, it will be some time before the necessary staff can be recruited from the present depleted ranks of trained men in this country or elsewhere. Whilst the question whether the natives of Nigeria should be encouraged to grow cotton in preference to some other crop, such as ground nuts, must depend, in each district, on whether it is to their greater advantage to do so, the general system of native administration facilitates propaganda work. Over the greater and more populous part of the Northern Provinces, the political work of the European staff is carried on through powerful Emirs. Where the Resident and the Agricultural Officer are able to enlist the interest of the Emir in cotton growing, the way is open to the Department of Agriculture, with the assistance of the British Cotton Growing Association, to arrange for the seed supply and the instruction of the native growers. If, therefore, there is to be any substantial extension of cotton growing in Nigeria, especially in new districts, the first essential is the strengthening of the Agricultural Department with a view to this propaganda work. At the same time, there is great need for the establishment of further experimental farms and seed farms in connection with the distribution of the improved seed. Also, in many districts, pioneer work has still to be begun. Thus, in the Lake Chad districts, for example, nothing at all is known (except by inference) of the possibilities of the country for cotton growing. Investigations into its general suitability for cotton cultivation should be made, and, if they seem favourable, experiments on a small scale in growing cotton should be carried out as the first step, before the means for developing this tract can be usefully considered. In every direction the need for increased staff is pressing.

(134.) **Commercial Handling of the Crop.**—Next to the provision of improved seed and its distribution to the cultivators in the course of propaganda work, the most important contribution which has been made to the development of cotton growing for export in Nigeria, has been the work of the British Cotton Growing Association in establishing a system for the purchase and handling of the crop. At first, European plantations with hired native labour were tried in certain parts of West Africa, but these were all unsuccessful and it became clear that the only satisfactory method would be to encourage the small native cultivators to take up cotton growing themselves. In order to do this, however, it was essential that the market for the crop should be more or less assured, and at a very early stage it was decided to secure this by guaranteeing a fixed minimum price for seed cotton. The price was first  $\frac{3}{4}d.$  per lb. and was subsequently raised before the war to  $1\frac{1}{4}d.$  On the outbreak of war it had to be reduced temporarily, but since then it has again risen rapidly; and the present price (1919) is  $2\frac{1}{4}d.$  for native cotton and  $2\frac{3}{4}d.$  for the exotic type. It must be remembered that, owing to the low ginning outturn and the high cost of transport both inland and by sea the price of  $1d.$  per lb. for seed cotton in Nigeria before the war was equivalent to  $6d.$  per lb. of lint in Liverpool. It does not follow that the same proportion would hold in the case of a higher price.\* The payment of this fixed price and the whole system of collecting the crop has been organised by the British Cotton Growing Association. An arrangement has been made under which all the local merchants act as agents for the Association on a very small commission and buy the cotton from the native growers. The Association has also throughout been entirely responsible for the ginning and baling of the crop, and the supply of the seed so far as it was required for sowing.

The policy which the Association has adopted with regard to the establishment of ginneries has been to place them along the lines of transport communication. Three types or classes of ginneries have been erected. Class I. is a large double storeyed building, containing eight gins of seventy saws each, in batteries of four, fitted with pneumatic suction tubes and with conveyors for seed and lint. The press is hydraulic with a pressure of  $2\frac{1}{2}$  tons per square inch. The power employed is generally obtained from a suction gas plant, the fuel being cotton seed. This ginnery would turn out about 10,000 to 12,000 bales per year, working ten hours per day during forty weeks. Class II. is of similar design, but with only one battery of four gins. It is capable of dealing with 5,000 to 6,000 bales per year of forty weeks. Class III. is what is known as a pioneering ginnery, and is similar to Class II., but with only four or five saw gins of fifty saws each. The gins are fed by hand, and the press is only capable of making a bale of 200 lbs., which has to be re-pressed at the main centres. Such a plant can deal with from 1,500 to 2,000 bales a year. Appropriate storage is provided at each class of ginnery. In the Southern Provinces ginneries have been erected on the railway at distances of roughly sixty miles apart. The first is the Churchill Ginnery near Abeokuta, which is a Class II. plant, and is sufficient to deal with any cotton likely to be produced within a radius of thirty miles. Forty-five miles west of Lafenwa the Association has a buying store and a number of hand saw gins at a place called Meko. This station is off the railway, and the plant is now proving insufficient. At Eruwa Road, between Lafenwa and Ibadan, there is a Class III. ginnery. It has, however, been found more economical to send the seed by rail direct to Lafenwa for ginning. The ginnery at Eruwa Road, though at present "silent" or out of use, is available to deal with any big

\* In 1918-19 the price of  $2\frac{1}{4}d.$  for seed cotton in Nigeria was equivalent to 13-70d. per lb. of lint at Liverpool.

increase in cotton growing that might take place. Sixty miles further up the railway from Lafenwa there is a Class II. ginnery, situated at Ibadan, and thirty miles to the west is another "silent ginnery" at the town of Oyo. Iwo, further up the line again, is the site of a ginnery, but, for similar reasons to those in the case of Eruwa Road, it is not at present working. The plants at Oyo and Iwo belong to Class III. Sixty miles from Ibadan is the town of Oshogbo, near which is a Class I. ginnery, which is sufficient to deal with any cotton likely to be produced for a few years. At Zaria the Association has two ginneries, one Class I. and the other Class II. These two ginneries can deal with from 18,000 to 20,000 bales per annum. On the Niger there is a Class III. ginnery with a standard hydraulic press at Lokoja. Although the country around this town does not itself produce cotton in any large quantity, seed-cotton is purchased from the other towns on the river bank and brought to Lokoja for ginning and baling. At Ibi, some miles up the Benue River, there is a Class III plant; the 200 lb. bales pressed here are sent down the river to Lokoja for re-pressing. Reference should be made to the sketch map which illustrates the distribution of the Association's branches and ginneries.

The capacity of the Association's plant in Nigeria, not including the "silent ginneries" at Eruwa Road, Iwo and Oyo, amounts to 38,000 to 46,000 bales. This presents an ample margin at the moment, but the Association wisely considers that full provision must be made for accidents. If, for instance, a fire occurred at Zaria and destroyed the plant, practically half the cotton ginning capacity of the country would be destroyed. It is hoped that further developments may soon keep the Association's plant fully employed.

It should be added that the methods of ginning and baling adopted have proved thoroughly satisfactory and the West African bale is one of the best in Liverpool. It is a matter of regret that it has not been possible to develop a larger export trade in seed owing to transport difficulties. An experiment which was tried before the war in the erection of a crushing mill in the country did not prove profitable.

(135.) **Importance of Nigeria as a Source of Cotton Supply.**—The general position of Nigeria in the Empire's sources of supply is of particular importance. It is the most promising area in the British Empire (except India) for producing large quantities of cotton comparable with the ordinary American, the type of cotton upon which Lancashire so largely depends. There is no doubt that the possibilities of Nigeria are substantial, though the low yield, especially in certain districts, introduces a serious element of uncertainty in estimating future possibilities. It seems clear that Nigeria ought some day to be able to produce a large quantity of cotton for export; but there are several conditions which must be fulfilled before such a state of affairs can be brought about. In order of urgency these may be summarised as follows:—(1) strengthening the Agricultural Departments, (2) improvement of transport, both in areas where cotton has been proved, and in new districts, (3) supporting the British Cotton Growing Association, so as to enable it to cope fully with the commercial handling of the crop as transport extensions take place, (4) arranging for pioneer and exploratory work to be carried on systematically. The first two of these conditions are obviously matters for the local Government, but the third is one in which we are more directly interested. We have discussed it very fully with the British Cotton Growing Association and we have explained in Part I. of this Report the policy which we consider should be followed in affording such support if and when it is required. With regard to the fourth condition, viz., pioneer work, our assistance would be given conformably with the principles laid down in Part I. of this Report. Such assistance may particularly be necessary in the development of the Lake Chad area. If the small experimental trials which we have recommended should be made in this district prove encouraging, more extensive trials will be needed before expenditure on ginneries, &c., on a commercial scale will be required.

#### CONCLUSIONS AND RECOMMENDATIONS.

(136.) We see reason for hope that great expansion may be possible in the growing of cotton in Nigeria, but before this can be attained, a large increase in the staffs of the Agricultural Departments will be necessary. We have to reiterate here once more the need for an increase in the salaries paid, if these Departments are to be maintained in an efficient state.

We are of opinion that progress equally depends upon the systematic development of the transport systems. Until main line railways can be constructed, we think that efforts should be made to open up the country by other means of transport. We understand that several methods have been tried, and we would press the authorities to decide upon those most suited to local conditions.

We are of opinion that the work of the British Cotton Growing Association in promoting the commercial development of the cotton crop has been very valuable.

Meanwhile, we recommend that the British Cotton Growing Association be asked to proceed energetically with its work in the areas in which it is now operating, with a view to increasing the cotton crop to the fullest extent of the capacity of the ginning and baling plant already installed, which appears sufficient to deal with a large increase upon the output of recent years. In this connection, we recommend that our Committee should enter into a working agreement with the Association, as outlined in § 26 of this Report.

Exploratory work in new districts, for example in the region of Lake Chad, appears to us desirable, and we recommend that we should assist the local Government in pioneer work.

## INDIA.

*Maximum production, 1914,—approximately 5,209,000 bales (400 lbs.).*

*Actual production, 1918,—approximately 3,671,000 bales (400 lbs.).*

(137.) **The Indian Cotton Committee.**—A very thorough enquiry has recently been made by a special committee, known as the Indian Cotton Committee,\* appointed in India to deal with all questions connected with cotton growing there. That Report has been published and is available at H.M. Stationery Office. Reference should be made to it for any details, as only a condensed summary, with our comments, is here given. The figures in square brackets refer to the paragraphs of the Report of the Indian Cotton Committee. This Committee was appointed in September, 1917, to examine the work done in establishing better cottons in India and to make recommendations. The Committee toured through all the cotton growing parts of India, inspected crops, Government farms, experimental stations, demonstration plots, ginneries and presses, &c., besides obtaining evidence, oral or written, or both, from a large number of witnesses—over 300 in all [2]. They have presented a full account of the possibilities and difficulties attending the improvement and development of cotton growing in India, and have made a number of specific recommendations covering agricultural, irrigational, statistical and commercial questions. We recognise that this Committee in India has so simplified our work in reporting on India—in fact, what they have accomplished could not have been attempted in London—that we desire to convey to the Government of India our thanks for appointing this Committee, and, through the Government of India, to express to the President and members of the Committee our appreciation of the thoroughness of the enquiry, the lucidity of the Report, and the practical nature of their advice. In view of the character of the Report, we have confined our attention to the main points raised.

(138.) **Extension and Improvement of Indian Cotton.**—The Indian Cotton Committee place the normal crop in India at  $4\frac{1}{2}$  million bales of 400 lbs. each, cultivated on  $22\frac{1}{2}$  million acres, giving an average yield of 85 lbs. of lint per acre. This is low compared with the average yield in many other countries. The total area over which cotton is grown is widespread, and conditions and seasons vary in different parts of India. Although in India cottons possess numerous general characteristics in common, many different varieties are, in fact, grown. In most provinces considerable improvements have, in recent years, been effected, either in agricultural practice or by the introduction of better varieties, or both. For various reasons the full commercial results of such improvements have not always been obtained. They conclude, however, that within the next ten years it is improbable that cotton of staple above  $1\frac{1}{8}$  inches will be forthcoming in India in large commercial quantities, but that within that limit some 700,000 bales should be produced if their recommendations be followed. If, also, the irrigation scheme known as the Sukkur Barrage Project prove feasible, cotton of a quality unknown in recent times in India could be grown on some 400,000 acres [3,4]. As it is, they consider that several of the Indian cottons are probably suited for certain sections of the hosiery trade in England [5]. This should be investigated.

(139.) **Cultivators' Interests Paramount.**—In order to avoid misapprehension, the Indian Cotton Committee at the outset lay down the principle that in all questions of growing different kinds of cotton the interests of the cultivator are paramount. We heartily agree. A distinction is also drawn between long staple cotton as understood in Bombay and in Lancashire. Cotton actually measuring three-quarters of an inch and over would pass as long staple in Bombay, but not in Lancashire. They proceed to classify the different cottons grown in India (i) as definitely short staple, (ii) as long staple within their definition of Bombay requirements, and (iii) as cotton suited for making the class of goods usually made in Lancashire from ordinary American. We accept the classification thus made by the Committee in their table [7], and note that out of a normal crop of  $4\frac{1}{2}$  million bales they estimate that 478,000 bales and 726,000 bales, respectively, would at present fall in their last two classes; but they rather significantly add that these quantities are not realised commercially, as in several tracts the varieties named are not marketed pure [Annexures I, II to Chapter I].

(140.) **Aims and Methods Recommended.**—The recommendations of the Indian Committee are directed towards three main objects—

- (i) More intensive and widespread agricultural work on cotton, and the improvement of agricultural methods and practice, in order to evolve where possible, and establish over large areas, strains of improved staple, and to increase everywhere the yield of cotton per acre.
- (ii) Improvements in methods of marketing and of handling cotton and the checking of malpractices.
- (iii) Better organisation of the different cotton associations and closer co-operation between these bodies and Agricultural and Government Departments.

There is constant evidence in the Report that the problems connected with the improvement of cotton in India are neither solely agricultural nor solely commercial; and we are strongly of opinion that if permanent results of commercial value are to be achieved, work

\* See Appendix III.



must, as the Committee advise, be directed towards each of the above three objects. The methods recommended for adoption are most easily considered under the headings—agricultural, irrigational, and commercial.

#### *Agricultural.*

(141.) **Scientific Work.**—The Indian Cotton Committee insist on the need for more detailed botanical investigation of the existing kinds of cotton in most of the cotton growing tracts, accompanied, or followed by systematic and methodical trials of varieties to determine the most suitable in order to promote subsequent uniformity of type over wide tracts of country. They consider selection as the first step in evolving better types, to be followed by plant breeding, which, however, should be entrusted to selected officers who can devote personal attention and considerable time to it. They also recommend more uniformity in the ways in which preliminary and field tests of different varieties should be conducted. The adoption of a well understood plan for the conduct of such tests enables the work done on selection and new varieties to be more easily followed and the results better understood [192-195]. We endorse all these recommendations.

(142.) **Improvement of Agricultural Methods.**—The Indian Cotton Committee strongly emphasize the need of continued and increased attention to improvements in agricultural practice in its widest sense, including therein the adoption, where possible, of more efficient and remunerative implements, the possibilities of manuring, the rotation of crops, the use of seed drills and harrows, &c. The average acreage yield of cotton in India is 85 lbs., in America it is 200 lbs. The annual area under cotton in India is 22½ million acres. An appreciable increase in this low yield, whether due to improved strains or to improved agricultural methods, or both, would, when spread over so large an area, produce greater total results than could be expected from the extension of cotton cultivation to new areas in India. The Committee have found—(a) that the areas which can be brought newly under cotton in the existing cotton tracts are very limited; and (b) after a careful consideration in each Province of the possibilities for extension under new irrigational schemes, that only the Punjab and Sind offer any large prospects. These two provinces depend mainly on the same sources of supply for water and it is probable that the various projects might to some extent be mutually destructive. But even assuming such not to be the case and that on investigation all the schemes prove satisfactory and practical (in itself an unwarranted assumption), the Committee estimate the new areas that might be brought under cotton of some kind at about 1½ million acres. [37, 98, 196.] Even allowing for an increase in the number of wells, &c., it is clear that more total cotton can be expected from a considerable increase in the average annual yield than from new areas. Hence we associate ourselves with the Committee in emphasizing the importance of work directed towards improvements in agricultural practice.

(143.) **Seed Supply.**—Regular supplies of pure seed are essential if better crops of higher quality are to be raised and if purity of product is to be attained. We, therefore, concur in the conclusion of the Committee that the production and distribution of pure seed should be controlled by the Agricultural Departments, and that the evolution of suitable organisations for seed distribution forms one of their proper duties [197]. We also endorse their finding on the importance of demonstrations carried out on the fields of the cultivators [198]. We recognise that these duties of testing and discovering improvements in seed and in agricultural practice, of demonstrating widely their advantages, of organising seed distribution will occupy much of the time and attention of the Agricultural Departments, and we agree that these departments should be staffed, organised and equipped to discharge such work on an extended scale, otherwise large commercial and economical results will not result from their labours.

(144.) **Pests.**—In view of the experience everywhere of the importance of recognising serious crop pests and diseases at an early stage, and being in a position to combat them, we concur in the advisability of appointing an additional mycologist and, further, consider the Committee's advice to cease work on tree cottons to be both prudent and wise. [200, 199.]

(145.) **Increased Agricultural Staffs.**—In order to carry out this programme of work, the Indian Cotton Committee place the minimum increase required in the superior staffs of the Agricultural Department at 33, with corresponding increases in the lower grades. Considering the extent and varying conditions of the country, the promise foreshadowed by the work already done, and the practical and essential nature of the duties assigned to these departments by the Committee, we are satisfied that they have asked for the bare minimum necessary. To the figures given by the Committee, we would add that Egypt even now spends about £10 per 1,000 of population on agriculture, as compared with £1·5 in India. [201.] There will probably be difficulties in recruiting such a number of men promptly. We propose that, through our Sub-Committee on Research and Education, we should keep the Government of India informed of any schemes we are able to develop for training candidates for agricultural departments. Also, in view of the advantages which accrue from experts having opportunities after a short period of service abroad to take special or "refresher" courses, we recommend that unless suitable provision already exists, it be suggested to the Government of India to consider the possibility of granting study leave to members of the Indian Agricultural Service.

#### *Irrigational.*

(146.) **Sukkur Barrage.**—The Committee examined carefully in each province the possibility of extending cotton cultivation under irrigation. We have already referred to their main conclusions. They are important, but, except in the Punjab and Sind, are for the



most part limited in scope, *e.g.*, to improvement in wells, &c. We would only refer to one project, viz., the Sukkur Barrage in Sind. The Committee come to a very definite conclusion about this enterprise, and if it be practical, the effect on cotton cultivation in India should be most important. Without it they state that all work on exotic cottons in Sind should be abandoned. With it they expect at least 400,000 acres will ultimately be cultivated with cotton of Egyptian quality, or at least with long-stapled American varieties. We would point out that this almost equals one quarter of the whole area normally under cotton in Egypt, and, though the yield per acre cannot be expected to equal that in Egypt, the addition to the world's supply of stapled cotton would still be substantial. The importance of this to the Indian cotton industry and to cotton growing generally is clear. In view of this definite conclusion, we earnestly recommend that the possibilities of this irrigation project be re-examined at an early date. [90-98, especially 93, 98 and 38.]

*Commercial.*

(147.) **Deterioration owing to Malpractices.**—Owing to defective methods of marketing in many parts and to mishandling of cotton, especially at the ginneries and presses, it is reported that the better types of Indian cotton frequently fail to realise their full value in the world's markets; and that cultivators do not always get the full return they could reasonably expect for the better quality of their produce. The continuance of these drawbacks must hamper all attempts to produce new and better types of cotton on a commercial scale. The Indian Cotton Committee attribute these defects to five main causes:—

- (a) Mixing of the seed sown by the cultivator, either due to carelessness, or, much more frequently, to the fact that only mixed seed is obtainable from the ginneries. [214.]
- (b) Wilful mixing by the cultivator of seed sown—this is rare. [214.]
- (c) Unorganised village sales whereby the cotton passes often in small lots through many hands before reaching the large purchaser. [205.]
- (d) Careless handling of cotton at the ginneries or presses, frequently due to lack of accommodation and bad design of the buildings. [219.]
- (e) Wilful mixing at the ginneries or presses. Cotton is usually described in India by the name of the tract or village from which it comes. Cases came before the Committee in which inferior cotton was railed to ginneries situated in tracts normally producing better quality cotton, there to be mixed with and sold as cotton of that tract. [221.] Even mill waste is at times consigned to ginneries or presses to be mixed and pressed with good cotton. [220.] The continuance of such practices must tend to stultify the attempts of the Agricultural Departments and cultivators to produce in quantity improved qualities.

(148.) **Mixing.**—The measures proposed by the Indian Cotton Committee to meet these evils are as follows:—

(i) *Mixing of Seed Sown.*—The duty of providing pure seed and organising its supply on an adequate scale has been laid on the Agricultural Departments. If these duties are adequately discharged, and the supply of mixed seed from the ginneries checked by the means proposed later by the Committee, the difficulties arising from the cultivators sowing mixed seed will very largely disappear. We agree.

(ii) *Marketing.*—The principle here laid down is not to restrict the ryot's freedom of sale in any way, *e.g.*, by inducing him in certain tracts to sell to one organisation, but to organise the general method of sale so as to leave him freedom and yet draw him steadily into closer touch with large buyers. [210, 211.] We endorse this. In the initial stages, when new types are only produced in small quantities, the Agricultural Departments must actively assist in the marketing, either (a) as has been done in certain provinces by introducing the growers to particular buyers, or (b) by organising and superintending auctions, a system which has been successful in the Punjab. There are limits, however, to the scale on which this can be done [209]; and for general large scale improvement the Committee advocate (1) the establishment of cotton markets under rules regulating sales on the plan adopted in Berar, where the farmer can come into touch with the larger dealers, and where standard weights alone are used and competitive prices easily ascertained; and (2) the fostering of co-operative sale by villagers. We support these recommendations, noting that they involve recognition of the principle that agricultural officers must interest themselves directly in improving the methods of marketing. This we believe to be correct; but it forms an additional reason for the need of adequate district staff and organisation.

(149.) **Ginneries and Presses.**—The Indian Cotton Committee recommend (i) the prohibition by legislation of the transport by rail, except under license, (a) of cotton in any form except to spinning or weaving mills or to a port [221]; (b) of cotton waste or fly, except from one mill to another or to a port [220]. We believe that action on these lines is necessary to check mixing. Road traffic will be unaffected. It is difficult to deal with generally, and action may prove necessary in only few instances. (ii) That all ginneries and presses be licensed. These licences would insist on conformity to certain structural designs, obligations to keep machinery properly set, to stamp bales to permit of identification, to use stamped weights, to keep proper records of cotton handled, to submit statistical returns, to conform to

regulations regarding the disposal of seed, and to be open to inspection by specified officers, &c. [223-225.] Many of the better-managed ginneries already conform to such conditions. Breach of the terms of the licence, or the proof of continued malpractices, *e.g.*, damping, "false packing," &c., will ultimately entail withdrawal of the licence by the local Government. The recommendation to withdraw a licence would be tendered to the local Government by the Central Cotton Committee (*see* § 154 below) after investigation by the Provincial Committee. These bodies, which are organised bodies composed of representatives of the cotton trades and Agricultural Departments, will be described later. The object is to avoid making breaches of the licence penal offences, and to secure the participation of the trade in preventing and remedying abuses. [226-229.] We strongly support the proposal to license all ginneries and presses in the method indicated, and consider the proposal to associate the trade in the administration of the Act a wise one.

(150.) **East India Cotton Association.**—The Indian Cotton Committee have also considered the higher trade organisation. At the time of their enquiry there were seven Cotton Associations in Bombay, none representative of the trade as a whole. There were no fixed frequent settlements. Also no grade could be tendered against a future contract except the one grade of the particular class on which the contract was based. The Committee recommend the establishment under Royal Charter of an East India Cotton Association similar to the Liverpool Cotton Association to represent the trade as a whole and to regulate dealings. Draft rules and constitution have been prepared. We have ascertained that the establishment of such an Association in Bombay will be welcomed in Liverpool. It should prove to the general benefit of the cotton trade in India. We hope the scheme will be carried to fruition. [Chapter XVIII.]

(151.) **Standardisation of Weights.**—The weights at present in use in different parts of the country, though frequently known by the same name, differ in value. The Indian Cotton Committee recommend the universal adoption for cotton of the scale 28 lbs. (Avoirdupois) to the maund, 28 maunds (784 lbs.) to the khandi. This is already in use in Bombay and fits in with the 400 lbs. bale of which the recognised tare is 8 lbs., giving a net weight of 392 lbs. or half a khandi. This would be a very useful reform, and the table is preferable to one based on the maund equal to 82½ lbs. [212, 213.]

#### *Statistical.*

(152.) **Statistics.**—The recommendations of the Committee are calculated to improve the crop forecasts and returns of cotton, especially those advising—

- (a) the issue of a fifth forecast in April, to include the Madras crop;
- (b) that the co-operation of non-officials be sought in estimating the yield;
- (c) that the interest and help of Native States be sought for making these forecasts more correct;
- (d) the compulsory submission of returns from ginneries and presses of cotton ginned and pressed;

(e) that the Agricultural Departments be responsible for these forecasts; but in the interests of accuracy we consider that mills should also be compelled to report the quantities of unpressed cotton delivered direct to them. [Chap. XVII.]

#### *Finance.*

(153.) **Raising of Funds.**—Funds will obviously be needed to provide for the expansion of the agricultural department even to the minimum estimated as necessary and for the proposed Central Committee (*see* § 154 below). The estimate submitted is Rs. 16 lakhs a year, viz., Rs. 14 lakhs and Rs. 2 lakhs. Considering the small amount at present spent on agriculture in India, the value of the results already attained, and that the benefit to a country from agricultural improvements in its staple crops increases rapidly as these improvements are carried out on a scale sufficiently large to have commercial effect, it is hoped that Government will be able to supply the funds needed. The Indian Cotton Committee are, however, anxious that action should not be deferred for financial reasons, and report that "the evidence they received showed that no objection would be raised if a small cess of eight annas a bale were levied on all cotton consumed by the mills of India as well as on all cotton exported, provided the proceeds of such a cess were definitely earmarked for work on cotton in India." Such a cess would produce about Rs. 20 lakhs annually.

(154.) **Central Cotton Committee.**—Finally, in its scheme of organisation the Indian Cotton Committee recommend the establishment of a Central Cotton Committee at Bombay under the Presidency of the Agricultural Adviser to the Government of India. It would be composed of representatives of the Agricultural Departments of the different provinces, of the chief cotton associations and chambers of commerce, &c., and of a representative appointed by Lancashire interests. For convenience it would often work through smaller similar local committees in the provinces. It would thus be a properly constituted body of non-officials and officials directly interested in and in close touch with cotton; it should ensure closer co-operation between the Agricultural Departments and the trade which is needed in the interests of both; it would be available to Government for considered advice on cotton matters; it would make

recommendations regarding withdrawal of licences of ginneries and presses (*see* § 149 above); it would arrange for tests and valuations of different varieties of cottons; and it would act generally as a bureau of information on cotton, &c. A permanent Secretary and Technologist would be required [Chap. XIX, 260, 261]. We strongly support this recommendation. We should be glad to keep in touch with the developments in India of this proposal, and when the time comes to assist in any way in our power in obtaining a Lancashire representative for nomination to this committee. We believe that such an appointment would promote mutual understanding between two important parts of the Empire on matters connected with cotton.

(155.) **Action Recommended.**—We are glad to know that the Indian Government has now given consideration to the Indian Cotton Committee's report, and has passed resolutions urging the provincial Governments to lose no time in dealing with the question of additional appointments to the Agricultural Departments. With regard to the commercial side of the problem, the Government of India gives precedence to the consideration of the proposed Central Cotton Committee. Some progress has been made with the proposal for the formation of an East India Cotton Trade Association, and a Cotton Contracts Committee has already been set up in Bombay. We would respectfully advise that early effect be given to the various recommendations of the Indian Cotton Committee, which, in our opinion, are judicious, well-conceived, and calculated both to improve cotton in India and to re-act for the material benefit of that country.

#### CONCLUSIONS AND RECOMMENDATIONS.

(156.) Following the recommendations of the Indian Cotton Committee, which sat in 1917-18, we advise:—

- (i) That in order to obtain permanent improvements in cotton in India on a commercial scale, more detailed agricultural work, better methods of marketing and handling, and closer co-operation between the Agricultural Departments and the Cotton Trade interests should all be promoted.
- (ii) That more detailed investigations of the existing kinds of plants in cotton-growing areas and more systematic tests of different varieties should be made. The work both of selection and plant breeding should be conducted solely "by research officers specially qualified therefor and able to devote their full attention to it." That the methods of field tests should be systematised.
- (iii) That special weight be given to (1) the importance of work directed towards the improvement of agricultural practice in its widest sense; (2) the need of staffing, organising and equipping Agricultural Departments on a scale adequate to carry through widespread demonstration work; (3) the vital necessity of Government control in organising the selection, supply and distribution of pure seed.
- (iv) That the recommendations to appoint an additional mycologist and to discontinue work on perennial cottons be adopted.
- (v) That the increase asked for in the staff of the Agricultural Departments, which is the minimum that can be expected to discharge the necessary duties assigned to these officers, should be granted.
- (vi) That the possibilities of the Sukkur Barrage project be re-examined.
- (vii) That, with a view to improving the marketing of cotton, markets should be established under definite rules and regulations, and co-operative sale by the villagers should be encouraged.
- (viii) That effect be given to the Indian Cotton Committee's suggestions for the licensing of ginneries and presses, and that the needful legislation be introduced. We also support their recommendation that the transport of cotton and waste be controlled.
- (ix) That the proposal to form an East India Cotton Association be carried out, since we believe that the formation of an association on the lines indicated would be of benefit to the Indian Cotton Trade, and would be welcomed by similar organisations in other countries.
- (x) That the standardisation of weights on the plan suggested—namely, 28 lbs. (Avoird.) to the maund, 28 maunds to the khandi—be adopted.
- (xi) That the recommendations for improving crop forecasts be carried out, but that, in the interests of accuracy, the advisability of securing returns of unpressed cotton delivered direct to the mills be considered.
- (xii) That the proposal to form a Central Cotton Committee, as outlined in the Report, be put into effect, and that the Empire Cotton Growing Committee work in co-operation with it, wherever possible, in the interests of cotton production.

Finally, we would request sympathetic consideration for, and early action on, the various recommendations of the Indian Cotton Committee, which we consider well calculated both to improve cotton growing in India and to promote the material benefit of that country.

## QUEENSLAND AND OCEANIA.

*Maximum production, 1912—approximately 160 bales (400 lbs.).*

(157.) **Queensland.**—Queensland is one of those countries which can undoubtedly grow cotton of good quality, if the economic conditions are favourable. During the famine of the 'sixties cotton was grown, but, as in many other countries, was abandoned when prices fell. Another attempt was made in 1890 to revive the industry, but this only lasted a few years. In 1913, however, the Department of Agriculture, in conjunction with the British Cotton Growing Association, again drew attention to cotton, and since then some progress has been made. Whether the industry will extend still further, or will outlast the present period of high prices, is difficult to say. The main obstacles to the production of cotton for export are the high cost of labour, especially for picking, the existence of other competing crops and the high freights on the long journey to Europe. We are not yet in possession of sufficient information to say whether these difficulties can be overcome in the near future, but we hope to receive further evidence on the subject when more data are available.

(158.) **Pacific Islands.**—Among the islands scattered over the Pacific there are many small areas in which cotton has been grown, sometimes experimentally, and in other cases on a small commercial scale. Most of these islands, such as the Philippine Islands (American), the Dutch Indies and New Caledonia, and the Society Islands (French) do not come within the scope of this survey.

(159.) **German New Guinea, Bougainville and Fiji.**—In German New Guinea and Bougainville (Bismarck Archipelago) small quantities of fine cotton have been grown, some of which has been described as Sea Island. We have no information which would enable us to judge how far these experiments had been carried before the war, or by which we could estimate the prospects of further extension. In Fiji, cotton cultivation has been tried several times. Sea Island cotton of exceptional quality was grown about 1880. The results seem to have been limited by the competition of other crops, such as copra, sugar and fruit. In many of these islands, however, the position of cotton, as compared with other competing crops, may have been substantially changed by the high prices of Sea Island cotton during the war; and if, as seems probable, these high prices are maintained owing to the failure of the Florida and Georgia crops, the cultivation of Sea Island cotton may become commercially possible. There seems little doubt that among these islands of various nationalities throughout Oceania there must be in the aggregate a relatively large area suitable for the production of Sea Island cotton if the demand for such cotton is well maintained.



## SUMMARY OF SPECIAL CONCLUSIONS AND RECOMMENDATIONS.

### WEST INDIES.

The crop, though small, is of world importance. We recommend that means should be provided to secure the continuance and, if possible, some enlargement of the Imperial Department of Agriculture.

We also recommend that careful enquiry be made as to the best means of replacing the Sea Island crop of the United States.

### EGYPT.

- (a) The Egyptian crop before the war had reached a total of over 7½ million kantars (or 1,875,000 bales of 400 lbs.). It has, however, during the war fallen to five million kantars. Having in mind this fact and the particularly serious reduction in the supply of fine cotton generally, owing to the loss of the Florida and Georgia crop, we regard the position in Egypt with peculiar anxiety, and desire to emphasise the necessity of leaving no step untaken to remedy the causes which have led to this decline and to attain the maximum production of which the country is capable.
- (b) As quality is of first importance in fine cottons such as Egyptian, we consider it essential that work should be directed methodically and constantly, not only towards maintaining the quality of the existing varieties, but also towards securing and holding in reserve other varieties for introduction when and as expedient.
- (c) We would especially emphasise the desirability of proceeding without delay with the measures already determined upon before the war, to remedy the unsatisfactory condition of parts of the Delta as regards drainage and the control of excess water.
- (d) Concurrently with the completion of these projects, it is of the utmost importance that water should be available for the reclamation and irrigation of the lands referred to, as well as of those further north which will be restored to cultivation by the new drainage works. An adequate water supply is available in the White Nile, and we trust that no time will be lost before adopting the best measures for its utilisation. Until this is done full advantage of the expenditure already incurred in the Northern Delta cannot be obtained.
- (e) It is estimated that the measures referred to in paragraph (d) would result in an increase of 3,500,000 kantars of cotton, or about 900,000 bales of 400 lbs. The magnitude of such a possible increase in the Egyptian crop overshadows, though it in no way detracts from, the importance of the prospective increase in Uganda or Nigeria, where some such figure as 100,000 bales may be expected as the result of development work.
- (f) Since part of the serious reduction in the average yield of the crop is due to the devastations of the pink boll worm, we consider it essential that no time should be lost in putting into force the measures decided upon just before the outbreak of war to combat the ravages of this pest.
- (g) We most cordially welcome the appointment of the new Cotton Research Board in Egypt and hope that every assistance will be given to it and to its endeavours to elucidate the problems affecting the Egyptian cotton crop, in particular (a) the environment of the crop, specially with regard to water and to the control of insect pests, and (b) the maintenance and improvement of the quality of the seed.

### SUDAN.

In our letters to the President of the Board of Trade dated 29th December, 1917, and 17th February, 1919,\* we referred to the importance to Egypt of the Sudan irrigation and accompanying drainage schemes; and we desire to emphasise once more the fact that the irrigation projects in the Sudan form an inseparable part of the comprehensive scheme for utilising to the fullest extent the water supplied by the Nile.

We have heard very full evidence with regard to the Blue Nile Barrage, which would make possible the irrigation of some 300,000 acres of land as a first instalment in the Gezira, with prospects of a further increase to about 1,000,000 acres suitable for cotton growing. We are of opinion that the Gezira is one of the most promising districts for development that we have had to consider; we recognise however that, with regard to the utilisation of the Nile, the interests of Egypt have to be considered before those of the Sudan. At the same time we hope that the possibilities of opening up and developing the Tokar and Kassala areas may be carefully considered.

\* See Appendix VI. (d) and (e).

In the Sudan, as elsewhere, we consider experimental work to be of the greatest importance. We are glad to be informed that this is fully recognised by those responsible for the Government of this important country.

#### MESOPOTAMIA.

We are of opinion that the results obtained by the experimental work of the Department of Agriculture are very promising. These experiments were, however, necessarily carried out on a small scale. It is therefore most important that the work should be continued and extended in order to determine whether cotton can be economically produced on a commercial basis. It is essential for this purpose that arrangements should be made to build up a supply of approved seed for large sowings in 1921, and we have already recommended\* that the funds required to make this possible should be at once provided by a special grant.

#### UGANDA.

We recommend that the Agricultural Department should be enlarged, and that the salaries paid to its officers should be substantially increased, so as to retain those already employed, and to attract men of ability to the service.

Continued attention should be paid to the development of transport facilities, including improved waterways.

We recommend that Government control of the Cotton Industry already established should be maintained.

#### NYASALAND.

We wish to emphasise the necessity here, as elsewhere in Africa, of strengthening the Agricultural Departments and improving transport facilities.

#### RHODESIA.

We think it desirable that the possibilities of Rhodesia as a whole should be more fully explored, since, although none of the districts where pioneer work has been undertaken can be regarded as likely to produce a large cotton crop in the early future, they apparently possess possibilities for further development which may prove valuable later on.

The addition of cotton experts to the otherwise well equipped Agricultural Department is essential before progress can be expected.

#### THE UNION OF SOUTH AFRICA.

The cotton growing industry has now emerged from the experimental stage in South Africa. The results obtained indicate that cotton of excellent quality can be grown. We recommend that the valuable work done by the Department of Agriculture should be extended with the object of developing cotton growing on a much larger scale.

#### NIGERIA.

We see reason for hope that great expansion may be possible in the growing of cotton in Nigeria, but before this can be attained a large increase in the staffs of the Agricultural Departments will be necessary. We have to reiterate here once more the need for an increase in the salaries paid, if these Departments are to be maintained in an efficient state.

We are of opinion that progress equally depends upon the systematic development of the transport systems. Until main line railways can be constructed, we think that efforts should be made to open up the country by other means of transport. We understand that several methods have been tried, and we would press the authorities to decide upon those most suited to local conditions.

We are of opinion that the work of the British Cotton Growing Association in promoting the commercial development of the cotton crop has been very valuable.

Meanwhile, we recommend that the British Cotton Growing Association be asked to proceed energetically with its work in the areas in which it is now operating, with a view to increasing the cotton crop to the fullest extent of the capacity of the ginning and baling plant already installed, which appears sufficient to deal with a large increase upon the output of recent years. In this connection, we recommend that our Committee should enter into a working agreement with the Association, as outlined in §26 of this Report.

Exploratory work in new districts, for example in the region of Lake Chad, appears to us desirable, and we recommend that we should assist the local Government in pioneer work.

#### INDIA.

Following the recommendations of the Indian Cotton Committee, which sat in 1917-18, we advise—

- (i) That, in order to obtain permanent improvements in cotton in India on a commercial scale, more detailed agricultural work, better methods of marketing and handling, and closer co-operation between the Agricultural Departments and the Cotton Trade interests should all be promoted.
- (ii) That more detailed investigations of the existing kinds of plants in cotton growing areas and more systematic tests of different varieties should be made. The work both of selection and plant breeding should be conducted solely "by research officers specially qualified therefor and able to devote their full attention to it." The methods of field tests should be systematised.

\* See Appendix VI. (f).

- (iii) That special weight be given to (1) the importance of work directed towards the improvement of agricultural practice in its widest sense; (2) the need of staffing, organising and equipping Agricultural Departments on a scale adequate to carry through widespread demonstration work; (3) the vital necessity of Government control in organising the selection, supply and distribution of pure seed.
- (iv) That the recommendations to appoint an additional mycologist and to discontinue work on perennial cottons be adopted.
- (v) That the increase asked for in the staff of the Agricultural Departments, which is the minimum that can be expected to discharge the necessary duties assigned to these officers, should be granted.
- (vi) That the possibilities of the Sukkur Barrage Project be re-examined.
- (vii) That, with a view to improving the marketing of cotton, markets should be established under definite rules and regulations, and co-operative sale by the villagers should be encouraged.
- (viii) That effect be given to the Indian Cotton Committee's suggestions for the licensing of ginneries and presses, and that the needful legislation be introduced. We also support their recommendation that the transport of cotton and waste be controlled.
- (ix) That the proposal to form an East India Cotton Association be carried out, since we believe that the formation of an association on the lines indicated would be of benefit to the Indian Cotton Trade, and would be welcomed by similar organisations in other countries.
- (x) That the standardisation of weights on the plan suggested—namely, 28 lbs. (avoird.) to the maund, 28 maunds to the khandi—be adopted.
- (xi) That the recommendations for improving crop forecasts be carried out, but that, in the interest of accuracy, the advisability of securing returns of unpressed cotton delivered direct to mills be considered.
- (xii) That the proposal to form a Central Cotton Committee, as outlined in the report, be put into effect, and that the Empire Cotton Growing Committee work in co-operation with it, wherever possible, in the interests of cotton production.

Finally, we would request sympathetic consideration for, and early action on, the various recommendations of the Indian Cotton Committee, which we consider well calculated both to improve cotton growing in India and to promote the material benefit of that country.

NOTE.—*General Conclusions and Recommendations will be found at the end of Part I., page 14.*

In conclusion, we wish to express our indebtedness to the various Government Departments, officials, and others who have assisted us at every stage of our enquiries, and not least to our Secretary, Mr. J. A. Todd, and to his assistant, Captain C. R. Eddison.

Mr. Wadia has been absent in India for several months, and is still away. We have not, therefore, had the advantage of his assistance in drawing up this Report. Mr. Kershaw is also absent from England. He concurred, however, in the sections dealing with India, in the drafting of which he took part.

We have the honour to be,

Sir,

Your obedient Servants,

HENRY BIRCHENOUGH (*Chairman*).  
 J. S. ADDISON.  
 W. LAWRENCE BAILS.  
 W. C. BOTTOMLEY.  
 PETER BULLOUGH.  
 A. CANHAM.  
 D. T. CHADWICK.  
 JOSEPH CROSS.  
 WYNDHAM R. DUNSTAN.  
 ANDREW FISHER.  
 N. S. GLAZEBROOK.  
 W. H. HIMBURY.  
 F. HODGKINSON.  
 J. ARTHUR HUTTON.  
 RICHARD H. JACKSON.  
 JOHN W. McCONNEL.  
 WILLIAM MULLIN.  
 J. MURRAY.  
 CHARLES M. WOLSTENHOLME.

C. R. EDDISON (*Acting Secretary*).  
 22nd October, 1919.



## APPENDIX I.

EXTRACT FROM RECOMMENDATIONS OF BOARD OF TRADE DEPARTMENTAL COMMITTEE  
ON THE TEXTILE TRADES (Cd. 9070, PAGE 13).

B. As there is now available very much more knowledge with regard to the scientific principles underlying the development of cotton than was the case some years ago, the time appears opportune for a new departure, and we therefore recommend that H.M. Government, without delaying the action urged in the previous paragraphs, should immediately appoint a Special Committee to investigate in all its bearings the question of increasing the supply of cotton in the British Empire.

The primary duty of such a Committee would be to assist in the development of the cotton resources of the Empire, and, keeping as it would, in constant touch with work in progress in India and the Colonies and Dependencies connected with the growing, handling and marketing of cotton, it would become a clearing house of information which could not fail to be of great practical assistance to the various Governments.

The exact terms of reference will need careful drafting, but we consider they might, with advantage, include an investigation into:—

- (a) The scientific development of cotton, both as to quantity and yield.
- (b) The possibilities of the extension of cotton-growing within the Empire.
- (c) The areas suitable for cotton-growing owing to soil, climate, labour and transport facilities.
- (d) The kinds of cotton suited to special districts
- (e) The improvement of transport.

- (f) The best method of marketing the crops, particularly in those parts of the Empire where cotton-growing is in its infancy.
- (g) The means by which suitable experimental work can best be conducted by the Governments of the different Colonies and Dependencies.
- (h) The methods of co-ordinating the results obtained in different places, so as to make the knowledge available for the whole cotton-growing industry.

It is suggested that the Committee should include representatives of the interests affected, that is to say, the Governments of India, Egypt, and the Colonies and Dependencies concerned; the trades involved both in the United Kingdom and in India, viz., cotton merchants, cotton spinners, manufacturers and dyers; the British Cotton-Growing Association; the Imperial Institute; and at least one botanist who has devoted special attention to the growth of cotton.

We desire to make it clear that it is not our intention that this Committee should be vested with any powers of control. While its assistance and advice would be at the disposal of the various Governments, the discretion of those Governments in deciding the extent to which, and the manner in which, development should proceed, must necessarily remain unfettered.

A separate memorandum by Mr. J. W. McConnel is appended, which explains more fully the views which he has personally explained to us.

## APPENDIX II.

## MEMORANDUM TO THE PRIME MINISTER. (Presented in July, 1917.)

MEMORANDUM ON THE DEVELOPMENT OF COTTON  
GROWING IN THE BRITISH EMPIRE.

1. At a meeting held in Manchester on 13th December, 1916, the following bodies were represented:—

British Cotton Growing Association.  
Federation of Master Cotton Spinners' Associations.  
Cotton Spinners and Manufacturers' Association.  
Wigan and District Cotton Employers' Association.  
Amalgamated Association of Operative Cotton Spinners.  
Amalgamated Association of Card and Blowing Room Operatives.  
Operative Cotton Spinners' Provincial Association, Bolton.  
Northern Counties Amalgamated Association of Weavers.  
Liverpool Cotton Association.  
Manchester Cotton Association.  
Bleachers' Association, Ltd.  
Bradford Dyers' Association, Ltd.  
Calico Printers' Association, Ltd.  
Fine Cotton Spinners and Doublers' Association, Ltd.  
Lancashire and Cheshire Coal Owners' Association.

The following resolutions were passed unanimously:—

- A. "That the present situation as to the supply of cotton is most serious, and requires the immediate attention of His Majesty's Government."
- B. "That it is essential for the future prosperity of this country, and also for the welfare of the Colonies, that cotton growing should be developed as rapidly as possible in all suitable parts of the Empire."

C. "That the authorised irrigation works for the development of the Gezira Plain should be pushed on with the least possible delay."

D. "That immediate steps should be taken both to improve the quality and to increase the quantity of Indian cotton."

E. "That a departmental or other committee should be appointed to consider the best method of continuing and developing the work inaugurated by the British Cotton Growing Association, and that, pending a decision on this question, the Government should render such financial and other assistance to the Association as will enable them to carry on their work to the fullest possible extent."

It was further resolved:—

"That copies of this resolution be sent to the Prime Minister, the Secretary of State for the Colonies, the Secretary of State for India, the Chancellor of the Exchequer, and to the President of the Board of Trade, and that the Prime Minister be requested to receive a deputation on the subject."

The bodies present at the meeting represent practically the whole of the Cotton Spinning and Manufacturing Industries of Lancashire.

The British Cotton Growing Association was formed in 1902, and its existence is evidence of the anxiety which even years ago was felt about the future supply of cotton. Its supporters have subscribed £500,000, without receiving any monetary return for their outlay. The object of the Association has been to ascertain how far it is possible for the British Empire to produce the cotton required for its mills.

The other Associations present at the meeting represent the various amalgamations of both Capital and Labour interested in and dependent on the Cotton Trade, and there were also present represen-

tatives of many of the largest firms engaged in the manufacture and shipping of cotton goods.

It may be further stated that the views expressed in the foregoing resolutions are almost universally agreed to by all persons interested directly or indirectly in the Cotton Trade of Great Britain.

2. The Manchester Chamber of Commerce at a recent meeting passed the following resolution:—

"That the Board of Directors view with grave apprehension the rapidly increasing world's consumption of cotton, and are of opinion that it is absolutely vital in the interests of Great Britain that new and reliable sources of supply within the Empire should be obtained as soon as possible and encouraged to the utmost extent—to neutralise the effect of this increasing scarcity. The Board therefore call upon the Government to appoint forthwith a committee to envisage the whole question and to report to the Government."

Similar resolutions have been passed by other Chambers of Commerce.

3. It is understood that the Textiles Committee of the Board of Trade in its interim report on raw cotton made recommendations which are for practical purposes identical with the resolutions passed at the joint meeting of the bodies concurring in this statement.

4. While it is thus evident that the resolutions now presented to the Government have behind them an immense weight of public opinion, yet it is no doubt desirable that an attempt should be made to state as plainly as possible the elements of the problem which the Government are asked to solve.

It will perhaps conduce to clearness if something is said about each of the resolutions in turn.

A. *That the present situation as to the supply of cotton is most serious, and requires the immediate attention of His Majesty's Government.*

5. The growing insufficiency of the supply of cotton is a world problem, as well as a special danger to the British Empire.

Considered as a world problem, all people who have studied the matter are agreed that the use of cotton and the need for cotton is increasing largely every year, and they are also agreed that a corresponding increase of supply is not developing spontaneously.

6. The cotton crops of the world are estimated by the Census Bureau of the United States to have averaged about 22,600,000 bales of 500 lbs. each in the three years ending July 31, 1915. This figure omits the short scrapings from the seed, known as "linters" in the United States, and also such parts of the Chinese and Indian crops as are used in home manufacture. It therefore represents the cotton destined to enter commercial channels. The origin of the cotton is shown in the following table, stated in bales of 500 lbs. each:—

United States	...	...	...	14,000,000
India	...	...	...	3,600,000
Egypt	...	...	...	1,500,000
China	...	...	...	1,300,000
Russia	...	...	...	1,000,000
Brazil	...	...	...	400,000
Rest of world	...	...	...	800,000
				22,600,000

Many of these figures are only approximate estimates, and comparisons of a reasonably accurate character are only available for a few years back. There is however very little doubt that for the past half century there has been a fairly regular increase in the world's production. There are no records for past years of the world's consumption as separate from supply, but the world's consumption is necessarily limited by the supply, and the balance between supply and demand is reflected in the price. Measured in this way it is evident that even before the war supply had become noticeably insufficient for the world's needs. The price of Middling American affords the best index of the relations of supply and demand. The average price of Middling American during the last twenty years was as follows:—

5 years—1895-1900	...	...	...	3.76d.
" 1900-1904	...	...	...	5.44d.
" 1905-1909	...	...	...	5.78d.
" 1910-1914	...	...	...	7.16d.

In no single year since 1875 until 1909-10 had an average price been recorded so high as 7.0d.

7. In the opinion of those qualified to judge, there is (apart from the war), an increase in the world's actual requirements of cotton each year, at an average rate of at least three, or more probably, three and a half per cent. That is to say that the world calls at the present time for its supply of cotton to be added to and increased in each year by at least 600,000 bales and probably by 800,000 bales of 500 lbs. each.

8. Cotton is the cheapest clothing material. It supplies the garments for all the more backward and impoverished peoples, and moderate prices are a necessary foundation of the Cotton Trade.

9. Such is the matter considered as a world problem. The special interest of Great Britain is due to several reasons. In the first place the enormous importance of the Cotton Trade to Great Britain must be mentioned. In 1913 the total exports "wholly or mainly manufactured" from the United Kingdom were returned at £411,400,000, and of this cotton yarns, piece goods, and other cottons amounted to £125,600,000. It is estimated that the capital engaged in the Cotton Trade and the subsidiary and allied industries amounts to over £500,000,000, and that 10,000,000 of the population of this country are directly and indirectly dependent on the Cotton Trade for their livelihood.

10. Then there is another factor of great moment. The British Cotton Trade is very largely an export trade. It is estimated that four-fifths of the British production of cotton yarns and goods are for export. The Cotton Trade practically originated in Great Britain, and the history of its development in other countries may be described as a continuous effort to replace British-made cotton goods by domestic manufacture. Consequently it is very generally the case that Great Britain supplies the surplus for countries which partly manufacture for themselves. Wherever this is the case the difficulties which arise from any shortage in the supply of raw material are found to fall most seriously upon the country supplying this surplus. It has certainly been the case that in those seasons, when mills had to run short-time or to stop altogether in consequence of shortage of cotton, Lancashire has suffered more severely than either America or the Continent of Europe.

11. There is another feature of the Lancashire Cotton Trade to which attention must be drawn, and which may require rather careful explanation. In accordance with the natural laws of commerce, each country, as it develops its own manufacture of cotton, begins with the coarsest numbers, and what Lancashire is able to retain is generally the finer end of the trade. There are many reasons for this: in coarse goods of low value freights are proportionately a more heavy charge; fine goods require better and more experienced workmanship; the Lancashire climate also is more suitable for fine cottons than that of many other countries. It is customary in Lancashire to divide the trade according to the varying "fineness" of the yarn under the headings of "coarse," "medium," "fine," or "extra-fine," but all of these headings represent finer yarns than are usual in most other countries, and the "coarse" numbers manufactured in Lancashire are finer than the finest numbers spun in many other cotton manufacturing countries.

12. It follows from this that it is of vital importance to Lancashire, not merely to obtain increased supplies of cotton, but to get cotton suitable for the counts she spins. In normal times Great Britain requires for her own use (deducting raw cotton re-exported) about 4,000,000 bales of 500 lbs., and of this some 3,200,000 bales or 80 per cent. come from America, 600,000 bales of 15 per cent. from Egypt, and 200,000 or 5 per cent. from elsewhere. In this connection special attention must be drawn to the present position as regards the American supply. There is at present no other country in the world which can give to Lancashire in any considerable quantity cotton of the right kind to replace the 3,200,000 bales she draws from America. Referring to the table of the world's supply given in paragraph 6, Indian cotton is for the most part unsuitable for Lancashire mills, and Chinese cotton entirely so; Russia grows only for herself; and Egyptian cotton, on the other hand, is limited in quantity. Some small

quantities of suitable cotton are already drawn from Brazil and from those countries grouped in the last line, but on the whole it is strictly true to say that the regular Lancashire trade depends to-day upon American cotton just as much as it did at the time of the Civil War.

13. The danger to be faced is the insecurity of this supply. The American cotton crop, as is the case with cotton crops elsewhere, varies greatly from season to season owing to climatic and other reasons. On the whole there has been a steady increase since the days of the reconstruction after the war, but many people doubt whether this rate of increase will be maintained in the future. There are reasons for the doubt. New extensions of cotton growing will necessarily be outside the negro belt; there are other crops equally or more remunerative; the Boll Weevil certainly reduces production and adds to the cost, and no complete remedy for it has yet been discovered; and it also inflicts a special injury on fine spinners, because where this pest is prevalent only early maturing cotton can be satisfactorily grown, and most early maturing cotton is short and unsuitable for finer counts.

14. In addition the consumption of cotton in the mills of the United States has lately been increasing with great rapidity. Before the war affected matters, the following particulars of deliveries to spinners gives at any rate an indication of what was happening:—

(In 1,000 bales.)	Great Britain.	Europe.	U.S.A.	Etc.	Total.
Average, •					
1903/4—1905/6	2,870	3,930	4,380	330	11,510
1911/2—1913/4	3,400	5,270	5,430	590	14,690
Increase in 8 years	530	1,340	1,050	260	3,180
Percentage ...	18½	34	24	79	27*

(Shepperson, 1916, p. 36.)

\* 27 per cent. increase in eight years is equal to an annual increase at the compound rate of 3 per cent.

Since the war began the increase in American consumption has been much larger.

—	Great Britain.	Europe.	U.S.A.	Etc.	Total.
Deliveries to spinners in 1914/5 ...	3,112	4,129	6,088	712	11,041
in 1915/6 ...	3,250	2,831	6,810	742	13,633

The recent rapid increase in the consumption of cotton in the United States is even more clearly shown by the following figures:

—	Total American Crop.	U.S.A. Consumption.	Percentage of Crop.
	Bales.	Bales.	
1913/4 ...	14,552,000	5,503,000	37·8
1914/5 ...	15,136,000	6,088,000	40·2
1915/6 ...	12,862,000	6,810,000	53·0

The above figures deal with American cotton only and do not include linters, which are largely used in the manufacture of explosives, and which have therefore since the war been more extensively produced than was usual before.

15. It is of course impossible to predict whether America will retain, when peace comes, any considerable portion of the extra trade she has lately secured. But it is certainly alarming for the Lancashire Cotton Trade, practically dependent as shown previously on American cotton, to find that a year has now arrived when America has reached the point of herself using more than half her own crop.

B. "It is essential for the future prosperity of this country, and also for the welfare of the Colonies, that Cotton Growing should be developed as rapidly as possible in all suitable parts of the Empire."

16. The importance to this country of fresh supplies of cotton has been already dealt with in some degree, but there is one special disadvantage of our present dependence on America that has yet to be named. This lies in the fact that cotton is an annual crop, and its growth in any year is dependent on weather and local circumstances. The production in America has varied in recent years from 158 lbs. to the acre, to 224 lbs. or more (the actual production in 1914-15 was probably nearly 250 lbs., but large quantities were not brought to market). Such a variation would mean, on the present acreage, crops varying from 11,400,000 to 16,200,000 bales. It is obvious that where such difference is possible with only a few months' notice of the probabilities, prices must be very erratic. This is all the more disastrous because the American crop dominates the cotton markets of the world, and variations in the prices of American are largely reflected in the quotations of other crops.

17. It is clear that the most satisfactory remedy for the present and prospective shortage in cotton supplies would be found in a large and rapid development of Cotton Growing in other parts of the world, where the climatic conditions are likely to differ in any particular season from those prevailing in America, and where the harvests mature at a different time of the year. The broader the basis of supply the steadier the price of cotton.

18. But it is maintained that altogether apart from the advantages to the Cotton trade in Great Britain, it is also essential for the welfare of the Colonies that Cotton Growing should be developed as rapidly as possible in all suitable parts of the Empire.

19. The British Cotton Growing Association, in the fourteen years of its existence, has been doing work of a pioneer character. Incidentally it has met with some disappointments, but these have had their use in indicating some of the conditions which limit the area where the growing of cotton is commercially possible. The main result of the work done by the Association is that they have conclusively proved that cotton can be satisfactorily grown in increasing quantities in several parts of Africa, notably in the Sudan, in Uganda, Nigeria and Nyasaland, and also in the West Indies. And moreover, they have also proved that in all these countries the cotton that will grow to the best advantage is cotton very well suited for use in Lancashire mills in place of the American cotton now used.

20. There can be no doubt that the growing of cotton is beneficial to those countries for which it is suitable.

In Egypt, cotton and cotton seed form 90 per cent. of the exports of the country. In the Sudan cotton is already more than 10 per cent. of the exports, and in Uganda nearly 70 per cent.

In the West Indian Islands cotton forms over 30 per cent. of the total exports of St. Vincent, Montserrat, and the Virgin Islands, and is an important factor in St. Kitts-Nevis, and Barbadoes.

In India, even as things are, cotton is among the first three of the articles exported and forms more than one-tenth of the whole.

In a Memorandum sent to the Colonial Office by the British Cotton Growing Association on Dec. 15th, 1915, it was stated that the Government Revenues of the Colonies and Protectorates where the Association was operating were benefiting to the extent of over £130,000 per annum in direct consequence of the cultivation of cotton.

C. "That the authorised Irrigation Works for the Development of the Gezira Plain should be pushed on with the least possible delay.

21. While there are very large openings for the future development of Cotton Growing in many parts of the Empire, there are two propositions that are urged upon the Government to be taken in hand with the least possible delay. One is the development of the Gezira Plain in the Sudan; the other is the extension and improvement of cotton in India. The most immediate of these is the development of the

Gezira Plain. This is the tract of country lying between the Blue and the White Nile immediately south of Khartoum. It is thought to be ultimately capable of growing as much cotton as is now grown in the Egyptian Delta.

22. The preliminary scheme, estimated to cost £3,000,000, has already received the authorisation of His Majesty's Government. The details of this proposition were fully enquired into by the late Lord Kitchener, and were drawn up under his personal supervision. Briefly stated, the scheme is as follows:—

A. The construction of a dam or barrage on the Blue Nile capable of supplying water to irrigate 3,000,000 acres.

B. The construction of a preliminary main canal and of subsidiary canals to irrigate 300,000 acres, of which 100,000 acres would be under cotton.

It is estimated that if the work is pushed on rapidly the water supply will be available in two years from now, and that the whole of the preliminary area of 300,000 acres will be brought under cultivation five years hence, viz., in 1922. This area should produce about 80,000 bales of 500 lbs. per annum. It is hoped that the cultivated area will extend rapidly afterwards, but this will depend on two factors, namely, a sufficient population and the supply of water from the Blue Nile, part of which is required by Egypt.

Many years must elapse before the whole of the Gezira Plain can be brought under cultivation, and further investigations of the conditions will be necessary, and more especially as to the relative allocation of water to Egypt and to the Sudan. This does not however apply to the preliminary scheme, for full investigations have already been made as to suitability of soil, sufficiency of population, and the necessary supply of water. In addition, two large experimental stations on a commercial scale have been working for several years, and it has been definitely proved that Egyptian Cotton of good quality and most suitable for Lancashire requirements can be grown in the Gezira on a sound economic basis.

The Gezira scheme is the only proposition which offers any prospect of producing any appreciable quantity of cotton of high quality in the immediate future, and therefore it is of paramount importance that not one moment should be lost in pushing on its development with the least possible delay.

D. "*That immediate steps should be taken both to improve the quality and to increase the quantity of Indian Cotton.*"

23. In discussing the future supplies of cotton, it has been so often stated that India probably offers the best and quickest opportunity for obtaining relief, that the broad fact must be well known to members of the Government. It is therefore only necessary here to deal with the matter very shortly.

24. Cotton has been grown in India from the earliest times, and in early days cottons of the finest possible character were grown there, at any rate to some extent. Before the war, the acreage devoted to cotton was estimated to be about 25,000,000 acres. This may be compared with about 36,000,000 in the United States. The crop was estimated to have averaged in 1912-13 and 1913-14 the equivalent of 3,850,000 bales of 500 lbs. Thus, while America was producing on an average about 195 lbs. of cotton to the acre, the average production in India was about 75 lbs. only.

25. The average annual distribution of the cotton in 1912-14 was as follows, in bales of 500 lbs. each:—

Great Britain ... ..	91,000
Europe ... ..	1,124,000
China and Japan ... ..	1,065,000
<hr/>	
Total Export ... ..	2,280,000
Indian Mills ... ..	1,700,000
Home use ... ..	360,000
<hr/>	
	4,340,000

Some discrepancy will be noticed if these figures are compared with the production given above, or with the figure of the Census Bureau recorded earlier on, but the general conclusion is plain. Only a negligible fraction of the crop is used in Great

Britain; half the crop is used in India itself; the rest is shared about equally by China, Japan, and by Europe.

The fact is that the quality of Indian cotton makes it suitable only for the lowest counts, and it consequently only commands very poor prices. It is probably true to say that Indian cotton is less valuable than American by at least 20 per cent.

26. Taking these comparisons of quantity and price together, it appears that if the production of cotton in India could really be improved so that the value per acre there was equal to the value per acre in America, the total value of the Indian cotton crop would be trebled, and there would be added to the annual purchasing power of India the considerable figure of about £70,000,000. And it must be remembered that this would be achieved without lessening the food or other crops, and without putting a single extra acre into cotton. It must also be noted that this might and probably would be done quite as much by making the short cotton suitable for India more prolific as by growing new and longer cottons for Lancashire.

27. It is not suggested that a change of this kind can be brought about by merely waving a magician's wand; indeed, it cannot be said for certain that it can be done at all, but it is urged that both the British Government and the Indian Government should recognise in the first place the necessity for making a very full investigation, and in the second that, in a matter so important, very much more ought to be done in the near future than has been done in the past.

28. The British Cotton Growing Association so far back as 1904 made some useful recommendations to Lord Curzon of Kedleston, which may be briefly summarised as follows:—

A. The establishment of Government Seed Farms in all cotton growing districts.

B. The experimenting with fresh types of seed.

C. That the Government should carefully investigate the reasons why Egypt and the United States were more successful than India in growing cotton.

D. The formation of a special agricultural department devoted solely to cotton, so as to supervise and improve the selection of seed, the methods of cultivation, the ginning and grading of cotton.

E. The survey of varieties currently grown in India, and selection of those most suitable for particular districts.

29. The deputation desire to express their recognition that since 1904 a considerable improvement has taken place. The types of cotton grown have been improved; a beginning has been made in scientific work; and possibly the general level of cultivation has been slightly raised. But it is submitted that what has been done meanwhile ought only to be treated as the very beginning of what ought to be done and of what can be done by the co-operation of the Government, the growers, and the consumers.

This deputation is anxious not to commit itself to any specific recommendation, but it urges that the Indian Government ought to consider the whole matter *de novo*.

The following suggestions might be considered:—

(a) The strengthening of the official staff, and particularly the staff of Europeans engaged in experimental work, so that varieties of cotton of better quality and more prolific types may be made available for the different cotton growing areas as soon as possible.

(b) The establishment of local cotton markets for the protection of the small farmer, and the establishment of such arrangements as will ensure that the grower of improved varieties will receive a fair market price.

(c) The elaboration of some scheme by which the supply of good seed may be made available for all growers.

(d) The control and licensing of ginneries to prevent mixing of seed.

(e) The development by the various Provincial Governments of model plantations, or at any rate of what is known as demonstration work.

(f) The more rapid extension of irrigation.

30. The deputation ventures to suggest that possibly some improvements which have been found difficult in the past might be facilitated by the co-operation of the British Cotton Growing Association supported by practical spinners in this country as well as in India.

31. There is perhaps one other remark that it is necessary to make with regard to Indian cotton. As named before, about half the cotton grown in India is used in India. For the most part this is used in spinning coarse counts of yarn. It must be clearly stated that there is no desire in this country that cottons suitable for English spinners should be grown in India with the result of displacing cottons suitable for Indian use. Though the laws which govern the suitability of different cottons to different countries are not yet fully understood, yet it is probable that the great bulk of the cotton grown in India will always be short and coarse, and therefore only suitable for coarse counts of yarn. It is fully recognised that the Indian growers must not be asked to grow cottons which are unsatisfactory or unprofitable to the grower. There is, however, probably just the same room for improvement in such cottons as there is in finer kinds. The aim should be to so largely increase the production per acre in those districts where worse cottons must be grown so as to set at liberty large areas elsewhere which might be suitable for finer and more valuable kinds. It is confidently hoped that in a comparatively short time the production of short cotton could be largely increased, and that at the same time several hundred thousands of bales of cotton suitable for Lancashire could also be produced. At any rate it is strongly urged that the possibility of doing this should be exhaustively investigated.

E. *"That a Departmental or other Committee be appointed to consider the best method of continuing and developing the work inaugurated by the British Cotton Growing Association, and that pending a decision on this question the Government should render such financial and other assistance to the Association as will enable them to carry on their work to the fullest possible extent."*

32. The two previous resolutions deal with matters of great immediate importance, and yet they must be considered to be comparatively matters of detail. The great object the bodies represented by this deputation have in view is to get the whole question of Empire Cotton Growing treated as a national question, as affecting not only the welfare of this country but also the future prosperity of the Empire.

33. There is on the one hand the Cotton Trade of Great Britain, India, and Canada. So far as Great Britain is concerned it is one of her greatest industries. It more than holds its own against the competition of the World, but it is not an indigenous industry, nor one which is essentially impervious to attack. As has been shown, eighty per cent. or more of its raw material is drawn from foreign sources, and seventy or eighty per cent. of its products are exported to the Colonies or elsewhere. On the other hand there is within the Empire the opportunity for growing both in quantity and in quality all the cotton that it requires. In the British West Indies the finest cotton in the World is now grown; Egypt and the Sudan together are practically the only places in the World where cottons of the Egyptian character can at present be grown on a really large scale. These cottons are essential for spinning the great bulk of what are known in England as fine yarns. In India, at any rate, some large quantities of cotton equal to the American type could be grown. In Africa again the British Cotton Growing Association has proved that it will be possible to develop large crops of cotton suitable for Lancashire.

34. Even under existing conditions the following cottons are produced in the Empire:—

	Area in Square Miles.	Population.	Estimated Production Bales 500 lbs.
Extra Fine—			
West Indies ...	12,140	1,718,216	5,000
Long Staple—			
Egypt ...	363,181	11,287,359	1,500,000
Sudan ...	984,520	3,000,000	20,000
Medium Staple—			
Uganda ...	121,437	2,893,494	32,000
Nyasaland & N.E. Rhodesia.	323,801	1,847,904	6,000
Nigeria ...	336,000	17,611,944	32,000
			1,595,000
Short Staple—			
India ...	1,802,657	315,156,393	4,000,000
Total ...	3,949,736	353,515,310	5,595,000

35. In these days, when so much is wisely and nobly said about organising the resources of the Empire, this is surely a matter that should be taken in hand at once.

36. The British Cotton Growing Association has done the pioneer work. It has now reached the limit of its resources. Some new departure is urgently required.

What is asked for is that the Government should appoint a committee to consider the best method of continuing and developing the work inaugurated by the Association.

37. It would obviously be out of place to ask for such a committee to forestall its recommendations. But the nature of the work which will be required in the future may be briefly alluded to.

38. The organisation of the resources of the Empire means, in regard to this industry, the protection of the interests of all concerned in it and the development of close relations between them. At one end of the chain there is the grower of cotton; in between we have the shipper and the carrying agent, at the other end the spinner and manufacturer. The latter are in business to make profits, and, as is natural, will look after themselves. On the other hand though the cotton grower may also ultimately be in a position to look after his own interests, in the early stages it is essential that he should receive the assistance of some philanthropic body, and if the business is too large to render this possible, it will be necessary for the Government to assist.

39. In any case there is also a wide sphere of work which must be done by someone, and will certainly not be quickly done except with Government assistance.

40. It seems to be essentially the business of each Colony or country to decide for itself whether its climate, its soils, its population, and its means of access to markets are suitable for cotton. And if the conditions are suitable, then it has to decide what kinds of cotton will pay the grower best.

41. Again it is the business of the Colonial Government to try experiments, to establish model farms, to secure purity of seed, to regulate the industry so as to minimise pests, and also so as to create a confidence in the regularity of the quality produced.

42. Again it is the business of the Local Government to provide capital for any big schemes of irrigation or drainage that may be necessary, and to arrange for such railways, roads, or water facilities as may be necessary for the marketing of the cotton produced, and of the other crops which will probably be necessary as rotations.

43. It seems again that there is scope in almost all of these matters for a central bureau in the Imperial Government to advise and assist the separate Colonies. Apart from the help that is always required from the Mother Country for infant industries in Colonies which are not financially strong, there is also a special need in regard to cotton. The time

has come when cotton can be and ought to be systematically and scientifically studied. The cotton industry is less than 150 years old, and in its early days it developed itself both as to its raw material and as to its machinery almost by chance. Modern science tells us now that cotton can be modified so as to fit in with many limitations of climate, and to resist disease, and escape the attacks of insects. It can also be modified so as to be longer or shorter in staple, finer or coarser. There are, of course, some limits and there is much yet to learn. Such knowledge as has been gained is largely scattered in the local reports of agricultural stations. Codification and analysis into local and universal truth are much required. The study of cotton as a science ought therefore to be made a special business in the British Empire.

44. Then there are other matters that lie between the régime of private profit and public duty. There is the assistance necessary in the early days of an industry. Inexperienced planters require financial help as well as advice. Marketing has to be done almost on philanthropic lines until the growers know their markets. Probably at all stages of such an industry as Cotton Growing, a statistical bureau under Government direction would assist in keeping a fair balance between supply and requirement.

45. Much of this work has been done in the past to the best of its ability by the British Cotton Growing Association. But the business is now too large for its resources.

46. It is, of course, to be hoped that in any plan of work which the Government may eventually decide on as best for the future, it will be found possible to utilise the experience gained by the British Cotton Growing Association. In work of this kind any breach of continuity would be a misfortune. At the same time what is now urged is that the whole subject of the best way of organising the Cotton Growing of the British Empire should be carefully considered by a competent committee, and the organisations represented are prepared to loyally accept the decisions of the Government after such careful consideration.

47. It seems absolutely necessary that the Committee suggested should be appointed as soon as possible, but as it would be ruinous to the young industries which are now developing so rapidly in Nigeria, Uganda and the Sudan, if they were left meanwhile without support, it is urged that temporary financial support of a substantial nature be given under Government supervision to the British Cotton Growing Association, and that no time should be lost in giving effect to the resolutions for special work to be done in the Sudan and in India.

### APPENDIX III.

#### TERMS OF REFERENCE AND CONSTITUTION OF THE INDIAN COTTON COMMITTEE.

1. The Committee was appointed by the Governor General in Council under the Resolution of the Revenue and Agriculture Department No. 933-263, dated September 27th, 1917, the first two paragraphs of which are reproduced below:—

"The question of extending the cultivation of long stapled cotton in India is one which has frequently engaged the attention of the Government of India. It has again been brought into special prominence as the result of recent investigations by the Board of Trade which have shown the importance in Imperial interests of increasing the production of this class of cotton within the Empire. The Government of India consider it desirable that India should co-operate in the solution of this problem and they believe that the interests of this country in the matter will be found to coincide with those of Lancashire. It has repeatedly been urged by manufacturers in India that it is of even greater importance to them than to manufacturers elsewhere that sufficient cotton of long staple should be forthcoming in this country and that the extension of the growth of improved cotton would react most favourably on the manufacturing industry. There are certain areas in which there is reason to believe that long staple cotton will give a sufficiently large yield to enable it to be grown at a profit. Here the problem is one mainly of organization. In other areas, which include the majority of the cotton-growing tracts in India, a type of cotton combining yield and quality in sufficient degree to enable it to compete successfully with the prevailing short staple types does not appear to have been as yet evolved and the question of research will enter largely into the solution of the problem. An extension of the growth of long staple cotton in the above two cases would, in all probability prove of great benefit to the cultivators owing to the higher prices which long staple cotton commands, provided that the full benefit of these prices can be secured to them by improvements in the system of marketing and by the prevention of the harmful practices of adulteration and damping which have done so much in the past to lower the reputation of Indian cotton. In

these circumstances, the Government of India have decided that the possibilities of extending the growth of long stapled cotton in India should be investigated by a Committee constituted as follows:—

J. MacKenna, Esq., C.I.E., I.C.S., Agricultural Adviser to the Government of India	President
F. Hodgkinson, Esq., Member of the Council of the British Cotton Growing Association...	Members.
N. N. Wadia, Esq., Member, of the Committee and Ex-Chair- man, Bombay Millowners' Association ... ..	
G. S. Henderson, Esq., Officiat- ing Imperial Agriculturist ...	
W. Roberts, Esq., Principal and Professor of Agriculture, Lyall- pur Agricultural College ...	
H. F. Ashton, Esq., Executive Engineer, Punjab ... ..	
F. Noyce, Esq., I.C.S. ... ..	Secretary.

2. The Committee will examine the work which has been done in the various provinces of India in the establishment of long stapled cottons. It will report regarding the possibility of the extension of any methods which have led to success. It will investigate the causes of failure where this has occurred, and, if it finds that the failure has been due to agricultural, irrigational or economic causes or to administrative difficulties, will propose appropriate remedies. It will carry out a detailed study of local conditions in each cotton growing tract and will enquire into the possibility of improving existing methods of ginning and marketing and also of preventing adulteration and damping. It will further report on the possibility of improving the accuracy of the cotton forecasts and generally of making the statistical information published by Government of greater utility to the cotton trade. Finally, it will submit recommendations in regard to the staff required and the organisation necessary for the development of the cultivation of long stapled cottons in tracts which it considers suitable for that purpose.



## APPENDIX IV.

## CIRCULAR TO COLONIAL GOVERNORS.

Copy of Circular addressed by the Colonial Office to the Governors of the West and East African and West Indian Protectorates.

To the Officer Administering the Government of

Downing Street,

31st August, 1917.

SIR,

I HAVE the honour to inform you that His Majesty's Government have recently appointed a Committee to investigate the best means of developing the growing of cotton within the Empire, and to advise the Government as to the necessary measures to be taken for this purpose.

2. The Committee have prepared the accompanying statement of the points on which they desire information from various parts of the Empire, and I shall be glad if you will furnish me with your observations on these points so far as concerns your Administration.

3. You will understand that the Committee will welcome your views on any subjects, not covered by their statement, on which you consider that you are able to assist them in their enquiry.

4. It is desirable that as much information as possible should be in the hands of the Committee at an early date, and you may find it convenient to deal in the first instance with those points on which you can give an immediate reply, reserving others for further report after any enquiry which may be necessary.

5. The purpose for which the Committee have been appointed is one to which His Majesty's Government attach great importance from the point of view of the future security of the cotton trade of the United Kingdom, and in order to make the enquiry as extensive as possible I am addressing this despatch not only to Colonies and Protectorates in which the cotton-growing industry is firmly established, but also to others in which it does not exist or has for any reason been discontinued.

(Enclosure in Circular Despatch, dated 31st August, 1917).

## EMPIRE COTTON GROWING COMMITTEE

Points on which information is desired as to the possible production of cotton in Colonies and Protectorates.

A. What area or additional area of land suitable for cotton cultivation could be made available in the Colony or Protectorates—

(1) without expenditure from public funds?

(2) with a moderate expenditure on roads and means of local transport, clearing water channels, etc.?

(3) with an extensive programme of expenditure on railways, steamers for local transport, irrigation works, etc.?

It is advisable to distinguish between work which could be undertaken within the immediate future, say within the next ten years, and further extensions which could only be developed subsequently.

B. (1) Estimates of cost as far as possible in the case of A. (2) and (3).

(2) Rough statement as to portion of cost which could be borne by the local Government.

C. (1) Rough estimates of output of cotton or additional output in bales of 400 lbs. under A. (1), (2) and (3).

(2) Statement of what ginneries or additional ginneries would be required.

(3) Statement of population in each area recommended for cotton-growing and the probable proportion of population which would be available for cotton cultivation.

D. Reports should be furnished in the case of each area suggested for new production as to any difficulty which might arise owing to scarcity of the population or the existence of another industry which yields a greater prospect of remuneration to the peasant or the native.

An expression of opinion is also requested as to whether the best method of development is by plantations owned and managed by Europeans or by the establishment of a purely native industry or by cultivation by peasant proprietors; also as to the general effect on the welfare and the prosperity of the Colony or Protectorate which may be expected from the successful establishment or extension of cotton-growing.

Reports are invited as to the existing facilities for marketing the crop and as to whether the assistance of an unofficial body acting under Government auspices, such as the British Cotton Growing Association, would be required or would help in the more rapid extension of the industry.

E. What steps, if any, could be taken to establish residential experiment stations (acting later, perhaps, as seed-farms and ginneries also), one to each typical area of the districts proposed for cotton-growing?

F. Cotton produced in these experimental stations, if established, should be sent home for examination by the Imperial Institute and by the British Cotton Growing Association or other body.

## APPENDIX V.

## MEMORANDUM AS TO THE WORK OF THE IMPERIAL INSTITUTE IN CONNECTION WITH BRITISH COTTON CULTIVATION.

The Imperial Institute, since its establishment as a Government Institution in 1903, has continuously promoted the interests of British cotton cultivation by conducting investigations respecting the quality of cotton grown, in association with the Agricultural Departments of the countries concerned and with the British Cotton Growing Association; by collecting and publishing information respecting the progress of cotton growing in all countries, and by arranging and maintaining reference collections of cottons from every country of the Empire.

The first report from the Imperial Institute was issued as a Blue Book in 1904 (Dunstan: Cotton Cultivation in the British Empire and in Egypt; Cd.

2020, 1904). This report drew attention to the importance of cotton cultivation to the Empire and the desirability of its extension, and described the position and prospects of cotton cultivation in each country. In 1905, the year following the issue of this Report, a Cotton Exhibition was held at the Imperial Institute, with the co-operation of the British Cotton Growing Association. It was opened by H.R.H. the Prince of Wales (now H.M. The King), and was intended to arouse further interest in the subject of Empire cotton growing. It included samples of cotton grown in each British producing country so arranged as to display the length of staple and other characteristics, whilst for comparison a



collection of the chief cottons of the United States, Brazil, Peru, China, and other foreign countries were similarly shown. The various uses of cotton for textile purposes were fully illustrated and the chief types of machinery employed were shown. The Handbook issued in connection with this Exhibition supplied information respecting the position of cotton growing in each country of the Empire. The collections of cotton thus brought together at this Exhibition have been maintained and added to, so as to make a comprehensive illustration of the types of cotton produced in British territories, which has proved of the utmost service as a reference collection to enquirers from all parts of the world.

The Imperial Institute has acted continuously as a centre for information and investigation respecting many aspects of cotton cultivation. Numerous reports have been made to the local Governments, to planters and others respecting the quality and commercial value of cotton grown, as to the quality of the soil and its improvement by manuring, as to the types of cotton most likely to be suitable for trial in particular countries, as to the supply of seed and methods of seed disinfection, and as to the treatment required for insect and fungoid pests. Much information has also been supplied concerning the methods of improvement of varieties of cotton by seed selection, by breeding, etc. In order to cope with the increasing demand made on the Imperial Institute for information and investigation respecting cotton, the work has been organised in three chief branches of exhibition, information, and investigation. The work of exhibition has involved the display in the Public Exhibition Galleries, in the individual Courts assigned to the exhibits of the various countries of the Empire, of a series of samples, photographs, statistical and other diagrams illustrating the position of cotton cultivation in each country, and also the maintenance of the Reference Collection of samples of Empire-grown Cotton and of the chief cottons of foreign countries.

Information has been systematically collected and arranged from publications respecting cotton cultivation in every part of the world, and also that obtained by special application to Governments and planting companies. This information, which includes particulars as to land available, cost of labour, etc., is utilised in dealing with the numerous enquiries addressed to the Institute and in connection with the preparation of periodical publications.

In connection with investigation, the work has chiefly consisted in examining samples of experimentally grown cotton, mainly as to length and strength of fibres and its suitability for special purposes in comparison with other cottons or with the same type of cotton grown in other countries. This work has been carried out in collaboration with the local Agricultural Departments, whose efforts have been directed to secure the type of cotton best adapted to the particular country and its improvement by various means. Numerous analyses of cotton soils have been conducted before and after experimental manurial treatment. The commercial value of various experimentally grown cottons has also been determined by reference to manufacturers as well as to brokers, and this section of the work has been carried on in close touch with the British Cotton Growing Association. The whole of these operations have been conducted with the aid of a small grant of £500 a year made by the Treasury in the first instance for a term of five years from 1905, and then renewed for a further term of five years. This grant has not been again renewed during the period of war.

The Director of the Imperial Institute, as well as members of the staff, have visited cotton growing countries and made a special study of the economic and other conditions under which cultivation is carried on. Reports by Professor Dunstan on Cotton Cultivation in Cyprus and in Asia Minor have been published as Parliamentary Papers, and are referred to later.

The Director and Staff of the Institute have also contributed various papers and reports to Societies and Congresses connected with cotton cultivation. At the International Congress of Tropical Agriculture held in Brussels in 1910 the Director of the Imperial

Institute presented a General Report on the Position of Cotton Cultivation, with special reference to the British Empire, and also a collection of special reports on Cotton Cultivation in each country, some of which were contributed by the local Directors of Agriculture and others by members of the Staff of the Imperial Institute.

At the next International Congress of Tropical Agriculture which was held in London in 1914 and of which the Director of the Imperial Institute was President and two principal members of the staff were Organising Secretaries, prominence was also given to the subject of cotton cultivation, and a large number of papers and reports were contributed, and have since been published in the Transactions of the Congress. Concurrently with the London Congress an International Exhibition of Cotton and other Fibres was held at the Agricultural Hall. The Director of the Imperial Institute, as President of this Exhibition, offered a Silver Trophy for the best large sample of British grown cotton established within the preceding ten years and which had furnished at least three successive crops. From a number of excellent samples submitted and examined in detail at the Imperial Institute the trophy was awarded to the "Buri" and "Rosea" cottons from the Government Experimental Farm at Akola in the Central Provinces of India.

Finally, reference may be made to the reports on the various aspects of cotton cultivation which have appeared in successive years since 1905 in the quarterly "Bulletin of the Imperial Institute," the more important of which are included in the following list, which illustrates the wide range of the work of the Institute on this subject. The titles are also given in this list of the special reports alluded to previously and of that of a Handbook by Dr. Ernest Gouling on Cotton and Other Fibres in the Imperial Institute Series on the Commercial Resources of the Tropics, which has been recently published, and of which a second edition is in preparation.

In addition to these published reports numerous special reports on cotton cultivation have been made to the Governments and Agricultural Departments of the principal cotton growing countries of the Empire. Analysis of some hundreds of the reports shows that reports based on the results of investigations conducted at the Imperial Institute have been made among others to the following countries:—India, Egypt, the Sudan, British East Africa, Uganda, Nyasaland, Union of South Africa and Rhodesia, British West Africa, Australia, British North Borneo, Fiji, West Indies, British Guiana, Mauritius, British Honduras and Cyprus.

It will be seen that the Imperial Institute, which took a prominent part in the inception of the movement for cotton-growing within the Empire, has become a recognised centre and clearing house for investigation, information and exhibition, respecting the various aspects of cotton production. The need for the work undertaken by the Imperial Institute will not diminish with the extension of activity throughout the Empire to produce more and better cotton, nor should its work as a central clearing house be impeded by any agencies which may be inaugurated to assist cotton cultivation by scientific research. Such research can only be properly conducted and controlled in the countries in which cotton is grown and under the auspices of their Agricultural Departments and Planting Companies, and it is by the strengthening and extension of the scientific work of the Government Agricultural Departments in all cotton growing countries that advances will best be made. It is as a centre for collecting, collating and recording the results of this, and all other cotton work in British countries, in conducting investigations of the quality and value of the cotton produced, in affording general information and in publishing statistics and reports of progress, that the Imperial Institute will continue under the extended constitution provided by the Imperial Institute Act of 1916 to be of service in this subject to the Empire as a whole.

Imperial Institute,  
April, 1918.

IMPERIAL INSTITUTE.  
SPECIAL REPORTS, ETC., ON COTTON.

By PROFESSOR WYNDHAM DUNSTAN, C.M.G., LL.D.,  
F.R.S.

- Cotton Cultivation in the British Empire and in Egypt. Cd. 2020. 1904.  
Handbook of the Cotton Exhibition, Imperial Institute. 1905.  
Cotton Cultivation in Cyprus. Cd. 2717. 1905.  
Cotton Cultivation in Asia Minor. Cd 4324. 1908.  
British Cotton Cultivation. Cd. 3997. 1908.  
The Present Position of Cotton Cultivation. Report to the International Congress of Tropical Agriculture, Brussels, 1910.  
Papers and Reports on Cotton Cultivation. International Congress of Tropical Agriculture, Brussels, 1910.  
La Culture du Coton dans le Monde. Revue Economique Internationale, 1911.

By ERNEST GOULDING, D.Sc. (Lond.).

- Cotton and Other Vegetable Fibres: their Production and Utilisation. Murray, 1917.

REPORTS, SPECIAL ARTICLES, ETC. BULLETIN OF THE IMPERIAL INSTITUTE. 1905-1917.

- Examination of Cotton grown in South African Colonies. Vol. III (1905) No. 1, pp. 26-32.  
Cotton Growing in Northern Nigeria. Vol. III (1905), No. 1, pp. 49-55.  
Fungoid Disease of the Cotton Plant. Vol. III (1905), No. 1, pp. 60-62.  
Cotton Exhibition at the Imperial Institute. Vol. III (1905), No. 2, pp. 113-116.  
Cotton from British East Africa. Vol. III (1905), No. 2, pp. 139-142.  
Cotton from British New Guinea. Vol. III (1905), No. 3, pp. 225-226.  
Cotton Cultivation in Rhodesia. Vol. III (1905), No. 3, pp. 247-249.  
Cotton Growing in the Portuguese Colonies. Vol. III (1905), No. 3, pp. 250-251.  
Cotton from the Federated Malay States. Vol. III (1905), No. 4, pp. 314-316.  
Cotton Growing in Cyprus. Vol. III (1905), No. 4, pp. 327-334.  
Cotton Cultivation in the United States of America. Vol. III (1905), No. 4, pp. 334-345.  
Cotton from British North Borneo. Vol. IV (1906), No. 1, pp. 22-23.  
Insects which attach Cotton in Egypt. Vol. IV (1906), No. 1, pp. 48-52.  
Cotton Cultivation in Corea. Vol. IV (1906), No. 1, pp. 66-67.  
Cotton Cultivation in Ceylon. Vol. IV (1906), No. 2, pp. 178-179.  
Cotton Cultivation in British East Africa. Vol. IV (1906), No. 4, pp. 291-296.  
Improvement of West African Cotton. Vol. IV (1906), No. 4, pp. 349-350.  
Cotton from Bermuda. Vol. IV (1906), No. 4, pp. 363-364.  
Cotton from Nyasaland. Vol. IV (1906), No. 4, pp. 386-388.  
Cotton Growing in Spain. Vol. V (1907), No. 1, pp. 31-35.  
Cotton Growing in Portuguese East Africa. Vol. V (1907), No. 1, p. 61.  
Insect and Other Cotton Pests, and the Methods suggested for their Destruction. Vol. V (1907), No. 2, pp. 140-166.  
Cotton Growing in Algeria. Vol. V (1907), No. 3, pp. 269-276.  
Cotton Cultivation in German East Africa. Vol. V (1907), No. 4, pp. 425-426.  
Cotton from Cape Colony. Vol. V (1907), No. 4, p. 440.  
Cottons from India. Vol. VI (1908), No. 1, pp. 11-19.  
Cotton Growing in Central Asia. Vol. VI (1908), No. 1, pp. 60-74.  
Weight as a Factor in Seed Selection, with special reference to Cotton Seed. Vol. VI (1908), No. 1, pp. 74-73.  
Cotton Experiments in Eastern Bengal and Assam. Vol. VI (1908), No. 2, pp. 202-203.  
Cotton Experiments in Punjab. Vol. VI (1908), No. 2, p. 203.  
Cotton Experiments in Bombay. Vol. VI (1908), No. 2, pp. 204-205.  
Cotton Growing in the French Colonies. Vol. VI (1908), No. 3, pp. 288-292.  
Cotton from British Guiana. Vol. VI (1908), No. 4, pp. 383-387.  
Notes on the Present Position of Cotton Cultivation in the United States. Vol. VI (1908), No. 4, pp. 404-417.  
Cultivation of Egyptian Cotton in Sind. Vol. VI (1908), No. 4, pp. 418-419.  
Cotton Growing in Togo. Vol. VI (1908), No. 4, pp. 420-421.  
Cotton from the Gold Coast. Vol. VII (1909), No. 1, pp. 14-20.  
Cotton Ordinances of the Uganda and East Africa Protectorates. Vol. VII (1909), No. 1, pp. 92-93.  
Cotton from Southern and Northern Nigeria. Vol. VII (1909), No. 2, pp. 154-159.  
Agricultural Work in Nyasaland. Vol. VII (1909), No. 3, pp. 314-317.  
Cotton in Nyasaland. Vol. VIII (1910), No. 1, pp. 29-40; No. 4, pp. 372-381.  
Economic Development of German Protectorates in Africa. Vol. VIII (1910), No. 1, pp. 50-52.  
Cotton Growing in French Colonies. Vol. VIII (1910), No. 1, p. 61.  
International Congress of Tropical Agriculture. Vol. VIII (1910), No. 2, pp. 129-135.  
Present Position of Cotton Cultivation. Vol. VIII (1910), No. 4, p. 402.  
Cotton from the Cape Province, South Africa. Vol. IX (1911), No. 1, pp. 14-15.  
Cotton from the New Hebrides. Vol. IX (1911), No. 1, pp. 53-54.  
Agriculture and Industry in Grenada. Vol. IX (1911), No. 2, pp. 145-146.  
Cotton Growing in Sind. Vol. IX (1911), No. 3, pp. 217-227.  
Sakellaridis Cotton. Vol. IX (1911), No. 3, p. 288.  
Agricultural Development of Nyasaland. Vol. IX (1911), No. 4, pp. 380-382.  
Recent Progress in Cotton Cultivation. Vol. IX (1911), No. 1, pp. 66-70; No. 2, pp. 164-169; No. 3, pp. 304-306; No. 4, pp. 409-412.  
Some Cotton Soils of the Nyasaland and Uganda Protectorates. Vol. X (1912), No. 1, pp. 54-74.  
Cotton from Papua. Vol. X (1912), No. 2, p. 215.  
Economic Developments in the Belgian Congo. Vol. X (1912), No. 2, p. 296.  
Improvement of Cotton in India. Vol. X (1912), No. 3, pp. 351-372.  
Recent Agricultural Developments in Uganda. Vol. X (1912), No. 3, pp. 422-431.  
Work of the British Cotton Growing Association. Vol. X (1912), No. 3, pp. 479-481.  
Cotton from Uganda. Vol. X (1912), No. 3, pp. 481-482.  
Cotton Industry of Nyasaland. Vol. X (1912), No. 4, pp. 527-536.  
Cotton Worm in Egypt. Vol. X (1912), No. 4, pp. 584-620.  
Cotton from Ceylon. Vol. X (1912), No. 4, p. 657.  
Cotton Growing in French Colonies. Vol. X (1912), No. 4, pp. 657-658.  
Recent Progress in Cotton Cultivation. Vol. X (1912), No. 1, pp. 158-162; No. 2, pp. 321-324; No. 3, pp. 500-502; No. 4, pp. 677-679.  
Cotton Industry of Northern Nigeria. Vol. XI (1913), No. 1, pp. 70-79.  
Progress of Egyptian Agriculture with Special Reference to Cotton. Vol. XI (1913), No. 1, pp. 90-101.  
Agriculture of Mozambique Province. Vol. XI (1913), No. 1, p. 108.  
Recent Developments in Cotton Growing in the United States. Vol. XI (1913), No. 1, pp. 142-144.  
Recent Progress in Cotton Cultivation in the Sudan. Vol. XI (1913), No. 2, pp. 189-203.  
Cotton Industry of Uganda. Vol. XI (1913), No. 3, pp. 381-401.  
Organisation of Experimental Work in Agriculture in the German Colonies. Vol. XI (1913), No. 3, pp. 462-478.  
Cotton Protection Ordinance in Nyasaland. Vol. XI (1913), No. 3, p. 514.  
Cotton Growing in French Colonies. Vol. XI (1913), No. 3, pp. 514-516.  
Cotton Growing in Gold Coast. Vol. XI (1913), No. 4, pp. 600-615.

- Cotton Cultivation in Northern Nigeria. Vol. XI (1913), No. 4, pp. 656-660.
- Cotton Growing in the Ivory Coast. Vol. XI (1913), No. 4, pp. 672-673.
- Cotton Protection Rules in Uganda. Vol. XI (1913), No. 4, p. 673.
- Recent Progress in Cotton Cultivation. Vol. XI (1913), No. 1, pp. 164-166; No. 2, pp. 353-355; No. 3, pp. 532-534; No. 4, pp. 688-689.
- Agriculture in the Gold Coast. Vol. XII (1914), No. 1, pp. 115-116.
- Cotton Seed Distribution in Egypt. Vol. XII (1914), No. 1, pp. 117-119.
- Insect Pests of the Southern Provinces, Nigeria. Vol. XII (1914), No. 2, pp. 294-296.
- Insect Pests of the Nyasaland Protectorate. Vol. XII (1914), No. 2, pp. 296-297.
- Cotton Cultivation in the French Colonies. Vol. XII (1914), No. 3, pp. 466-467.
- Cotton Pests in German East Africa. Vol. XII (1914), No. 4, pp. 611-613.
- Recent Progress in Cotton Cultivation. Vol. XII (1914), No. 1, pp. 136-139; No. 2, pp. 312-316; No. 3, pp. 488-492; No. 4, pp. 628-630.
- Cotton Growing in German East Africa. Vol. XIII (1915), No. 1, pp. 124-125.
- Cotton from British Guiana. Vol. XIII (1915), No. 3, pp. 380-384.
- The War and the World's Cotton Crops. Vol. XIII (1915), No. 3, pp. 385-392.
- Cotton Breeding in the United Provinces, India. Vol. XIII (1915), No. 3, pp. 476-478.
- Cotton Problems in Italian East Africa. Vol. XIII (1915), No. 3, p. 478-479.
- Recent Progress in Cotton Cultivation. Vol. XIII (1915), No. 1, pp. 161-163; No. 2, pp. 311-315; No. 3, pp. 488-492; No. 4, p. 656.
- Cauto Cotton from British Honduras. Vol. XIV (1916), No. 4, pp. 591-592.
- Recent Progress in Cotton Cultivation. Vol. XIV (1916), No. 1, pp. 131-134; No. 2, pp. 302-303; No. 3, pp. 479-480; No. 4, p. 637.
- Cotton Cultivation in Australia. Vol. XV (1917), No. 1, pp. 23-32.
- The Improvement of Cotton in India. II. Vol. XV (1917), No. 2, pp. 149-177.
- Recent Progress in Cotton Cultivation. Vol. XV (1917), No. 1, pp. 129-131; No. 2, pp. 284-285; No. 3, pp. 452-455.

## APPENDIX VI.

### REPORTS AND LETTERS TO THE PRESIDENT OF THE BOARD OF TRADE.

#### (a) GENERAL POSITION OF RAW COTTON SUPPLIES, 1918.

Sir,

16th May, 1918.

We have the honour to present a brief Interim Report on the work of the Empire Cotton Growing Committee since its appointment on 25th July, 1917.

You will remember that the Committee was appointed in accordance with a recommendation of the Textiles Committee of the Board of Trade, supported by representations made by the British Cotton Growing Association and other bodies representing important trade interests.

The Committee includes representatives of India, Australia, South Africa, and Egypt, as well as of the Foreign Office, the Colonial Office, the India Office, the Board of Trade, the Imperial Institute, and various cotton trade associations, including those which represent labour.

We hope that such a report may be of interest to the representatives of the self-governing Dominions and of India, who will be present at the approaching Imperial Conference, as showing what progress is being made in the study of the Empire's resources for the production of raw material for the cotton industry. The question of increasing the supply of raw cotton from Imperial sources is of vital interest to all parts of the Empire as consumers of cotton goods or cotton seed products, if not as growers of cotton.

#### *India.*

Our attention was first drawn to India, which appeared to offer the best opportunity for a considerable increase of supply in the near future. Any investigation on our part was, however, rendered unnecessary by the appointment by the Indian Government on 27th September, 1917, of a committee to inquire into the whole situation with regard to the possibilities of extending the cultivation of long staple cotton in India. Our efforts were, therefore, for the time being confined to assisting in the selection of a suitable representative of the Lancashire industry to join the Indian committee, and this was done. The committee has, it is understood, almost completed its enquiries, and we trust that we shall be given an opportunity to advise on its report before action is taken by the Government of India.

#### *The Sudan.*

The Committee next turned its attention to the position in Egypt and the Sudan, and advantage was taken of the presence in this country of Sir Murdoch Macdonald, Adviser to the Ministry of Public Works in Egypt, and an official deputation from the Sudan, to obtain from them valuable evidence as to the whole position, both in Egypt and the Sudan. As the result of this evidence, the Committee joined the Sudan deputation in making representations through the Board of Trade to the Treasury with regard to the urgent necessity for an immediate grant in advance of the proposed loan of £3,000,000 which had been authorized just before the outbreak of war for railway and irrigation works in the Sudan. These representations were successful in securing a grant of £500,000, which will enable the Sudan authorities to undertake at once certain essential preliminary works in preparation for the actual work of construction of the main irrigation works upon which the Gezira scheme depends.

#### *Egypt.*

With regard to Egypt, it appeared that the drainage works in the northern delta, which had already been begun under Lord Kitchener, were suspended by the War, owing partly to scarcity of labour and partly to the impossibility of procuring the necessary engineering plant for the large pumping stations upon which the whole scheme turns. For this there is, unfortunately, no immediate remedy. It was pointed out, however, to the Committee that a large part of the work of constructing and realigning the main drains had already been done, and that if this work could only be carried a little farther it would at once begin to yield results which, although far short of the maximum benefit to be derived from the full scheme, would yield some return upon the capital already expended, and would add considerably to the area under cotton in Egypt, as well as to the yield of those areas affected by the scheme. The Committee therefore suggested that the Egyptian Government should be urged to take immediate steps for providing the funds necessary to complete these parts of the scheme in so far as this is possible under present conditions.

From further information, however, it appears that the difficulties in the way of proceeding even with the partial completion of these works are serious, apart

from the question of finance. The demands of military operations in Egypt and Palestine have made heavy calls upon the labour supply available in Egypt, with the result that the military authorities are opposed to the execution under present conditions of any schemes which would involve a large amount of labour, as the works in question admittedly would. It appears, therefore, to be very doubtful whether works of such an important character even as those in question can be carried out under present conditions in Egypt; nor is there any reason to believe that these conditions are likely to be substantially modified in the immediate future.

In connection with the Egyptian crop the Committee caused to be prepared a special report on the world's supply of fine cotton, the position of which is becoming increasingly acute. The Committee felt that this was an important factor in the question of the restriction of acreage in Egypt, which had been decided upon by the Egyptian Government in August, 1917, owing to the shortage of foodstuffs and the urgent necessity of increasing the area to be put under cereals in Egypt during the winter of 1917-18. This report was accordingly forwarded to the President of the Board of Trade for communication to the Egyptian authorities and to the various departments of the home Government specially interested from the point of view of the supply of fine cotton for aeroplane cloth. It was pointed out that, in view of the scarcity of flax for the manufacture of linen for aeroplane cloth, it was important that steps should be taken to maintain and increase the supplies of fine cotton within the Empire.

#### *Other Colonies and Dependencies.*

With regard to the Colonies and Dependencies generally, it was agreed that the first step should be the issue of a circular letter or questionnaire by the Colonial Office to all Colonies which possessed possibilities for cotton-growing. The terms of such a circular were settled with the Colonial Office, and it was despatched on 31st August, 1917. Replies have now been received from all the Colonies and Protectorates, as follows:—

*Africa.*—Nigeria; Gold Coast; Sierra Leone; Gambia; Nyasaland; Uganda; Rhodesia; Zanzibar; British East Africa.\*

*West Indies.*—Leeward Islands (Virgin Islands, Antigua, Montserrat, St. Kitts Nevis); Windward Islands (St. Lucia, Grenada, St. Vincent); Dominica; Jamaica; Barbados; Trinidad; Bahamas; Bermuda; British Guiana; British Honduras.

Many of these replies may be described as mainly negative in their character, but valuable reports have been received with regard to Uganda, Nigeria, and Nyasaland, and from Sir Francis Watts with regard to the general position in the West Indies.

Reports have also been received as to the possibilities of Queensland, where considerable quantities of excellent cotton have been grown in the past, and renewed efforts have recently been made to encourage its cultivation. In various parts of South Africa, too, especially Natal and certain districts of the Transvaal, recent developments have given encouraging results, and there are signs of cotton-growing becoming a success on a commercial scale. We have also initiated inquiries into the prospects of cotton-growing in Mesopotamia, where experimental cultivation has been commenced under an officer of the Madras Department of Agriculture. All these will be more fully gone into.

Having now received these reports and also heard evidence from various witnesses as to the progress already made in cotton-growing in all parts of the Empire, our next step must be to proceed to consider, in view of the information thus obtained, what organizations will be required to develop on a really large scale the growing of cotton within the Empire.

Speaking broadly, the Committee is of opinion:—

- (1) That the present position of the world's cotton supply cannot be regarded by the Empire without misgiving, not only because the supply is altogether deficient, but also because the cotton trade of the Empire

is, to a most undesirable extent, dependent upon an outside source for its supply of raw material, and

- (2) That if the proper measures be taken it is reasonably certain that in course of time a large proportion of the cotton required by the British Empire could be grown in its own territories.

These two propositions are very briefly treated in the following pages:—

#### *I.—General Position of the World's Supply.*

Even before the war there was already a deficiency in the world's annual cotton crops as compared with the actual consumption, which was only limited by the supply actually available.

The effect of the war was to reduce very materially the world's supplies of cotton, through a serious reduction of the acreage in all the countries which contribute most largely to the supply, while the demand after the first few months of the war exhibited a quite unexpected power of recovery. The resulting scarcity shows no signs of being materially mitigated while the war lasts; indeed, it is highly probable that the deficiency will be still more marked when peace brings a return to something like normal consumption among the Central Powers, who have been practically cut off from the world's supplies.

The war has brought home to the whole cotton trade the dependence of the industry upon the United States for its supply of raw material. While the general tendency of the American supply has been to increase, the annual returns show marked variation from season to season.\* These variations are mainly responsible for the violent fluctuations in price which have been experienced during recent years, and are most injurious to every branch of the cotton trade. Another point which must be taken into account in connection with the American crop is the increasing quantity which the American mills are taking for their own use.

An important advantage of the development of the resources of the Empire in medium cottons would be the provision of large areas for cotton-growing in different continents not subject to the same climatic vagaries as those of the American cotton belt, so that the world's supply would not be so largely dependent on the fortunes of the weather in one comparatively limited area.

#### *II.—Possibilities of the Empire for Cotton-Growing.*

The actual and potential sources of supply within the British Empire are India, Egypt, and the Sudan, the West Indies, and some of the African Colonies and Protectorates, more particularly Nigeria, Uganda, and Nyasaland. South Africa, Rhodesia, and Queensland have also proved their capacity to grow excellent cotton.

Of these, India offers the most promising prospects of a considerable increase of output within a reasonably short time; though the bulk of the Indian crop is of shorter staple than is required by the Lancashire industry and that of the British Empire outside India.

The cottons grown in the West Indies and in Egypt are each of a special character, which cannot at present be produced on a large scale in any other part of the world, and the exclusive possession of these sources of supply enables the British Empire to control to a great extent the spinning of fine counts of yarn which are mainly used in the production of the finer cotton materials. This is the more important inasmuch as there has been for many years a marked tendency, especially in Lancashire, towards the manufacture of finer fabrics, which require the use of longer stapled cotton.

In Uganda and in Nyasaland the cotton mostly grown has been of a grade intermediate between that of Egyptian and American. This grade is becoming increasingly important to the cotton industry, because in America of late years there has been a falling-off in the production of similar cotton.

The Empire's supply of cotton is chiefly deficient in the medium grades which form the raw material

\* A report has also been received from the Administrator of German East Africa

of the great bulk of the Empire's trade. Of such qualities the Empire's total production has hitherto been trifling compared to the world's production; but there have been distinct evidences of development on a large scale of new areas for the production of such medium cottons. Both India and West Africa have proved their capacity to produce such cotton in much larger quantities than hitherto.

The share of the British Empire in the world's cotton supplies is brought out in the following table, which shows the various grades of cotton, from the finest to the lowest, and the share of the British Empire in each grade.

[Here followed Table A, as printed in Appendix IX Statistics.]

From this it will be seen that, while the British Empire produces thirty-three per cent. of the very highest grade, eighty-nine per cent. of the second, and seventy per cent. of the third, its share of the great medium grade, the fourth, is only about two-and-a-half per cent., while in the lowest grade again it accounts for sixty-four per cent. of the total supply.

These facts have been generally known for some time past, and it was in view of them that the British Cotton Growing Association was formed in 1902. The Association, after much excellent and useful work, has reached the limit of its resources, and it has become necessary to consider how its work is to be carried on in the future. In the meantime there has become available much more knowledge of the scientific principles underlying the cultivation and improvement of cotton.

The Committee consider that the extension of cotton-growing within the Empire should form an integral part of any general plan for developing the resources of the British Empire and making it economically independent and self-supporting. It is undeniable that the measures which would lead to the extension of cotton-growing in various parts of the Empire, e.g., the extension and improvement of means of communication and transport, and the provision of irrigation facilities where necessary, are exactly the conditions which would lead to development in respect of every other crop which they are capable of producing, and at the same time would have the effect of raising the general standard of well-being of the inhabitants and increasing their purchasing power.

In view of these considerations, we are convinced that the appointment of the Empire Cotton Growing Committee, representative as it is of the various parts of the Empire, is amply justified. We are satisfied that the work of the Committee will expand and that its functions as a standing Imperial committee on cotton-growing should include the following:—

- (1) To secure the systematic collection, examination, and dissemination of information with regard to cotton-growing in various parts of the Empire, as well as in other parts of the world.
- (2) To consider and advise upon all questions affecting the development of cotton-growing within the Empire, including applications to or through the Imperial Government for funds for the execution of necessary public works, such as railways, roads, harbours, or other means of communication or transport, or of irrigation or drainage works.
- (3) To consider and advise upon the relative urgency and importance of schemes of development in connection with cotton-growing, and to secure the co-ordination of effort in different parts of the Empire.
- (4) To stimulate and secure the co-ordination of scientific research on cotton-growing, whether conducted by local Governments in the cotton-growing areas, or by suitable agencies in this country upon large questions of general interest to the Empire.

Much of this work has during recent years been performed in varying degrees by the British Cotton Growing Association and the Imperial Institute.

The Committee desire to put on record their appreciation of the admirable pioneer work done in many parts of the Empire by the British Cotton Growing Association, and in particular of the work of Mr. J. Arthur Hutton, Chairman of the Council of the Association, who gave to the Committee very full and most valuable evidence with regard to all the areas in which the Association has carried on its operations. The work of the Association in trying and proving the capabilities of various areas throughout the Empire for cotton-growing has been of value, even where the results have been negative, as well as in other areas where success has been clearly established, and cotton-growing upon a more or less commercial scale has followed from the efforts of the Association. Whatever be the future of the British Cotton Growing Association, certain branches of its work must be continued in one form or another in areas where cotton-growing is not fully established upon an independent commercial basis. The question of the most desirable form of this future organization is still under consideration by the Committee.

The Committee also desire to acknowledge the valuable work done by the Imperial Institute in connection with cotton-growing, especially in examining and reporting on samples of cotton grown in various parts of the Empire and in maintaining reference collections.

In conclusion, we desire to express the hope that the President of the Board of Trade will commend the work of the Committee to all the members of the Imperial Conference, and will endeavour to secure their co-operation and support in furthering its main object, namely, the development of the British cotton-growing areas, so as to free the Empire as far as possible from its dependence upon foreign sources of supply.

I have, &c.,  
(Signed) HENRY BIRCHENOUGH,  
Chairman.

#### (b) EXPANSION OF THE COMMITTEE.

SIR,

22nd October, 1918

In your original reference to the Empire Cotton Growing Committee you asked us to investigate the best means of developing the growing of cotton within the Empire and to advise the Government as to the necessary measures to be taken for this purpose.

2. The Committee has from the first understood that it was not your desire that it should merely present a Report and should then cease to exist, but that it was your intention that it should be a Standing Committee in connection with cotton-growing within the Empire and that it should be competent for it to make recommendations from time to time with regard to its own constitution and activities.

3. In our Interim Report to you dated May 16th, 1918, we stated that we were satisfied the work of the Committee would expand and that its functions should include the following:—

- (1) To secure the systematic collection, examination and dissemination of information with regard to cotton-growing in various parts of the Empire, as well as in other parts of the world.
- (2) To consider and advise upon all questions affecting the development of cotton-growing within the Empire, including applications to or through the Imperial Government for funds for the execution of necessary public works, such as railways, roads, harbours or other means of communication or transport, or of irrigation or drainage works.
- (3) To consider and advise upon the relative urgency and importance of schemes of development in connection with cotton-growing and to secure the co-ordination of effort in different parts of the Empire.
- (4) To stimulate and secure the co-ordination of scientific research on cotton-growing, whether conducted by local Governments in the cotton-growing areas or by suitable agencies in this country, upon large questions of general interest to the Empire.

It was not intended that this should be an exhaustive statement of the Committee's functions. There was not in our minds any finality about it. It is to be noted that all the functions set out in the above statements are either advisory or supervisory in their character. They do not indicate that the Committee should itself take the initiative and undertake constructive work in connection with cotton-growing within the Empire.

4. The Committee has now been in existence for rather more than a year. During that time it has been engaged upon various useful enquiries, as is shown in the Interim Report above referred to, and certainly its time has not been wasted. It is, however, felt that a stage has now been reached when, if it is to fulfil the expectations raised throughout the Empire at the time of its appointment, it cannot remain purely advisory or supervisory but must initiate and accomplish genuinely practical work. Unless it does, it may not only stagnate itself, but may paralyse existing agencies connected with Empire Cotton Growing, which might otherwise continue to do good work. In these circumstances the Committee has been led to examine its own constitution and organization with a view to determining whether they are appropriate to the work it considers should fall within its future sphere of operations.

5. The Committee consists of 20 members, including representatives of the Foreign Office, Colonial Office, India Office, Board of Trade, the Government of India, Australia and South Africa, the British Cotton Growing Association and the Imperial Institute, the merchants and manufacturers of Cotton in the United Kingdom and in India, and the workpeople of the English Cotton Industry. The Committee is fully representative of all the interests concerned and we have no further recommendations to make in that connection. It is, however, a large Committee for the transaction of detailed business. The problems with which it has to deal are extremely varied and we are unanimously of opinion that the work would be most efficiently done if these problems were considered by smaller bodies, specially interested in each class of questions and specially qualified to deal with them.

We therefore suggest the formation of a series of sub-Committees to consist partly of members of the Main Committee and partly of additional members appointed *ad hoc* by the President of the Board of Trade upon the nomination of the Main Committee. These additional members would in each case be chosen for their special knowledge and experience. They would not be members of the Main Committee but only of the sub-Committee or Committees to which they were appointed.

6. In making this recommendation we have also in mind the importance of interesting a larger number of the leaders of the cotton industry—both employers and employed—in the problems and work of Empire Cotton Growing than it was possible to include in the Main Committee. It is quite clear that the Committee can only succeed in its work if it commands the full confidence and co-operation of the whole Cotton Industry, and it can only obtain that confidence, if it satisfies the Industry that it means practical business and has a proper organization for the efficient transaction of business.

Another argument in favour of the appointment of additional members to the Sub-Committee lies in the fact that it would make it possible, if it were thought desirable, to associate with the Main Committee's work some of the existing agencies—such for instance as the British Cotton Growing Association, the Imperial Institute and the Cotton Research Association—by the appointment of some members of their Managing Bodies upon the appropriate Sub-Committees with which we are dealing.

It is intended that these Sub-Committees should deal with all questions remitted to them by the Main Committee, whether by Standing Order or by special reference, and should in all cases report to the Main Committee.

We further recommend that it should be competent for Sub-Committees, with the consent of the Main Committee, to hold meetings in Manchester. It is considered that this will not only meet the convenience of Lancashire members, but will have the advantage of associating the work of the Empire Cotton Growing Committee more closely with the industry.

7. The following is the preliminary list of Sub-Committees, which we recommend should at once be formed:—

Finance.

Commerce.

Research and Education.

Information, including both its collection and dissemination.

India.

Egypt and the Sudan.

The Dominions, Colonies, and Protectorates.

8. *Finance*.—To this Sub-Committee all questions of finance would be referred.

(a) It would be its first duty to draw up an estimate of the probable financial requirements of the Main Committee (1) for its establishment, staff, accommodation, and initial general expenses, (2) for any immediate practical work of development; so that the Main Committee may submit an estimate to the President of the Board of Trade.

(b) This Sub-Committee would consider and report upon the financial aspects of all schemes laid before it for the development of cotton-growing areas within the Empire.

In many cases financial assistance of a substantial character may be required in order to establish or maintain the industry in new districts by providing ginneries and buying agencies, by assuring to cultivators a satisfactory price for their crops, or by assisting to market their crops.

In other cases applications may be made to or through the Imperial Government for assistance in the raising of funds for public works, such as railways, roads, harbours and irrigation works, which are beyond the immediate means of the local Government.

All such questions—of which these are only intended as instances—would naturally be referred to the Sub-Committee of Finance before the Main Committee offered any advice to His Majesty's Government.

9. *Commerce*.—To this Sub-Committee would fall the consideration of the commercial aspects of all schemes for the development of cotton growing. It is suggested that it might in some form or other work with or through the organisation of the British Cotton Growing Association. That, however, is a matter for further investigation and consideration, which will engage the attention of the Main Committee almost at once.

10. *Research and Education*.—These subjects are bracketed together so as to avoid the formation of too large a number of sub-committees at the outset. The education we have in view is that of a body of skilled cotton agriculturists and investigators, the permanent supply of which is absolutely essential if progress is to be made in cotton growing.

(a) *Research*.—The importance of research is universally acknowledged. It will be the duty of this Sub-Committee in the first instance to consider and advise upon the part the Empire Cotton Growing Committee can best play with regard to (a) the investigation of the large questions of common interest to all cotton growers throughout the Empire and (b) those local problems which are mainly the business of the various Local Governments.

If a Cotton Research Association is ultimately formed for the Cotton Industry its sphere will cover all the problems involved in growing, spinning and manufacturing. It is suggested that this Sub-Committee might in liaison with the Research Association undertake the Empire Cotton-growing branch of the work. Failing the formation of a Cotton Research Association or in the event of such Research Association not including cotton growing in its scope, the Empire Cotton Growing Committee might through this Sub-Committee become the Research Body in connection with Empire Cotton growing.

(b) *Education*.—We consider that the provision of adequate training centres in the Empire, for the study of the agriculture of cotton growing is a matter of the greatest urgency. There is at present no centre to which a young man can go for the special training which is necessary. There is a great need throughout the Empire for education in the principles com-



mon to all tropical agriculture and it would be for this Sub-Committee to consider in the first place whether the attempt should be made to direct such education to cotton growing in particular or whether it should join its efforts with those of others who may have in view the provision of such education for tropical agriculture generally.

11. *Information.*—The Committee has always regarded the collection, examination and dissemination of information with regard to Cotton Growing as one of its essential duties. Such work, if properly carried out, obviously involves considerable expenditure and an adequate staff. It would be the first duty of this Sub-Committee to consider the question in all its bearings, and to make proposals. It is suggested that an arrangement might be come to with the authorities of the Imperial Institute for some form of close co-operation. The Institute possesses many of the necessary elements, including a staff, library, collections of samples, &c., and it ought to be possible to conclude an arrangement with the Imperial Institute which would avoid overlapping and multiplication of efforts. We have every reason to believe that proposals for collaboration would be welcomed by the Imperial Institute.

12. In view of the fact that the areas available in the Empire fall into three groups, namely,

1. India,
  2. Egypt and the Sudan,
  3. The Dominions, Colonies and Protectorates,
- and each of these groups presents problems in many respects different, it seems desirable to establish a Sub-Committee for each group. It is, of course, clear that in the case of India, Egypt, and the Dominions the functions of these Sub-Committees will be mainly advisory.

13. If our recommendations for what is in effect a large extension of the Committee's personnel and activities are accepted, it is clear that provision will have to be made for a suitable staff, and at no distant date for the service of an all-time Secretary. As already stated, it will be the first duty of the Sub-Committee on Finance to prepare an estimate of the probable immediate requirements of the Committee. Meanwhile we venture to ask for some general assurance that His Majesty's Government will afford such financial support to the Committee as is absolutely necessary, if real progress is to be made with the development of the cotton-growing areas.

We have the honour to be, Sir,

Your obedient servants, on behalf of the Committee,

(Signed) HENRY BIRCHENOUGH,  
Chairman.

#### (c) FINANCIAL REQUIREMENTS OF THE COMMITTEE.

25th November, 1918.

SIR,

1. The Finance Sub-Committee of the Empire Cotton Growing Committee has now been able to form a preliminary estimate of the Committee's financial requirements. They fall under two heads:—

- (1) Its immediate requirements for running expenses upon its establishment, for grants to allied bodies, for enquiries, missions, etc.
- (2) Its ultimate requirements for definite schemes in connection with development, research, and education, information, etc.

2. With regard to (1) it is necessary to ask for immediate provision to be made, and the following estimate is submitted.

It must, however, be remembered that the cost of the Establishment will depend upon the scope of the work to be undertaken, and that at his stage any estimate can only be provisional. Some little time may indeed elapse before all that is asked for in the estimate is really needed, but it is not considered that it would be safe to ask for less.

#### Staff—

Secretary	£800-£1,000
Two Assistant Secretaries—	
One with business or administrative experience—the other with some scientific knowledge	£300-£500
Three 2nd Division Clerks	£250-£350
Shorthand Writers and Typists, say 4	35s.-57s.

#### Premises—

- 1 Secretary's Room.
- 2 Two Assistant Secretaries.
- 1 Senior Clerk.
- 1 Office.
- 1 Typists' Room.
- 1 Library.
- 1 Sample Room.
- 1 Committee Room for at least 20 with witnesses, &c.
- 1 Ante Room for witnesses, &c.

#### Library, &c.—

Subscriptions to trade papers and publications	say	£200
Binding Reports, &c.	say	£200
Standard works of reference	...	—
Total	...	£2,500
Publications and Provisions for grants, special enquiries, missions, &c., and propaganda and education	say	£2,500
Total	...	£5,000

3. With regard to (2), namely, the ultimate financial requirements of the Committee for definite schemes in connection with the development of cotton growing throughout the Empire, it is clear that there are alternative sources from which the funds required for such schemes as are contemplated might be obtained. For instance, necessary expenditure might be provided—

- (a) entirely out of the funds of the local Government in whose territory the area to be developed is situated;
- (b) partly out of such funds and partly by a grant or guarantee from the Imperial Government, where local funds were insufficient, or where the general interests of the Colony or Protectorate were not so entirely coincident with the interests of cotton-growing as to justify the Local Government in meeting the whole expenditure out of local funds;
- (c) partly from the funds of private corporations, and partly by a grant or guarantee upon terms from the Imperial Government.

In connection with such schemes as are contemplated in (b) and (c) the Empire Cotton Growing Committee might either make a specific recommendation for submission to the Treasury in each individual case, or they might be entrusted with the administration of a block grant out of which they would themselves make allocations subject to the approval of the President of the Board of Trade.

The Committee would be glad to know which of these two methods of procedure is likely to be adopted. In case the former methods of procedure is likely to be adopted. In case the former method is adopted the Committee would like to receive some assurance that it is the intention of the Government to give most favourable consideration to schemes approved of and recommended by the Committee, so that real and speedy progress may be made in the development of Cotton growing areas within the Empire.

4. At the present time the Empire Cotton Growing Committee have the following schemes before them, which will shortly involve large expenditure:—

- (1) The completion of the drainage and irrigation works in the Northern Delta of Egypt which have been postponed owing to the war, through lack of machinery and labour. The financial responsibility for these works had already been undertaken by the Egyptian Government, and it is assumed that as soon as the war is over they will at once be pressed on to completion.
- (2) The large irrigation schemes on the Blue and White Niles which are partly the necessary concomitant of the works already commenced in the Northern Delta, and are partly intended for the direct improvement of the Sudan itself, particularly in connection with the Gezira cotton Scheme. Provision had already been made to a con-



siderable extent for these works before the War by the undertaking of the British Government to guarantee the proposed loan of £3,000,000 which the Sudan Government were to raise for these and other development purposes, *e.g.*, railways. Owing to the war the issue of this loan was suspended, but the Treasury in 1917 granted a temporary loan of £500,000 to the Sudan Government to enable them to carry out at once certain preparatory works which would save delay in proceeding with the major works as soon as the war was over. It is presumed that the principal works of these schemes will now be proceeded with at the earliest possible moment. The question of whether the British Imperial Government will take direct responsibility for the further finance required, or whether the original scheme of a guaranteed loan will be reverted to should be taken up at once.

- (3) In other parts of Africa there are at least three principal schemes which were under consideration before the war, and which will now come up for early decision. All three have reference to railway development, one in Northern Nigeria, one in Uganda, and the third in Nyasaland. The Empire Cotton Growing Committee is at present considering the relative merits of these schemes both as regards feasibility and probable cost, and in relation to the increased quantity of cotton which might be expected to result in each area at an early date as the result of railway extension. They hope to be in a position to put before you with the least possible delay a concrete scheme recommending the immediate initiation of one or more of these schemes.

It may be well to conclude by reviewing briefly the possible developments of the work of the other sub-committees which have now been set up, in reference to their probable financial requirements.

5. *Commercial Committee.*—The amount of funds likely to be required by this Committee will depend largely on the arrangement to be come to with the British Cotton Growing Association for the future carrying on of its work. It seems undesirable that this Committee should itself undertake commercial work through its own officials. Its duties, therefore, would be confined mainly to arranging with the Association or other bodies the terms upon which the work is to be carried on by them, with Government assistance if necessary, and to supervising the manner in which the money thus provided is spent.

6. *Research and Education.*—The amount to be spent in this connection will depend on whether the Committee is itself to undertake or directly subsidise scientific work either in this country or elsewhere. It is probable that its work for some time at least will consist mainly in promoting and co-ordinating research by other bodies. If, however, the other course should be adopted it would obviously involve a considerable budget for scientific staff, and for premises and equipment.

With regard to education, it is probable that the Committee's energies may from an early date be given a somewhat wider scope. It may be necessary to stimulate by grants teaching of the kind required for the training of young men for cotton work abroad, or to provide allowances for selected men who are preparing for such service to enable them to carry out specialised training, *e.g.*, young men who have gone through a general scientific course might be given scholarships to carry on their training in particular branches at the Universities or elsewhere with a view to equipping them specially for cotton work abroad. If such a scheme were decided upon it would involve considerable expenditure which is not provided for in the above Budget.

7. *Information.*—The expenditure to be undertaken under this head depends to a certain extent on the arrangement to be made with the Imperial Institute with a view to making use of the information and collections already in their possession. If their library, for example, is taken as the basis of a collec-

tion for this Committee, the initial outlay would obviously be much less than if the Committee is to lay down such a library *ab initio*.

In the same way the probable expenditure on publications depends very largely on whether satisfactory use can be made of existing publications, such as the Board of Trade Journal or the Bulletin of the Imperial Institute, or whether it may be found desirable to issue a special publication. On this point much will depend on the character and extent of the scientific research work for which the Committee decides to make itself responsible.

In the meantime only very moderate allowances have been made in the above Budget for expenditure under these heads, but it is essential, even at this stage, to provide a certain amount for probable expenditure on special enquiries, missions, &c., and propaganda.

I have the honour to be,

Sir,

Your obedient Servant,

(Signed) HENRY BIRCHENOUGH,  
Chairman.

(d) IRRIGATION AND RECLAMATION SCHEMES IN EGYPT.  
(Extract from a letter dated 29th December, 1917.)

"In particular my Committee hope that the Government will find it possible to agree with the Egyptian Government (1) to confine the restriction of acreage in 1918 within the narrowest limits consistent with the necessities of the case as regards food supply; (2) to take every possible measure to combat the ravages of the pink boll worm which has already reduced the average yield of the Egyptian crop so seriously; and (3) to take immediate steps to accelerate the completion of such portions of the reclamation works in Northern Egypt as are not absolutely held up by lack of essential machinery.

My Committee are informed that a great part of the work which has already been done in the direction of drainage is at present incomplete and therefore unfruitful, and that, while the work cannot be completed on the original lines until after the war, much could be done by comparatively small expenditure to bring into effect those parts of the work which are nearly complete. This would go far to improve the condition of the land already under cultivation, and to extend the possible area. It would be of the greatest benefit to the cotton position if even a hundred thousand feddans could thus be dealt with for the coming season's crop.

I am, &c.,

(Signed) HENRY BIRCHENOUGH,  
Chairman."

(e) IRRIGATION AND RECLAMATION SCHEMES IN EGYPT  
AND THE SUDAN.

17th February, 1919.

SIR,

As you are no doubt aware, the irrigation and reclamation schemes which had been contemplated in Egypt and the Sudan before the war, are now being again considered with a view to immediate work. It is understood that the money required for the works in the Gezira district of the Sudan is to be provided at an early date, but this Committee is most anxious that the drainage and irrigation schemes in the Delta, and the barrage on the White Nile should also be pushed forward as early and as energetically as possible.

In my letter to you of the 29th December, 1917, I pointed out that a considerable part of the drainage work in the Delta had even then been completed, and that although it was impossible at that time to complete the two sections of the full scheme which had already been commenced owing to the impossibility of getting the heavy pumping machinery made in England, a considerable amount of work remained which involved but little manual labour, and which if completed would go far to secure immediate benefit from the work already done. This would not only have brought a considerable area of new cotton land into cultivation, but it would also add materially to the fertility of the land already under culti-

vation, and so increase the average yield of cotton per acre.

In reply to the representations which you then addressed through the Foreign Office to the Egyptian Government, the latter stated that it was then impossible to proceed further with these works, owing to the insistent demands of the army in Egypt for labour in connection with the military operations then proceeding in Egypt and Palestine, but they also stated that as soon as these operations were completed the work would be proceeded with at once.

Now that this condition has been fulfilled my Committee is most anxious that this essential work should be gone on with at the earliest possible moment. The Egyptian crop has suffered very severe curtailment during the war owing in part to the exigencies of the food supply. The restrictions on the acreage under cotton which the Egyptian Government found it necessary to impose in 1918, have now however been withdrawn, and it is extremely desirable that everything possible should be done to develop the Egyptian crop beyond its former dimensions. The completion of the drainage works is part of the necessary work to be done towards that end, and my Committee believes that no difficulty is now apprehended in obtaining the necessary labour. We should therefore be greatly obliged if you would now take the opportunity of pressing upon the Egyptian Government our great anxiety that this part of the work should now be pressed forward with the minimum of delay. It is in our view the most desirable that material progress should be made with the work during the coming spring and summer, so that the benefit of the improved drainage may be felt during the next flood season.

With regard to the completion of the two sections already undertaken by the installation of the large pumping plants at the sea-coast, my Committee believes nothing stands in the way of the immediate placing of the necessary contracts, and that such contracts would now be welcomed by the engineering firms concerned in this country. It is in our view very desirable that this should be done at once, so that these two sections may be completed at the earliest possible moment, and the full benefit of the work already done be realised as soon as possible.

Before that can be done, however, it is necessary that large reclamation works in the newly drained areas should be undertaken and the execution of these works must await the provision of further water supplies for the Delta. For this purpose the proposed dam on the White Nile, South of Khartoum was planned, and it is now essential that this scheme also should be taken up and pushed through to completion as soon as possible. Upon this will also depend the commencement of the remaining sections of the full scheme for the drainage and reclamation of the Delta, which, when finished, will add well over a million acres to the area available for cotton in the Delta. Such an addition is an essential matter to Britain, and my Committee trusts that no delay will take place in pushing the whole scheme through to completion. The supply of fine cotton is extremely critical, especially in view of the steady advance of boll weevil into the Sea Island districts of Florida and Georgia, and it is absolutely essential as a very minimum that the increase of the Egyptian crop should at least keep pace with the reduction of the Sea Island supply.

The Committee has recently had the advantage of hearing further evidence on this whole subject from Sir Murdoch Macdonald, K.C.M.G., Under-Secretary of State for the Public Works Department of the Government of Egypt. Sir Murdoch Macdonald made it clear that the Gezira scheme and the Blue Nile barrage, the Delta drainage scheme and the White Nile Dam, form one comprehensive whole, and the Committee is convinced that they would make possible a great increase in the production of cotton, the desirability of which we need not press on you. The Committee understands that the Gezira scheme is being pursued and does not therefore feel it necessary again to emphasise its importance at the moment; it does however wish to insist on the equal importance of the expansion of area in lower Egypt.

The Committee, therefore, wishes me to beg you to impress upon the Government of Egypt the necessity

for proceeding at once with the drainage of the Delta, and the barrage on the White Nile, both of which it feels are vital to the increased production of cotton in Egypt.

I am, Sir,

Your obedient Servant,

(Signed) HENRY BIRCHENOUGH,  
Chairman.

(f) MESOPOTAMIA.

5th August, 1919.

SIR,

As you may be aware, this Committee was approached some time ago by Colonel Wilson, Acting Civil Commissioner for Mesopotamia, with a view to securing from this country the assistance of capital for the preliminary stages of the development of cotton-growing in Mesopotamia. They have since discussed the question with Mr. H. St. J. B. Philby, I.C.S., who was authorised by Colonel Wilson to carry the matter further after the latter's return to Mesopotamia, and more recently with Captain R. Thomas, of the Indian Agricultural Department, who has since 1918 been carrying on the experimental work in Mesopotamia. I may mention that these experiments have so far yielded most promising results.

Mr. Philby placed before this Committee a Memorandum embodying a statement of the position and the result of his interviews with the British Cotton Growing Association. This Memorandum has been discussed by this Committee, and they have also taken the evidence of Captain R. Thomas on the whole subject.

From this evidence it appears that the work, which was begun experimentally in 1918, is being carried further this year—still on experimental lines—but that in 1920 it ought to be ready for development on something more nearly approaching to a commercial scale. In that year a considerable area should be laid down as seed-farms, to provide a sufficient supply of commercial seed for the commencement of work on a large scale in 1921.

The British Cotton Growing Association have arranged to send out a deputation to Mesopotamia this autumn. This deputation, after going over the ground, will meet the Civil Commissioner, and discuss with him the terms of an agreement under which the British Cotton Growing Association will set up a number of model plantations, which will at once serve the purpose of seed farms and demonstration farms. It is extremely unlikely, however, that the necessary arrangements for putting this scheme into effect can be completed in time for the 1920 season, and it is therefore of the first importance that the Department of Agriculture in Mesopotamia should be put in a position to carry their present work beyond the experimental stage in that season to the extent of setting up a number of small seed-farms to propagate seed on a substantial scale.

It appears, however, that no provision has been made in the Mesopotamia Budget of the present financial year (1st April to 31st March, 1920) to cover the necessary preparations which must be made during the coming winter for the establishment of these farms next summer. The Budget, which, it seems, has been rigorously cut down, provides only for the carrying on of the present experimental work on the minimum scale.

My Committee is strongly impressed with the fact that, unless these seed-farms can be established in 1920, there will be a delay of at least a year in starting the production of cotton on a commercial scale; and in the present position of the world's cotton supplies such delay is to be avoided at almost any cost.

My Committee have, therefore, asked me to bring the matter before you immediately, and to represent to you in the strongest possible manner how desirable it is that the Authorities in this country (presumably the Treasury) should make sure that the Authorities in Mesopotamia are authorised and are in a financial position to carry on this work during 1920. The amount required is comparatively small, and would involve an addition to the Budget of only 75,000 rupees, which at the present rate of exchange is £6,250.

I enclose copies of two Reports by Captain Thomas on the recent experimental work, and also of memoranda submitted by him and Mr. Philby to this Committee.

I have the honour to be, Sir,  
Your obedient Servant,  
(Signed) HENRY BIRCHENOUGH,  
Chairman.

(g) AGRICULTURAL DEPARTMENTS OF THE COLONIES AND PROTECTORATES.\*

5th August, 1919.

Sir,

Among the many points which have been brought out by the evidence laid before this Committee with regard to the development of cotton-growing in various parts of the Empire, none has impressed us as being more urgent than the necessity for the immediate strengthening of the staffs of the Agricultural Departments in every Colony and Protectorate, where the possibilities of cotton production have been proved. Even before the war these staffs have never been really adequate, either in point of numbers or of the scale of salaries offered, and this fact had been recognised by many of the Governments concerned, who were taking steps to improve the conditions of service in their departments, and to add considerably to their strength. The outbreak of war, however, brought matters to a head. Many members of the staffs were called up for military service, while those who remained were in many cases transferred to other duties, with the result that the position of the Agricultural Departments more than ever calls for immediate consideration and action.

My Committee were greatly struck by the absolutely unanimous evidence of every witness that no effective measures can be taken to develop cotton-growing until this state of affairs has been remedied. In every case the work of improving or extending the cotton crop falls first and mainly upon the Department of Agriculture. We could quote many instances in which any scheme that this Committee would wish to propose is rendered impossible by the lack of staff to carry it out.

My Committee are so strongly impressed with the necessity of immediate action on this point, that they have decided, instead of waiting for the presentation of their Report, to bring the matter before you at once. They have, therefore, prepared a set of resolutions, of which I enclose a copy, and have asked me to forward these to you and respectfully to request that you will be good enough to place the matter

before the Colonial Office at the earliest possible moment, with your support.

I understand that the Colonial Office are, as a matter of fact, already considering the question, and that the views of the Committee may be of assistance to them in dealing with the matter.

My Committee desires to draw particular attention to the case of the Imperial Department of Agriculture in the West Indies, which apparently suffers from one peculiar disability. The funds of the Department being provided directly from the British Treasury, the salaries paid to the staff are subject to the deduction of British Income Tax, and the increased burden of the tax upon salaries already inadequate is proving so serious that the Director is afraid that he will lose the services of several of his staff unless arrangements can be made immediately to meet the difficulty. It is for this reason that the case of the Imperial Department has been specially referred to in the last of the resolutions.

I have the honour to be,  
Sir,  
Your obedient Servant,  
(Signed) HENRY BIRCHENOUGH,  
Chairman.

RESOLUTIONS REGARDING STAFFS OF AGRICULTURAL DEPARTMENTS, 30TH JULY, 1919.

That in the opinion of this Committee one of the necessary conditions for increasing the cotton crops of the Empire is the enlarging and strengthening of the Agricultural Departments in these Colonies and Protectorates in which cotton can be grown.

That this enlargement and strengthening is not possible without a considerable raising of the scale of remuneration for the members of the staff employed in those Departments.

That such raising of the scale of remuneration is advisable on general grounds apart from the extra cost of living consequent upon the war.

That this Committee respectfully recommends that the Colonial Office be asked to appoint a Committee to advise on the scale of numbers, salaries, and general expenditure which should be aimed at for adoption as and when circumstances permit.

That in certain cases which have come to the notice of this Committee, notably in the case of the Imperial Department of Agriculture for the West Indies, the matter is so urgent that it is desirable that, pending the Report of the suggested Committee, immediate increases of pay should be granted to the men employed.

\* See footnote to § 15, page 8.

## APPENDIX VII.

## SUB-COMMITTEES OF THE EMPIRE COTTON GROWING COMMITTEE.

1. *Finance.*

Sir Henry Birchenough, K.C.M.G., Chairman.  
 Mr. J. S. Addison.  
 Mr. W. C. Bottomley.  
 Mr. D. T. Chadwick.  
 Mr. J. Cross.  
 Mr. J. Murray.  
 Mr. W. H. Himbury.  
 Mr. J. A. Hutton.  
 Mr. R. H. Jackson.  
 Mr. J. W. McConnel.  
 Mr. N. N. Wadia, C.I.E.

2. *Commerce.*

Mr. J. S. Addison, Chairman.  
 Sir Henry Birchenough, K.C.M.G.  
 Mr. Peter Bullough.  
 \*Mr. H. Boothman.  
 Prof. W. R. Dunstan, C.M.G., F.R.S.  
 Mr. N. S. Glazebrook.  
 \*Mr. William Greenwood.  
 Mr. W. H. Himbury.  
 Mr. F. Hodgkinson.  
 Mr. J. A. Hutton.  
 Mr. R. H. Jackson.  
 Mr. J. W. McConnel.  
 Mr. N. N. Wadia, C.I.E.  
 Mr. C. M. Wolstenholme.

3. *Research and Education.*

Mr. J. S. Addison, Chairman.  
 Sir Henry Birchenough, K.C.M.G.  
 Dr. W. Lawrence Balls.  
 Mr. W. C. Bottomley.  
 Mr. D. T. Chadwick.  
 Mr. J. Cross.  
 Prof. W. R. Dunstan, C.M.G., F.R.S.  
 \*Prof. J. B. Farmer, F.R.S.  
 Mr. J. W. McConnel.  
 \*Dr. E. J. Russell, F.R.S.  
 \*Sir Frank Warner, K.B.E.

4. *Information.*

Mr. J. W. McConnel, Chairman.  
 Sir Henry Birchenough, K.C.M.G.  
 Dr. W. Lawrence Balls.  
 Mr. W. C. Bottomley.  
 Mr. D. T. Chadwick.  
 \*Mr. J. I. Craig.  
 Prof. W. R. Dunstan, C.M.G., F.R.S.  
 Mr. J. A. Murray.  
 Mr. W. H. Himbury.  
 Mr. J. A. Hutton.  
 Mr. William Mullin.  
 \*The Chairman, Publications Committee of the  
 Textile Institute (Mr. F. W. Barwick).

5. *Indiv.*

Mr. D. T. Chadwick, Chairman.  
 Sir Henry Birchenough, K.C.M.G.  
 \*Sir Charles H. Armstrong.  
 Mr. N. S. Glazebrook.  
 Mr. F. Hodgkinson.  
 Mr. R. H. Jackson.  
 Mr. L. J. Kershaw, C.I.E.  
 Mr. W. Mullin.  
 Mr. N. N. Wadia, C.I.E.  
 \*Sir Marshall Reid, C.I.E.

6. *Egypt and the Sudan.*

Mr. J. S. Addison.  
 Sir Henry Birchenough, K.C.M.G.  
 Dr. W. Lawrence Balls.  
 Mr. Peter Bullough.  
 Mr. W. H. Himbury.  
 Mr. J. A. Hutton.  
 Mr. R. H. Jackson.  
 \*Mr. A. T. Loyd.  
 Mr. J. W. McConnel.  
 Mr. J. Murray.  
 Mr. William Mullin.  
 \*Hon. G. Peel.  
 Mr. C. M. Wolstenholme.

7. *Dominions, Colonies and Protectorates.*

Sir Henry Birchenough, K.C.M.G., Chairman.  
 Mr. J. S. Addison.  
 Mr. Peter Bullough.  
 Mr. W. C. Bottomley.  
 Mr. A. Canham.  
 Prof. W. R. Dunstan, C.M.G., F.R.S.  
 Rt. Hon. A. Fisher.  
 Mr. W. H. Himbury.  
 Mr. J. A. Hutton.  
 Mr. R. H. Jackson.  
 \*Mr. E. Judson.  
 Mr. J. W. McConnel.  
 Mr. William Mullin.  
 Mr. C. M. Wolstenholme.

8. *Joint Standing Committee with the British Cotton Industry Research Association.**Empire Cotton Growing Committee.*

Dr. W. Lawrence Balls, Chairman.  
 Mr. J. S. Addison.  
 Mr. J. Cross.  
 Mr. R. H. Jackson.  
 Mr. J. W. McConnel.

*British Cotton Industry Research Association*

Mr. F. W. Barwick.  
 Mr. H. Cliff.  
 Mr. J. C. M. Garnett.  
 Mr. William Greenwood.  
 Mr. K. Lee.

\* Co-opted Members.

## APPENDIX VIII.

## WITNESSES.

The following gentlemen have given evidence before the Committee or one of the Sub-Committees. The names are given in the order in which they appeared before the Committee:—

- Sir Murdoch MacDonald, K.C.M.G., C.B., Adviser and Under-Secretary of State for Public Works in Egypt.
- Mr. E. Bonham Carter, C.M.G., Legal Secretary to the Sudan Government.
- Col. E. E. Bernard, O.M.G., Financial Secretary to the Sudan Government.
- Mr. D. P. McGillivray, Manager, Sudan Plantations Syndicate.
- Mr. J. Arthur Hutton, Vice-President, British Cotton Growing Association.
- Mr. E. R. Sawyer, Sudan Educational Department.
- Sir Daniel Morris, K.O.M.G., late Imperial Commissioner, West Indian Agricultural Department.
- Mr. Norris Dent, Managing Director of the Northern Rhodesian Cotton Company.
- Mr. A. McClure, Assistant Director of Public Works in Uganda.
- Mr. D. F. Baden, Chairman of the Uganda Company, Ltd.
- Major E. H. M. Leggett, D.S.O., British East Africa Corporation.
- Mr. F. H. Leakey, Uganda Cotton Ginning and Buying Company.
- Mr. W. H. Johnson, Director of Agriculture, Southern Provinces, Nigeria.
- Mr. J. P. Jones, Chairman of West African Section of the Liverpool Chamber of Commerce, and General Manager of the Lagos Stores, Ltd.
- Mr. W. H. Himbury, Manager of the British Cotton Growing Association.
- Mr. G. C. Dudgeon, C.B.E., late Consulting Agriculturist, Egyptian Government.
- Mr. A. T. McKillop, Ministry of Agriculture Egypt.
- Dr. E. J. Russell, F.R.S., Director of the Rothamsted Experimental Station, Harpenden.
- Lt.-Col. B. F. E. Keeling, O.B.E., M.C., Surveyor General of Egypt, Chairman, Cotton Research Board.
- Prof. W. Bateson, F.R.S., Director of the John Innes Horticultural Institution, Merton.
- Major H. V. Gorle, D.S.O., South Africa.
- Prof. J. B. Farmer, F.R.S., Professor of Botany, Imperial College of Science and Technology.
- Prof. W. Roberts, Professor of Agriculture, Lyallpur, India.
- Sir F. Lugard, G.C.M.G., C.B., D.S.O., late Governor-General, Nigeria.
- Mr. H. S. Goldsmith, C.M.G., Lieutenant-Governor, Northern Provinces, Nigeria.
- Sir H. F. Wilson, K.C.M.G., Chairman, North Charterland Exploration Co. (1910), Ltd., Secretary of the Colonial Institute.
- Mr. J. S. J. McCall, Director of Agriculture, Nyasaland.
- Mr. P. H. Lamb, Director of Agriculture, Northern Provinces, Nigeria.
- Mr. H. St. J. B. Philby, C.I.E., Indian Civil Service.
- Sir H. Hesketh Bell, K.C.M.G., Governor of Mauritius, late Governor and Commander-in-Chief of Northern Nigeria.
- Mr. S. Simpson, Director of Agriculture, Uganda.
- Mr. H. R. Palmer, First Class Resident, Northern Provinces, Nigeria.
- Mr. H. Martin Leake, Principal of the Agricultural College, Cawnpore, India.
- Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies.
- Captain R. Thomas, Indian Agricultural Service, Deputy Director of Agriculture (Research), Mesopotamia.

## APENDIX IX.

## STATISTICAL TABLES.

## TABLE A.

THE WORLD'S COTTON SUPPLY AND THE BRITISH EMPIRE'S SHARE IN IT.  
(Based on Pre-War Figures.\*)

Grade and Quality.	Where Grown.	World's Crop. Bales of 500 lbs.	Empire's Share. Bales.	Per cent.
I. Best Sea Island ...	Islands, South Carolina ... ..	8,000	4,000	33
	West Indies ... ..	4,000		
		12,000		
II. Sea Islands ... ..	Florida and Georgia ... ..	70,000	552,000	89
	West Indies ... ..	2,000		
	Best Egyptian (Sakel, etc.) ... ..	550,000		
III. Egyptian ... ..	Egypt ... ..	622,000	760,000	70
	Sudan ... ..	700,000		
	Mississippi Delta, etc. ... ..	20,000		
IV. American ... ..	Nyasaland, Uganda, and East and South Africa ... ..	200,000	415,000	2·5
	Peruvian ... ..	40,000		
	Peru ... ..	125,000		
V Indian, etc. ... ..		1,085,000	4,500,000	64
	United States of America ... ..	15,000,000		
	Mexico ... ..	150,000		
	Brazil ... ..	300,000	6,231,000	24·5
	Russia ... ..	500,000		
	West Africa ... ..	15,000		
	Levant ... ..	100,000	4,500,000	64
	India ... ..	400,000		
	China and Corea ... ..	250,000		
		16,715,000	6,231,000	24·5
	India ... ..	4,500,000		
	Russia ... ..	750,000		
	China ... ..	1,800,000	6,231,000	24·5
		7,050,000		
		25,484,000		

\* In the case of Egypt the allocation between Grades II. and III. is based on the figures of the 1917 crop.

## TABLE B.

ACREAGE, YIELD AND PRICES OF THE WORLD'S CHIEF CROPS. 1913-19.

Season.	Acreage.	Percentage on 1913.	Crop.	Yield per Acre.	Liverpool Prices (pence per lb.).		
					Lowest.	Highest.	Average.
<i>American.</i>	<i>Acres.</i>		<i>Bales-500 lbs. approximately.</i>	<i>Lbs.</i>		<i>Middling.</i>	
1913-14 ...	37,458,000	—	14,609,968	195	6·20	7·96	7·26
1914-15 ...	37,406,000	100	15,067,247	200	4·25	6·50	5·22
1915-16 ...	32,107,000	86	12,953,450	200	5·34	8·74	7·51
1916-17 ...	36,052,000	96	12,975,569	180	8·12	19·45	12·33
1917-18 ...	34,925,000	93	11,911,896	170	16·90	24·97	21·68
1918-19 ...	37,207,000	99	11,602,634	156	15·24	24·77	19·73
1919-20 ...	33,960,000	91	11,000,000†	165‡	—	—	—
<i>Indian.</i>	<i>Acres.</i>		<i>Bales-400 lbs.</i>	<i>Lbs.</i>		<i>No. 1. Fine Oomra.</i>	
1913-14 ...	25,020,000	—	5,065,000	81	4·70	6·56	5·87
1914-15 ...	24,595,000	98	5,209,000	85	3·94	5·00	4·46
1915-16 ...	17,746,000	71	3,738,001	84	4·75	6·90	6·09
1916-17 ...	21,745,000	87	4,502,000	83	7·10	18·30	11·00
1917-18 ...	25,188,000	100	4,000,000	64	15·50	20·36	18·78
1918-19 ...	20,497,000	82	3,671,000	72	13·97	23·00	18·12
<i>Egyptian.</i>	<i>Feddans.*</i>		<i>Kantars.†</i>	<i>Lbs.</i>		<i>F. G. F. Brown.</i>	
1913-14 ...	1,723,094	—	7,684,172	444	8·15	10·45	9·44
1914-15 ...	1,755,270	102	6,490,221	369	6·30	8·30	7·34
1915-16 ...	1,186,004	69	4,806,331	406	7·50	11·90	10·42
1916-17 ...	1,655,512	96	5,111,080	310	11·60	31·50	21·56
1917-18 ...	1,677,310	97	6,307,618	375	28·56§	35·50§	30·97§
1918-19 ...	1,361,000	79	4,820,660	355	26·59§	30·19§	27·85§
1919-20 ...	1,573,662	91	6,000,000‡	380‡	—	—	—

\* 1 Feddan = approximately 1 acre.

† 1 Kantar = approximately 100 lbs.

‡ Estimates.

§ Sakel.

|| Government crop estimates which are generally about 20 per cent. below the trade estimates of the actual crop.

TABLE C.  
EGYPTIAN COTTON CROP.  
AREA AND YIELD, 1895-1919.

From the Annuaire Statistique de l'Egypte, Alexandria General Produce Association Bulletins,  
and the "Cotton Diagram."

Season.	Area.	Percentage of total area cropped.	Percentage.		Crop.	Average Yield lbs. per Feddan.
			Upper Egypt.	Lower Egypt.		
	Feddans.				Kantars.	
1886	874,645	—	5·5	94·5	2,872,000	330
1887	865,396	—	7·9	92·1	2,996,000	345
Delta Barrage completed.						
1894-95	965,946	15·21	5·5	94·5	4,619,000	478
1895-96	997,735	15·51	7·0	93·0	5,275,383	529
1896-97	1,050,749	16·04	7·9	92·1	5,879,750	560
1897-98	1,128,151	16·68	8·8	91·2	6,543,628	580
1898-99	1,121,262	16·37	8·2	91·8	5,589,314	498
1899-1900	1,153,307	16·40	7·6	92·4	6,510,050	564
1900-01	1,230,319	17·18	7·1	92·9	5,435,480	442
1901-02	1,249,884	17·14	8·4	91·6	6,369,911	510
1902-03	1,275,677	17·17	8·4	91·6	5,838,790	458
Assuan Dam completed.						
1903-04	1,332,510	18·16	12·0	88·0	6,508,947	488
1904-05	1,436,709	18·94	17·0	83·0	6,313,370	439
1905-06	1,566,602	20·71	19·8	80·2	5,959,883	380
1906-07	1,506,291	20·14	16·3	83·7	6,949,383	461
1907-08	1,603,224	20·92	19·5	80·5	7,234,669	451
1908-09	1,640,415	21·59	20·8	79·2	6,751,133	412
1909-10	1,597,055	20·83	16·9	83·1	5,000,772	313
1910-11	1,642,610	21·30	19·2	80·8	7,573,537	457
1911-12	1,711,241	22·68	21·2	78·8	7,424,208	433
1912-13	1,721,815	22·42	21·8	78·2	7,532,920	437
Assuan Dam raised.						
1913-14	1,723,094	22·35	22·1	77·9	7,684,172	446
1914-15	1,755,270	23·19	21·8	78·2	6,500,000	370
1915-16	1,186,004	15·16	20·9	79·1	4,806,331	406
1916-17	1,655,512	21·73	22·1	77·9	5,111,080	310
1917-18	1,677,310	21·82	22·9	77·1	6,307,618	375
1918-19	1,361,000	—	22·1	77·9	4,820,660	355
1919-20	1,573,662	—	22·5	77·5	6,000,600*	380*

\* Estimates.

TABLE D.  
AFRICAN COTTON CROPS (EXCEPT EGYPT).  
From the Annual Reports of the British Cotton Growing Association.  
In bales of 400 lbs.

—	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
West Africa :—																	
Gambia ... ..	—	50	100	300	—	—	—	—	—	—	—	—	—	—	—	—	—
Sierra Leone ... ..	—	50	100	200	150	100	—	—	—	—	—	—	—	—	—	—	—
Gold Coast ... ..	—	50	150	200	200	250	200	200	100	100	120	100	100	100	100	100	100
Lagos and Southern Nigeria ... ..	25	550	2,100	3,350	6,150	9,750	5,700	12,400	6,200	6,100	9,170	14,200	13,750	6,300	9,400	7,900	3,100
Northern Nigeria ... ..	—	50	100	500	1,000	1,500	500	400	400	600	2,600	2,000	1,000	1,200	10,800	3,900	3,000
Total West Africa ... ..	25	750	2,550	4,550	7,500	11,600	6,400	13,000	6,700	6,800	11,890	16,300	14,850	7,600	20,300	11,900	6,200
East and South—																	
Uganda ... ..	—	150	850	2,000	500	2,000	4,000	5,000	12,000	20,000	29,000	26,000	42,000	25,200	25,100	24,000	23,000
British East Africa ... ..	—	—	—	—	200	200	300	300	400	500	900	1,000	500	300	200	200	200
Nyasaland and Rhodesia ... ..	—	—	—	—	2,300	2,700	2,400	3,200	3,400	5,300	7,200	7,500	8,000	9,000	8,500	6,500	5,000
South Africa ... ..	—	—	4	24	55	60	114	190	109	88	80	100	345	390	330	580	640
Total East and South Africa ... ..	—	150	854	2,024	3,055	4,960	6,814	8,690	15,909	25,888	37,180	34,600	50,845	34,890	34,130	31,280	28,840
Total West Africa ... ..	25	750	2,550	4,550	7,500	11,600	6,400	13,000	6,700	6,800	11,890	16,300	14,850	7,600	20,300	11,900	6,200
Sudan ... ..	300	2,900	3,500	4,000	4,063	7,773	9,540	6,890	15,370	21,907	15,000	14,000	10,000	24,000	16,200	23,000	12,000
Total ... ..	325	2,900	6,904	10,574	14,618	24,333	22,754	28,580	37,979	54,595	64,070	64,900	75,695	66,490	70,630	66,180	47,040



TABLE E.

DISTRIBUTION OF THE AMERICAN COTTON CROPS. (IN THOUSANDS OF BALES OF 500 LBS.)

Compiled from the Shepperson Company's "Cotton Facts," 1918, and from the Annual Statement of the American Cotton Crop published by the Liverpool Cotton Association, Ltd.

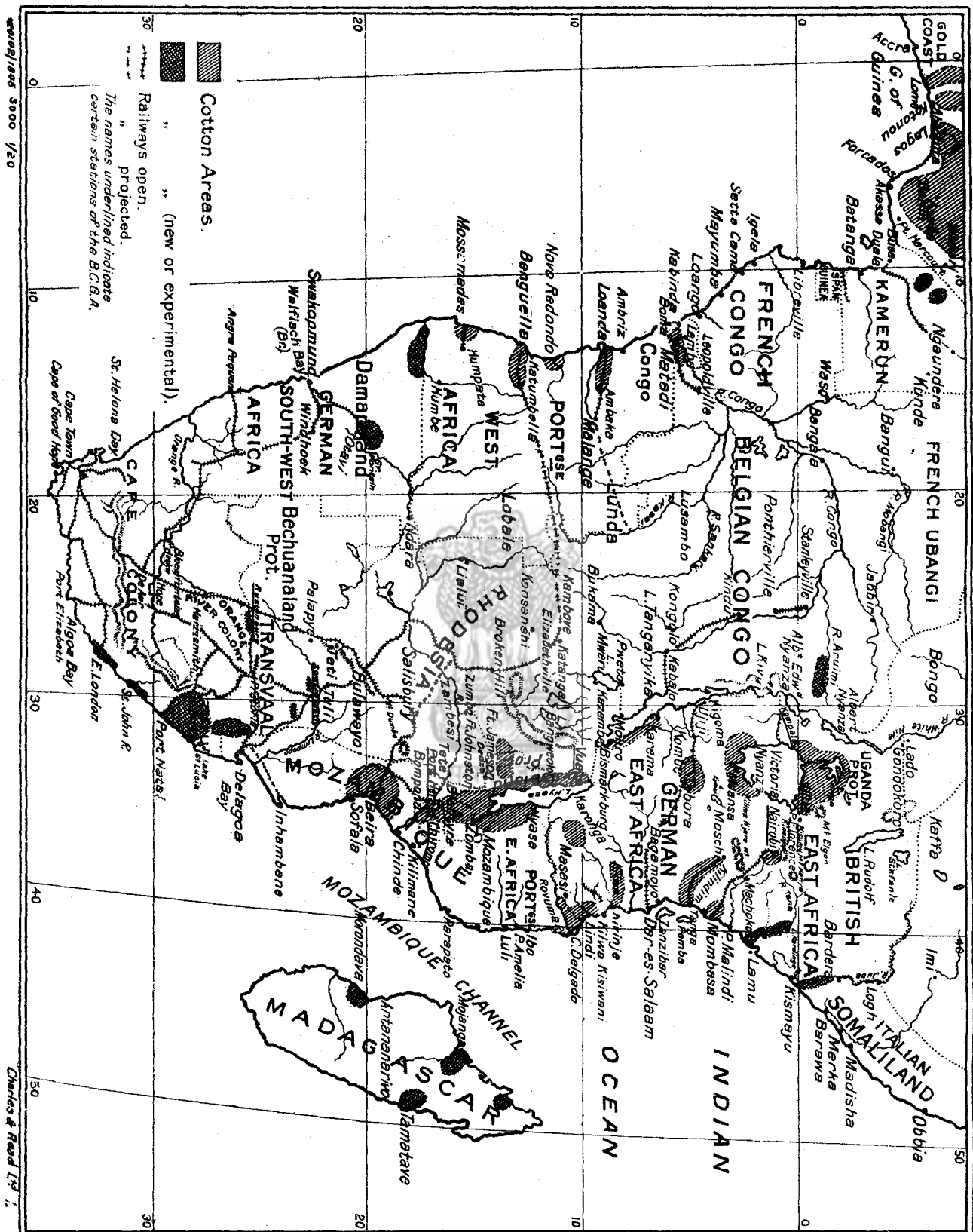
Season.	Total Commercial Crop.	Exports.			Taken by United States Mills.	Percentage of Crop taken by U.S. Mills.
		To Great Britain.	To Continent, Japan, Mexico, etc.	Total Exports.		
1836-41 ...	1,670	984	418	1,402	268	16
1841-46 ...	2,161	1,230	541	1,771	390	18
1846-51 ...	2,330	1,244	538	1,781	549	24
1851-56 ...	3,219	1,696	802	2,498	721	22
1856-61 ...	3,780	2,020	933	2,953	827	22
					Takings of Northern Mills.	Takings of Southern Mills.
1861-65 ...	Civil War—No record of Cotton Movement.					
1865-70 ...	2,532	1,234	445	1,679	703	140
1870-75 ...	3,831	1,889	768	2,657	1,075	121
1875-80 ...	4,943	2,131	1,259	3,389	1,363	164
1880-85 ...	6,086	2,585	1,551	4,135	1,625	296
1885-90 ...	6,871	2,749	1,861	4,610	1,769	453
1890-91 ...	8,674	3,345	2,446	5,791	2,027	613
1891-92 ...	9,018	3,317	2,541	5,858	2,172	684
1892-93 ...	6,664	2,301	2,089	4,390	1,652	723
1893-94 ...	7,532	2,861	2,371	5,232	1,580	711
1894-95 ...	9,837	3,449	3,277	6,726	2,019	852
1895-96 ...	7,147	2,299	2,328	4,627	1,605	900
1896-97 ...	8,706	3,022	2,957	5,979	1,793	999
1897-98 ...	11,216	3,544	3,996	7,540	2,211	1,254
1898-99 ...	11,256	3,525	3,788	7,313	2,217	1,415
1899-00 ...	9,422	2,343	3,603	5,946	2,047	1,597
1900-01 ...	10,339	3,050	3,488	6,538	1,964	1,583
1901-02 ...	10,768	3,041	3,601	6,642	2,066	2,017
1902-03 ...	10,674	2,849	3,826	6,675	1,966	1,958
1903-04 ...	10,002	2,577	3,455	6,032	2,046	1,889
1904-05 ...	13,654	4,124	4,609	8,733	2,292	2,270
1905-06 ...	11,234	2,891	3,696	6,587	2,335	2,292
1906-07 ...	13,540	3,750	4,614	8,364	2,510	2,495
1907-08 ...	11,441	2,944	4,517	7,461	1,885	2,079
1908-09 ...	13,817	3,539	4,908	8,447	2,688	2,555
1909-10 ...	10,513	2,430	3,778	6,208	2,012	2,244
1910-11 ...	12,075	3,347	4,269	7,616	1,994	2,307
1911-12 ...	16,101	4,248	6,404	10,652	2,619	2,772
1912-13 ...	14,104	3,604	5,176	8,780	2,450	2,939
1913-14 ...	14,552	3,419	5,447	8,866	2,466	3,037
1914-15 ...	15,136	3,798	4,571	8,369	2,817	3,271
1915-16 ...	12,862	2,866	3,185	6,051	2,877	3,933
1916-17 ...	12,737	2,688	3,076	5,764	2,727	4,187
1917-18 ...	11,837	2,155	2,111	4,266	2,694	4,129

## TABLE OF PARAGRAPH HEADINGS.

Paragraph.	Page.	Paragraph.	Page.
Introductory ... .. .	4	42 History of Cotton Growing in British West Indies ... .. .	18
The Cotton Situation ... .. .	4	43 Introduction of Sea Island Cotton ... .. .	18
The Constitution and Work of the Empire		44 Excellence of the Crop Maintained by Concentrated Effort on the part of all Interests ... .. .	19
Cotton Growing Committee ... .. .	5	45 Survey of certain Islands ... .. .	19
Indian Cotton Committee ... .. .	5	46 Future Prospects ... .. .	20
Circular to Colonial Governors ... .. .	5	47 Conclusions and Recommendations ... .. .	20
Previous Reports ... .. .	5		
Sub-Committees ... .. .	5		
Preliminary Financial Requirements ... .. .	6		
Plan of this Report ... .. .	6		
</			



SKETCH MAP OF SOUTH AFRICA.

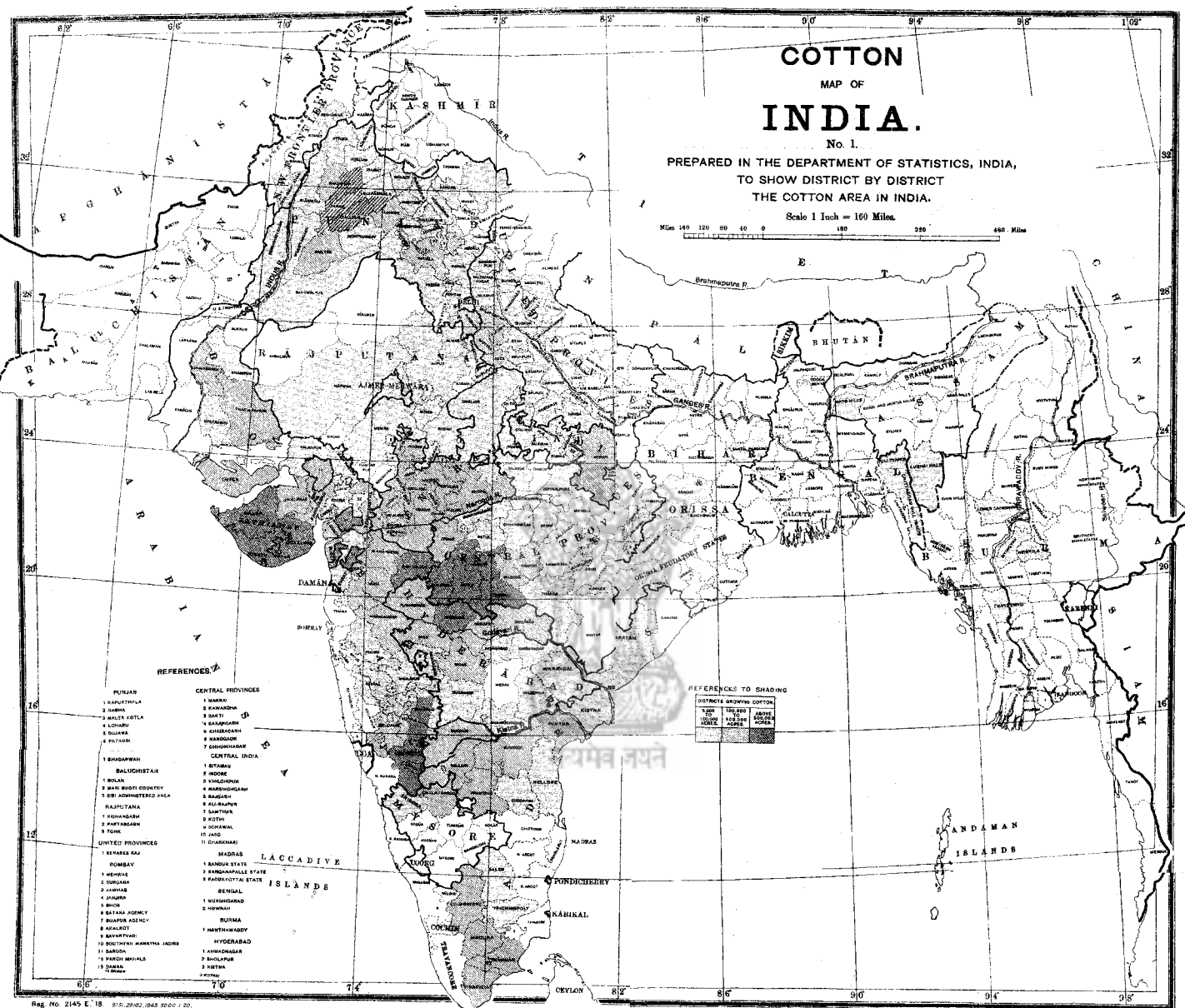


# COTTON

## MAP OF INDIA.

No. 1.  
PREPARED IN THE DEPARTMENT OF STATISTICS, INDIA,  
TO SHOW DISTRICT BY DISTRICT  
THE COTTON AREA IN INDIA.

Scale 1 Inch = 160 Miles.  
Miles 160 120 80 40 0 160 320 480 Miles



Reg. No. 2145 E. 18. 9/11/20/02, 1943 2000 / 20.

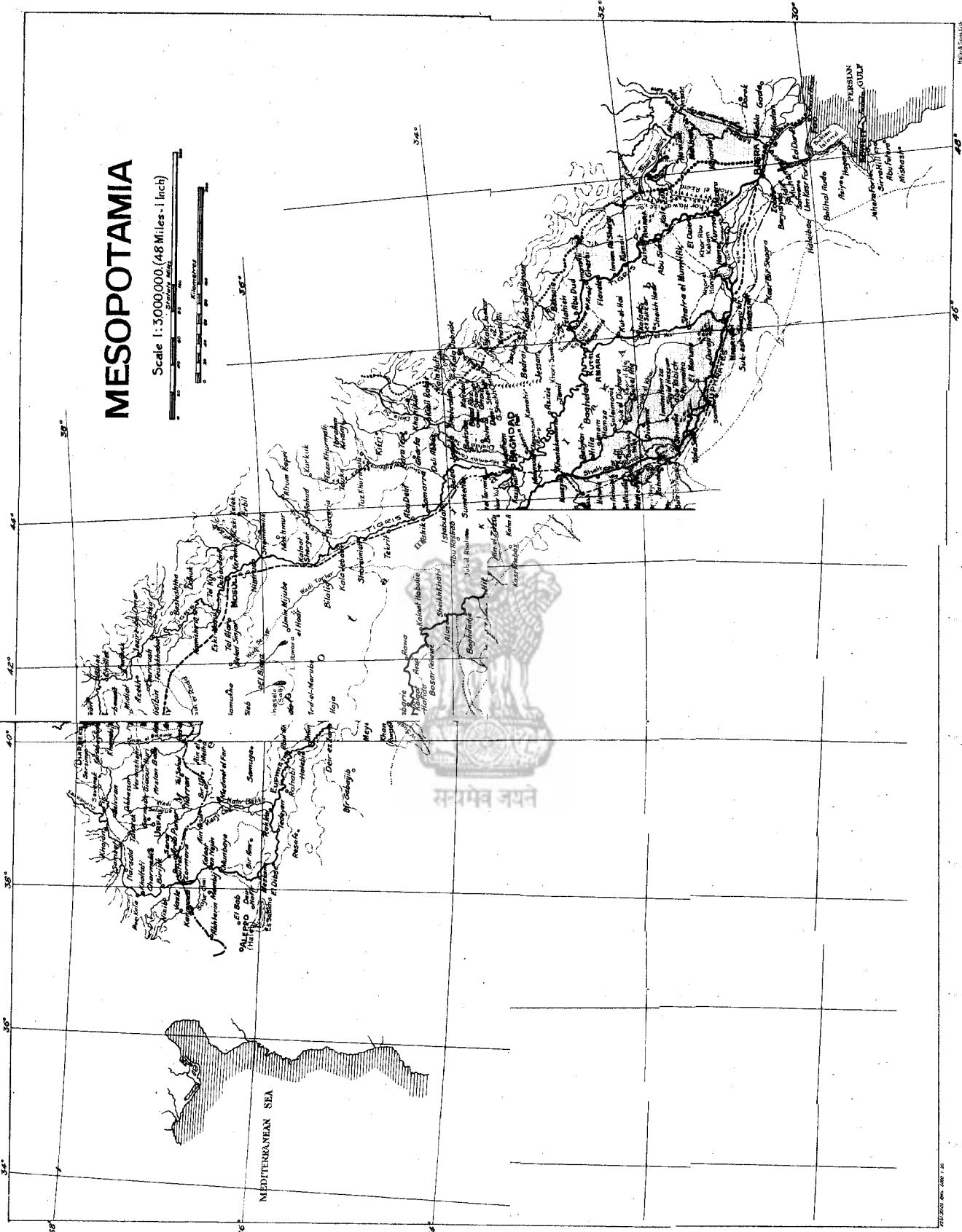
Note. - No stippling has been made for any District containing less than 5,000 acres under cotton.

Scale 1 Inch = 160 Miles. HELD IN COPYRIGHT BY THE DEPARTMENT OF STATISTICS, CALCUTTA.



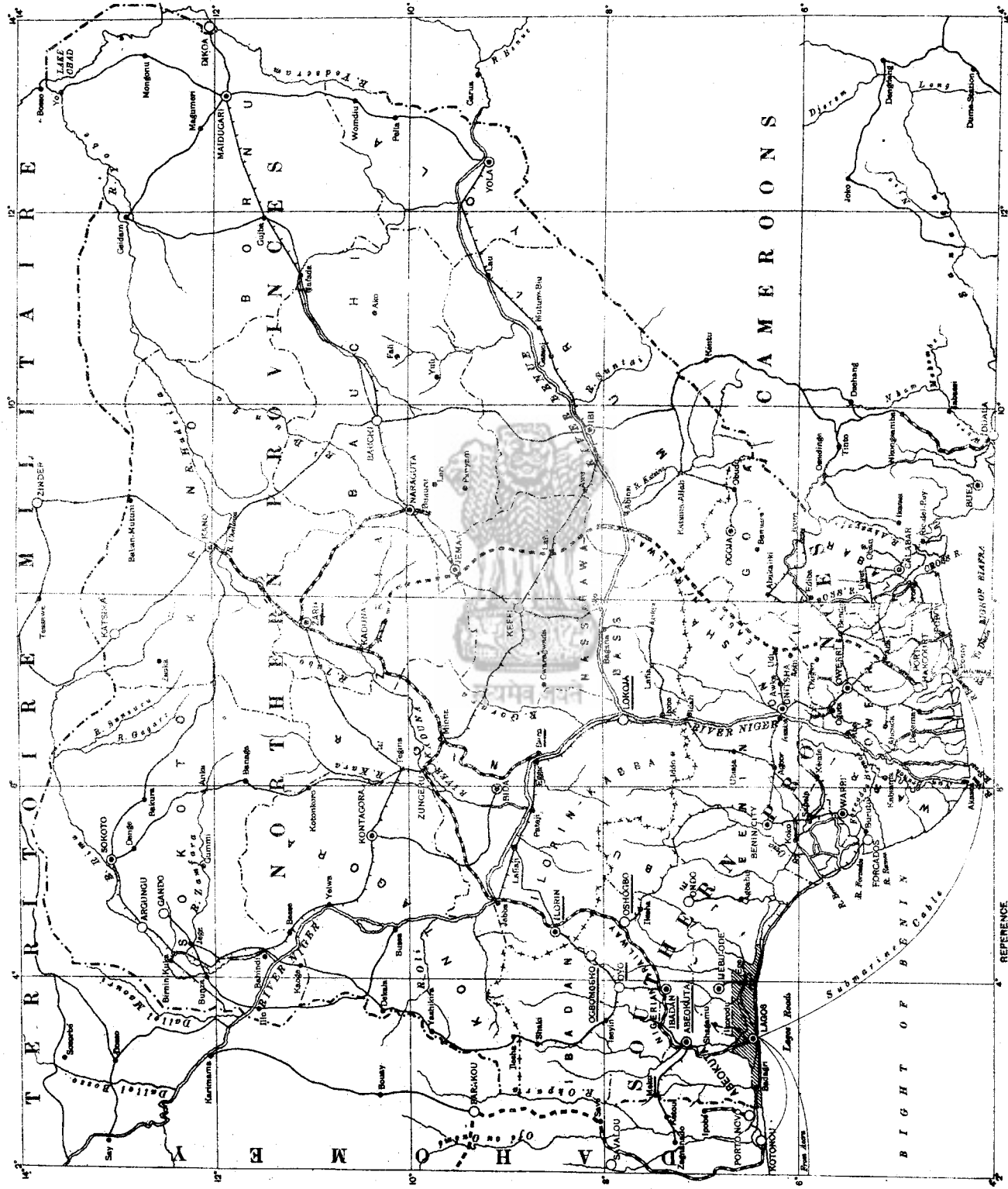
# MESOPOTAMIA

Scale 1:3000000 (48 Miles - 1 Inch)





# NIGERIA.



**COTTON GROWING DISTRICTS.**



