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OF THE
NATIONAL COMMISSION ON AGRICULTURE



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SUMMARY OF RECOMMENDATIONS

1. A rigorous ban on a uniform basis should be imposed on the movement of seed potato within the country from all such areas which have recognisedly developed such diseases and pests whose spread can pose a threat to this crop in other parts too.

(Paragraph 3.5)

2. The country is now itself producing enough healthy potato seed of good quality. It is very necessary to see that no chance is taken to introduce new diseases and pests through continued imports of seed material. Hence imports of foreign seed potato should be banned completely. An exception can be made for the material needed for new introductions and even then the imports should be made under conditions of rigid quarantine procedures.

(Paragraph 3.6)

3. The responsibilities for the production of potato seed of breeder and foundation stages should be as follows :

(a) breeder seed potato should continue to be produced by the CPRI but other suitably situated and equipped agricultural institutions may also be free to participate in this programme;

(b) potato seed of foundation stage I should be produced by the NSC and other well developed agencies;

(c) the potato seed of foundation stage II should be produced by the State Departments of Agriculture/Horticulture.

(Paragraph 4.9)

4. The NSC and the State Governments should utilize to the extent possible the facilities available in the Agricultural Universities, the State Farms Corporation and other institutions for the production of foundation seed.

(Paragraph 4.10)

5. There should be a definite committed responsibility of the State Departments of Agriculture/Horticulture for organising and coordinating the multiplication, storage and distribution programmes of seed potato in their respective States.

(Paragraph 4.11)

(ii)

6. There should be a Potato Seed Development Council in every State and also at the Centre. The State Council should have a representative each of the State Department of Agriculture, Horticulture and Agricultural University, certified potato seed growers and potato seed merchants. The Central Council should consist of one representative each nominated by the State Councils, a representative each of the National Seeds Corporation, the Union Ministry of Agriculture, the C.P.R.I. and the ICAR. These Councils should have the powers to review and make recommendations on matters pertaining to production, distribution, transport, storage, marketing, quality control, publicity and incentive aspects of the seed development programmes. The recommendations of these Councils should be considered and implemented duly by the State and Central Governments as the case may be. (Paragraph 4.12)

7. The Seeds Act should be extended to potato crop by December this year. The production of seed potato is a highly technical job and it has specially to be safeguarded at every stage that the seed is free from diseases and pests. Therefore, its certification is necessary at every stage. Breeder seed is produced by the CPRI itself and hence no separate certification is needed. Foundation seed at stage I should be certified by the CPRI. Foundation Seed stage II and certified seed of stages I and II should be certified by the usual State certification agencies and for this purpose, the concerned State officials should be imparted special training by the CPRI. (Paragraph 5.5)

8. The functions and facilities of the CPRI should be enlarged adequately in order to enable them to undertake certification of potato seed of foundation stage I and train the State officials in certification work. (Paragraph 5.6)

9. There should be adequate number of cold storages in the country for storing potato seed. The ownership of cold storages should lie with the agency which is responsible the production of a particular stage of seed. The network of cold storages for the foundation and certified potato seed should be developed in such a manner that every cold storage is as near the area it commands as possible. This is very necessary for crop like potato which is subject to delay and decay in transit. (Paragraph 6.9)

10. The Governments concerned should provide proper financial assistance for the construction of the required number of cold storages. The Governments should also examine and

(iii)

enforce such steps as are required to eliminate chances of breakdown in the running of the cold storages. (Paragraph 6.10)

11. The private cold storages which are used for potato seed should be specifically on the list of the Government and none other than those in this list be officially recognised to deal in seed potato storage. It should be enjoined upon the selected cold storages to maintain most scrupulously all records of seed transactions. This step is very necessary to avoid malpractices
(Paragraph 6.11)

12. The transport of seed potato must take place in refrigerated wagons. The Union Ministry of Agriculture should consult the Railway Board and indicate what should be the number of railway wagons which should be set apart for the transport of potato seed in the coming years. The Railway Board should then take steps to fit the needed number of wagons with refrigeration apparatus in a phased manner keeping in view the most immediate requirements. (Paragraph 7.6)



INTERIM REPORT ON POTATO SEED

SECTION I

INTRODUCTION

1.1 A variety always imposes certain limits on production obtainable from any crop and the maximum potential is only attainable when the seed is healthy as well as pure, both genetically and physically. The problems involved in the production and distribution of quality seed came to the fore in our country during the period 1961 to 1966 when the high yielding varieties and hybrids of certain cereal crops were introduced. The Commission has already issued an interim report on these problems relating to cereals.

1.2 Potato now forms an important part of Indian diet. It is wholesome. It is a rich source of carbohydrates. It also contains proteins and minerals like calcium, phosphorous, iron, manganese and iodine. It contains vitamins B and C too. It has a potential for supplementing cereal diet. It gives better returns than cereals and is considered as a cash crop. Even so, its all-India average yield is only 83 quintals per hectare, although possibilities do exist for doubling the same. One single factor that could contribute materially to bring about the change is the use of quality seed. The use of quality seed is all the more imperative because seed in itself represents nearly half of the total cost of production in the case of potato. If the margin of profit could be increased in this crop by making available good seed in adequate quantities, its cultivation will become more lucrative than at present. This will then lead to higher production and per capita consumption too. The per capita consumption of potato in our country is only 13 Kg at present, whereas in Germany it is 175 Kg.

1.3 The Commission has, therefore, felt urgency to highlight in this Report the problems which need immediate attention in regard to seed potato. A questionnaire was issued to all the

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States eliciting information on potato seed multiplication and distribution. The Central potato Research Institute at Simla and its seed multiplication farm at Daurala (Meerut) were visited in this connection. The potato seed multiplication farm of the U. P. Department of Agriculture situated at Daurala was also visited. The questionnaire is given in Appendix I. The officials and organisations, who replied to the questionnaire or provided separate notes or with whom discussions were held, are mentioned in Appendix II.



SECTION II

PRESENT POSITION

Historical

2.1 Potato is a crop exotic to India. Its origin is traced to the Andes region of South America. It came from there to Europe in the latter half of the 16th century. It was introduced into India in the beginning of the 17th century. It reached Burma also around the same time. Coming from the temperate climate of Europe, it faced different conditions in this part of the sub-continent. The quality of potato degenerates rapidly in tropical and subtropical regions specially due to diseases. Experiments have shown that such deterioration occurs at a rate of about 25 per cent per year in the very first two years. Thus the seed of this crop had to be imported regularly. Internally, the high hills of India and Burma provided some ground for breeding and multiplication work. The lower trans-Himalayan belt—specially the region around Simla hills—and the Nilgiri area in south assumed prominence in India in this context. But the extent of production being limited in the hills, the bulk of the seed had to flow from Europe and Burma.

2.2 World War II conditions compelled a change. India had to seek self-reliance. Though a beginning had been made as early as in 1935 to start a potato breeding institute at Simla, a full-fledged Central Potato Research Institute (CPRI) was established at Patna in 1949 only. It was charged with the responsibility of research work on all the aspects of improvement of potato cultivation in India. This Institute was shifted to Simla in 1956.

Present Position : Seed flow pattern

2.3 Three crops of potato are taken in the northern plains : (i) between October and December, (ii) between October-November and February-March and (iii) between December-January and April. In the high hills, there is only one crop, viz. between April and October. Because of reasons of

dormancy, the hill crop is used for seed for the third crop and the produce of third crop serves as seed for the first two crops in the plains.

2.4 The peninsular India raises two crops: (i) between November-December and February-March and (ii) between June and September. The September harvested produce of the April-October crop raised over the hills of the north or the Nilgiris serves as seed for the winter crop and the produce of the winter crop supplies planting material for the Kharif crop. The inflow of seed material from the crops raised in the northern plains has also been taking place to some extent or the other.

2.5 The imports have continued till recently to some extent. Thus the seed that is circulating in the country today is either derived from the imported material or from the hills of the country or from the produce of the plains itself. As a result, all sorts of seed material are noticed in the market. This state is a serious deterrent to any effort for effecting improvement in the quality of seed.

Area and Production

2.6 Potato is grown on an area of about 5 lakh hectares. The area and production are given in Appendix III. The Gangetic plain comprising Uttar Pradesh, Bihar and West Bengal accounts for 70 per cent of the area under potato. Uttar Pradesh leads in area and the next two States follow in order. The yields in different States are not strictly comparable because of wide variations in area. In so far as the three States of Uttar Pradesh, Bihar and West Bengal are concerned, the yield is fairly uniform around 85 quintals per hectare. The high yields of 165-170 quintals per hectare noticed in Haryana and Gujarat, here the area under potato is only 0.7 per cent of the all India total, can be regarded as illustrative of the better yield potential for the country in general in future.

Potato Seed Plot Technique

2.7 The insufficiency of high quality of seed material has been a very great stumbling block in raising the yield standards. Earlier, there was no choice except to produce seed in the hills only, because there was the handicap of the preponderance of aphids over the plains. Aphids transmit viruses, which are very deadly in causing degeneration. Continued observations, however, revealed in course of time that October to December was fortunately an aphid-free period over the plains. This

happens to be a very major break-through in so far as the potato seed programme is concerned. It was possible for the CPRI to develop a technique of growing disease free stock over the plains in this aphid-free period. The technique was standardised around 1966-67 and is now established to be known as the Potato Seed Plot Technique. With this technique, the barrier of multiplying seed potato only on the hills no longer exists. It is possible now to grow any amount of seed material over the plains.

Seed Requirement for different Stages

2.8 There are five stages involved in the production of potato seed. These are : (i) breeder seed, (ii) foundation seed stage I, (iii) foundation seed stage II, (iv) certified seed stage I (approved seed) and (v) certified seed stage II (certified seed). The actual requirement of seed for different stages of production are shown in Appendix IV. For working out these requirements, the multiplication ratio has been accepted as 6 and the seed rate as 25 quintals per hectare. These are the values which are used by the CPRI. The calculations shown in Appendix IV do not make any allowance for spoilage or carryover. It may be seen that the requirement of breeder seed for saturating the entire area of potato will be of the order of 10,000 quintals. The CPRI had been producing only about 6,000 quintals of breeder seed annually till recently. It has acquired a large farm in Daurala (Meerut) only last year. It has already got a farm at Jullundur. It is now in a position to produce about 20,000 quintals of breeder seed annually, which should be more than sufficient to produce enough certified seed for the coverage of the entire potato area even after making due allowance for spoilage and carryover.

2.9 Assuming that the production of breeder seed by the CPRI is going to be in full swing in the season October-December 1972, it should be possible to produce the first instalment of adequate quantity of certified seed for full coverage at the end of the year 1976. Thus the country could be expected to be using high quality potato seed over all its potato growing area in the year 1977 and thereafter as long as the chain of production of quality seed is maintained, it will always be using the best of seed.

Responsibilities for seed production

2.10 Production of breeder seed has to pass through four stages and is all done by the CPRI.

2.11 Foundation seed in both the stages has so far been produced by the National Seeds Corporation (NSC) as well as the State Governments. The NSC generally organises production on its own farms and sometimes on the farms of private individuals on contract basis. State Governments raise foundation seed on their own farms. There does not seem to be a clear-cut demarcation between the responsibilities of the NSC and the State Governments in the production of foundation seed.

2.12 Certified seed is also produced in two stages. The certified seed in the first stage is called the 'approved seed', while that of the second and final stage is really the 'certified seed' which is meant for distribution among the farmers. Both the approved as well as certified seed is produced by progressive growers under governmental supervision. Such growers have to be approved by the Government. Those authorised to grow the approved seed are known as 'approved growers' and those authorised to grow certified seed as 'certified growers'. The NSC has also been producing some certified seed since 1971.

Quality Control

2.13 The Seeds Act has so far not been extended to potato crop except for the fact that potato seed is required to be raised in accordance with the specifications of the Seed Plot Technique and that certified seed is tagged. There is no certification as such by any agency for this crop. What is in circulation at present, therefore, can just be called a graded seed. It is learnt that the Union Ministry of Agriculture is already taking steps to notify the potato crop under the Seeds Act.

Cold Storages

2.14 The temperature in the high hills is such that ordinary methods of storage can suffice for seed potato. Such is not the case in the plains. Storage of seed potato in plains requires temperature control in order to keep it fully viable. Cold storages are now-a-days preferred for this purpose. Accurate information of the number of cold storages, which are being used at present for the storage of seed potato in the country, is not completely available but many States have mentioned that the present number is inadequate. Most of the existing cold storages are private. There are complaints of their malfunctioning. There are break-downs because of which the quality suffers. Sometimes the farmers are cheated by unscrupulous

owners; their material is inter-changed or inferior stocks supplied on the plea of power failure.

Transport

2.15 In the field of transport, there is general experience that railway wagons are inadequate for transport of seed and delay occur in transit. The result is that either the seed for sowing arrives late or damaged. The wagons are seldom temperature-controlled.

Scope

2.16 The entire potato area is proposed to be saturated with high class seed within the next five years. For this to be accomplished, certain concomitant steps must be taken right now. These relate to :

- (i) rationalisation of the sources of seed supply,
- (ii) fixing of responsibilities of multiplication of seed,
- (iii) problems of quality control,
- (iv) cold storages, and
- (v) transport of seed potato.

Views and recommendations of the Commission on these matters are given in the following sections.

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SECTION III

RATIONALISATION OF THE SOURCES OF POTATO SEED SUPPLY

Internal

3.1 Potato seed circulating in the country at present is obtained either through the official channel or through private sources. In private deals, Himachal Pradesh potato has an all-India appeal. Punjab as a neighbouring State of Himachal Pradesh and Uttar Pradesh, Bihar and West Bengal by virtue of their area under potato also serve as a source of seed supply to other States in private transactions. Tamil Nadu has the facility of multiplication of seed potato in the Nilgiri hills; hence potato from this area is also supplied to the neighbouring parts through private trade. The existence of multiplicity of channels of seed supply is in fitness with the Commission's line of thinking. More than one source of supply must be opened to the producer in order to enable him to make a choice of his own but what is necessary for the Government to ensure is that, whatever be the source of supply, the seed that reaches the farmer must be pure, healthy and sound. Purity and high quality will be ensured when official certification gets extended to this crop too. In so far as health is concerned, vigilance by Government is surely needed.

3.2 The Darjeeling hills are highly infected with Wart disease and this is the very area around which multiplication of seed potato has principally taken place in West Bengal. Thus any seed which moves from here to adjoining States of Assam, Bihar and Orissa carries with it the chance of spreading the disease in those parts. The Government of India have already imposed restrictions on the movement of potato from the Darjeeling area to other parts but perhaps its rigid enforcement yet to be achieved. The National High Level Scientific Committee for Plant and Animal Introduction and Quarantine (1971) has stated that potato seed-tuber material booked from Darjeeling to Calcutta within West Bengal by rail is often short-landed enroute at some Bihar stations, although the material

is said to be received at a destination on paper. The short-landed material is then illegally labelled as Bihar seed-tuber of potatoes and is re-booked to other places in India, where it should not be sent on the grounds of domestic quarantine. It had recommended that cooperation of the railway authorities should be sought for locating such loopholes.

3.3 Potato in Tamil Nadu is grown around the Nilgiris (Ooty-Kodaikanal region). The seed grown in this area is infested with Golden Nematode. This seed material goes to Mysore and other neighbouring areas of Kerala and Andhra Pradesh. The danger of spreading of Golden Nematode to wider areas outside Tamil Nadu has also to be stopped.

Foreign

3.4 The CPRI had conducted some comparative trials in regard to the performance of the Indian variety 'Up-to-date' with the Burmese varieties like Rangoon, Military Special or Sit-Bo. Stocks of these varieties continue to be imported from Burma. On examination, it was found that these varieties were similar to the Indian variety Up-to-date in characteristics and that the Indian variety yielded even more (Appendix V). If such trials are extended to other imported varieties, the results may not be found to be different in good many cases. That is because a number of good varieties have been developed now within the country itself. As a matter of fact, continued imports now pose a serious threat to the introduction of new diseases and pests. Time is, therefore, ripe now for imposing a ban on the imports of potato seed material from abroad. The only exception that can be permitted now should relate to the new material needed by the CPRI for research.

3.5 The Commission recommends that a rigorous ban on a uniform basis should be imposed on the movement of seed potato in the country from all such areas which have recognised developed such diseases and pests whose spread can pose a threat to this crop in other parts too.

3.6 The Commission strongly recommends that foreign imports of seed potato must be completely banned. An exception can be made for the material required for new introductions and even then the imports should be made under conditions of rigid quarantine procedures.

SECTION IV

RESPONSIBILITIES FOR THE MULTIPLICATION AND DISTRIBUTION OF SEED POTATO

Principles

4.1 We have already laid down certain principles on this matter in our Interim Report on the Multiplication and Distribution of Quality Seed pertaining to High Yielding Varieties and Hybrids of Cereals. We have been of the opinion that the responsibility for multiplying breeder seed in adequate quantities for meeting the requirements of foundation seed agencies should be entrusted to certain selected breeders and institutions. We have also held that there should not be any monopoly by any single agency in the production and distribution of foundation and certified seed but in respect of varieties of all-India importance, the NSC should be a major agency in so far as foundation seed is concerned.

The CPRI and the breeder seed

4.2 Breeding of potato has an all-India character because of many considerations. It can be done only in the high hills of our country, of which the Simla hills are very ideal. The multiplication of nucleus seed obtained through breeding is also a very highly specialised job, whether it is done over the hills or over the plains with the help of the Seed Plot Technique. The basic work of breeding potato as well as the production of breeder seed are being done at present by the CPRI alone. It would be a welcome development if certain suitably situated and equipped agricultural institutions take up breeding-work on potato and subsequently the production of breeder seed.

4.3 Foundation seed of potato is at present produced both by the NSC and the States. There is no distinct division of labour between the two. There are two stages of foundation seed production and both these are done by the NSC as well as States. Besides these two agencies, there is no third agency involved in it at present. It is now to be settled whether there

should be a clear demarcation of responsibilities between the NSC and States and whether out of the private or quasi-government organisations, only the NSC should take part in potato seed production at the foundation stages.

States and foundation seed

4.4 Certified seed of potato is even now produced at the State-level only. This seed is grown from foundation seed of stage II. Recognising the vulnerability of potato seed for deterioration and recognising the delays involved in transits over long distances, it is very desirable that the seed of foundation stage II should be available as near the place of production as possible. Therefore, its production within the States themselves appears very reasonable. Rigid methods of production are absolutely essential even in this stage because on its quality depends the health and soundness of the seed material of the certified stages I & II. It appears essential, therefore, that the seed of foundation stage II should be raised under governmental responsibility.

NSC and foundation seed

4.5 Foundation seed of stage I is the immediate next step of development after breeder seed. Hence the all-India character of the job is still necessary because the limited quantity of seed that is going to be produced needs to be equitably distributed among the States according to some common standards. The total quantity of seed involved in this stage is only 6,000 tonnes (without allowance—Appendix IV). This does not call for many agencies at present because the production of small quantities by many agencies may not be economically commensurate with the invested resources of material and expertise. Considering these facts, specially the all-India character of the job, it is obvious that the NSC should have a major role in the production of seed of this stage. Even so, other well organised agencies like the Tarai Development Corporation can also be drawn into the process.

Other agencies and foundation seed

4.6 We had stated in our earlier Interim Report that the Agricultural Universities, State Farms Corporation and other institutions, which were in a position to coordinate performance and quality, should be associated with the programme of production of foundation seed. This should be so even in the case of potato.

Certified seed

4.7 Certified seed potato is even now produced by private growers, who have been recognised for the purpose by the Government. Private growers can be organisations or individuals. We have envisaged the involvement of (i) seed corporations, (ii) seed cooperatives, (iii) seed growers' organisations, (iv) other private agencies or even (v) the agro-industries corporations (the latter for distribution alone). As long as this is done, the present arrangement seems all right.

Coordination

4.8 At present some general governmental guidance does exist in the multiplication and distribution programme of seed potato in the States. But what is required now is a definite committed responsibility for organising and coordinating production, storage and distribution of potato seed by the Departments of Agriculture or Horticulture as the case may be. Governmental job will be facilitated if a Potato Seed Development Council is also created in every State. This will help (i) to bring out from time to time to deficiencies in implementation, (ii) to review the requirements, mode and terms of the supplies of credit and inputs, and (iii) the extension and training needs. As a matter of fact, a few States have themselves suggested creation of some such body in their replies to our questionnaire. State Potato Seed Development Councils should be apexed by a similar Council at the Centre. The constitution of these Councils should be such as to include all interests involved in the seed business of potato.

4.9 In the light of the foregoing discussion, the Commission recommends that the responsibilities for the production of potato seed of breeder and foundation stages should be as follows : (a) breeder seed potato should be continued to be produced by the CPRI but other suitably situated and equipped agricultural institutions may also be free to participate in this programme, (b) potato seed of foundation stage I should be produced by the NSC and other well developed agencies, and (c) the potato seed of foundation stage II should be produced by the State Department of Agriculture/Horticulture.

4.10 It is also recommended that the NSC and the State Governments should utilize to the extent possible the facilities

available in the Agricultural Universities, the State Farms Corporation and other institutions for the production of foundation seed.

4.11 The Commission further recommends that there should be a definite committed responsibility of the State Departments of Agriculture/Horticulture for the organisation and coordination of the multiplication, storage and distribution programmes of seed potato in their respective States.

4.12 The Commission also recommends that there should be a Potato Seed Development Council in every State and also at the Centre. The State Council should have a representative each of the State Departments of Agriculture, Horticulture, Agricultural University, certified potato seed growers and potato seed merchants. The Central Council should consist of one representative each nominated by the State Councils, a representative each of the National Seeds Corporation, the Union Ministry of Agriculture, the CPRI and the ICAR. These Councils should have the powers to review and make recommendations on matters pertaining to production, distribution, transport, storage, marketing, quality control, publicity and incentive aspects of the seed development programmes. The recommendations of these Councils should be considered and implemented duly by the State and Central Governments as the case may be.

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SECTION V

QUALITY CONTROL

Seeds Act

5.1 Notification on potato crop under the Seeds Act is very essential for the success of its seed programme. As the Union Ministry of Agriculture is already examining the issue, it should be possible for them to extend the Act to potato by about December this year. This will be quite in time for initiating steps for certification of the crops which will be harvested in 1973.

Certification of foundation seed

5.2 In the matter of quality standards, it has been stated in our earlier interim report on cereals seeds that (i) internal checks are necessary at breeder and foundation seed stages, (ii) there should be an agency in each State for official certification of certified seed, which should be independent of production, marketing and seed law enforcement, and (iii) there should also be a Certification Board in every State apexed by a Central Certification Board for laying down policies and for regulatory functions. The CPRI, NSC or other institutions and States will apply internal checks on potato seed according to what they produce. The official State certification agencies will certify the certified seed of potato in both the stages of its production. It is desirable that the States should not involve the NSC in the certification work relating to potato. The usual certification boards will be responsible for this crop too. In addition, this crop requires some special consideration because of the highly technical and delicate procedures of seed production involved. It has to be safeguarded at every stage that the seed is free from diseases and pests. It is no use taking risk at any of the stages of seed production for these reasons. As breeder seed is produced and distributed only by the CPRI no separate certification of this seed is necessary but the certification of foundation seed is quite essential. It will be quite appropriate if the certification of foundation stage 1, which will

be produced by a central organisation like the NSC, is entrusted to the CPRI. The production of seed of foundation stage II is to be done within the States and therefore its certification can be done very conveniently by the usual State certification agencies.

5.3 The States' certification personnel have to deal with many crops and therefore their training is usually general. The requirements of potato crop for this purpose will be very special. A certification officer must be familiar with the Seed Plot Technique and the methods of testing tuber quality. All this will require special training. There are no two opinions that such a training can best be imparted by the CPRI.

5.4 At present the CPRI is responsible for the breeding and multiplication of potato seed at breeder stage. If the certification work for foundation seed stage I and training work for the certifying seed personnel are to be undertaken by the CPRI, their functions and facilities will have to be increased accordingly.

5.5 The Commission recommends that the Seeds Act should be extended to this crop by December 1972. The foundation seed in the case of potato should also be certified. Seed of foundation stage I, produced by the NSC and other agencies should be certified by the CPRI. The certification of foundation seed stage II and certified seed stages I and II should be the responsibility of the usual State certification agencies. The State certification personnel should be imparted special training by the CPRI for the certification of potato seed.

5.6 The Commission further recommends that the functions and facilities of the CPRI should be enlarged adequately in order to enable them to undertake certification of the foundation seed stage I and train the State officials in certification work.

SECTION VI

COLD STORAGE

6.1 Potato is subject to quick deterioration in hot climate. The viability and firmness of potato seed are well maintained by storing it between 1.5°C and 3°C under a humidity range of 80-85 per cent. Therefore, it is very necessary that proper storage under refrigerated conditions is ensured at every stage of seed production. The responsibility of proper storage has to rest with the agency which is responsible for the production of seed in different stages.

6.2 The CPRI is multiplying breeder seed at Kufri in Himachal Pradesh for use in the hills. For the storage of such seed in high hills, there is no need for cold storage. The CPRI is, however, nowadays multiplying breeder seed for use in the plains with the help of the Seed Plot Technique at stations like Jullundur and Daurala (Meerut). The seed produced at such plain stations will certainly need cold storage facilities and it is very necessary for the CPRI to build the same at some suitable places. When other institutions start producing breeder seed, they will also have to provide for their own cold storages.

NSC Cold Storages

6.3 The NSC will be producing foundation seed of stage I after securing the planting material from the CPRI. What the NSC produces will have to be distributed to the States for the production of foundation seed stage II. Between the production of seed by the NSC and the distribution among the States for sowing, there may be a gap of a season or two. Hence storage by the NSC will also become necessary. The NSC has no cold storage of its own at present. The NSC will, therefore, have to build cold storages of its own. These may be distributed as follows :—

- (1) Meerut or Delhi to cater to the needs of Jammu & Kashmir, Punjab, Haryana, Rajasthan and Uttar Pradesh.

- (2) Patna to cater to the needs of Bihar, West Bengal, Assam and Orissa.
- (3) Bhopal for Madhya Pradesh, Gujarat and Maharashtra.
- (4) Bangalore for Andhra Pradesh, Mysore, Tamil Nadu and Kerala.

6.4 Other agencies, which may come in the business of production of potato seed of foundation stage I, will also have to develop suitable cold storage facilities of their own.

Governmental

6.5 State Governments have been recommended to be responsible for the production of the foundation seed of stage II. Each of the State Governments should, therefore, have its own cold storages for storing the produce of this stage. The number of cold storages to be owned is left to be determined by the Governments of each State depending upon the amount of seed and the number of places at which it is produced. Seed requirements for different stages have already been given in Appendix IV, which will be helpful in arriving at the number of cold storages required.

Private Sector

6.6 In so far as the certified seed of stages I and II is concerned, it will need private cold storages, whether owned by individuals or organisations. It will be a good principle if the source of supply of certified seed is kept nearest to the point of utilisation. This will avoid delays and deterioration, which are inherent in the arrival of seed supplied from distant places at the time of sowing.

6.7 A cursory examination of the total acreage under potato and the total requirements of certified seed has revealed that a cold storage of a capacity around 1,000 tonnes can suffice to command an area of 400 hectares. A statement of the cold storages needed in various States at this rate is given in Appendix VI. By going through these calculations, an impression should not be created that the Commission is in any way suggesting monopoly that there should be only one cold storage to cater to every 400 hectares. The number of cold storages arrived at in Appendix VI should be taken to be a rough estimate. The

number can be increased and the capacity per storehouse decreased if a better scatter is needed in order to command an area efficiently. As a matter of fact, the Commission will welcome if the cold storages are abundant so that the farmer has a free choice for keeping his produce.

6.8 It is necessary to note that the existing cold storages may not be exclusively meant for potato and therefore when malpractices occur, it is difficult to pin-point defaulters. The farmers are often cheated in various ways. The capacity of storage is exceeded by greedy owners, which results in damage to equipment. It is, therefore, very necessary that the cold storages which are assigned to deal in potato seed should be very distinctly recognised in governmental records and the transactions made by such storehouses should also be scrupulously maintained. Steps are also needed to ensure that the temperature regulating machines run continuously without breaks in storehouses.

6.9 The Commission recommends that there should be adequate number of cold storages in the country for storing potato seed. The ownership of cold storages should lie with the agency which is responsible for the production of a particular stage of seed. The network of cold storages for the foundation and certified potato seed should be developed in such a manner that every cold storage is as near the area it commands as possible. This is very necessary for a crop like potato, which is subject to delay and decay in transit.

6.10 The Commission also recommends that the Governments concerned should provide proper financial assistance for the construction of the required number of cold storages. The Governments should also examine and enforce such steps as are required to eliminate chances of break-down in the running of the cold storages.

6.11 The Commission further recommends that the private cold storages which are used for potato seed should be specifically on the list of the Government and none other than those in this list be officially recognised to deal in the storage of seed potato. It should be enjoined upon the selected cold storages to maintain most scrupulously all records of seed transactions. This step is very necessary in order to avoid malpractices.

SECTION VII

TRANSPORT OF SEED POTATO

7.1 Movement of seed potato in the country can be of three kinds. One is through the official channel of the CPRI to NSC or other agencies to State Departments of Agriculture/Horticulture to producers. The second is from the seed producers of Himachal Pradesh or other hill States. The third is through inter-State transactions in general.

Quantum of seed movement

7.2 In the official channel, the seed of foundation stage II will be produced by the Government in every State. Within a State, motor transport will be more than sufficient and hence railway wagons will not be ordinarily needed in any large number. Seed of foundation stage I will be produced by the NSC. For this, the NSC will have to obtain breeder seed from the CPRI and move it to the production centres. From the production centres, the NSC will have to transfer the produce of stage I to their regional storages. From the regional storages the seed will have to move different states for raising the seed of foundation stage II. In all this, the NSC will be greatly involved and will require railway wagons. The total quantity of seed involved in the breeder stage and the foundation stage I is 7,000 tonnes (Appendix IV). When other agencies develop in the field of production of breeder seed and foundation seed stage I, their requirements will also have to be taken into consideration.

7.3 Movements in private transactions will be chiefly for the certified seed of stage II. Much of this seed will be produced within the States themselves by the certified producers and for its internal transport trucks will usually suffice. Some of the producers may, however, like to get seed from Himachal Pradesh or other States. This will need railway transport. If we assume that at least 35% of the certified seed will involve long distance transport through the railways, its quantum will come to 4.36 lakh tonnes. The quantity of breeder seed and foundation seed stage I has already been shown as 7,000 tonnes. Taking this

as well as some extra allowance into consideration, the seed that can be expected to be moved over the railways in a year can be said to be of the order of 5 lakh tonnes. The movement of seed potato will generally take place in the months of August-October and May-July. Thus the railways are expected to carry on the average about 83,000 tonnes of potato seed material per month during these six months. This average quantum of seed movement is calculated just to familiarise ourselves with the magnitude of the problem. The exact quantum will depend on many factors, which will become clear only on practical working.

Railway wagons and their refrigeration

7.4 The exact number of wagons needed for the movement of seed potato will require to be worked out by consultations between the Union Ministry of Agriculture and the Railway Board. Assistance of the Central Potato Seed Development Council (when set up according to our recommendation) may be useful in this regard.

7.5 The railway wagons in which potato seed is moved at present are not refrigerated. The immediate need is, therefore, that the Railway Board should take steps to provide for cold storage arrangements in the number of wagons which may be required for the purpose of potato seed movement. Refrigeration of the wagons can be done in a phased manner keeping in view the most immediate needs. It should not appear as though the refrigerated wagons are exclusively meant for potato seed. The same wagons will be useful to the railways in the movement of many other kinds of perishable commodities.

7.6 The Commission recommends that the transport of seed potato must take place in refrigerated wagons. The Union Ministry of Agriculture should consult the Railway Board and indicate what should be the number of wagons which should be set apart for the transport of potato seed in the coming years. The Railway Board should then take steps to fit the needed number of wagons with refrigeration apparatus in a phased manner keeping in view the most immediate requirements.

SECTION VIII

ACKNOWLEDGEMENTS

8.1 The Commission takes this opportunity to thank the CPRI, NSC, the Central and State Governments and the Directorates of Agriculture/Horticulture for providing material in response to specific references by way of personal contacts, correspondence or questionnaire.

8.2 Dr. R. K. Misra, Specialist, contributed substantially in the preparation of this report. He was assisted by his Senior Technical Assistant, Shri R. P. Varma, in tabulation, analysis and study of the data.

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Member-Secretary

Member

B. S. Nag

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Hari Singh

N. K. Panikar

NEW DELHI

11th August 1972

APPENDIX I

National Commission on Agriculture

Questionnaire on Potato Seed

Yields of potato in the country are only of the order of 80 quintals per hectare on an average, whereas such an average for the West is 150 to 200. Therefore, even on the face value, there is room for improvement in out-turn. Being vegetatively propagated, seed alone in the case of potato accounts for nearly half of its production cost. Tubers are highly prone to diseases (specially virus) and they also degenerate metabolically very fast if not stored under low temperature conditions. Because of these two reasons, there is always a problem of providing high quality seed material.

Potato seed is multiplied in hills, specially those of Himachal Pradesh, West Uttar Pradesh and Himalayan West Bengal. Himachal Pradesh presents the most ideal conditions and, therefore, has throughout played a pioneering role in supplying seed potato to other parts. Individual farmers, cooperatives and the Government of Himachal Pradesh have all been involved in potato seed industry.

Two to three crops of potato are usually taken in a year in this country. Seed brought from hills serves as a primary source for ware production every year. Subsequent crops in a year are raised from the produce of previous crops, giving due allowance for dormancy. Multiplication of seed over plains had posed a serious drawback in the past because of abundance of insect vectors and diseases. However, new methods of chemical control have reduced this handicap. A new scheme for the production of nucleus seed was introduced at the Central Potato Research Institute at Simla in 1967. According to this scheme, nucleus seed is produced by this institute with the cooperation of its regional stations, both in the high hills as well as in the northern plains. Nucleus seed thus produced is made available to the National Seeds Corporation Ltd., and the Departments of Agriculture of some of the northern and eastern states, which are suitably located for multiplication from the climatological point of view. The programme of seed production and multiplication is ultimately coordinated by the Ministry of Agriculture.

This questionnaire is issued in order to elicit information on the present position with regard to supply of potato seed in the country.

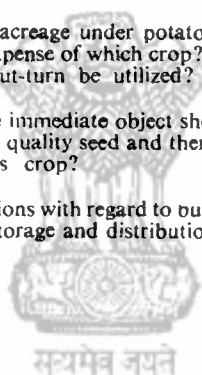
1. Give the area and production of potato in your state in 1970-71 and averages of five years ending 1969-70, separately during the different seasons, and also for hill areas and plains separately, wherever applicable.

2. From where is the seed procured in your state? If any seed is directly imported from abroad, that also may kindly be indicated together with justification.
3. Is the seed in your state obtained at the nucleus stage and then subsequently multiplied further for ware production within the state itself or is it procured in quantities sufficient for ware production directly?
4. Which are the agencies from whom such seed is procured? Are dealings with individual merchants or with cooperatives or with any other private agencies or with governments of the states involved in seed production?
5. On your side, which are the agencies which procure such seed for your state? Is this done by your government or by quasi-government or private agencies or by individual merchants?
6. What are the financial arrangements for procurement transactions? Does government give any aid or are the arrangements left to be worked out between the agencies concerned?
7. What are the transport arrangements both with regard to mode of transport and state of seed in the process of transport? The answer to this question may cover transport between the source and your state and transport within your state to point of distribution.
8. Are such transport arrangements ideal to deliver seed in time and without deterioration of quality? If not, please suggest improvements.
9. How is the seed so obtained stored within the state in order to avoid deterioration of quality? Are existing arrangements of storage ideal and adequate?
10. How is seed distributed to cultivators at field level? Is it through the direct involvement of the government or through private agencies or through individuals?
11. What is the quantity of seed which is procured by your state? Is it sufficient to cover the existing area under this crop or does it cover only a part of the area? If so, what fraction of the area under potato cultivation in your state is covered by the above system of procurement?
12. What has been the cost of procurement? Kindly give figures for latest five years.
13. What is the rate at which, seed is distributed to cultivators by your state? Kindly give the figures for the latest five years.
14. Are there any arrangements for official certification or informal tests by which quality of seed is ascertained at the stages of (a) procurement, (b) storage and (c) distribution.

15. Does your state participate in the production of foundation seed?
16. From where do you get nucleus seed for multiplication as foundation seed?
17. How do you ascertain the quality of seed used for multiplication as foundation seed?
18. Which are the places in your state which are used for raising foundation seed and under whose control are they?
19. What are the methods adopted for examining crop and its produce at foundation stage so that these conform to normal standards? Who conducts such examination?
20. How is foundation seed stored? Have you any suggestions to offer?
21. How is foundation seed disposed of for further multiplication and distribution? Is it given to National Seeds Corporation or some other agency? Is any certification test applied at this stage? If so, is the seed labelled accordingly?
22. What are the arrangements for multiplying certified seed in your state? Is there government monopoly or do other quasi-government and/or private agencies also participate?
23. How is foundation seed obtained by the agencies concerned for multiplying as certified seed?
24. Where is certified seed multiplied by the agencies concerned?
25. How are standards maintained during growth of seed crop and in the final produce? Is produce certified by any agency? If so, in which manner?
26. How is certified seed stored? Are existing storage facilities ideal and sufficient? If not, what are your suggestions?
27. How is certified seed distributed among farmers?
28. What are the present handicaps, in your view, which impede the progress of seed production in all the three stages, viz., the nucleus, foundation and certified stages? How should these be removed?
29. Do you agree with the view that certification of nucleus and foundation seed should be the responsibility of the Central Potato Research Institute at Simla, because potato cultivation in these stages is a very highly skilled job and cannot be performed without expert supervision and guidance?
30. Do you agree with the view that certification at certified seed stage should be done by the usual state certification agency and for this

purpose the Central Potato Institute should impart special training to the personnel of the agency concerned?

31. What is the percentage of the existing area under potato in your state which is raised with certified seed? Are there any targets of area and production for your state in this respect? If so, please mention these for the succeeding years.
32. If the entire existing area under potato is to be brought under certified quality seed, what will be the total requirement of seed for your state?
33. Will farmers automatically take to certified seed? If not, how can they be induced to do it? Do you suggest any measures which can serve as impetus specifically for bringing all the existing potato acreage under quality seed? Please detail the measures.
34. Do you feel whether acreage under potato can be increased in your state? If so, at the expense of which crop? To what extent and how will the additional out-turn be utilized?
35. Do you agree that the immediate object should be to bring the entire existing acreage under quality seed and then only attempt for expanding areas under this crop?
36. What are your suggestions with regard to building up suitable organisation for production, storage and distribution of quality potato seed?



APPENDIX II

List of Officials and Organisations, who replied to the Questionnaire and/or provided notes or took Part in the Discussions

Name	Designation	Address
1. Shri U.S. Kang	Director (HVP)	Ministry of Agriculture. (Department of Agriculture), Krishi Bhavan, New Delhi-1.
2. Dr. Mukhtar Singh	Director	Central Potato Research Institute, Simla-1, Himachal Pradesh.
3. Dr. H.B. Patkar	Chief Potato Development Officer	Central Potato Research Institute, Simla-1, Himachal Pradesh.
4. Dr. Hari Kishore	Geneticist	Central Potato Research Institute, Simla-1, Himachal Pradesh.
5. Dr. B.B. Nagaich	Plant Pathologist	Central Potato Research Institute, Simla-1, Himachal Pradesh.
6. Dr. Y.R. Mehta	Deputy General Manager (P)	National Seeds Corporation Ltd., F-44-A, South Extension I, New Delhi-49.
7. By designation	State Agronomist	Directorate of Agriculture, Government of Assam, Shillong.
8. Shri S. Bakshi	Deputy Secretary	Agriculture and G.D. Department (Planning Cell), Government of West Bengal, Calcutta.
9. Shri G.N. Das	Economic Botanist	Rice Research Station, Government of West Bengal, P.O. Chinsurah, Distt. Hooghly.
10. Shri S.N. Sharma	Secretary	Agriculture and Animal Husbandry Department, Government of Bihar, Patna.

Name	Designation	Address
11. Shri Ram Krishan	Director of Agriculture	Directorate of Agriculture, Government of Uttar Pradesh, Lucknow.
12. Shri Yashpal Chandra	Deputy Director of Agriculture (Potato)	Directorate of Agriculture, Government of Uttar Pradesh, Lucknow.
13. Shri Rajendra Nath	District Magistrate	Meerut, Uttar Pradesh.
14. Shri S.S. Rana	Deputy Director of Agriculture.	Directorate of Agriculture, Government of Haryana, Chandigarh-17.
15. Shri Sohan Singh Dhesi	Potato Development Officer	Directorate of Agriculture, Government of Punjab, Ludhiana.
16. Shri B.S. Jogi	Director of Agriculture	Directorate of Agriculture, Government of Himachal Pradesh, Simla.
17. Dr. G.C. Sen-gupta	Director of Agriculture	Directorate of Agriculture, Government of Orissa, Bhubaneshwar.
18. Shri A.G. Khare	Officer on Special Duty	Department of Agriculture, Government of Madhya Pradesh, Bhopal.
19. By designation	Director of Agriculture	Directorate of Agriculture, Government of Gujarat, Ahmedabad-6.
20. Shri W.P. Sole	Director (Seed Cert.)	Directorate of Agriculture, Government of Maharashtra, Poona.
21. Shri A.B. Joshi	Deputy Director of Agriculture	Directorate of Agriculture, Government of Maharashtra, Poona.
22. Shri B.R. Venkataram	Deputy Director of Agriculture (HQ-B&P)	Directorate of Agriculture, Government of Andhra Pradesh, Hyderabad.
23. By designation	Director of Horticulture	Directorate of Horticulture, Government of Mysore, Lalbagh, Bangalore-4.
24. Shri A.V. Antony	Director of Agriculture	Directorate of Agriculture, Government of Tamil Nadu, Chepauk, Madras-5.

APPENDIX III

Area, Production and Average Yield of Potato in Different States of India based on Five Years (1965-66 to 1969-70)

States	Area 000' hectares	Area % of all- India	Produc- tion 000' tonnes	Yield in quintals per hectare
Uttar Pradesh	157.1	31.6	1322.6	84
Bihar	99.6	20.0	855.2	86
West Bengal	78.7	15.8	685.9	87
Assam	39.6	7.9	196.7	50
Orissa	30.3	6.1	354.5	117
Himachal Pradesh	17.8	3.6	64.3	36
Madhya Pradesh	15.9	3.2	148.2	93
Maharashtra	13.6	2.7	56.8	42
Punjab	12.9	2.6	176.9	137
Tamil Nadu	10.7	2.1	82.7	77
Mysore	7.8	1.6	34.0	44
Haryana	3.7	0.7	61.3	166
Gujarat	3.6	0.7	61.6	171
Tripura	2.8	0.6	17.0	61
Rajasthan	1.6	0.3	3.7	23
Jammu & Kashmir	1.3	0.3	4.9	38
Andhra Pradesh	0.6	0.1	2.2	37
Delhi	0.3	0.1	1.4	47
All India	497.9	100.0	4129.9	83

APPENDIX IV
Potato Seed requirement

States	Average area in hectares	Seed requirement (quintals) in the stages of				
		Certified II	Certified I	Foundation II	Foundation I	Breeder
Uttar Pradesh .	157100	3927500	654583	10997	18183	3031
Bihar .	99600	2490000	415000	69167	11528	1921
West Bengal .	78700	1967500	327917	54653	9109	518
Assam .	39600	990000	165000	27500	4583	764
Orissa .	30300	757500	126250	21042	3507	585
Himachal Pradesh .	17800	445000	74167	12361	2060	343
Madhya Pradesh .	15900	397500	66250	11042	1840	307
Maharashtra .	13600	340000	56667	9445	1574	262
Punjab .	12900	322500	53750	8958	1493	249
Tamil Nadu .	10700	267500	44583	7431	1238	206
Mysore .	7800	195000	32500	5417	903	151
Haryana .	3700	92500	15417	2569	428	71
Gujarat .	3600	90000	15000	2500	417	69
Tripura .	2800	70000	11667	1945	324	54
Rajasthan .	1600	40000	6667	1111	185	31
Jammu & Kashmir .	1300	32500	5417	903	151	25
Andhra Pradesh	600	15000	2500	417	69	11
Delhi .	300	7500	1250	208	35	6
TOTAL .	497900	12447500	2074585	345766	57627	9604

NOTE :—The calculations in this table have been made on the following basis :—

- (i) Multiplication ratio of the case of potato has been accepted as 6 on the basis of the CPRI.
- (ii) Although there is a good lot of variation in seed-rate from State to State, a flat rate of 25 quintals per hectare has been accepted on the basis of the CPRI.
- (iii) The figures are factual without making allowance for decay or carry-over.

APPENDIX V

*Performance of Up-to-Date (Indian) and Burma Seed in
Different States (Extracted from the Indian Potato Journal,
October 1960)*

States	Percentage in- crease in yield of Up-to-Date Over Burma Po- tato
Uttar Pradesh	85.04
Bihar	60.71
West Bengal	93.59
Punjab	83.31
Rajasthan	110.90
Madhya Pradesh	137.25
Orissa	146.51
Overall average	94.64

APPENDIX VI

Number of cold Storages required for Certified seed of Potato for stages I and II (i.e. Approved and Certified Stages)

States	Cold storages needed with their approximate capacity			
	Area under potato in hectares	Cold storages at one per 400 hectares	Total certified seed of stages I & II in quintals	Approximate capacity per cold storage in quintals
Uttar Pradesh . . .	157100	400a	4582083	12000
Bihar . . .	99600	250	2905000	12000
West Bengal . . .	78700	200a	2295417	12000
Assam . . .	39600	100a	1155000	12000
Orissa . . .	30300	80	883750	11000
Himachal Pradesh . .	17800	b	519167	—
Madhya Pradesh . . .	15900	40	463750	12000
Maharashtra . . .	13600	40	396667	10000
Punjab . . .	12900	30	376250	13000
Tamil Nadu . . .	10700	30a	312083	10000
Mysore . . .	7800	20	227500	12000
Haryana . . .	3700	10	107917	11000
Gujarat . . .	3600	10	105000	11000
Tripura . . .	2800	7	81667	12000
Rajasthan . . .	1600	4	46667	12000
Jammu & Kashmir . .	1300	3a	37917	13000
Andhra Pradesh . . .	600	2	17500	10000
Delhi . . .	300	1	8750	10000

a—Subject to alteration depending upon the area in high hills.

b—Not needed due to elevation.