

**PRELIMINARY SURVEY REPORT**  
**ON**  
**THE INDO-JAPANESE JOINT AGRICULTURAL**  
**RESEARCH PROGRAM IN HORTICULTURE**

**February 1971**

**Overseas Technical Cooperation Agency**

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## Contents

	Page
I. Purpose of Survey .....	1
II. Itinerary of Survey Mission .....	1
III. Records of Survey .....	2
3-1 Background of India's Request for Joint research in horticulture and view of the Mission .....	2
3-2 Anticipated Subjects of Joint Research .....	7
3-3 Policy of promoting Joint Research .....	17
IV. Resumé .....	18

## I. Purpose of Survey

The purpose of the Fundamental Survey Mission For Japan-India Joint Research Project (Horticulture) was to study the possibility of joint research cooperation in the field of horticulture in compliance with strong request of the Indian Government, conduct preliminary survey and consultations with researchers concerned with fruit gardening and horticulture for mapping out a master plan for the project and probe into the background of India's request and comprehend details of the request.

## II. Itinerary of Survey Mission

From November 21 to 24, 1971: New Delhi

- Japanese Embassy in New Delhi (Consultations concerning the survey)
- Ministry of Food & Agriculture, the Government of India (Consultations concerning survey plan)
- Indian Agricultural Research Institute (Briefings were made on general condition of horticulture in India by the directors of Fruit Gardening, vegetables and Processing Departments respectively and the Mission was conducted on a study inspection processing facilities and experiment farms).

From November 26 to 29: Observation tours of hilly horticultural farms in the northern area of U. P. State.

- Baradari Farm, Ruderpur, Nainital, U. P.
- Government Hill Fruit Research Station
- Vegetable-seed Production Nursery
- Directorate of Fruit Utilization U. P. Drug Research & Production Farm.
- Surinagar Development Block Office

° Surinagar (Garhwal) Directorate of Fruit Utilization U. P.

November 30, 1971: New Delhi

From December 1 to 6, 1971: Observation tours in Bangalore and in the Coorg district of Mysore State

- ° University of Agricultural Science
- ° Institute of Horticultural Research (ICAR) Hessaraghatta
- ° Indo-American Hybrid Seeds Farm
- ° Saraswatti Farm
- ° Department of Horticultural Farm, Madur
- ° District of Horticultural Office, Mandya
- ° Extension Horticultural Office
- ° Department of Agriculture Office, The Research Assistant Scheme for Production of Tall x Dwarf Seed Coco-nut
- ° Coorg Orange Growing Cooperative Society Ltd., Tithimathi-Coorg
- ° Citrus Die-back Research Station, Gonikopal, South Coorg
- ° Government of Mysore Department of Horticulture, Horticultural Farm, Fruit & Spices Development Chethalli, Coorg District, Mysore State

From December 7 to 16, 1971: New Delhi

- ° Japanese Embassy (Consultations)
- ° Ministry of Food & Agriculture (Discussions with Deputy Minister T. P. Singh and other officials)

### III. Records of Survey

3-1 Background of India's request for joint research in horticulture and views of the Mission

#### A. Fruit Production

1) India places great hope on the joint research programme and is particularly interested in the promotion of fruit production. This is mainly due to the policy of the government to secure sufficient production of fruit in proportion to the growth of her population from the standpoint of nutrition. The Indian Government has so far been making efforts to increase fruit production under the fourth five-year-plans by setting the goal of fruit consumption at 2 ounces per capita per day, but the goal has not yet been attained.

The failure to attain the object is attributed to the fact that in the past emphasis was placed on the production of pulse crop and less priority has been given to horticulture in agricultural administration, that there has been limit in new plantation in lowland area and that there has been a major obstacles in marketing system.

2) India, having attaining the object of pulse crop production in almost every part of the country and is now ready to shift to horticulture with the aim of expanding production of high-class food-stuffs, shows a strong tendency to model its horticulture after Japan. This is because India still lags behind other countries in the production of temperate fruit which assumes an important position in the world's fruit market despite India's earnest longing for it, not to speak of tropical and sub-tropical fruit, but has strong enthusiasm for promotion of temperate fruit production backed by the consciousness that there is the temperate zone in India where deciduous fruit trees can be grown. Besides, it seems that India feels the scale and location condition of fruit industry in Japan are worthwhile for study in planning the plantation of deciduous trees in the northern hilly district and that India is impressed by the fact that the technology of fruit

production in Japan is founded on the use of medium size agricultural implements and various types of materials.

3) The Indian people have an excellent ability to make plans and therefore the planned expansion of fruit production is aimed not only to meet the nutrient requirement of the nation and reduce fruit imports from abroad but to expand fruit exports to other countries. For the export of banana, in particular, attention is focused on Japan as a promising market.

Such facilities as fruit research institutes and model farms which are directly related to the extension of fruit production are well arranged and maintained. It may be said, therefore, that the basic structure for the promotion of fruit production in India is completed to a certain extent. Under present conditions, however, there is no systematic communication between the farmers and these organizations. Besides, it seems that the research and experiments are still limited to the basic study of fruit production and have not reached the level on which specific problems presented by the farm are handled.

4) The attitude of the Indian authorities toward the joint research project is such that they are inclined to attach importance to the promotion of deciduous fruit production in the temperate zone of the northern hilly area and this is particularly true in the research cooperation with Japan. Although it is difficult to draw any inductive conclusion since the recent preliminary survey trip was restricted to the northern U. P. State and the southern Mysor State because of the India-Pakistan conflict, these two regions are in striking contrast each other from the standpoint of Indo-Japan joint research for horticulture as far as the recent survey is concerned.

(1) The northern region is the so-called temperate zone as referred to by the Indian people, where the authorities plan to promote production of peaches, plums, apricots, pears and cherries centering on apples as a regional industry. This region, however, is very rugged in topography and shows climatical conditions that are quite different from those of Japan. It may be said, therefore, that the region is under such condition that it is difficult to expect smooth development of the region unless the Government take drastic measures for improvement of distribution channels instead of improving fruit production techniques. It is essential to the planning a joint research project for this region, therefore, to ascertain the Governments intention for definite development programmes and provide a field survey for a certain period of time to determine the feasibility of the proposed joint research project.

Judging from the present state of the region, however, there is a possibility that more importance might be attached to technical cooperation to strengthen the foundation of fruit production in the region than to the limited joint research and that the joint research programme of a small range might be crushed under heavy pressure. For the implementation of any joint project in this region, therefore, it would be more fundamental and effective to apply Japan's technology to the practical use in the field such as the preparation of foundation for orchards, improvement of production technique and improvement of packing and shipping techniques from the standpoint of technical cooperation from the beginning. This is probably what the Indian side is looking for. For this purpose, it will be necessary at first to send a group of experts on fruit production to India and the joint research



scheme may be considered only after these measures have been taken.

As it is said that a West Germany sponsored project is already under way in the neighboring region under the integrated plan ranging from production to marketing and processing with the help of two German experts on horticulture.

If Japan is to extend its cooperation to the project in this region, the results will be evaluated in comparison with those of the project aided by other foreign countries. It is very important for Japan, therefore, to extend its cooperation to the said joint research project on a considerably large scale and with the firm determination.

(2) For the southern state of Mysor, the India authorities expect the cooperation from Japan in the research for production of fruit centering on the mandarines and grapes. There is an opinion that India does not need Japan's cooperation for research on citrus fruits because they are classified as sub-tropical fruits. However, India is now introducing Satsuma orange varieties from Japan and has strong attachment to it. It seems that they are looking to Japan for cooperation in relation to this point.

This region is provided with excellent facilities including the Institute of Horticultural Research, regional research and experiment stations and cooperative farms. Besides, as the natural and cultural environments of this region are very favorable and easily adaptable to the Japanese researchers, the start of the joint research project at a relatively early stage is considered possible. Judging from the fact that Japan's achievements

in the research on citrus fruits originate mainly from the research on Satsuma orange, it will be advantageous to base the planning of joint research for this region on the introduction of Satsuma orange which is highly recommended by the Indian side and on the project associated with its production to be in an advantageous position as Japanese researchers and step into the research on other citrus fruits, production of which might help form foundation for regional development.

As the greater part of grapes raised in this region is of European origin and their variety is different from that of the grapes in Japan, no effective results can be expected from the joint research on their production technique. However, as grapes are very sensitive to the environment, they are a good material for physiological study. In this region where the repetition of vegetation period is seen at least twice a year through dormant period by pruning, a greater benefit can be expected from the joint research.

### 3-2 Anticipated Subjects of Joint Research

From the analogical inference of the above discussion, the priority subjects of the proposed joint research in the two fruit production areas covered by the current survey may be selected from the following.

#### 1) Northern Region (Deciduous fruit production area)

##### (1) Establishment of Fruit Orchard

In planning the development of this region as a central production area of deciduous fruits in the future, it is essential to make a careful study as to how the local condition should be incorporated into the development technique based on the existing

technique in Japan in order to develop standards which match local conditions and which are backed by the complete basic facilities. The standards should include systematic arrangement of farm roads, improvement of terrace, establishment of windbreak forests, irrigation and chemical spraying equipment and the use of small agricultural implements for sloped farmland.

(2) *Physiology and ecology of fruit trees*

Though this region is generally referred to as a temperate zone, there is quite a difference between this region and Japan in the climatical factors. Therefore, the vital importance in the extension of fruit production in this area will be to clarify the physiology and ecology of fruit trees in the comparison of the data obtained in Japan while referring to the data already studied at the local research institutes. It will be specially important to make a study on the plant dormancy, physiology of the blooming phase, waves of physiological fruit drop, and some factors which exert influence on the fruit quality. Such a study will prove to be very useful in introducing new varieties.

(3) *Propagation of fruit trees*

Propagation of fruit trees is essential to the formation of a fruit production area. As Japanese people are skillful in the efficient "vener-grafting", it will be necessary to attempt the research on the stock selection and extension of grafting while comparing it with the customary bud-grafting practiced in this region. It will also be necessary to promote a project for establishing a nursery center at the specific location within the region at the same time.

(4) *Training and pruning*

Japan has advanced techniques in training and pruning of

fruit trees. Close pruning is not necessarily a high level technique of fruit production, but under present conditions, there seems to be room for further study to establish a training and pruning method in relation to the physiology and ecology of fruit trees. In particular, restriction of fruit bearing through pruning is considered very important to realize production of fruit of an optimum size. In introducing a pruning technique it is very important to plan harmony and coordination with the existing pruning and training trial programme.

(5) Plant protection

Plant protection include such measures as soil preservation at sloped orchards, disease and insect control and measures against climatical factors and natural disasters. In this region, contrary to Japan, annual rainfall concentrates on the specific period of the year and there is a little fluctuation of temperature through the year. It is essential, therefore, to apply stricter standards in the study of the above-mentioned measures.

(6) Fertilization management

Research on fertilization with the aim of establishing standards of fertilizer application is being carried out in this region as a matter of course. It is desirable, however, to make the research on fertilization more efficient through the use of lysimeters and isotope. It is also advisable to consider introduction of such advanced techniques as improvement of fruit bearing rate by means of flower visiting insects and chemical thinning for improvement of fruit quality, which are widely in use in Japan.

(7) Packing and Transport

As this region is a remote place which depends on a single

road, considerable damage to fruit is expected during the transit over a long distance. Therefore, unless appropriate packing materials are available in the region, such measures as the improvement of transport crates and packing method and use of efficient packing materials by importing them from foreign countries, if necessary, must be taken to deliver quality fruits to the market as essential part of fruit production in the region. As for transport method of fruits, it is said that high-ranking officials of the Ministry of Food and Agriculture on visit to Japan in 1971 highly admired the method of carrying tangerine by means of cable conveyer in Shizuoka Prefecture. Such a method should be given due consideration as one of the subjects for substantive research.

## 2) Southern Region (Citrus fruit production area)

### (1) Propagation of citrus fruit trees

The main citrus fruit trees grown in the southern Deccan plateau, Mysor State are loose skin citrus fruits. Experiments on the stock of these citrus fruit trees are being carried out in the region on a large scale and under careful control, which cannot be expected in Japan.

It will be important, therefore, to avoid this field in the initial stage of the proposed joint research project and concentrate effort on the research on the propagation of trees by means of grafting while introducing the stock of the much demanded trifoliolate orange from Japan and proving the technique of raising seedlings of Satsuma orange in the interest of both the Japanese researchers and the Indian side to avoid unnecessary competition. Introduction of Satsuma orange trees of the Japanese variety as scions as well as the stock will also be beneficial to them. It is the position of the Japanese Government to continue such

a study in India by establishing a detachment of a Japanese research institute and assigning Japanese researchers to the detachment on rotation system. Opposition to the idea of producing Satsuma orange, a speciality of Japan, in a foreign country is an indication of narrowminded concept and instead the attention must be paid to the benefits derived from the research in India which is advantageous to the fruit industry of Japan.

Besides, India is a treasure-house of citrus fruits and provides Japanese researchers with very interesting subjects in the science of classification. Moreover, there are many among the Indian scholars and researchers who specialize in this field. Therefore, it is highly probable that the Japanese researcher will be provided with an opportunity to introduce the variety which might be useful for breeding late maturing citrus fruit in the course of the proposed joint research.

## (2) Training and pruning

Die-back of citrus trees has become an issue in this region and necessary measures are being taken by specially designating an experiment farm to cope with the die-back. It was felt that the die-back might be related with training and pruning to some extent. In this region trees are given natural form training and moreover, the position of lower branches is very low with the position of root grafting being so low that it is virtually buried in the ground. There is a possibility, therefore, that the technique used in Japan for training and pruning might provide a hint for the improvement. As the Japanese experts have confidence in their technique of training and pruning, it will encourage the Japanese expert to emphasize this point in participating in the joint research and good results can be expected from their participation.

### (3) Improvement of production method

The main point of the improvement of citrus production method in this region seems to be placed in the improvement of quality. Although fertilizer tests are being conducted naturally, introduction of new test equipment and materials will further promote the efficiency of the experiment and research. As there is still room for research in such fields as the relationship between the selection of stock and pruning and quality of fruit, maintenance of the optimum fruit shape by application of new materials of various types and higher concentration of fruit juice, the joint research with the India counterparts will be carried out without friction.

### (4) Disease and pest control

Control of virus diseases is one of the subjects for study demanded by the Indian side. This is the question not only in India but the world over. As the Miyakawa Satsuma orange, particularly its apogamy strain, is the variety with the least virus infection, there will still be sufficient room for research cooperation in the field of virus diseases by comparing the results of research with those of the above-mentioned Japanese variety. On the other diseases and insect pests, there must be the establishment of a plant protection method with application of safe agricultural chemicals as in the case of Japan as a matter of course, and it is expected that the research on insect control and plant protection through cultivation method conducted in India will contribute to the citrus fruit industry in Japan to a considerable extent.

As India is the center of origin of citrus fruits, there is a possibility that there might be found a potential natural enemy of citrus trees which has not been encountered in Japan.

(5) Mechanization of orchards

Mechanization of orchards in India is different in concept from that in Japan where mechanization has been introduced as part of labour saving measures. As the Indian side desires to introduce machinery to replace part of the existing hand work to promote production efficiency, the machinery to be introduced must be of the medium and small size so that the labour and machinery can coexist and go side by side. As to the type of machinery suitable for use in India, study and survey by experts on agricultural implements are awaited.

B. Vegetables

It seems that the Indian side attaches more importance of the proposed joint research project of fruit production than to vegetable production. The only conspicuous point in the proposal made by the Indian side in relation to vegetables was seed production for temperate regions. During the observation tour of the Mission, production of vegetables was observed only as a second importance.

This does not mean of course that the Indian side is less enthusiastic in vegetable production. It is understandable that they are more inclined to ask for cooperation from Japan in seed production which is the basic requirement for vegetable production in that part of the world because they are too conscious of the fact that the region is the temperate zone when considering Japan as the production area of vegetables. It is true that the Indian authorities are well aware of the fact that the seed production in Japan is backed by many excellent variety of vegetables and that the majority of them are the results of cross-breeding. They are paying special attention to the numerous number of F<sub>1</sub> variety in Japan from a technical point of view.

In the field of vegetable production, therefore, it will be



appropriate for Japan to extend its cooperation in the research on breeding of improved variety and seed production as requested by the Indian side. The proposed joint research project centering on seed production may evolve as follows.

(1) Introduction of temperate vegetables

As there is a number of summer season vegetables raised in Japan that were originated in the tropic zone, it is very probable that many of them can be produced in India by selecting the variety or by cross-breeding. Since the introduced variety must be examined for its adaptability to the region from a physiological and ecological point of view. If such a function is assigned to the Japanese experts who are well familiar with the characteristics of the said variety, it will contribute greatly to the selection of optimum variety. Exchange of seeds and seedlings between the two countries does not remain only in the joint research but provides a basis of mutual understanding between the two countries. In this context, vegetable seeds are considered most appropriate as they are readily available.

(2) Establishment of seed production technique

Seed production has aspects which are different from the ordinary vegetable production. Even when an improved variety is found among the vegetables imported from foreign countries propagation of the variety requires the establishment of special seed production techniques. Seed production techniques of Japan are highly evaluated in India and the joint research in this field is highly hoped for. The subjects for study which are conceivable under the project are physiology of flowering, discovery or introduction of male steril pedigree for breeding  $F_1$  variety or development of triploid hybrid.

In Japan there are a number of researchers specializing in this field in the government organizations, but nursery companies show rather excellent achievements in this field. The nursery companies in Japan show a tendency to shift their seed production activities to foreign countries because of the rising labour cost in Japan. In Taiwan, for example, seed production for a Japanese nursery company is now under way in the form of development import system. Some nursery companies in Japan are prepared for business tie-up with the Indian partners if the seed production is practical in the suitable location in India and have already conducted a survey in India to found out the possibility of this undertaking on their own initiative. Therefore, research on seed production in India by private sectors on commercial base will also be possible. As the private enterprises must pursue a profit to the end in such an event, business tie-up with Indian concerns must be planned carefully and on the basis of mutual understanding so that the seed production in India may serve as a medium for promoting seed production technique in India.

### (3) Improvement of production technique

There seems to be still room for improvement of quality of vegetables in India as compared with Japan though it cannot be said definitely because there is a wide difference between the two countries in the taste of the people and use of vegetables. Improvement of quality depends much upon breeding and improvement of production technique.

Partly due to the special necessities that nursing of seedlings must begin in the low temperature, Japan has adequate facilities and advanced technique in nursing seedlings. There will be sufficient room for research cooperation with Japan's experience and

stock-pile of accomplishments in this field. An example of Japan's latest accomplishments in the research on vegetable production is the technique of using stock for production under low temperature and for evading diseases and insect pests. Japan's cooperation other fields such as the establishment of agricultural standards, particularly of fertilizer application standards, and the standards for plant protection through application of harmless agricultural chemicals by introducing new research equipment and materials will also be possible. On the other hand, it is essential to conduct a market survey on vegetables in the urban area.

In India efforts are being made to secure two ounces of fresh fruit for per person per day from the standpoint of nutrition for the people under the programme set forth by the Government.

As such vegetable fruits as mask melon, cantaloup, strawberry and watermelon may be regarded as fruits and their production can be accomplished in a relatively short period of time, it is considered appropriate to include these vegetables in the category of fruit as part of sources of nutrients for the people.

### C. Flowers

Joint research on flowers has not been brought up by the Indian authorities as the matter of urgency mainly due to the fact that the taste and interest of the general public in India in flowers are directed to the tropical and sub-tropical flowers. However, the public has strong taste for chrysanthemum and rose as far as New Delhi is concerned. As the chrysanthemum has made unique development in Japan, introduction of such varieties as large and small flowered chrysanthemum to add to the popular medium size chrysanthemum in India will provide an opportunity for Indo-Japanese joint

research. Other flowers which might be introduced for joint research are such temperate flowers as camellia, rhododendron and other flowering shrubs of various types.

As for the designing of Japanese gardens which has been proposed by the Indian side, it must be said that building the Japanese garden is a sort of vogue over the world and there are a number of the so-called Japanese gardens in various Asian countries as well as Western countries. As much enthusiasm is seen for the research on the Japanese garden in the Institute of Horticultural Research (ICAR) in Hesaraghatta, Japan's cooperation in this field will be readily available. If an authentic Japanese garden is built at an appropriate site in the northern temperate zone, the Japanese garden may create a boom and become a tourist resource, thus helping promotion of understanding Japan. The Japanese garden built in the region can also play a role of the temperate botanical collection center and will stimulate the production of temperate fruits and vegetables which will be planned for the neighboring area as well as the production of flowers and will go a long way toward the advancement of research on horticulture in India.

### 3-3 Policy of promoting Joint Research

The discussion so far has been centered on the ideal pattern of the joint research in the field of horticulture in India conceived by the Survey Mission within the framework of the current survey. In actuality, however, the Survey Mission observed only a portion of horticulture in India and therefore no inductive conclusions have been reached. It will be necessary, therefore, to make a further study on this matter by sending experts on horticulture to the horticultural districts which have not been covered by the current survey in such regions as Assam, Meghalaya, Punjab and Himachal Pradesh. As the Indian side is determined to go ahead

with the undertaking mainly with their own efforts regardless of the outside cooperation, there is no possibility that their policy will change greatly depending on the movement of Japan. There is sufficient time for Japan, therefore, to make a study as to the most effective way in extending her cooperation upon careful evaluation of the situation in India through field survey and investigations.

It is hoped that the next survey mission for horticulture in India include at least two experts in each field of fruit, vegetable and flower and are allowed sufficient time to remain at the key site for several days to make a detailed study.

#### IV. Resumé

- 1) The purpose of the current preliminary survey mission for Indo-Japanese joint research (Horticulture) was to explore the feasibility of joint research in the field of horticulture as a step toward mapping out a master plan of the project.
- 2) The survey covered a period of 28 days from November 21 to December 18, 1971. Due to the Indo-Pakistan conflict which flared up just then, the originally scheduled observation tour of the regions adjacent to West Pakistan and East Pakistan had to be cancelled and the survey was limited to the Himalayan Mountain district in U. P. State in the north and part of the State of Mysore in the south.
- 3) The request of India for joint research in the field of horticulture stemmed from the basic agricultural policy which aims at promoting horticultural production from the standpoint of maintaining the required nutrient standard for the people and placing emphasis on the production of fruits.

- 4) The long-term plan for the promotion of horticulture has already been worked out and the necessary research and experiment facilities have been provided. The Indian Government has a strong desire for Japan's cooperation in the research on horticultural production particularly in the temperate zone.
- 5) As far as the deciduous fruit production area in the northern hilly district, it may be unavoidable for Japan to extend also technical cooperation aimed at regional development. Against this, the citrus fruit production area in the south is under favourable condition for concentrating efforts on research activities.
- 6) The perspective of joint research project discussed so far has been drawn after listing desired subjects for study in the field of fruit, vegetables and flower in the respective region and commenting on them on the basis of the findings of the survey.
- 7) As the current survey is very limited in scope, it is almost impossible to implement the joint research in India on the basis of findings obtained during the survey. It is essential, therefore, to make efforts to draw an inducive conclusion on the main point of the joint research project by reviewing the findings of the current survey and further dispatching a mission consisting of experts on horticulture to India for detailed field survey.

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3. The third part of the document addresses the need for continuous monitoring and reporting. It stresses that organizations should have a clear process in place for regularly reviewing their financial performance and risk levels. This section also discusses the importance of communicating this information to stakeholders in a timely and transparent manner.

4. The fourth part of the document discusses the role of technology in enhancing financial reporting and risk management. It highlights how modern software solutions can streamline data collection, analysis, and reporting, thereby improving the accuracy and efficiency of these processes.

5. The fifth and final part of the document provides a summary of the key points discussed and offers recommendations for future actions. It encourages organizations to adopt a proactive approach to financial reporting and risk management, ensuring that they are always prepared to face any challenges that may arise.