List of Research papers published by
Dr.M.S.Swaminathan

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2. ---------- 1950 Wild relatives in potato breeding. Farming 4 : 370-73.

3. ---------- 1951 Notes on induced polyploids in the tuber-bearing Solanum species and their crossability with S.tuberosum. American Potato Journal 28:472-489.

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6. ----------and M.W. Howard 1953 The cytology and genetics of the potato (Solanum tuberosum L.) and related species. Bibliographia Genetica 16 : 1-192.

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MATERIAL FOR THE ADDRESS OF SHRI ANNASAHEB P. SHINDE

It is now widely realised that we have bid good-bye to the era of low yields in our major cereals and millets. In order to have a balanced agricultural production programme and to maintain stability in the relative price levels of different crops, it is important that ~~this situation also happens~~ the barriers to high yields are destroyed in all ~~of~~ our other crops, particularly pulses, oil-seeds and fibre crops. It is hence that the Indian Council of Agricultural Research has formulated a series of All India Coordinated Crop Improvement Projects which aim to bring together scientists working in different institutions throughout our country as well as in different disciplines for the purpose of ~~destroying as rapidly as possible the barriers to high yields in all the other crops,~~ providing the scientific ingredients necessary for high yields. ~~The Indian farmer has~~ Our farmers have now become both yield-conscious and time-conscious. ~~He now wishes~~ They wish to measure his yield and income per day rather than per crop. Therefore, we need as fast as we can to change the architecture and thegrowth patterns of plants like cotton, sugarcane, tapioca and arhar. All these crops have to become ready for harvest much earlier than they do now. Only then the farmer who has invested on inputs like water would be able to get the maximum return.

Increased efficiency ~~of~~ in farming should be the key note of our efforts during 1968. Today, the farmer is able to get a good return even ~~the~~ though the efficiency of farming is low because of the prevailing high prices. In the long run, however, the farmer should be able to get a good income by selling his produce at a price which is reasonable to the urban consumer. This can be done only if the efficiency of farming is greatly improved and the return from the investment on inputs maximised. That there is much scope for doing this is clear from experiments, such as those carried out at the Indian Agricultural Research Institute, which have revealed that in wheat the timing of the first irrigation may make as much as ~~a~~ 1 ton of grain per hectare difference in the final yield, given the same total number of irrigations and fertilizer dose. The rapid transfer of information from the laboratories

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to the farmers, therefore, assumes great significance. It is hence that I am happy that the Special Supplement giving information on some of the new developments in the field of agriculture is being brought out.

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MATERIAL FOR THE MESSAGE FOR THE UNION MINISTER FOR FOOD & AGRICULTURE

1967 will be long remembered in the history of Indian our agriculture as the year when a significant shift from a static to a scientific farming took place. It is, therefore, appropriate that all the leading newspapers of India are bringing out a special supplement to highlight the recent scientific discoveries which have made this Agricultural Revolution possible. It is the widespread interest now evinced by the educated people of our country in agriculture that is responsible for the developments in the rural areas we are witnessing. The press can legitimately claim a major credit for educating the general public on the vastness of potential India's agricultural production potential. How vast this is can be judged from the fact that today in our irrigated areas, it is possible to obtain at least 10 tons of foodgrains per hectare per year by growing two or three crops.

There is little need for
Research ~~has no place~~ in a static agriculture. Conversely, a dynamic agricultural programme can neither be initiated nor sustained without a strong research and educational base. The fruits of the All India Coordinated Research Projects initiated by the I.C.A.R. in wheat, rice, maize, jowar and millets are seen in the form of the high yielding varieties and hybrids which have been produced and distributed with commendable speed. In fact, there are few parallels in the world for the accomplishments made in our country in the last few years in the field of agricultural research. If the Agricultural Revolution, which has now been initiated is to be carried forward to its logical conclusion, namely making India not only self-sufficient both quantitatively and qualitatively in food, but also make agriculture transforming our primary industry, we have to support and understand utilise the work of our agricultural research institutions in a far greater measure than we have done so far. I, therefore, welcome the issue of this Special Supplement which to me is a fitting finale to this year which that has

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brought in new hopes and new possibilities on the food front.

(Jagjivan Ram)

Wheat varieties for drought condition

In India wheat is grown over 33 million acres of land, out of which about 10 million acres are under irrigation. Thus major wheat growing areas of the country are to face chronic drought problem due to vagaries of rain every year. No wonder the average yield figure for the whole country is as low as 618 lb/acre. However with the introduction of high yielding dwarf varieties of wheat and other crops it has been possible to make a major break-through in agriculture in irrigated areas, resulting in the emergence of an advanced sector of agriculture led by a new class of "Gentleman farmers", a phenomenon described by some people as "agricultural revolution from the top". This movement is however confined to wet areas served by canal and/ or tubewells. The vast areas of the country constituting 1/3 of the cultivable land unsuitable for tapping underground water is still neglected. The way forward is scientific dry farming in these arid areas, predominantly under small peasants. It is, therefore, of utmost national importance to intensify research for developing suitable wheat varieties adapted to drought condition.

Work done in the past has brought a few good varieties like K65 (U.P.), D134(Rajasthan), Hy.b.65(M.P.), A206(Gujrat), N.P.858, N.P.860 etc. Other promising varieties under test are N4999, N1200, N-3199(Maharashtra), A-1-2-3(Gujrat) and H.D.1469(I.A.R.I.). The yield range of most of these varieties in test plots varied from 7 to 17 Q/hect. Most of these varieties have excellent grain quality but are more or less susceptible to rusts and need further improvement. Among the new high yielding introductions, S227 has shown better drought adaptation compared to other Mexican dwarf wheats. It is obvious that in order to raise the yield level, drought resistant genes are to be transferred in the high yielding Mexican and other varieties. For this intensive ~~Search~~ Research for drought resistant genes are to be made all over the world to build such a gene pool in India for our future work. Use of low temperature (Vernalisation) and light treatment will be necessary for a successful crossing programme. Majority of drought resistant lines developed by countries like Canada, Australia, U.S.S.R. etc. are susceptible to disease and use of resistant donor parents in the crossing programme would be necessary. Both aestivum and durum sources as well as other species need exploration. ~~In the conventional breeding method~~, -.....2.

In the conventional breeding method it is the usual practice to grow segregating progenies under drought/rainfed condition for visual selection of best lines and progenies. It is, however, difficult to maintain large plant population under limited moisture and the visual selection is also subject to more environmental bias than under irrigated favourable condition. Thus the genetic advance under such conventional method is slow. Use of more efficient breeding methods should, therefore, be explored to facilitate screening of superior genotypes adapted to moisture stress.

Work done at I.A.R.I.(Roy & Murty,1967) throw some interesting light in this direction. This investigation indicates that selection for developmental traits such as synchrony of tillering under favourable environment can result in strains suitable for wide adaptation including areas of moisture stress.

The dwarf wheat varieties have in general shorter coleoptile length and is not suitable for deep sowing. The emergence difficulty created by deep sowing under limited moisture and by increasing use of semi-dwarf Mexican and other exotic germplasm in our wheat breeding programme has made it imperative to screen at laboratory large number of segregating generations for eliminating short coleoptile lines. Some associated seedling characteristics may help selection of superior lines through laboratory and/or field tests. Based on these findings a new selection technique for breeding drought adapted varieties has been preposed (Roy,1967, unpublished) which is under test.

Growth of root is the most important study for determining drought adaptation. It is, however, very difficult to make root study of the standing plant by excavating the soil. Varietal differences independent of seed weight in respect of primary roots have been noticed (Roy & Yadav 1967, unpublished) in wheat. Indications are that it may be possible to develop a selection index based on seedling root development and eliminate inferior lines with poor root under laboratory tests. Association of seedling root development with subsequent field performance is under investigation.

.....3.

More data are needed to find out proper agronomic practices (viz. date of sowing, seed rate, spacing, fertilizer dose etc) and moisture conservation measures. It has been found that application of 20 lbs nitrogen and 20 lbs. P_{205} before sowing usually helps a wheat crop under rainfed condition. It is quite possible that using some of the Mexican varieties as high-yielding base and transferring in them some of the characteristics of drought adaptation, it will be possible to evolve varieties which will respond to more and more fertilizer application even under rainfed condition. A beginning can be made in this direction by using S.227 which is likely to respond to 40 lb. or more of nitrogen and P_{205} under rainfed condition.

LIST OF GOVERNMENT OF INDIA HOLIDAYS FOR 1973

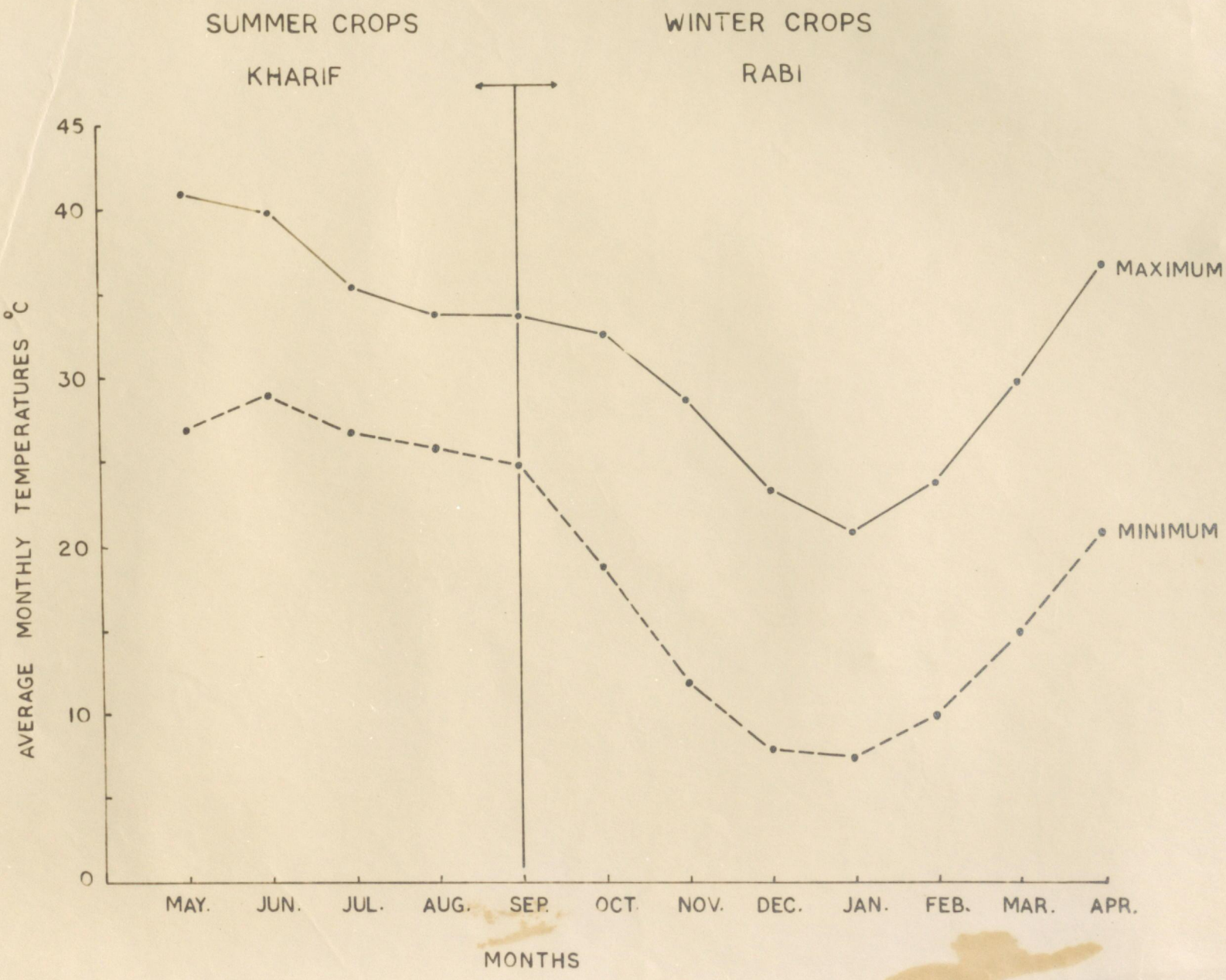
Holidays	Date on which these fall	Date of the week
1. Id-ul-Zuha	16th January	Tuesday
2. Republic Day	26th January	Friday
3. Muharram	14th February	Wednesday
4. Mahasivaratri	3rd March	Saturday
5. Holi	19th March	Monday
6. Ramanavami	11th April	Wednesday
7. Good Friday	20th April	Friday
8. Buddha Purnima	17th May	Thursday
9. Independence Day	15th August	Wednesday
10. Janmastami	21st August	Tuesday
11. Mahatma Gandhi's Birthday	2nd October	Tuesday
12. Dussehra	5th October	Friday and
13. -DO-	6th October	Saturday
14. Diwali	25th October	Thursday
15. Id-ul-Fitr	29th October	Monday
16. Christmas day	25th December	Tuesday

Note: This list does not include Guru Nanak's Birthday (10. 11. 1973.) which falls on a Second Saturday.

RESTRICTED HOLIDAYS FOR 1973

1. NewYear's Day	Ist January	Monday
2. Guru Gobind Singh's Birthday	11th January	Thursday
3. Guru Ravi Dass's Birthday	17th February	Saturday
4. Cheti Chand (Chaitra sukladi/udi/ Padva/ Ugadi)	4th April	Wednesday
5. Vaisakhi	13th April	Friday
6. Milad-un-Nabi	14th April	Monday
7. Hazarat Ali's Birthday	13th August	Monday
8. Rakhi Bandhan	14th August	Tuesday
9. Vinayaka Chaturthi	31st August	Friday
10. Dusshera (Ist Day)	4th October	Thursday
11. Maharishi Valmiki's Birthday	12th October	Friday
12. Jamat-ul-Vida	26th October	Friday
13. Goverdhan Puja	26th October	DO
14. Guru Tegh Bahadur's Martyrdom Day.	30th October	Tuesday

Note: This list does not include Pongal (14. 1. 73.) Holi (18. 3. 73) Mahavira Jayanti (15. 4. 73), Onam (9. 9. 73.) and Bhai Duj (28. 10. 73.) which fall on Sunday.


SUMMER CROPS
KHARIF
WINTER CROPS
RABI
AVERAGE MONTHLY TEMPERATURES °C
45
40
30
20
10
0
MAXIMUM
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MAY.
JUN.
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JAN.
FEB.
MAR.
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MONTHS

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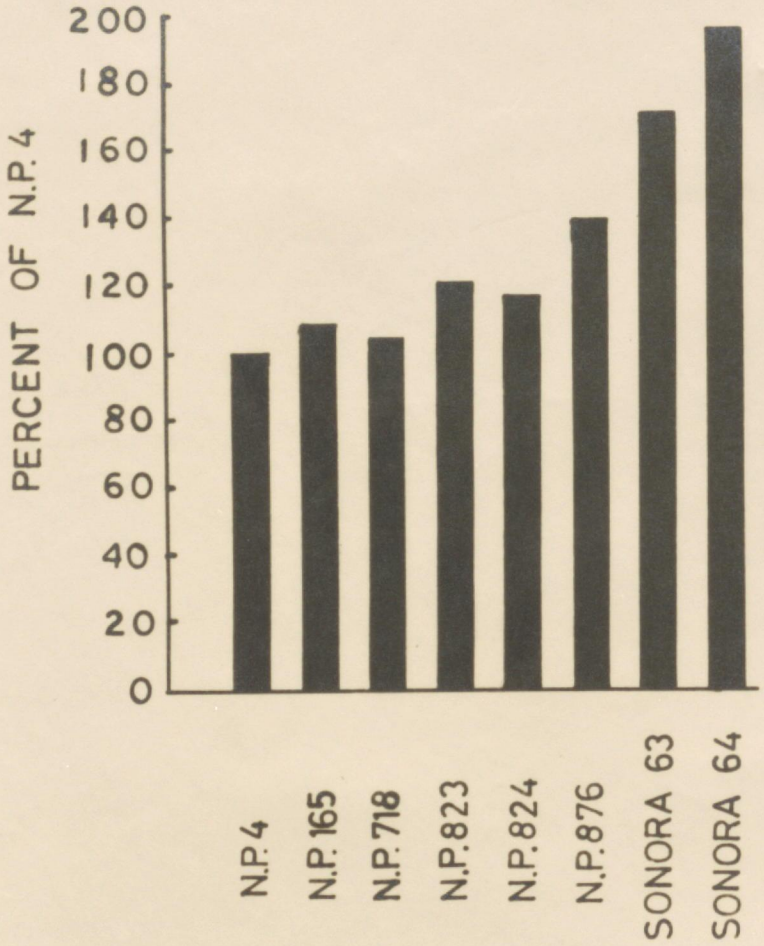

Tropical Agricultural Research Program

July, 1967

Agriculture, Forestry and Fisheries Research Council

Ministry of Agriculture and Forestry

Government of Japan

TROPICAL AGRICULTURAL RESEARCH PROGRAM

1. Basic Concept of the Program

Tropical regions of the world, particularly the Southeast Asia, are lavished with precipitation and light vitally essentials to agriculture. Hence the region has been much more thickly populated than any other regions of the world from ancient time and the population is on a salient trend of remarkable increase in recent years, due partially to the post-war improvement of sanitary condition. And such an unbalance in population increase and food production is causing a serious bottleneck in the economic development of the region.

The agriculture of the Southeast Asian countries still occupies a very important sector of national economy in spite of the strong efforts of these countries towards industrialization. In order to achieve the objective of industrialization, however, the idea that agricultural development will serve as the jumping board is gaining general support. Prior to emphasizing the important role of agriculture as a supplier of raw materials to industry, improvement of food supply in the region should be regarded as more urgent and important in view of the salient trend of population increase in the region as stated above.

The worldwide increase in the demand of agricultural commodities other than food grains accompanied with improved living standards in many countries including Japan, is expected to form a potential market to the agricultural production in Southeast Asian countries if it is rationally improved and intensified. Accordingly, the improvement of agriculture in Southeast Asian countries will contribute further to the economic development of the countries in the region.

Japan is very closely related to tropical Southeast Asian countries because of her geographical and economic environments. This is particularly true in the case of agriculture; a commom and mutual similarities can be found

between those countries and Japan, as to the kind of crops cultivated, dominancy of small peasant farming, and agricultural technology as well as managements developed for this type of farming.

In the light of such a situation stated above and because of expected important role of agricultural technology in agricultural development of Southeast Asian countries, Ministry of Agriculture and Forestry of the Government of Japan desires very much to promote international cooperation in the field of agricultural objective to contribute in some measure to the more enhanced improvement of agricultural technology and the further advancement of the agricultural research standards of Southeast Asia.

2. Scope of the Program.

a) Geographical region covered. Tropical region covers a very large part of the world. However, as stated above, the tropical region of Southeast Asia including India, Pakistan and Ceylon is provisionally considered as the main area to be covered by the Program in the light of their economic and geographical relations to Japan. However, in view of the nature of the researches, the findings obtained through the Program are expected to be applicable widely to other tropical regions.

b) Fields of researches involved. As for agriculture, the fields of research will be set so as to cover those crops extensively cultivated by small holders and sharing large sectors of agricultural production. The same is aimed with animal industry and the researches will be conducted on animals with larger herds and larger production.

However, Japan is not able to launch immediately on all research sectors stated above because of the shortage or lack of research scientists and research findings so far accumulated domestically and utilizable to the promotion of researches under tropical condition. So, as for agriculture, she hopes to take up food crops with the first priority on rice and researches will be carried in such phases as breeding, agronomy, soil and fertilizing, protection and water utilization.

As for animal industry, veterinary science is expected to contribute to ensuring the stability of animal production under tropical condition and accordingly will form a major subject of the research under the Program.

Furthermore, in order to further promote the tropical agriculture, food technology is being remarked as a very important field of research and the Program will include this field rather immediately.

In addition to the fields of research mentioned above, it is intended to include in the Program those researches related with tropical crops and their products of importance in Southeast Asia but Japanese agricultural research officers have just poor knowledges thereof. For the time being this sector of research will be limited and will start from the training of research officers.

3. Implementation of the Program

a) Selection of Research Project. Since the program has the nature of international cooperation in the phase of agricultural development, the subjects of research to be adopted under this Program should have the nature of mutual concern and interests of both Southeast Asian countries and Japan. Selection of research subjects shall be made through the negociation of agricultural research authorities concerned on both sides.

b) Investigation of Actual Situation of Tropical Agriculture. In order to clarify the confronting problems in the research phase of tropical agriculture and to contribute to the establishment of research subjects, the exchange of discussions and opinions between related research institutions and competent administrative agencies for agriculture shall be made by sending Japanese mission. The investigation also involves the survey on actual agricultural conditions on-the-spot and collection and analysis of various published and unpublished informations and materials.

c) Dispatch of Overseas Research Officers. In order to carry out a cooperative research on the subjects deemed as mutually beneficial through the investigations mentioned above, the Research Council of the Ministry of Agriculture and Forestry, Government of Japan, hopes to dispatch and station the overseas research officers

at appropriate research institutions in Southeast Asian countries. The term of service of the overseas research officers is set, as a rule, two years or more.

d) Interchange of Knowledges Related with Tropical Agriculture. In order to contribute to raising the research standards for tropical agricultural techniques, symposia shall be held on special subjects by inviting competent research officers to the panel from Southeast Asian countries.

Besid above, to ensure a close liaison and mutual exchange of opinions on the promotion of the Program, competent research supervisors shall also be invited to Japan.

e) Expenditure. All expenditures required for the activities assumed by Japanese side shall be fully paid by the Research Council of the Ministry of Agriculture and Forestry, Japanese Government.

4. Cooperation and Assistance Expected to Counterparting Countries.

In order to expect efficient implementation of the Program, the Ministry of Agriculture and Forestry of the Government of Japan is requesting for the following cooperation and assistance of the counterparting countries.

a) Use of Research Installations and Instruments Available.

Although overseas research officers may carry necessary scientific equipments and instruments from Japan, it is requested that overseas research officers be permitted to use experimental fields, laboratory space and the equipments and instruments sparable at the institutions they are stationed. The cost for consumables is paid by Japanese side.

b) Appointment of Counterparting Research Officers. The research subject of overseas research officers shall be determined under consultation between two parties, which is of mutual interest and deemed as significant. Thus, the research should preferably be carried jointly. In order to ensure the smooth and efficient operation of research and to achieve more profitable results, it is desired that counterparting research officers be appointed to carry on the research jointly.

c) Assistance to Obtain Living Quarter. It is requested that the assistance be rendered to overseas research officer to obtain a living quarter. The cost of living quarter will be paid by the overseas research officer.

d) Exemption from Tax and Impost. The Ministry of Agriculture and Forestry will send money to overseas research officers to cover the costs of field trip, experimentation and other research activities. The Government will also send materials or have him take with him. If the money and these materials come under import duty or taxation, it is requested that measure be taken to exempt from such a duty, etc.

e) Assistance on Entrance Visa. The term of office of overseas research officers is two years or more as a rule. However, during the said period, measure is provided for him to return to Japan twice a year, once at the end of Japan's fiscal year, March, and other in case of necessity to report and liaison on his research. Accordingly, it is requested that assistance be rendered on his permit in leaving and entering the country.

f) Others. It is further requested that assistance and cooperation be given to overseas research officers on his field investigation and in his aquisition of necessary materials for carrying out the research.