

REPORT OF THE JAPANESE PRELIMINARY SURVEY
MISSION FOR AGRICULTURAL DEVELOPMENT
IN
EAST PAKISTAN

SEPTEMBER 1970

OVERSEAS TECHNICAL COOPERATION AGENCY
TOKYO, JAPAN

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FOREWORD

At the request of the Ministry of Foreign Affairs of the Japanese Government, the Overseas Technical Cooperation Agency organized a preliminary survey mission for agricultural development in East Pakistan headed by Dr. Hitoshi Fukuda, Professor Emeritus of Tokyo University, and dispatched it to East Pakistan for a period of 30 days from August 10, 1970.

Japan's cooperation in the agricultural development of East Pakistan dates back to the time when Japanese agricultural experts were dispatched for the purpose of demonstrating Japanese paddy cultivation techniques in East Pakistan in response to the request made by the Pakistani Government in February 1958. With the establishment in February 1960 of Pakistan Academy for Rural Development, an institution under direct control of the Provincial Government of East Pakistan, Japan's agricultural cooperation was extended to the demonstration and guidance of paddy cultivation techniques at demonstration farms, agricultural extension and guidance activities in rural districts, and further to the dispatch of experts in vegetable growing in February 1969 to Agricultural Development Corporation in Dacca.

In parallel with these cooperation and assistances, a survey mission led by Professor Tokari of Tokyo University produced findings in 1958 which served as the basis for the agreement concluded in July 1960 between Pakistan and Japan for establishment of Agricultural Extension Training Institute in Dacca. After a two-year extension of the agreement, the Centre was reorganized, at the request of the East Pakistan Provincial Government, into Farm Mechanization and Training Centre, with Japanese experts additionally stationed to assist in the training of Pakistani farm machinery experts.

In March 1970, the Provincial Government of East Pakistan formulated the Accelerated Rice Production Programme intended to be materialized through introduction of IRRI-20, and requested Japan to urgently provide one senior expert and three junior experts to be assigned to each of 10 model farms planned to be established in the Province for enhanced introduction of the new variety.

Upon receipt of the request, the Japanese Government reviewed what appraisal was given to Japan's agricultural cooperation by the Provincial Government and from what viewpoint Japan's assistance was requested, and reached the conclusion that the request was closely related to Japan's past cooperation and the present activities of Japanese experts stationed in various areas of the Province. The preliminary survey mission for agricultural development, dispatched in due consideration of the said request, therefore aimed primarily at conducting an overall examination of the current agricultural cooperation and charting the future course of technical cooperation to East Pakistan.

It is my sincere hope that this report, which contains the outcome of the survey conducted with the abovementioned purpose, will prove useful for the furtherance of cooperation and amity between Pakistan and Japan.

I take this opportunity to extend my heartfelt gratitude to the competent government officials of Pakistan for the valuable assistance they rendered to the survey mission, and also wish to express my thanks to the leader and members of the survey mission for their laborious work and to the Japanese Embassy in East Pakistan.

September 1970



Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency

ACKNOWLEDGEMENT

I had the opportunity to visit East Pakistan, in company with experts in agricultural economy, irrigation, cultivation and agricultural extension, as the leader of the Japanese Preliminary Survey Mission for Agricultural Development which was commissioned by the Japanese Government to the task of mapping out an optimum method for extending agricultural development cooperation.

During the Mission's stay in East Pakistan, flood waters covered the greater part of land, giving the impression that agriculture in the Province was a speculative undertaking in the monsoon. The acuteness of food situation in East Pakistan was brought to full understanding of all Mission members as they made survey trips to different localities and had talks with government officials and farmers who were making untiring joint efforts for increased rice production.

The Mission reviewed, on the one hand, the achievements made by Japanese experts over many years in the past in the agricultural development of East Pakistan, and studied, on the other, the method of implementing the technical cooperation which the Government of East Pakistan requested the Japanese Government in its Accelerated Rice Production Programme. Efforts were also made by the Mission to bring these two assistance schemes to a rational concordance and to find a way in which the desired technical cooperation can be extended most efficiently.

The Mission's survey activities led to the conviction that the Japanese agricultural experts can fully display their functions in the systematized cooperation for increased agricultural production. It is the hope of the entire Mission members that such a systematized cooperation will be extended as soon as possible.

On behalf of the survey Mission, I wish to express my heartiest gratitude to the competent Pakistani authorities for their unlimited cooperation and assistances which were most valuable in the execution of survey.

Competent Japanese Government offices and staffs concerned of the Overseas Technical Cooperation Agency for their support and kind arrangements.

Tokyo, September 1970

Hitoshi Fukuda

Hitoshi Fukuda
Leader,

East Pakistan Agricultural Survey Mission

Members of the Japanese Preliminary
Survey Mission for Agricultural Development in East Pakistan

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MAF = Ministry of Agriculture and Forestry

OTCA = Overseas Technical Cooperation Agency

CONTENTS

	No. of page
I. GENERAL DESCRIPTION	
1. Characteristics and Development of Agriculture in East Pakistan	1
2. Field Survey for Agricultural Cooperation	3
3. Japanese Cooperation in the Agricultural Development in East Pakistan	9
II. ITEMIZED DESCRIPTION	
1. Agricultural Economy	19
2. Irrigation and Drainage	32
3. Cultivation	42
4. Agricultural Extension	56
APPENDICES	
(1) Tentative Memorandum of the Japanese Preliminary Survey Mission for Agricultural Development in East Pakistan	
(2) Itinerary of Japanese Preliminary Survey Mission for Agricultural Development in East Pakistan	
(3) Reference Figure	

I. GENERAL DESCRIPTION

I. Characteristics and Development of Agriculture in East Pakistan

World today embraces many countries whose deficient agricultural production forces them to resort to import for the supply of foodstuff. Pakistan is one of such countries, and the deficiency of its agricultural production is conspicuous in East Pakistan. There may be many factors responsible for the prevailing extreme shortage of food in the Province, but the most prominent of them are the physical factors.

In the south of the Himalayas, the world's highest mountain system, there extends Assam Province where the rainfall records one of the heaviest in the world. East Pakistan adjoins this area and its greater part is covered by the extensive Bengal Plain which is comparable to any major plains of the world. While the fury of flood can be readily imagined from this physical condition, the flood damage is accelerated by the Ganges, one of giant rivers of the world, which flows through East Pakistan. The abundance of rain and snow water from Assam flows into the Bramaputra whose course surrounds the Himalayas in the north, east and south. The Ganges, on the other hand, increases in width as it flows through East Pakistan and is joined by the Megna which issues from Assam. The Mission was astonished to learn that these three rivers combined have a flood flow seven times as large as that of the Mississippi. The earth viewed from the aeroplane en route to Dacca in the beginning of August was covered by muddy flood water which surrounded numerous villages and minarets, making land indistinguishable from water. The vast extension of muddy water was studded with pieces of land, with dots of white sails indicating the flow direction of rivers.

East Pakistan has an area nearly twice as large as Hokkaido of Japan or approximately the same as Nepal. While Nepal has a population about equivalent to Tokyo, the population of East Pakistan is about seven times as large as Tokyo. (Area: 139,500 km². Population: 71,000,000). Cultivated land occupies about 75% of the total area of East Pakistan, and is wider than the total cultivated land in Japan by about 1.75 times. More than 70% of cultivated land is used for production of paddy, the most important crop. Practically all paddy field area is occupied by rainfed Aman. More than 80% of cultivated land

lies in fallow during the dry season. Ratio of irrigation remains on a low level of 7%. The next important crop is jute which earns the precious foreign currency income, then comes pulse. Agricultural production accounts for about 56% of the total production and 60% (jute constituting 40%) of the total export value of East Pakistan.

Most of the inhabitants live on a subsistence level and many of them suffer from malnutrition and diseases. About 80% of them are farmers. Growth rate of population is said to be about 3%, while that of agricultural production in recent years averages about 2.0%, which indicates that the shortage of foodstuff is quite a serious problem.

During its survey trips to different rural districts, the Mission had talks with officials of government agencies and farmers on many occasions, and was much impressed by their strenuous efforts towards increasing agricultural production.

Recent output of foodstuff is reported to be 11.8×10^6 tons/year. On the other hand, import of foodstuff, which was 1.12×10^6 tons in 1968/1969, is estimated to reach 1.7×10^6 tons in 1969/1970.

In its effort to cope with this food crisis, the Government of East Pakistan established the Accelerated Rice Production Programme which aims at a yield increase of 4.6×10^6 tons to be added to 11.5×10^6 tons of paddy production in the base year of 1969/1970 so as to attain the annual production target of 16.1×10^6 tons set for the year 1974/1975.

To materialize this Accelerated Rice Production Programme (hereinafter referred to as ARPP), the Government of East Pakistan requested the cooperation of the Japanese Government, which resulted in the deputation of the Mission whose task was to study the nature of technical cooperation to be extended. It is believed that an important momentum that induced the East Pakistani Government to seek the cooperation of Japan is the contribution made by many Japanese experts in the extension of effective cultivation techniques in East Pakistan including the introduction of newly improved varieties such as IR-8.

A balanced combination of irrigation water, fertilizers and good seeds is generally considered an effective technical means for agricultural production.

Agricultural development would not be feasible without such combination, but its success also hinges on socio-economic conditions such as price, marketing and transport of products.

The Mission comprised experts specialized in agricultural economy, irrigation, cultivation and agricultural extension, who made endeavours to find a way to effect Japan's cooperation most efficiently from the standpoint of their respective specialized field. In the course of their activities, the Mission members also gave consideration to matters which they considered were needful of remedy or further improvement.

It is hoped that the government officials and farmers of East Pakistan will work actively on the farmers' level as the nucleus in the agricultural development and achieve the desired increase of rice production in close cooperation with Japanese experts.

2. Field Survey for Agricultural Cooperation

In 1970, the Government of Pakistan requested Japan for the deputation of a number of agricultural experts to materialize its Accelerated Rice Production Programme with their cooperation. The attempt of the Pakistani Government was to establish extension farms of IR-20, a new variety of rice, at 10 places and seek the cooperation of 40 Japanese senior and junior agricultural experts in the extension of improved cultivation techniques among farmers for increased rice production.

Prior to this, Japan despatched agricultural experts to East and West Pakistan in February 1956 under the Colombo Plan. 15 years have passed since then, and while the cooperation extended to West Pakistan was suspended in the fourth year, the services of Japanese experts stationed in different areas of East Pakistan have continued up to the present time. In the mean time, the well-known Pakistan Academy for Rural Development Comilla has been pushing forward agricultural development of East Pakistan through the activities of cooperative associations, directing its efforts to the improvement and expansion of its development measures in Kotwali Thana where it is located.

In cooperation with this development drive, the Japanese experts engaged in extension of improved cultivation techniques of rice and vegetables in rural districts, and also gave lectures to Government trainees and offered guidance in the operation of Japanese farm machinery and equipment as well as in the practical land evaluation. Progress made by this development effort eventually resulted in the expansion of the experimental development area from the Thana level to the District level. Thus, the services of Japanese experts played a role of important driving force in the development from the traditional farming practice into a high advanced agriculture in Comilla and its vicinities.

Prior to its departure from Japan, the Mission was instructed by the Japanese Government to undertake the following task.

- 1) Overall evaluation of the achievements made by Japanese experts stationed in East Pakistan;
- 2) Review of the Pakistani Government's request for Japan's cooperation in the Accelerated Rice Production Programme chiefly by the cultivation of IR-20; and
- 3) Charting of the future course of Japan's cooperation.

After its arrival in Dacca, the Mission held consultations with the officials of the Government of East Pakistan, and commenced its survey activities according to the itinerary prepared by their kind and scrupulous arrangements.

In the beginning, the Mission obtained useful information and data at a number of agricultural facilities near Dacca such as Farm Mechanization Training Institute in Teigaon, East Pakistan Rice Research Institute in Joydebpur, and Agricultural Development Estate in Kashimpur, and also had the opportunity to hear the opinions of Japanese experts stationed in Dacca and its vicinities on several occasions.

This was followed by a trip to the eastern part of the Province where the Mission visited Agricultural Development Estate at Patia of Chittagong District, Haidgaon district designated under ARPP, and a private cooperative association at Rangunia. In Comilla District, the Mission visited the well-known PARD and had a talk with its Director, Mr. Azizul Haq, and other officers, and expressed its respect to their untiring development efforts.

During its visit to KTCCA (Kotwali Thana Central Cooperative Association), the Mission was much impressed by the achievements made by this PARD-affiliated organization whose reputed activities now cover an extensive area. Prior to its return to Dacca, the Mission also visited Laksham and Chowdagram districts.

In the western part of the Province, the Mission visited AETI (Agricultural Education Training Institute) at Nator and ADE, and expressed its respect for the efforts made in the training of experts. After the visit to these two organizations where two Japanese experts offered valuable cooperation in obtaining information, the Mission proceeded to Jessore to observe the activities of ADE and also met the staff of AETI stationed in Daulatpur. Endeavours made by the staff of these two organizations were truly noteworthy. The Mission noted with pleasure that AETI's principal, Mr. M. Ahmad, was well informed of Japan and shared the same opinion with the Mission regarding agricultural development. It was also observed that cooperative associations in this district were performing active and efficient functions under the guidance of an able leader, Mr. Mahul Alarm.

Above are the outline of the Mission survey activities in East Pakistan. The fact that the survey yielded a fairly fruitful outcome without being impeded by flood hazard despite its short period is to be attributed to the unsparing preparations and arrangements made by the Government of East Pakistan, cooperation of Japanese diplomatic missions and other organizations, and the proficiency of Mr. S. A. Wahed and Mr. M. S. Haq who accompanied and guided the Mission.

In an effort to fulfil the foregoing three tasks which the Japanese Government assigned to the Mission, repetitive intra-mission discussions were held during the survey and each member exerted his best in his specialized fields in spite of the high atmospheric temperature and humidity which made the survey activities not very comfortable. The Mission trusts that it has accomplished the objectives of the survey whose results are briefed hereunder.

- 1) As stated earlier, efforts made by Japanese agricultural experts have come to meet with recognition of the Government and farmers. The so-called improved cultivation techniques of rice are now

spreading in areas surrounding the districts where the Japanese experts provided direct guidance services. In the cultivation of vegetables and in the field of farm machinery, they also made much contribution in the extension and development of techniques, outcome of which is still alive and prevalent in the agriculture of East Pakistan. Term of assignment of most of Japanese experts expires within 1970, but the Mission hopes for their continued services in view of the nature of agricultural development and the current level of farmers in East Pakistan.

- 2) ARPP centering on the cultivation of IR-20 is planned to be implemented in selected flood-free areas provided with irrigation facilities (low lift-pumps or deep tube-wells). It would therefore be safe to presume that the programme does not incur a huge cost for irrigation and drainage facilities. The major means for increased rice production would, then, be the proper fertilization, and cultivation and recommendation of IR-20, though it will certainly be required to maintain a balanced combination of irrigation, fertilization, cultivation and extension. Considering the technical level of those farmers who have absorbed the so-called improved techniques of rice cultivation through their experience with IR-8, and the experience about IR-20 which was provided by Japanese experts stationed in Comilla District, it does not seem to entail many difficulties to realize a largescale cultivation of IR-20 provided that it is accompanied by adequate guidance and extension services. And this gave rise to the idea that successful cultivation of IR-20 would be possible in areas where farmers are acquainted with the cultivation techniques of IR-8 and other improved varieties. It is to be pointed out, however, that though IR-20 is a truly interesting and also very promising variety, its full-scale extension not only involves many technical problems that have not yet been solved but also is subject to the development of unexpected problems. Utmost care must be taken in bringing these problems to solution.

The following paragraphs describe major improvements which were

considered necessary from the viewpoint of different specialized fields including water utilization.

(1) Agricultural Economy

Since the land reform of 1950, there has been the trend for division of cultivated land into smaller lots and for the resultant small increase of tenant-lands. As a whole, however, the existing land tenure does not appear to be too detrimental to agricultural development.

In the aspect of development finance, particularly the advancement of short-term farming funds, improvement must be made to assure smoother flow of funds from advancement to recovery. Loaning and collection of funds should be separated and assigned to independent staffs.

As a means to maintain the upward tendency of rice production, physical and institutional improvement of rice market must be effected. A plan recommendable as an expedient for this purpose is to strengthen rice marketing cooperative associations and to expand the distribution system of imported grains. Another improvement to be made is the maintenance of the selling price of rice on a certain level. This will serve to incite farmers' willingness for increased production.

(2) Irrigation

If a country situated in the lower basin of an international river is subjected to extraordinarily heavy flood calamities, it is next to impossible for such a country to carry out an efficient flood control near the source of the river. This is exactly the case with East Pakistan. Hence, measures are taken to minimize the influence of flood water in the lower basin rather than to control the river near its source. To be more precise, the primary measure adopted in East Pakistan in protecting an area of certain extension against flood hazards is to build a protective embankment and to divide the polder created with smaller levees, thereby providing acceptable farming conditions. This method proved successful in some areas of the Province. But it incurs a huge capital investment for the necessary civil engineering work and cannot immediately cope with the serious food shortage with which East Pakistan is confronted

at present. For this reason, low-lift pumps (ADC) and deep tube-wells (EDWAPDA) are in wide use because of the quick effects they produce. These irrigation means mostly have a capacity of 2 cusec, and are essentially intended for minor irrigation.

Serious consideration is given to the importance of efficient minor irrigation in many countries of the world where irrigation schemes are implemented, and improved minor irrigation suited to physical conditions of different areas is also discussed by many people concerned. Rate of use of irrigated land is extremely low in East Pakistan, and double cropping is almost exceptional, not to speak of triple cropping. In addition, yield from irrigated land is poor, and this trend is conspicuous in areas where the conventional local varieties are cultivated.

Improvements to be effected to the minor irrigation in East Pakistan are as itemized below.

(a) Survey of residual surface water at the end of aman season and of underground water in boro season for their use in irrigation.

(b) Efficiency improvement of irrigation facilities controlled by EPWAPDA (discharge: less than 10 cusec) and of the facilities operated by pump groups (discharge: 2 cusec). The improvement is intended for increasing the duty of water which is the area covered by 1 cusec of discharge.

(c) Increased establishment of irrigation facilities for use in aman season which is the major season for rice crop. Irrigation facilities for aman season are still small and limited unlike those for boro season which have been on the steady increase recently.

It is hoped that agriculture in East Pakistan, now regarded as a sort of speculative undertaking in the monsoon, will soon emerge from the existing poor conditions.

(3) Cultivation

To ensure the high-yielding capacity of IR-20, close care must be taken in water management, fertilization and improved cultivation techniques. Even if sufficient care is taken of these conditions, IR-20 cannot be considered

completely free from common pests, diseases and other risks that may accompany the widespread application of the cultivation techniques in the course of rapid expansion of planted area. To avert this danger, it is advisable to expand its crop area at a reasonably slow rate.

For the extension of improved cultivation techniques, it is essential that a sufficient number of extension workers are made available and that each of them is ready to assume responsibility for the extension service he performs. This means that they will be required to devote all their working hours to the extension work.

(4) Technical Extension

One of the important steps taken in East Pakistan for its agricultural development is the establishment of farmers' training centres in different districts which are intended for increased number of agricultural technicians. Materialisation of increased rice production through introduction of IR-20 calls for a larger number of technicians who will devote themselves to the extension and IR-20. It is hoped that the number of extension workers will be increased from the present level of one in each union to one in each village. It is further hoped that efforts will be made for establishment of an improved extension system under which extension workers will engage in practical extension of new techniques and knowledges through constant and direct contact with farmers. In the past, Japanese experts tended to offer their services in practical guidance, whereas Pakistani counterpart experts were more or less inclined to giving only lectures to farmers. Remedy must be brought to this trend.

Considering the level of farmers and socio-economic conditions in East Pakistan, it is probable that Japan's cooperation in the accelerated rice production through cultivation of IR-20 will produce best results in Comilla and Chittagong Districts.

3. Japanese Cooperation in the Agricultural Development in East Pakistan

The Mission gave its consideration to Japanese cooperation in the

increased rice production through introduction of IR-20 as well as in the overall agricultural development of East Pakistan. The following is the gist of the Mission's considerations.

(1) ARPP

The desired accelerated rice production calls for the selection of areas provided with such local conditions that promise its achievement. In other words, adoption of the so-called priority principle is inevitable. Local conditions to be satisfied generally involve the following.

- (a) Farmers have the knowledges and willingness necessary for rapid increase of agricultural production.
- (b) Farmers' guidance system is consolidated to an acceptable extent.
- (c) Irrigation facilities, farm roads and other fundamental facilities are available, and the land is relatively free from flood hazards.
- (d) Economic conditions including marketing and distribution are satisfactory, and no impediments to agricultural production are found in land tenure and other social conditions.

In addition to the above, the Mission gave particular consideration to the maximum utilization of the achievements of Japanese experts accumulated in the field of agricultural extension over the past 15 years.

Comparison of different areas of East Pakistan, particularly those covered by the present survey, with consideration given to the above-mentioned local conditions, led to the conclusion that concentrated efforts for accelerated rice production should be made in Comilla and Chittagong Districts which are included in Chittagong Division. The Mission is of the opinion that Japan's technical cooperation should first be concentrated in these two districts, and then extended to other districts on the basis of outcome achieved therein.

Suitability of Chittagong and Comilla Districts for concentrated extension of technical cooperation is as outlined below.

- 1) A comparatively large number of Japanese experts have been working for technical extension in these districts over a long period. As a result, improved rice varieties such as IR-8 have been introduced fairly actively and the improved cultivation techniques are in wide

practice. In particular, irrigated farming by improved cultivation techniques established in Kotwali Thana for boro crop is largely due to the efforts of Japanese experts. The Mission learned that the area cultivated by improved techniques for boro crop, which was zero in 1960, recorded 4,800 ha (12,000 acres) in 1969. In this particular Thana, fertilization and application of pesticides and fungicides for plant protection is more advanced than in other areas.

2) As is well known, Comilla District is now an advanced agricultural district in East Pakistan. Agricultural development of this district is considered ascribable to the activities of PARD (Pakistan Academy for Rural Development) and KTCCA (Kotwali Thana Central Cooperative Association) as well as to the technical cooperation of Japanese experts. Chittagong District follows Comilla District in its development into another advanced agricultural district of East Pakistan under the guidance of able agricultural technicians. Needless to say, efforts for rapid production increase yield better results in advanced agricultural districts than in other areas.

3) Both Comilla and Chittagong Districts are situated near Dacca, Narayanganj and Chittagong which constitute the "statutory food rationing area," and will therefore readily find the outlet of the increment of rice production.

4) In Chittagong District, IR-20 is planned to be cultivated in an area of 27,600 ha (69,000 acres) which is larger than any similar areas in other districts.

For reasons given above, the Mission visited different Thanas in Comilla and Chittagong Districts with particular interest, and discovered that Thanas such as Patia, Rangunia, Laksham and Chowddagram were provided with favourable conditions for concentrated extension of technical cooperation.

The Government of East Pakistan stressed to the Mission that besides the above-mentioned areas, the western part of the Province, particularly Thakurgaon in Dinajput District, was suited for the concentrated technical cooperation, and pointed out that farmers were progressive in their pursuit as a result of their past training on cooperative activities and that irrigation by

means of deep tube-wells and other facilities was widely practised. The Mission maintained, however, that no accurate judgement could be made regarding the districts not covered by the survey. The Mission is of the opinion that inclusion of Thakurgon in the selected areas of concentrated activity should await the results of technical cooperation in the eastern part or the results of another survey ensuing the present one.

Agricultural development cannot be achieved without a comprehensive progress of technical, economic as well as social conditions. Accordingly, cooperation in agricultural development should preferably be extended by a systematized way in which the services of experts specialized in different fields are organically coordinated, and not under the conventional system under which experts offered their services on an individual basis. The Mission proposed such a systematized cooperation to the Government of East Pakistan and obtained its agreement. The proposed systematized cooperation, which is naturally a provisional plan that must be elaborated and revised by close examination, envisages the following.

- 1) A team comprising about four junior experts is to be assigned to each of selected Thanas in Comilla and Chittagong Districts. The team would probably be composed of agronomists capable of offering technical cooperation in soil, fertilizers and farm machinery and equipment, and of irrigation experts who are able to give guidances in surveying, consolidation of land.
- 2) One senior expert is to be stationed in each district. He would be assigned to the task of collaborating with a number of teams of junior experts working in his district and of exercising overall control over their activities. It is therefore expected that one senior expert would be stationed in Chittagong and Comilla Districts, respectively.
- 3) One chief advisor is to be stationed in the Department of Agriculture of East Pakistan to give advices and recommendations on the overall agricultural development as well as on ADC and other aspects related with agriculture. He would also head the organic cooperation system comprising the aforementioned senior and junior experts and control their activities. Further, he would be expected to collaborate

with other Japanese agricultural experts and lead them. Thus, the chief advisor would be expected to exercise overall control over Japan's agricultural cooperation.

4) The Pakistani Government is to appoint agricultural experts and extension workers who would be held responsible for the extension of agricultural techniques. Number of these counterpart experts and extension workers should be enough to ensure effective extension work, and they would be expected to offer full-time extension service. The Japanese chief advisor would be authorized to request the Government of East Pakistan to arrange for a situation allowing the Japanese experts to provide full and efficient cooperation on the basis of an agreement between Pakistan and Japan, and to take whatever measures that may be necessary in ensuring smooth cooperative activities of Japanese experts.

5) Extension farms and extension plots are to be established to provide Japanese and Pakistani experts an area of mutual cooperation.

Extension farms are to be established on farm lands whose soil layers represent different geological formations, and it is expected that each district would be provided with one extension farm. Extension farms would be intended for collecting and compiling data needed in guidance of farmers within the shortest period possible by the mutual cooperation of Pakistani and Japanese experts, and would accordingly be equipped with modern farm machinery and equipment for the convenience of these experts.

Extension plots would be smaller in area and established on farm lands whose soil layers are representative of same types of past land use. Land would be cultivated in these plots with the cooperation of progressive farmers. A number of such extension plots would be included in the area covered by each extension farm. These extension plots would be intended mainly for the guidance of progressive farmers by Pakistani experts and extension workers who would be occasionally aided by Japanese experts. It is to be stressed that the agricultural extension service should be concentrated in these extension plots.

Establishment of extension farms and plots entails many unsolved problems such as their size and facilities. Efforts would have to be made to avoid an excessive disparity in facilities which is noted between the well-equipped conventional training centres and the surrounding farm lands.

6) It is hoped that scrupulous consideration would be taken in determining the treatment of the chief advisor and experts. Treatment of the chief advisor, in particular, is hoped to be decided in due consideration of the treatment offered to advisors of the United Nations and other organizations who are already stationed in the Department of Agriculture, so that the activities of Japanese experts would play the expected role in agricultural development of East Pakistan.

(2) Farm Mechanization Training Institute

This institute was established in 1960 under an agreement between Pakistan and Japan. Since 1965 when the institute was handed over to the care of Pakistani Government, Japan has been offering its assistance in the form of experts' service and contribution of equipment and materials. A total of seven Japanese experts despatched to the institute have assisted in the operation training of farm machinery and equipment and have also effected modifications to various machinery to suite the conditions in East Pakistan. They further made contributions in the introduction, trial cultivation and extension of high-yielding varieties of paddy, fruit-trees and vegetables imported from Japan and other countries. Number of trainees trained by these experts increased substantially, and a total of 40 trainees comprising 30 from farm households and 10 Union Agricultural Assistants (UAA) were given a three-month training course. A total of about 160 trainees were trained each year, and 596 completed the training course during the period from 1965 to 1970. It is planned that a new mechanic course of six months duration, intended chiefly for giving training on assembling and repair techniques of machines, will be inaugurated in addition to the existing course which is called the mechanization training course.

Farm mechanization plays the same role in East Pakistan as in other

countries of Southeast Asia. A power tiller is economically far more advantageous than a two-cow plow in that it is generally said to cut down the working hours to 1/12 and the cost to 1/5. Peak farm labour is noted in the harvesting and preparation of fields during the transitional period from aus season to aman season, and from aman season to boro season. Use of farm machinery and equipment in this transitional period is quite instrumental in cutting down the peak labour.

Prospects into the fairly distant future make it foreseeable that farm machinery and equipment will play a vital role in the agriculture of East Pakistan. Japan's continued technical cooperation in the expanded use of farm machinery and equipment is therefore considered very important. It is hoped, however, the cooperation for this purpose would be extended by a new system under which Pakistani counterpart experts and workers would play the major role in cooperative activities, assuming full responsibility for the training and guidance.

(3) Cooperation with Comilla Academy

Agriculture in Kotwali Thana advanced to the top level in the whole East Pakistan under the guidance of Comilla Academy. Agricultural development in this Thana is also indicative of the fruitful results of the efforts made by Japanese experts. Introduction of junior experts described in the preceding paragraph is not considered necessary in Kotwali Thana. Since the existing method would suffice for efficient and full-scale extension of IR-20, it would be necessary that one Japanese expert be stationed in the Academy who would scientifically contribute to further improvement of agriculture in this area. Efforts of such a resident Japanese expert would prove, in harmony with the outcome of the aforementioned systematized cooperation in the extension of IR-20, very instrumental in the agricultural development of East Pakistan.

(4) Cooperation with East Pakistan Rice Research Institute

Cooperation in rice research activities of East Pakistan through assignment of Japanese experts to this well-equipped institute will work combinedly with the practical cooperation in rural districts to bring about large benefits to

the agriculture of the Province.

- (5) Acceptance of Trainees from selected areas of Japanese cooperation agricultural development calls for a high level of extension work, and superlative extension service naturally demands activities of capable agricultural technicians.

In accepting Pakistani trainees in Japan, no considerations have so far been given to the selected areas of Japanese cooperation. It goes without saying that mutual cooperation of Pakistani and Japanese experts is most desirable in enhancing the effect of training in Japan and of Japanese cooperation in Pakistan. It is therefore advisable that trainees be so selected and assigned that their cooperation with Japanese experts is assured in the areas and projects in which Japan extends its concentrated assistance. It is hoped that trainees who returned to Pakistan after completing the training course at Uchihara Training Centre of the Overseas Technical Cooperation Agency will actively cooperate with Japanese experts in future.

It is to be added that the training in Japan should be enriched in substance by stricter planning so as to yield better results and to assure that trainees will play an active role in the agricultural development after their return to Pakistan.

- (6) Activities of Japanese experts and term of their office

There are a number of preconditions that must be satisfied for effective technical cooperation. No fruitful cooperation can be expected unless environmental conditions involving such preconditions are fully fulfilled.

As described earlier, Japan's cooperation in the improvement of agricultural techniques would have to be extended systematically through the integration of experts, equipment and organization. What counts most in assuring the effects of such cooperation is the satisfactory conditions on the Pakistani side for accepting it. There are rooms for further improvements in living environments, formalities for importing equipment and materials, and many other points. Improvement of these points will be expressly stated in an agreement between Pakistan and Japan which will be formulated after scrupulous consideration.

The conventional two-year term of office of Japanese experts is too short. It should be extended to at least two to four years if the experts are to attain the expected results.

It is understandable that Japanese experts despatched to East Pakistan are eager to produce something complete within their short term of office. They must be on the alert against inviting a loss due to their overzeal in their attempt and the consequent restriction on their activities.

II. ITEMIZED DESCRIPTION

I. Agricultural Economy

(1) Three Stages of Agricultural Development

Among the developing countries of the world, East Pakistan holds quite a unique economic position.

In the first place, 95% of its total population live in rural communities and 85% are engaged in agriculture which turns out 56% of the gross domestic product of the Province. There are no countries in the whole Asia whose economy depends so heavily on agriculture.¹⁾

Secondly, nearly 85% of the entire crop area of the Province is intended for foodgrain production, and 99% of the foodgrain crop area is occupied by rice. This high rate of dependency on foodgrain and rice cultivation can never be witnessed in the agriculture of any other Asian countries.²⁾

The third and most noteworthy fact is that despite such a high dependency on agriculture and on rice cultivation, East Pakistan is unable to support its population with its domestic food production, and is forced to resort to import for the supply of more than 10% of the required foodstuff in recent years. This indicates that the increase in food production fails to catch up with that in population in the so-called "food-population race" and that the food situation of East Pakistan is quite serious.

Table 1 shows the growth trends of population and production and import of foodstuff up to the present time since the implementation of the First Economic Development Plan. The table clearly indicates that the food production failed to catch up with the population increase since the implementation of the Third Five Year Plan. The shortage of domestic food production had to be covered by import which increased year after year since the Second Five Year Plan was put into operation and reached 1,700 tons in 1969/1970. Despite this huge amount of import, demand for food has never been fully satisfied and the domestic rice price kept on rising until today. (Per capita food supply calculated by adding imported food to the available domestic food production recorded 177 kg per annum during the Second Five Year Plan, but declined to 157 kg per annum during the Third Five Year Plan)

Failure of domestic food production to catch up with the population

Year	Population		Food Production (1,000 tons)				Food Import (1,000 tons)			
	(Million)	Index	Rice	Wheat	Total	Index	Rice	Wheat	Total	Index
Average of 55/56 - 59/60	52.1	100	7,514	24	7,538	100	414	89	502	100
1960/1961	55.9	107	9,519	32	9,551	127	464	234	698	139
1961/1962	57.5	110	9,465	39	9,504	126	206	202	408	81
1962/1963	59.3	114	8,730	44	8,774	116	542	894	1,436	286
1963/1964	61.1	117	10,456	34	10,490	139	346	656	1,002	200
1964/1965	63.1	121	10,337	34	10,371	138	95	250	345	69
1965/1966	65.0	125	10,335	35	10,370	138	360	529	889	177
1966/1967	67.0	129	9,424	58	9,482	126	432	647	1,079	215
1967/1968	69.0	132	10,995	58	11,053	147	308	712	1,020	203
1968/1969	71.0	136	10,900	92	10,992	147	236	884	1,120	223
1969/1970	73.0	140	11,710	100	11,810	157	465	1,235	1,700	339
Plan for 1970/1971	75.0	144	12,100	161	1,400	279

Note: * - Annual average during the period from 1960/1961 to 1964/1965:

Population - 59.4 million. Food Production - 9,738 thousand tons.

Import of Food - 778 thousand tons.

Food available for consumption is the amount after deducting 10% from total food production.

Source: Planning Department of East Pakistan up to 1969/1970.

Food Department of East Pakistan for 1970/1971.

Calculation of annual average value and index by the mission.

increase in the food-population race would be less problematic if the export of agricultural and industrial commodities is active enough to counterbalance the deficient food production by earning foreign currency income. In East Pakistan, however, the only agricultural and industrial sectors that earn foreign exchange are jute cultivation and jute manufacturing industry whose export value is just too meager to expect such counterbalancing effect. For this reason, recent trade balance of East Pakistan, including that of inter-wing trade with West Pakistan, is increasing red figures.

The situation indicates that agriculture is not discharging its expected function in the national economy of East Pakistan. To enable agriculture to fully perform its function in the national economy, some active policy measures must be taken for agriculture, particularly for rice production which is the largest sector in agriculture, so as to attain self-sufficiency of foodstuff and overall agricultural development. This will have to be ensued by the efforts for overall development of national economy involving non-agricultural sectors.

In this sense, the mission considers it reasonable that the Government of East Pakistan gave priority to rice production in its development policies after the revision of the Third Five Year Plan in 1966/1967. Opinion is entertained by certain quarters that agricultural development should be promoted with prime stress placed on the cultivation of jute and other cash crops.³⁾ The mission does not find this opinion justifiable because the successful cultivation of some new export crops comparable to jute cannot be easily achieved within the limited time allowed.

Enforcement of agricultural development policies with emphasis placed on rice production for the time being will lead, as illustrated below, to the overall economic development through three stages of progress.

Technological breakthrough in rice cultivation

Production breakthrough in rice cultivation

Agricultural breakthrough including non-rice agricultural sectors

Economic development

In the following pages, description will be given on the problems entailed

in the agricultural development of East Pakistan in each of the three stages, measures to be taken for their solution as well as on possible Japan's cooperation in the desired development.

(2) Stage of Technological Breakthrough

The most outstanding question to be solved in this stage of development is the technical feasibility of achieving increased rice production not only in experimental farms but in the fields of common farmers.

In the rice importing countries of Asia, technological breakthrough in rice cultivation is in progress on a large scale through the accelerated introduction of IRRI and other high yielding varieties effected since the latter part of the 1960's rapid improvement of minor irrigation schemes resorting to tube-wells and low-lift pumps, and application of such modern inputs as fertilizers, pesticides and fungicides for plant protection and farm machinery and equipment. This has enabled the "Green Revolution" in rice cultivation to be pushed forward which is no less important than that in wheat cultivation. Like Indonesia, East Pakistan has so far been behind other Asian countries in this "Green Revolution" in rice cultivation, but succeeded in establishing the basis for technological breakthrough for boro crop (winter crop). With this as the stepping stone, the "Green Revolution" in East Pakistan now shows signs for progress.

ARPP (Accelerated Rice Production Programme) formulated recently is intended for a wholesale extension of the "Green Revolution" not only to boro crop but also to aman (summer) crop, the largest cropping season in East Pakistan. The programme may be considered as incorporating an excellent idea since aman crop incurs a less irrigation cost and can cover a wider area as compared with boro crop. The most imminent problem involved in the implementation of ARPP is the fact that IR-20 to be introduced in aman crop is still in the experimental stage and the technological breakthrough for its aman cropping is not yet completed. Detailed description on this particular problem will be given in Chapter 3.

The already known feasibility of increasing boro crop production through introduction of new varieties and cultivating IR-20 for aman crop does not bring

complete solution to the problems involved in the stage of technological breakthrough. The reason is that the imported varieties now cultivated must eventually give place to new locally bred varieties which will suit the conditions in East Pakistan and will also ensure, in the strict sense of the word, the development of rice production programme. In this connection, EPRRI (East Pakistan Rice Research Institute) is hoped to play a positive role in future. The mission is of the opinion that the extension of Japan's technical cooperation to EPRRI will not only contribute to the agricultural development of East Pakistan but will also serve the progress of Japan's agricultural science.

Government of East Pakistan now places stress on aman crop. The Mission wishes to state that boro crop should not be taken lightly. It is recommended that research work be vigorously carried out for cultivation of profitable cash crops besides rice in boro season to provide the basis for future diversification of agriculture.

(3) Stage of Production Breakthrough

In this stage of development, the main problem is how to recommend and extend improved cultivation techniques among rice-producing farmers to attain the target of increased yield and production. And the key to the successful achievement of the target lies in the improvement of socio-economic conditions.

What must be remedied in this stage include, among others, the low intellectual level of farmers, lack of farmers' organization, inefficiency of agricultural administration, and poor quality and small number of the staff participating in agricultural extension and development. Detailed description on these problems and measures recommended for their solution will be given in Chapter 4.

Apart from the above-mentioned problems, the small size of farms, land tenure and development funds are the major questions in this stage of development.

(a) Small-Size of Farms

Size of farms in East Pakistan is extremely small. Average size in this Province is, like those in Indonesia, Formosa, Korea and Japan,

on the world's smallest level. Division of farm land into smaller unit farms, which was accelerated after the country's independence and tends to be accelerated even today is one of the serious problems in East Pakistan. Cultivated area per farm in this Province, reported to be in the neighbourhood of 5.2 acres in the 1930's,⁴⁾ dropped to 3.1 acres according to the 1960 census. Now it is estimated to be below 2 acre level.⁵⁾

Unless a suitable preventive measure is taken at present, the existing trend for increased division of farm land is liable to prove detrimental to the endeavours currently made for production increase of rice and to the future agricultural development. Stricter restriction on the divided succession is conceivable as a means to check the division of farm land. A radical cure of this problem, however, would be the promotion of production activities in non-agricultural sectors to absorb surplus farming population.

To overcome disadvantages arising from the small size of farms, the following may be cited as measures to be taken in the immediate future.

- 1) Acceleration of the current trend for higher cropping intensity;
- 2) Consolidation of fragmented farm lands; and
- 3) Organization of farmers' cooperative groups of suitable size for elevation of farm labour efficiency.

(b) Land Tenure

Large estate ownership system went out of existence in East Pakistan since the Zamindari system was abolished by the East Bengal State Acquisition and Tenancy Act of 1950. According to the 1960 census of agriculture, 61% of a total of 6,140 thousand farmhouseholds in East Pakistan are owner farmers, 37% are owner-cum-tenant farmers, and 2% are tenant farmers. The composition of farmers, as revealed by the said census, is quite sound with owner farmers constituting the major part.

The land tenure in East Pakistan, when checked on the basis of

other statistical data than the said 1960 census takings, cannot be considered quite so sound for reasons given below.

Firstly, the census does not appear to have covered all tenant farmers.

Secondly, landless farm labourers are categorically disregarded in the census. Other statistical data than the 1960 census indicate that the total number of landless cultivators involving tenant farmers and farm labourers accounted for 55% of the total number of farm households in 1961, 60% in 1963 and 55% in 1964.⁶⁾ Further, 1961 population census discloses that 17.5% of all farm workers was occupied by landless farm labourers.⁷⁾

Thirdly, 1960 census of agriculture does not indicate that owner farmers were on the decrease whereas owner-cum-tenant farmers were on the increase. Other statistical data show that the ratio of owner farmers in the total number of farm households dropped from 35.6% of 1961 to 21% of 1964, whereas the ratio of owner-cum-tenant farmers increased from 9.4 to 21.3% during the same period.⁸⁾

Thus, a detailed study brings to light many grave problems involved in the ostensibly sound land tenure of East Pakistan. Further, the absence of the large estate ownership system is conducive to the difficulty in bringing a sweeping solution to evil influences of land tenure by using the usual means of land reform such as eminent domain and land allocation. Agricultural development would not be impeded by the existence of a large number of tenant farmers and owner-cum-tenant farmers if the tenant system is sufficiently modernized. In this respect, it must be pointed out that the tenant system of East Pakistan is in extreme want of modernization. The share-cropper system is still dominant in the tenant system of the Province though it is about to be dissolved in the eastern districts, particularly in Comilla District.

To ensure the success of the planned increase of rice production and further to make the future agricultural development possible, it will be necessary, on the one hand, to prevent the degradation of farmer's status from owner farmer to owner-cum-tenant farmer, owner-cum-

tenant farmer to tenant farmer, and tenant farmer to farm labourer, and on the other, to enhance the modernization of the tenant system. It is desirable that the share-cropper system be shifted to the fixed rent tenant system which allows, whenever possible, the payment of rent in cash and not in kind. Needless to say, the introduction of the fixed rent system should preferably be accompanied by the reduction of rent.

(c) Development Funds

Financing for the promotion of agricultural development may be considered under two categories, i. e. , long-term investment for infrastructural improvement, installation of irrigation facilities and procurement of large type farm machinery and equipment; and advancement of short-term farming funds.

For the long-term investment which demands a huge amount of funds, the Central Government of Pakistan and the Provincial Government of East Pakistan appear to be determined to bear a substantial financial burden with the support of a multilateral financial aid system comprising the World Bank, Asian Development Bank and Consortium for Pakistan. Detailed description of the long-term investment will not be given here, however.

For the supply of short-term farming funds, it seems that the counterpart funds for the import of goods offered by foreign countries (of which the major part is occupied by the rice import from Japan) are planned to be utilized as revolving funds. An aspect of the Pakistani-Japanese bilateral economic cooperation is found in this plan. Japanese aid in rice, which registered an import of 100 thousand tons in 1969/1970, is expected to be increased to 200 thousand tons in 1970/1971. The Government's selling price of the Japanese rice in 1969/1970 was Rs 30 per maund (1 ton=27 maunds). The Government income earned by the sale of the Japanese rice is therefore estimated to have exceeded Rs 80 million (Rs 30 x 27 x 100,000 = Rs 81,000,000). Net income after subtracting all the required expenses is considered to have surpassed the Rs 70 million level. Since new varieties were planned to be

introduced in an area of 500 thousand acres in the initial year of ARPP and a short-term farming funds of Rs 200 was estimated to be needed per acre, the total funds required amounted to Rs 100 million. This indicates that more than 70% of the required funds could have been covered by the counterpart funds for the import of Japanese rice. However, since the crop area of new varieties in the initial year of ARPP was limited to 200 thousand acres, certain amount of surplus fund is believed to have been saved after all the short-term funds were advanced from the counterpart funds. (Short-term farming funds required for introduction of IR-20 and local improved varieties in 200 thousand acres and 300 thousand acres respectively are calculated to be Rs 74.5 million).

Farming funds are scheduled to be advanced to farmers through cooperative associations and recovered also through them. This system, however, seems to entail substantial difficulties since the organization of cooperative associations is yet to be furthered in East Pakistan excepting few districts.

In providing funds, care must be taken against their leakage before reaching farmers and their misuse on the part of farmers, e. g., diversion of the allocated funds to some other purposes (especially to the purpose of consumption). The most expedient way to prevent the misuse of funds would be to loan the required capital goods and not cash.

Collection of loans is much harder than their advancement. If loans are not collected smoothly, funds will flow only one way without revolving and deter the production increase in subsequent seasons. Cautions must be exercised not to follow the same course taken by BIMAS Project of Indonesia which appears to have failed in production increase due to unsuccessful collection of loans. To ensure efficient recovery of loans, it would be advisable to collect them in kind (paddy) and not in cash.

TCCA's advancement and collection of loans is now conducted concurrently with the extension work by inspectors. Since this will reduce the efficiency of both extension service and working of funds,

these two functions should be separated and commissioned to their respective staffs.

(d) Priority Principle in Development

Adoption of the principle of giving priority to selected areas should be stressed as a fundamental strategy in the stage of production breakthrough. It may as well be added that the breakthrough itself is essentially based on the priority principle. To make best use of limited availability of various resources on the basis of this principle for the materialization of planned increase of rice production, a number of areas best suited for the initial development efforts should be selected, and after the breakthrough in these areas are completed, development efforts should be directed consecutively to the remaining areas.

The mission selected Comilla and Chittagong Districts in the eastern part of the Province as areas suitable for concentrated activity for reasons given below.

- 1) The two districts rank next to the northwestern districts in the acreage of flood-free area and are therefore technically suited for the introduction of new varieties for aman cropping;
- 2) Comilla District has transformed from a backward agricultural area into an advanced farming area by virtue of past ten years of activities of PARD and KTCCA (and by the contribution made by agricultural experts dispatched by Japan). Chittagong District, on the other hand, is chasing Comilla and is about to be transformed into an advanced farming area. Needless to say, the breakthrough efforts yield the best effects in advanced farming areas.
- 3) Both districts are situated near large food consuming areas and can therefore easily find the outlets of increment of rice production.

Rationed areas in East Pakistan are divided into "statutory area" where the food distribution control is constantly obligatory and "modified statutory area" where the food distribution is effected according to the demand-supply condition of each year,

and the ration standards in these two areas differ from each other. The former area embraces Cities of Dacca, Narayanganj and Chittagong that constitute the three major food markets. Comilla and Chittagong Districts are located close to these three markets.

4) Unlike the central and western districts, Comilla and Chittagong Districts do not have cash crops such as jute and sugarcane, which indicates the need for giving farmers a new cash crop: paddy. In addition, farmers in these two districts are quite willing to cultivate new cash crops and are eager to raise the yield per unit area through introduction of new varieties because their farms are smaller in size than those of farmers in central and western districts.

5) Technical cooperation extended by Japanese agricultural experts over the past 15 years finds its outcome most well absorbed in Comilla District. To make best use of such accumulated outcome of Japan's technical cooperation in the coming years, it would be reasonable to concentrate cooperation activities in the eastern area with Comilla District as its centre.

(4) Stage of Agricultural Breakthrough

Objective to be achieved in this stage of development is to maintain the upward production trend after succeeding in the increased rice production so as to attain the self-sufficiency of food, and further to bring about the overall agricultural as well as economic development of the Province.

Problems entailed in this stage and measures for their solution must be studied by dividing the stage into the period up to the achievement of self-sufficiency and the period after that.

(a) Period up to Self-Sufficiency of Food is Attained

The prime task to be accomplished in this period is to maintain the upward trend of rice production over a long period of time.

The first problem to be solved in carrying out the said task is the virtual absence of facilities and institutional system for marketing rice. This situation was invited by the fact that the rice cultivation in East

Pakistan has hitherto been based on the self-supporting of farmers. The only exception is the existence of the marketing system of surplus rice produced in northern and northwestern districts and supplied to Dacca and its vicinities. This distribution channel of surplus rice is in the hand of a small number of middlemen. Agricultural commodities whose marketing system is established are limited to jute, tea, and sugar-cane for delivery to sugar mills. To maintain the trend for increased rice production, the rice marketing system must be established at an early date. Fundamental policy to be adopted for this purpose is to encourage and enhance the collective marketing activities of farmers' cooperative associations, but the expansion of distribution system of imported foodgrains may as well serve as an expedient for some time to come.

The second problem is the pricing of rice since the production increase attained by the introduction of new varieties is liable to incur a higher production cost, particularly when the supply of Government's subsidies is suspended for budgetary reasons. Production increase, however, will serve to reduce the selling price of domestic rice by degrees. It can be logically assumed that there will be no fall in the price of rice only if the import is so curtailed as will counterbalance the increase of domestic rice production, but a drastic fall in the harvesting season could result from an inaccurate estimate of demand-supply condition. Such a seasonal fluctuation of rice price would be very large if the marketing system is not established. If the selling price of rice declines drastically as a result of production increase and seasonal glut, farmers will soon lose their willingness for increased rice production; and should such a situation develop, the Government would be requested to apply its pressure on the rice market for mitigation of seasonal price fluctuation and prevention of fall of price level. Therefore, the Government is required to formulate an accurate food demand-supply programme and take measures for price stabilization.

(b) Period after Attainment of Self-Sufficiency of Food

The major task to be done in this period is to gradually modify the

one-sided policy for increased rice production and realize the diversified agricultural production. Achievement of self-sufficiency means nothing more than that farmers in the whole Province are able to eat rice to their heart's content and support the non-farming population in urban areas such as Dacca, Narayanganj and Chittagong with the surplus rice. Since industrialization and urbanization in East Pakistan are both extremely backward and cannot be expected to make a phenomenal progress in the near future, agricultural development brought to a standstill in the stage of self-sufficiency means the retrogression of the national economy to a subsistence level which will never accelerate further overall agricultural and economic development. Self-sufficiency of food is only a precondition for agricultural and economic development. The target to be realized lies far beyond this stage.

What may be first conceived of for diversification of agriculture is the cultivation of traditional cash and export crops such as jute, tea and sugar-cane. Production increase of these crops is not sufficient for the desired diversification since it only serves to reproduce the conventional agro-type.

The second plan conceivable is to promote the production increase of vegetables, fruits, poultry and livestock which is in progress to satisfy the demand of consumers in cities. The course of future agricultural development under this plan is quite promising but presents many problems such as the need for improving the marketing system just as in the case of rice, and the danger of excessive production that could readily occur due to the small size of domestic market. Insofar as the Mission observed, bazaars in major cities are needful of much improvement in facilities and hygienic conditions. The Mission is of the opinion that modern auction markets should be established as soon as possible under the supervision of local autonomous bodies. Danger of excessive production would have to be averted through the activities of cooperative associations or by administrative actions.

The third and most important plan is to develop new export crops comparable to jute and tea. The importance of this plan is the more

emphasized because export of tea, excepting that to West Pakistan, is now reduced to almost nothing. Agricultural commodities for which the global demand is on the increase today are feed, oil and oil seeds. Hence attention should be given to coconut and peanut (both copra and peanut can be used as oil seeds, and residue after oil extraction serves as feed). Maize and rubber which are not yet introduced in East Pakistan also deserve attention. Further, cultivation of cashew-nut in the eastern mountainous area should be given due consideration. It is also recommendable to increase the production of potatoes, beans and oil seeds by taking advantage of boro season for their export. Promising items for diversification of agriculture may also be found among livestock commodities, and fish meal is another promising primary product, though it is not an agricultural product.

Notes

- 1) Government of East Pakistan, Planning Department, Agricultural Development and Rice Economy in East Pakistan, by Dr. Miodrag Petkovic, General Economist, UNDP Economic Programming and Projection Project, January 1970, pp.68-77.
- 2) Ibid., pp. 86 and 91.
- 3) Opinion expressed by Dr. Miodrag Petkovic, Ibid., passium.
- 4) Ibid., p. 149.
- 5) Survey by the Bureau of Economic Research indicates that the cultivated land per farm in 1969 averaged 1.85 acres in the Province.
- 6) Planning Department, op. cit., p. 151.
- 7) Ibid.
- 8) Ibid.

2. Irrigation and Drainage

Introduction of a new variety of high-yielding rice constitutes the strategy of ARPP (Accelerated Rice Production Programme) which the

Government of East Pakistan is pushing forward under its fourth Five Year Plan.

Insofar as irrigation and drainage is concerned, extension of the improved techniques of rice cultivation is conditioned by the following two requirements.

One of such requirements concerns the fields. To be precise, there should be established irrigation and drainage facilities with which to conduct the water management of field with ease.

The other requirement is demanded of farmers. To explain more fully, farmers are required to acquaint themselves with the techniques of water management in their fields to make full use of the rice cultivation techniques as well as with the water distribution techniques in the area under irrigation, and further to strengthen their organizations so as to assure efficient use of water in the irrigated area.

In the following pages, existing situation in East Pakistan will be studied to clarify the problems involved in the fulfilment of these two requirements, and a conclusion will be given on the optimum way of extending Japan's technical cooperation in the agricultural development of East Pakistan.

(1) Existing State of Agricultural Water Utilization

(a) Existing State Viewed with Respect to Water Management in Fields

Rice cultivation in East Pakistan is being carried out by excellent adaptation to severe natural conditions which are subjected to floods in the wet season and drought in the dry season.

Severity of natural conditions in this Province is such that man's efforts to moderate it meet an almost categorical rejection. As a result, rice cultivation of East Pakistan presents a harmony with nature that has been cultured through many years of experience.

The severity may be better understood by the following fact.

River basins of three giant rivers combined, i. e., the Ganges, the Brahmaputra and the Meghna, are said to cover an area of about 600 thousand square miles, but only 7.5% of this huge area lies within East Pakistan. In other words, practically all of this extensive river

basin is found outside the Province (India and China), which means that the greater part of flood waters of the three rivers flow in East Pakistan from outside its territory. Flood discharge is also so enormous as will stupefy anyone with amazement.

Yearly attack of heavy flooding invited by these harsh natural conditions makes it quite understandable that the conventional rice cultivation in East Pakistan had to be conducted in a passive pattern adapted to nature.

As is well known, a flood control scheme, granted that it is attainable, incurs a huge amount of capital investment and requires a long time before its completion. In East Pakistan, however, it is not allowed to shy away from the difficulty entailed in the flood control because the pressing need for solving the acute food shortage demands the formulation and enforcement of some effective measure for rapid production increase of foodstuff. In pushing forward agricultural development of East Pakistan, therefore, it is of controlling importance to seek consonance between two schemes, i. e., flood control which requires a relatively long time for completion and increase of food production which must be attained as early as possible.

ARPP is a scheme in which the latter, increased food production within a short time, is intended to be driven forward.

Improved techniques of rice cultivation and irrigation techniques using power pumps, whose introduction is incorporated in ARPP, should be studied in relation to the abovementioned two schemes. In other words, studies should be made in advance to clarify if the irrigation by means of power pumps is economically justifiable for attainment of advanced agriculture in future.

The existing state of irrigation in East Pakistan can be roughly represented by the ratio of total irrigated area to the total cultivated area.

1959/1960 survey discloses that the ratio stood at about 7%, and that the irrigation resorted mostly to conventional Pakistani facilities such as buckets and wooden "dones." Use of power pumps became

active since 1960. In 1969/1970, area irrigated by power pumps reached about 631 thousand acres under Thana Irrigation Programme and about 174 thousand acres under EPWAPDA (East Pakistan Water and Power Development Authority), totalling 805 thousand acres. This value, however, accounts for only 6% of the total cultivated area.

It must be noted that the irrigation mentioned above is conducted only during boro season when water management can be carried out relatively easily.

The foregoing fact leads to the judgement that capital investment in water management facilities including irrigation facilities is still deficient in East Pakistan.

Improvement and establishment of field facilities required for water management including irrigation facilities is undertaken by EPWAPDA and EPADC (East Pakistan Agriculture Development Corporation). While EPWAPDA carries out large scale projects aiming mostly at flood control, EPADC implements relative minor scale projects centering on low-lift pump irrigation and deep tube-well irrigation.

Thana Irrigation Programme is in progress under the control of EPADC. The programme deserves attention in that EPADC is carrying out its task systematically on the farmer's level by loaning power pumps to farmers' pump groups comprising 15 or more farm households, with technical guidance for pump operation also provided.

Consequent on the topographical feature of East Pakistan represented by the flatness of its land, the typical pattern of flood control undertaken by WPWAPDA is as described below.

The project area is surrounded by embankment to sever water within the area from outside, and a large type pump is employed for both drainage and supply of irrigation water within the area. The pump is therefore of dual-purpose type having two functions of draining and irrigation. At the outset of work, drainage rivers within the area are used as irrigation canals into which water is supplied by means of the said large type pump to raise their water level. Irrigation is conducted by low-lift pumps and other equipment, with these rivers as the water

source. Major irrigation projects already completed by this method include DND, Chandpur, Buri-Teesta, and Ganges-Kobadak. Area irrigated by these projects in 1969/1970 reached 85,400 acres under G.K., 10,056 acres under DND, 5,552 acres under Buri-Teesta, and 382 acres under Chandpur.

For irrigation by low-lift pumps and deep tube-wells under Thana Irrigation Programme, 2 cusec power pumps are employed and the area covered by these pumps averages 50 acres.

Attention must be paid to the fact that as outlined above, the so-called lift irrigation constitutes the major means of irrigation in East Pakistan. Gravity irrigation from the intake to irrigation canal is scarcely practised.

The following may be cited as characteristics of lift irrigation and gravity irrigation.

The latter usually incurs a huge construction cost and a relatively long construction period, and often entails technical difficulties in its construction, whereas the former incurs a less cost per machine and produces irrigation effects quickly because of the easy construction work. Cost per machine amounts to Rs 25,000 to 30,000 in case of deep tube-well (US\$1 = Rs 4.75).

These differences between the two types of irrigation are very important in obtaining full cognizance of the existing situation of irrigation.

In a general way, flood control may be considered a basic undertaking, whereas irrigation by means of low-lift pumps and other equipment may be regarded as a terminal work. To ensure efficient promotion of agricultural development under the existing conditions, flood control and irrigation must be carried out progressively while maintaining them in close relation with each other.

(b) Existing State Viewed from Conditions Required of Farmers

The fact that irrigation in East Pakistan is conducted only in the dry season as briefed in the preceding paragraph deserves to meet with recognition, since it gives a good clue to measuring farmers' concern

for irrigation.

There is a marked difference of rainfall between the wet season and dry season. Of the total average annual rainfall of 81.75 inches, about 90%, or 73.20 inches, is concentrated in the May - October period, and the remaining 10%, or 8.55 inches, is recorded during the November - March period. Rice cultivation in the dry season when the rainfall is thus extremely small cannot be carried out unless artificial measures are taken for supply of irrigation water.

Under such severe natural conditions, irrigation in East Pakistan was initiated in the dry season and has been carried out in areas of low elevation where surface water can be made use of fairly easily.

Study of the existing situation on the part of farmers with consideration given to the severe natural conditions makes it reasonable to believe that irrigation was originally initiated on an individual basis resorting to nearby water sources. From this, it can be inferred that farmers' voluntary organizations for a universal practice of irrigation would never have come into existence.

In recent years, however, power pumps came to be employed in irrigation, and establishment of farmers' organizations is in progress partly because of the Government's active incentive measures for irrigation.

Pump groups organized under Thana Irrigation Programme are expected to serve to consolidate farmers' organizations for further extension of irrigation. They will also play an important role in establishing farmers' voluntary organizations which would act as the nucleus in the desired agricultural development.

(2) Problems Involved in Introducing Irrigation Techniques

(a) Land Conditions

Further improvement is required of land conditions involving canals and farm roads which constitute the prerequisite to the introduction of improved techniques of rice cultivation. Full-scale investment for this purpose will be necessary in the future.

Rice cultivation in East Pakistan is rain-fed cultivation in almost all cases. Even in the flood-free areas having a relatively high elevation where gravity irrigation is feasible, plot-to-plot irrigation is noted to be prevalent.

In areas of low elevation, prime importance must be attached to flood control since it is the basis for improving land conditions. However, on account of the urgent national need for self-sufficiency of food, flood control is being carried out concurrently with low-lift pump irrigation which produces immediate effects for increased rice production.

In the attempt to provide perfect land conditions for agricultural production, a close relationship must be maintained between flood control and low-lift pump irrigation which are being carried out in parallel. Gravity irrigation using canals and other means would be the ultimate goal of the irrigation and drainage system in East Pakistan. In this connection, the Commission considers it justifiable to evaluate the low-lift pump irrigation as a means to provide a perfect irrigation and drainage system. In the extension of improved techniques of rice cultivation that necessitates irrigation facilities, the low-lift pump irrigation will play an important role because it can be readily established and produces effects rapidly.

For these reasons, due consideration must be given to the pump irrigation which is scheduled to be carried out on a large scale in selected flood-free areas under ARPP.

Duty of 1 cusec of water discharge averages 25 to 35 acres in East Pakistan. It is technically possible to increase this value to about 60 acres per cusec, provided that distribution loss is reduced by suitable means such as lining of canals and levelling of fields.

The following may be cited as measures to be taken for further extension of irrigation.

- 1) Survey of available surface water at the end of aman season and underground water during boro season for their use in irrigation.

- 2) Studies for efficiency elevation in terminal irrigation systems.
- 3) Extension and recommendation of irrigation at the end of aman season.

(b) Human Conditions

It should be pointed out, among others, that farmers are not fully prepared or qualified to introduce improved techniques of rice cultivation.

Since an irrigation and drainage system has a substantially public nature in itself, extension of irrigation will require the solidarity and unity of farmers. Scale of farm management of East Pakistani farmers is rather small, with the holding per farm household reported to average about 3 acres. In addition, the per household holding is said to be on the decrease due to the equalized division of succession.

Planning of improved land conditions, particularly the construction of canals and farm roads that occupy a large area, if conducted with full consideration given to the above-mentioned trend of the current land tenure, would be largely affected by the need for adjusting the conflicting farmers' interests in farm land.

It is preferable that problems of conflicting farmers' interests be solved on the farmer's level, and in this sense, voluntary unity of farmers is much hoped for. Needless to say, the Government should provide an influential administrative system and staff capable of giving advices for solving such problems.

It merits attention that there are many problems that cannot be brought to a satisfactory solution without the unity and consolidation of farmers, such as adjustment of conflicting interests in distribution of irrigation water and offer of services for maintenance and management of canals and other facilities.

(3) Future Technical Cooperation Viewed from the Standpoint of Irrigation and Drainage

(a) Objective of Technical Cooperation

In extending technical cooperation to East Pakistan in agricultural irrigation in relation to the extension of improved techniques of rice

cultivation, it is considered that stress should be placed, for some to come, on technical guidance for the operation of irrigation systems.

In this connection, due account must be taken of the role played by UAA (Union Agriculture Assistants) who come in touch with terminal farmers and provide them with technical guidance under ARPP and TIP now being impelented in East Pakistan.

(b) Method of Technical Cooperation

Japan's technical cooperation to East Pakistan has been extended in the form of deputation of experts specialized in various fields of agricultural science over the past 15 years. Activities of these experts, however, were made only in limited areas of East Pakistan, and produced no effects that could influence the whole Province. It is to be pointed out that the results of efforts made by Japanese experts are not incorporated in the policies of the Government. In the future technical cooperation, therefore, consideration should be given to a systematized despatch of experts so as to maintain a more organic relationship with the Government.

For a systematized extension of technical cooperation, it is advisable to despatch a team of experts comprising those working on a field level, managerial experts who control their activities, and an advisor who gives administrative and technical advices to the Government for the agricultural development of East Pakistan.

To maintain an organic relationship with the Government in the technical cooperation, it is necessary that counterpart engineers (experts and assistants) responsible for implementing the technical cooperation should be secured on the part of East Pakistan.

(c) Services to be Included in Technical Cooperation

1) Selection of Extension Farms

For demonstration of water management techniques and practical and technical training of UAA and other end extension workers, extension farms should be designated in suitable areas of East Pakistan.

The extension farms should preferably have a scale compatible

with the average size of one pump group organized under TIP. It would be advisable that the farms cover an area of about 50 acres that could be serviced by a 2 cusec pump.

In selecting the farms, consideration should be given to the willingness of farmers to improve their rice cultivation techniques and the physical conditions of proposed areas. Particular care should be taken of the topography and geology so that a number of areas having different patterns of physical conditions will be selected for designation of extension farms.

2) Technical Guidance for Irrigation and Drainage

Technical guidance should be given with stress placed on practical training and should include the following.

- i) Technical guidance for improvement of land conditions
 - Land Survey: Topographic survey (traversing, plate-table survey, and levelling)
Route survey (levelling)
 - Hydro-logical & soil survey: Hydrology (precipitation, evaporation, atmospheric temperature, water requirement in depth)
Soil (physical and chemical properties of soil)
 - Design: Canals (irrigation canal and drainage canal) and farm roads of smaller scale
 - Execution of work: Small-scale works that can be completed by the collective services of farmers.

- ii) Practical training on water management techniques
 - o Water management techniques useful for rice cultivation.
 - o Water distribution techniques within extension farms (with particular emphasis on the water distribution and with consideration to the cropping pattern of respective farmer's fields)
 - o Maintenance and management of canals.
 - o Operation and routine maintenance of pumps.

3) Provision of Equipment

Equipment to be provided to extension farms should include

pumps of about 6', surveying equipment, rain gauges and other equipment for hydrological survey, equipment for soil analysis, etc.

(4) Conclusion

Introduction of improved techniques of rice cultivation calls for the availability of the minimum farm conditions that allow for the successful application of such techniques. However, what counts more than the establishment of such conditions is the willingness on the part of farmers to employ the improved techniques. Where there is a will, there always is a creative effort to attain the desired target. Techniques should in all cases be adaptive to the physical conditions in which they are employed. The most effective driving force in the agricultural development is the creative measures devised voluntarily by farmers. The Mission therefore hopes that farmers will be encouraged to devise such measures.

Reference Data

- 1) Accelerated Rice Production Programme, Phase-I, 1970/1971.
- 2) Flood Control Plan of East Pakistan.
- 3) Action Programme for Development of Agriculture in East Pakistan, 1970/1971.
- 4) Agriculture in East Pakistan.
- 5) Evaluation of the Thana Irrigation Programme in East Pakistan, 1968/1969.
- 6) Introducing EPWAPDA.

3. Cultivation

- Cultivation of IR-20 and Cooperation of Japanese Agricultural Experts -

- (1) Significance and Problems of ARPP through Cultivation of IR-20
 - (a) Weight of ARPP in the Foodgrain Production Targets
 - 1) Demand and Production of Rice in East Pakistan

Estimated area of cultivated land in East Pakistan in 1967/1968 was 22.48 million acres, of which net cropped area and current fallow occupied 21.75 million acres and 0.73 million acres, respectively. Room for expanding cultivated area is extremely small, and the Government envisages that the total area of cultivated land would not exceed 22.7 million acres in 1989/1990. However, since double or triple cropping is feasible in wide areas, the total crop area with multiple cropping was 31.44 million acres in 1967/1968 and the cropping intensity estimated 145% in the same year. With the increased installation of irrigation facilities in future, the cropping intensity is expected to rise and reach about 155% in 1989/1990.

Rice production in East Pakistan is subjected to a remarkable annual fluctuation. During the past 10 years, however, production has been clearly on the increase, and over the past few years, it ranged from 9,420 thousand tons (1966-1967) to 11,500 thousand tons (1969/1970) in terms of paddy rice. Production fluctuation is caused chiefly by flood calamities, insect damages and drought damages which give a great production instability of wet season crops such as Aus and Aman. On the contrary, production of the dry season crop, Boro, is fairly stable. With the expansion of irrigation facilities as well as enhanced cultivation of suitable varieties such as Taiwan-varities and IR-8, particularly of IR-8, a rapid expansion of rice fields has recently been achieved in the area for Boro cropping. Increased adoption of improved cultivation practices by farmers accelerated this trend, and production of Boro crop showed a remarkable increase. It should be noticed that the production of Boro crop, as shown in the statistics of the East Pakistan Government, increased from 574 thousand tons in 1964/1965 to 1,611 thousand tons or 14% of total rice production in 1968/1969.

The increase in Boro crop production is the outcome of the policy for yield increase which the Government has pushed forward

since 1965/1966 under the Third Five-Year Plan. Progress made during the five-year period up to 1969/1970 is quite noteworthy and involves such achievements as accelerated diffusion of newly improved varieties, higher doses of fertilizer application, expansion of plant protection areas, and augmentation of irrigation facilities through installation of low-lift pumps and deep tubewells. Farmers are assuming an increasingly positive attitude towards introducing improved paddy cultivation techniques based on the above-mentioned achievements. It may safely be said, therefore, that moves are gaining momentum for improved agricultural practices. Successful production increase of Boro crop in dry season is to be highly evaluated since it was given the top priority under the Third Five Year Plan.

However, the population in East Pakistan has been rapidly increasing, and an annual growth rate was more than 2.8% in 1969/1970 which was the last year included in the Third Five Year Plan. In contrast with this sharp population increase, the average annual growth rate of major foodgrains such as rice and wheat was slightly over 2.0% during the past 10 years, and increased to about 2.5% over the past five years. Therefore, the present foodgrain production is not sufficient to support a population of 73 million even if the intake of nutrition is maintained on the current low level. Under the circumstances, East Pakistan is compelled, though it is one of the major rice producing districts of the world, to import a great quantity of rice each year. It is estimated that about 1,700 thousand tons of rice will have to be imported in 1969/1970.

It is evident that the food situation will be even more aggravated than at present if the growth of foodgrain production remains as stagnant as in the past. The Third Five-Year Plan ended without bringing any solution to the unbalance between production and population, though its implementation made it possible to see the signs of increased production.

2) The Fourth Five-Year Plan and ARPP through Cultivation of IR-20

The Fourth Five-Year Plan was put into operation from 1970/1971. In East Pakistan, the prime objective of the Plan is the production increase of wet and dry season crops of rice and other foodgrains. One of the features of the Fourth Five-Year Plan not found in the Third Five-Year Plan is the particular stress placed on the production increase in the wet season.

Increase is expected in the cultivation area and production of Boro crop which recorded a remarkable production increase under the Third Five-Year Plan. However, land suitable for this crop is rather limited (2,040 thousand acres or about 8% of total rice crop area in 1968/1969), and the production of this crop is affected by the availability of irrigation facilities which demand a huge capital investment. Hence, no phenomenal growth of rice production can be expected from the production increase of Boro crop alone.

About 9 million acres or 38% of the total rice crop area in East Pakistan are occupied by trans-planted Aman during the wet season (growth duration: July to December). Of this 9 million acres, about 5 million acres are said to be reasonably free from flood hazards or susceptible to shallow flooding only, which means that paddy cultivation can be conducted economically in this area without irrigation facilities or with a limited supplementary irrigation water. If full advantage is taken of such favourable conditions, it would certainly serve for the desired accelerated production.

EPRRI introduced seeds of a newly improved variety, IR-20 (IRRISAIL No. 1), from IRRI of the Philippines in 1968 and conducted tests in different districts of East Pakistan in the following year. The tests revealed that this new variety produced an excellent yield when cultivated as the aforementioned transplanted Aman crop. According to the test results, the newly introduced

IR-20 produced a yield 25 to 40% higher than that of improved varieties cultivated in East Pakistan, promising a yield of 50 maunds per acre (=4.6 tons per hectare) in paddy rice. Having perceived the highyielding capacity of IR-20, the Government of East Pakistan formulated a yield increase programme resorting to the cultivation of this new variety and to the maximum utilization of the afore-mentioned relatively favourable conditions for Aman crop cultivation, and incorporated it in the Fourth Five-Year Plan with a high priority given to it.

However, the implementation of the yield increase programme entailed the following problems.

- (i) Quantity of seeds of IR-20 available at the outset of the programme was far less than required.
- (ii) IR-20 is an entirely new variety whose agronomic characteristics are not quite well known to farmers and extension workers. Further, existing system for promoting rice production is far from satisfactory if the diffusion of the variety concerned is to be prompted and the rapid production increase is to be attained.
- (iii) On the other hand, the acute food crisis stated in the preceding subparagraph was such that "...this Province can hardly wait for another year in this critical phase of its food production (from ARPP, 1970-71, p. iv, Department of Agriculture, East Pakistan)."

For these reasons, the Government of East Pakistan effected a partial revision and supplementation to the Fourth Five-Year Plan, and formulated an accelerated rice production programme under the title of "ARPP, Phase-I, Five Lakh Acres of IR-20 Aman, 1970-71" which was intended for a favourable turn in the food situation within a short time. According to the strategy of the programme, rice production of 11,500 thousand tons in 1969/1970 is to be increased to 16,100 thousand tons in 1974/1975. In other words, a production increase of 4,600 thousand tons is

envisaged, and a production increment of 2,500 tons is planned to be attained by the aforementioned transplanted Aman crop.

ARPP is a plan to materialize increased rice production chiefly through expansion of crop area of IR-20 during the Aman season together with IR-8 and other IRRI varieties prepared for cultivation in Boro and Aus season respectively, for which an intensive measure will be taken for supplying fertilizers, pesticides and fungicides, farm machinery and equipment, irrigation facilities, and farm management funds, as well as for strengthening the extension organization in the selected areas of concentrated activity and budgetary appropriations. The programme also provides a price support to the produce of IR-20 at Rs. 4 per maund over the normal procurement price of paddy and gives the assurance of the Government's purchase of entire produce. Extension officers and assistants are entitled to an incentive bonus varying from Rs. 100 to Rs. 250 per year under the programme.

(b) Impelentation and Problems of ARPP

1) Cultivation of IR-20

It is planned that 5 million acres will be under cultivation of IR-20 in 1972/1973, the third year of the programme. To accomplish this goal, the programme envisaged, in its first plan, that an area of 500 thousand acres would be planted with IR-20 in the first year (1970/1971). Actually, however, the planted area covered only 200 thousand acres as scheduled in its second plan. This was caused mainly by the shortage of seeds, and partly to problems which occurred in some districts with respect to the advancement of farming funds.

Failure to attain the planned planted area in the first year of the programme is not considered to give any adverse influence on the smooth supply of seeds needed for expanding the planted area in the second and subsequent years. The fact remains, however, that the number of farmers and extension workers experienced in this new variety was made smaller than had been originally

anticipated, and this would give direct and indirect effects on the production in coming years.

Cultivation of IR-20 is expected to show excellent results for some time to come. However, forecast of growth condition and yield of this variety in 1974/1975, the last year of the Fourth Five-Year Plan, when it could be planted over an area of 5 million acres as scheduled in ARPP, entails many difficulties at present for reasons given below.

- (i) Past experimental results indicate that IR-20 is resistant to many common pests and diseases. However, it cannot be readily foreseen that it will maintain the same resistance when it is cultivated over a wide area and under high doses of fertilizer application. It should be borne in mind that a new variety propagated in an extensive area within a short period is often vulnerable to the epidemic of new types of pests and diseases.
 - (ii) A total of 5 million acres is included in the programme as being suitable for cultivation of IR-20. However, there must be some differences in suitability between individual farmers' fields within the area concerned, especially because of their different soil fertilities and irrigation water depths. This gives rise to the misgiving as to the suitability of the entire 5 million acres for cultivation of IR-20; and if this misgiving can be dispelled, it is still open to question and review whether the expected yield can be obtained with stability.
 - (iii) It is feared that the cultivation of IR-20 by farmers may result in an unexpectedly low yielding level due to its small grain size.
- 2) Supply of Equipment and Materials Other than Seeds, and Improvement of Irrigation Facilities

To assure the high yielding ability of IR-20, it is necessary to supply suitable fertilizers, pesticides and fungicides for plant

protection and their spraying. Further, satisfactory irrigation facilities must be available to avert the drought damages during the period from the flowering stage to the maturing stage. During the present survey, it was not possible to discover to what extent these requirements were actually fulfilled during the first year of ARPP or will be fulfilled during the coming years of the programme in the entire 5 million acre area. In the limited number of districts visited by the mission, it was noted that the supply of equipment and materials was not enough and irrigation facilities were needful for further improvement, though these districts were considered to be provided with relatively favourable conditions. From the glance taken by the mission during its survey trip, it is believed that the overall supply of equipment and materials or improvement of irrigation facilities is not in smooth progress as envisaged in ARPP.

3) Direction and Training of Agricultural Extension Workers and Farmers

Direction and training of agricultural extension workers and farmers are an activity which is given a high priority in ARPP and is actually carried out positively in rural districts.

However, the direction and training activity now being carried out does not seem to include on-the-job training, and cannot therefore be expected to display any immediate effect for practical purposes. In future, direction and training involving practical exercises should be provided continuously, while Union Agricultural Assistants and other extension workers should be kept mobile with the necessary information media suitably established so that the quality of extension work will be elevated in many aspects.

Needless to say, these activities must be preceded by the diffusion of elementary and common education of farmers.

(c) Comments

1) The Government of East Pakistan is concentrating its efforts

on the production increase of foodgrains on the basis of ARPP which is a highly intensive plan. This Government's policy deserves much recognition since it is most effective in assuring the accelerated rice production. The Government's measure to concentrate its activities in selected areas is also commendable since it will yield immediate effects and at once serve for the spread of such effects in areas surrounding the selected areas.

2) It appears, however, that the target set under ARPP, i. e., "coverage of the entire 5 million acres suited for transplanted Aman with IR-20 by 1974/1975 for an average production increase of 1/2 ton per acre," is based on a rather optimistic observation. Conditions that must be satisfied to justify the target are -

- (i) Establishment of facilities required for irrigation of the entire 5 million acres by 1974/1975;
- (ii) Supply of necessary equipment and materials, and the need for farmers to make full and free use of them; and
- (iii) Establishment and full functioning of an extension and guidance system for farmers by 1974/1975 which is satisfactory in both quality and quantity of services.

The target set under ARPP is judged to be rather too much hopeful because it does not seem fully warrantable that all the above conditions can be fulfilled. The mission entertains a similar apprehension about the yield increase targets of Boro and Aus crops under ARPP.

3) The production increase of 4,600 thousand tons envisaged under the Fourth Five-Year Plan may as well be set as a "target," but its "feasibility" does not appear to be fully justifiable. In case it becomes clear there is no prospect of 100% achievement of the target, factors preventing the realization of target must be put to proper analysis and evaluation. For this purpose, cool and accurate analysis and evaluation of each achievement of the programme must be made continuously in the course of its implementation. Formulation of effective measures in later stages of the

programme is possible only when it is based on such analysis and evaluation.

Technical Problems and Cooperation of Japanese Agricultural Experts in Accelerated Rice Production Scheme through Cultivation of IR-20

(a) Technical Problems Entailed in Recommendation of IR-20

1) General Description of Characteristic of IR-20 and Favourable Conditions for Its Cultural Practices

IR-20, called "IRRISAIL No. 1" in East Pakistan, is essentially a variety released by IRRI of the Philippines, and was given its present name in November 1969. IR-20 was released from the cross of Peta³ x Taichung (Native) 1 x TKM6. Pata is originally an Indonesian variety, but one of its parents is Latisail, a local improved variety of East Pakistan. Both Peta and Latisail are believed to be fairly resistant to tungro virus disease. Taichung (Native) 1 is a dwarf type indica variety of Taiwan, and is highly adaptive to varying environments. TKM6 is an Indian variety which is said to be resistant to stem borer.

Traits of IR-20 released from the above-mentioned parents are as given below.

It is dwarf and tillering type with erect leaves, and weakly sensitive in its reaction to photoperiod. It is resistant to rice blast, tungro virus and bacterial leaf blight diseases and also to stem borer attack. It has performed well at fairly high rates of nitrogen application. Its higher lodging resistance is far higher than local improved varieties, but falls behind IR-8. Its quality is fine but the grain size is small. The total milled rice recovery and the seed dormancy are both high.

One of the characteristics of IR-20 is that it is adaptive to transplanted Aman cropping because of its weak sensitivity to photoperiodism. No high yielding varieties were so far available in East Pakistan that were suited for Aman cropping. Cultivation of improved varieties of this type in Pakistan was forestalled by

the advent of IR-20. IR-20 is not suited for cultivation at low rates of nitrogen application because its nitrogen response is fairly high. Its cultivation necessitates a further review of the rates of fertilizer application and soil conditions to prevent severe lodging which occurs by its short and weaker stem as compared with IR-8. Its resistance against common pests and diseases revealed by experimental results needs to be carefully observed and reviewed when it comes to be cultivated in extensive paddy fields of farmers at high rates of fertilization application. Further, its small grain size makes it preferable not to expect too high a yielding level.

IR-20 is reported to be capable of standing a sudden flooding of up to a couple of days. However, since its resistance to flood hazards is believed to differ by the growth stages, further study must be made on this point in the event it is brought to cultivation in an extensive area. Being a dwarf type variety, IR-20 should essentially be cultivated at places completely free from flood hazards. In this respect, it is expedient that the Government designated only flood free areas under-ARPP as its prospective crop area.

2) Technical Problems Involved in the Recommendation of IR-20

(i) Importance of Extension Activities

Cultivation of IR-20 in East Pakistan was initiated on a small scale during Aman season of 1968 in experimental fields, which was followed by test cultivation conducted in 1969/1970 in different districts of the Province. Therefore, this new variety is not quite familiar either to farmers or to extension workers. Further, as described before, it has many problems that need to be clarified in future, and extension workers will have to play a vital role in the clarification of these problems. It is no exaggeration to say that the key to successful implementation of ARPP through full-scale introduction of IR-20 lies in satisfactory activities of extension work.

Assurance of quick production increase which the Government intends to realize through cultivation of IR-20 must be realized by special and scrupulous regard for the method of extension and guidance work. The importance of the extension work can never be overestimated since no failure can possibly be allowed of ARPP nor can the Province wait for another year in coping with the acute food situation.

(ii) Conditions for Satisfactory Recommendation and Extension of IR-20

Recommendation of IR-20 demands that the following conditions are fulfilled in advance.

a) Establishment of conditions for introducing improved techniques of rice cultivation

To ensure the increase of yield and production, environmental conditions should be so established that proper water management and improved techniques of rice cultivation can be introduced in an adequate way. Environmental conditions referred to here involve human and social conditions in addition to physical conditions.

To meet the purpose of production increase within a short time, the recommendation and extension activities should be concentrated in areas where such conditions are already furnished or being furnished. For production increase in other areas, it is advisable, for the moment, to resort to the spreading effects of concentrated activities in selected areas.

b) Proper assignment of well-trained extension workers

As already described, it is not yet made clear what type of weakness IR-20 will show when it is cultivated on a large scale, nor is it clearly known what type of cultivation techniques or land would be the most suitable for IR-20. To avert the possible impediments that may accompany the accelerated expansion of planted area of IR-20

and to ensure the increase of yield and production, these unknown factors must be brought to light as soon as practicable and made known widely to determine the propriety of expanding planted area.

This will require efforts of well-trained and able extension workers in selected areas of concentrated activity who will ensure rapid diffusion of useful information on each occasion it is obtained. As a whole, areas designated for recommendation of IR-20 do not appear to be fully provided with such a system at the moment.

(b) Cooperation of Japanese Agricultural Experts in the Recommendation of IR-20

1) Necessity for Cooperation

Establishment of various environmental conditions and activities of capable extension workers described in the preceding subparagraph are a matter of utmost urgency for the desired increase of foodgrain production in East Pakistan. It is a matter of pressing need particularly because the increased foodgrain production is planned with much dependence on the cultivation of IR-20 which is still unfamiliar to farmers and extension workers. The Central Government of Pakistan and the Government of East Pakistan are well aware of this fact, and have enforced an integrated policy compatible with such need. The policy, however, cannot be regarded to have produced the expected results to date. Provision of advices and guidances by the Japanese agricultural experts in the recommendation of IR-20 is therefore expected to contribute to accelerating the achievement of the target.

2) Roles and Method of Cooperation of Japanese Agricultural Experts

Since 1956, technical cooperation to East Pakistan has been continuously developed by Japanese experts under the Colombo Plan despite many difficulties they have encountered. Their

activities in the initial stage centered on the model farm system which was intended to demonstrate improved farming techniques to the extension workers and farmers in East Pakistan. The Japanese techniques of rice cultivation presented at model farms won a wide recognition as the "improved techniques of rice cultivation" and accepted by many farmers in several districts, contributing largely to production increase of rice. Activities of the Japanese experts deserve a high appraisal as they provided the basis for yield increase through cultivation of Taipei 177 and for the successful introduction of such improved varieties as IR-8 and IR-5 in years subsequent to 1968.

In recent years, Japanese experts despatched under the Colombo Plan came to give much higher priority to the extension work over the model farm system with the exception of their training activities at EMTI (Farm Mechanization Training Institute). Shifting from the model farm system to the extension work was effected in view of the fact that the incentive effect of the former system, which was remarkable during the initial few years, declined in later years. Recent activities of Japanese experts, with the exception of those at FMTI, are noted to be intended to train extension workers on the new type of extension services, and are giving, at the same, substantial influence on the farmers both directly and indirectly. The confidence placed by the farmers in Japanese experts is one of evidences for the success of their activities. The mission noted that the achievements made by Japanese experts are duly recognized and evaluated by the Government of East Pakistan and by administrative organs and extension organizations in different districts.

It should be noticed, however, that there are regional differences in the outcome of their cooperation. Effect of cooperation is noted to be prominent in areas where the Japanese experts attached importance to extension work in an earlier stage or where cooperative organizations were active and proper arrangements

were made for taking advantage of the cooperation offered.

It also deserves much recognition that the advices and training given by Japanese experts at FMTI proved useful for the trainees and instructors.

From the achievements made by Japanese experts over the past 15 years, the following can be recommended for their effective cooperation in the recommendation of IR-20.

(i) Cooperation in the action programme of accelerated rice production through the large-scale cultivation of IR-20 should be given in areas where the arrangements are made for systematized utilization of such cooperation.

(ii) Cooperation of Japanese experts should be given with particular emphasis placed on the training for extension workers.

(iii) To ensure the maximum effects and smooth implementation of the cooperation, an organization comprising chief advisor, senior experts and junior experts should be established.

(iv) Expansion of planted area is likely to call for advanced breeding from IR-20 and further improvement of its cultivation techniques. It will therefore be necessary to dispatch Japanese research workers, plant breeders and pathologists to EPRRI (East Pakistan Rice Research Institute) in the near future. They are expected to stay at the Institute to provide necessary advices and guidances on rice breeding and other research works.

4. Agricultural Extension

- Agricultural Extension in East Pakistan;

Its Existing State, Problems, and Desirable Future Improvement -

Existing State and Problems

(a) Existing State

In an attempt to cope with the acute food shortage, the so-called ARPP (Accelerated Rice Production Programme) is given the highest priority in East Pakistan and maximum efforts are being made for its successful implementation. The programme envisages the cultivation of IR-20, a newly introduced high-yielding variety, to be accompanied by high doses of fertilizer application, use of pesticides and fungicides for plant protection, establishment of irrigation facilities such as pumps, and introduction of powered tillers.

A plan for intensified agricultural extension was also formulated so that farmers may be given accelerated technical extension and guidance services for pushing forward ARPP. A total of 1,250 extension workers comprising TAO (Thana Agriculture Officers) and UAA (Union Agriculture Assistants) are being given training on the cultivation techniques of IR-20. It is planned that each UAA will cover an area of 400 acres so as to achieve the target of 500 thousand acres planted with IR-20.¹⁾

It goes without saying, however, that a plan of this kind, no matter how scrupulously it may be mapped out, yields no fruits unless farmers who actually participate in production activities are prepared to absorb new techniques and knowledges.

Accordingly, attention must be directed to the past activities for extension of improved cultivation techniques among farmers as well as to the conditions on the part of farmers for introducing highly improved techniques.

For the extension of improved cultivation techniques, efforts were made in the past for introduction of improved varieties, low-lift pumps and tube-well pumps for irrigation, fertilizers, sprayers, powered farm machinery. However, these advanced cultivation techniques and facilities are either not yet introduced by individual farmers, or not utilized in a proper way to display their full performance and functions even if they have already been made available to farmers.

Even in Kotwali Thana of Comilla District where the conditions are fairly satisfactory to make the area serve as the nucleus in the overall agricultural development, farmers' utilization of pumps is as inactive as tabulated below. ²⁾

Utilization of Pumps in Kotwali Thana, Comilla District
(June 1970)

Possession of pumps:

Farmers possessing pumps	- 66 (67.3%)
Farmers not possessing pumps	- 32 (32.7%)

Use of pumps for the last amon crop:

Farmers who used pumps	- 17 (25.8%)
Farmers who did not use pumps	- 49 (74.2%)

Frequency of use:

1.84 times a day on an average
(Max. 4 times a day; min. once a day)

Fertilizers are applied at higher rates each year but without bringing about much increase in yield as shown in the following table. This table also indicates that the effect of fertilizer application is small if conditions are immature for transformation into advanced agriculture.

Total Fertilizer Procurement and Yield of Rice (1966/1967 = 100)

		1966/1967	1967/1968	1968/1969
Whole East Pakistan ³⁾	Total Fertilizer Procurement	100%	135.1%	140.0%
	Yield of Rice	100	116.7	118.5
Kotwali Thana ⁴⁾	Total Fertilizer Procurement	100	112.8	117.2
	Yield of Rice	100	126.0	160.0

(b) Problems Entailed in Extension Service

Problems raised in the preceding paragraph may be ascribable to the following situations.

- 1) Situations on the part of farmers

- (i) Low standard of education of farmers as represented by the illiteracy rate of 83%.
 - (ii) Socio-economic conditions render it difficult for farmers to have a willingness for modernized and increased production.
 - (iii) Many farmers suffer from a large amount of debt due to their subsistence-level management and continued failure of crops.
- 2) Situations on the part of extension workers
- (i) Although there are organizations intended for agricultural extension and guidance for farmers, such services are not offered through direct personal contact with farmers.
 - (ii) Extension workers lack practical experience in agriculture, and are often short of qualifications and capabilities required for practical guidance of farmers. Since they are given only 2-year training at NDTI (National Development Training Institute), they can hardly be expected to be fully trained on the practical guidance techniques.
 - (iii) Recommendation and extension of the improved cultivation techniques is conducted by a standardized method and not under a plan incorporating crop combination and planting suited to respective areas.
 - (iv) Extension services tend to become less integrated by the diversified activities of such extension organizations as the Government controlled TAO, UAA and TIP (Thana Irrigation Programme), and of ADC (Agricultural Development Corporation) and ADE (Agricultural Development Estate) which are the projects for agricultural development. In addition, there is a lack of cooperation and coordination between these organizations. Further, extension and guidance work of ADC and ADE is performed by inspectors, but their activities center on the advancement and collection of funds.
 - (v) Routes and media of communication of agricultural tech-

niques are needful of improvement and consolidation.

As briefed above, the guidance system for extending the improved cultivation techniques requires no less improvement than the farmers' conditions for taking advantage of such techniques. Improvement of all the conditions cited above is the prerequisite of the desired extension of the improved cultivation techniques and rapid agricultural development.

(2) Extension and Guidance Activities for Accelerated Rice Production through Cultivation of High-Yielding Variety (IR-20)

(a) Fundamental Approach

The merit of high-yielding varieties is only that their yield potential is higher than conventional local varieties. The high yield potential can never be realized unless the cultivation is assured of the required conditions such as the farm consolidation work for facilitating irrigation and drainage, high rates of fertilizer application, adequate water management, and proper plant protection.

If a high-yielding variety is cultivated without satisfying these conditions, its yield would fall behind the conventional varieties.

Key to successful introduction of new high-yielding varieties lies in the establishment of conditions under which farmers can absorb and apply new techniques and knowledges and of a guidance system under which such techniques and knowledges can be satisfactorily disseminated among farmers.

As earlier described, it can hardly be said that these conditions are fulfilled at present. Introduction of new varieties is not therefore free from a number of technical problems.

It merits attention, however, that in Kotwali Thana of Comilla District where KTCCA (Kotwali Thana Central Cooperative Association) was established by its Academy as an experimental step for agricultural development, movement towards agricultural modernization is in progress including the organization of agricultural cooperative associations, initiation of agricultural development finance, combined execution of

field cultivation experiments and technical extension services, education and farmers, and rationalization of farmers' livelihood. With the technical assistances extended by Japanese experts, these activities are steadily improving the situation in Kotwali Thana, and the results are spreading to other Thanas and Chittagong District and serving as incentives to farmers for modernized agriculture and increased rice production. From this fact, it is probable that Comilla and Chittagong Division embracing Chittagong City will become the nucleus in the future agricultural development through introduction of highly improved techniques.

Conditions to be satisfied for satisfactory extension of IR-20 under ARPP are as given in the following paragraph. It is to be added that the desired increase of rice production cannot be achieved unless all farmers are induced by satisfactory extension work to show keen interest in and become eager to absorb the improved cultivation techniques.

(b) Conditions to be Satisfied for Satisfactory Extension Work

1) Consolidation of the extension and guidance system

It is of controlling importance to establish a powerful extension and guidance system under which extension workers will come in constant and direct contact with farmers and guide them in the practical application of improved techniques and new knowledges. For this purpose, the following measures should be taken.

- (i) Increase in number of able extension workers who are capable of actually applying and demonstrating the improved techniques on the fields.
- (ii) Constant extension and guidance service of extension workers who are capable of guiding and educating farmers.
- (iii) Assurance of proper guidance and advices exclusively for the staff for UAA.
- (iv) Organizational and institutional consolidation so that the activities of agricultural extension organizations will be directed exclusively to the elevation of farmers' level and extension of improved techniques and to contribute to the overall agricultural development of East Pakistan. This is

essential in view of the fact that extension activities of the Government, ADC and ADE tend to pursue diversified courses without coordination, and the greater part of the activities is occupied not by the actual extension services but by such other works as administrative liaison works, distribution of equipment and materials including agricultural chemicals, and advancement and collection of loans.

2) Rearing of capable extension workers and improvement of training system.

An agricultural extension worker should have the practical ability to guide farmers through personal contact with them, and is also required to be fully acquainted with the methods and means of extension. He is further demanded to have the knowledge and experience in farm management planning, and the sufficient technical capability to introduce the improved cultivation techniques involving, in particular, line plant, fertilizer application, plant protection, irrigation and drainage, and water management.

It is therefore necessary that enhanced education and practical training be given for future rearing of extension workers. It is also necessary that different types of existing training, such as the training for newly assigned extension workers, training on improved techniques and training on specialized fields of techniques, be integrated into a single training system under which to provide those already in extension service with improved training, with the Farm Mechanization Institute serving as the nucleus of technical extension service.

3) Consolidation of extension service

Extension workers who give guidances and advices directly to farmers should be kept mobile (with bicycles, etc.) so that they may be allowed to be in constant touch with farmers and incite their willingness for production increase and improved agriculture and livelihood. In inducing farmers to realize the need for collective farm work and enlightening them on new techniques, extension

workers should show practical examples on the fields and also resort to visual education using slide films and the like.

It is naturally preferable that all farm households are covered by the extension service. However, considering the high rate of illiteracy, it would be desirable to initiate the extension work with the selection of as many model farm households as possible for expansion of extension service from them to non-model farm households.

Cultivation of high-yielding varieties calls particularly for an improved network of irrigation canals and farm roads as well as for adequate water management. For this reason, stress must be placed on the grouping of farmers and organization of collective farming works in the extension service.

4) Establishment of cultivation techniques suited to each area

Since soil and water utilization conditions differ by areas, extension of improved cultivation techniques should be conducted on the basis of a combination of cultivation method best suited to the characteristics of respective areas and cultivation conditions under which the newly introduced varieties can fully display their characteristics.

It is advisable that a simple farmers' calendar be prepared by each union on the basis of such a combination on the Thana level.

In offering extension services, close relations should be maintained with research institutes, with a communication route established to assure quick availability of technical information.

5) Financial aid to farmers

Extension of improved cultivation techniques and knowledges does not promise any relief to the food situation, unless the cultivation of newly introduced varieties is backed up by the input of modern capital goods.

Most of farmers in East Pakistan are leading a debt-bound life. The Government is therefore providing loans at a low

interest rate of 5% for procurement of equipment and materials. In actuality, however, the funds made available to farmers are advanced at a high rate of about 15%. Further, the upper limit of loans is set at five times the amount deposited by farmers with their respective cooperative unions. This financial situation is one of the major causes for the retarded agricultural modernization in East Pakistan.

If the improved cultivation techniques and high-yielding varieties are to be introduced through extension service, the rate of commission charged by agricultural cooperative associations should be revised and farmers should be provided with Government funds at low interest rates.

(3) Roles of Japanese Experts in Future Agricultural Extension

Activities of Japanese agricultural experts despatched under the Japanese technical cooperation to East Pakistan have so far been confined, despite their strenuous efforts, to the demonstration farms where the so-called improved cultivation techniques were put in practice. It appears that a considerable time will be required before the results of efforts made by these Japanese experts spread throughout the Province.

It is therefore advisable that priority be given to the extension and guidance service in the future cooperation of Japanese experts.

(a) Concentrated Cooperation

It is desirable that concentrated technical cooperation be given to those Thanas which are favoured with suitable land, willingness of farmers, a powerful local guidance system, and other preconditions indispensable for extending improved cultivation techniques. In such concentrated technical cooperation, Japanese experts will best display their ability and will also yield better results.

(b) Advices and Recommendations for Local Extension Workers

In the future technical cooperation, Japanese experts should preferably offer their services in the capacity of advisors to local extension workers. Dissemination of the improved cultivation techniques by

Japanese experts through their direct personal contact with farmers is recommendable neither from their past achievements nor for the self-dependent agricultural development of East Pakistan.

It is recommended to establish extension farms in areas differing from each other in land and water utilization conditions in the future and to utilize such extension farms for the development of integrated cultivation techniques involving fertilizer application, plant protection, use of pumps and water management as well as knowledges of farm management. It is further recommended that efforts be made for developing means and measures for practical extension of such knowledges and techniques, and that data obtained by actual extension service be collected and accumulated by the experts of TAO and UAA.

Under this plan, extension workers who have acquired themselves with the aforementioned techniques and knowledges will be advised to establish a plot of relatively small area as the base of their extension services while providing direct guidances to farmers in their respective unions.

(c) Group Activities of Japanese Experts

To ensure effective and comprehensive guidance activities, the conventional activities under the individual system should give place to the group activities by five-man teams comprising one senior experts and four junior experts.

(d) Assurance of Counterpart Experts for Japanese Senior Experts

The Government of East Pakistan is urged to assign a young and able expert of Thana level who will be engaged exclusively in the extension and guidance work as the counterpart expert to each Japanese senior expert.

(4) Conclusion

Consolidation of agricultural extension service in East Pakistan, occasioned and promoted by the introduction of high-yielding varieties, is quite valuable for the agricultural development of East Pakistan.

In the extension of improved cultivation techniques, however, extension

workers should give a prior consideration to the situation on the part of farmers who actually engage in production activities so that the improved techniques may be recommended to those farmers who are ready to introduce them.

Extension of new techniques or varieties, no matter how they are superlative, will not only prove worthless but may even invite farmers' distrust in the Government's agricultural policy if it is effected before farmers are fully ready to introduce them.

Agricultural development of East Pakistan should aim at casting away traditional cultivation practices and replacing them with a newly created agriculture best adaptive to the Province. Achievement of this aim calls, among others, for the elevation of farmers' standard of education and their willingness and concern for increased agricultural production.

Although fulfilment of various conditions described in preceding pages is indispensable for the transformation of traditional agriculture into a modernized one, the underlying requirement is the rearing of farmers who are willing to improve their cultivation techniques and livelihood through their own creative efforts and forward-looking attitude.

Notes

- 1) Accelerated Rice Production Programme (Department of Agriculture), March 1970.
- 2) Utilization of Pumps Revealed by Interviews (Agricultural Extension in Comilla, Kotwali Thana, June 1970).
- 3) Accelerated Rice Production Programme (Department of Agriculture), March 1970.
- 4) Input, Fertilizers, Pesticides (Agricultural Extension in Comilla, Kowali Thana, 1970).

Post Script on Agricultural Extension

Junior experts are the high-spirited agricultural technicians who are fully ready to labour with the Pakistani and demonstrate their abilities for the agricultural development of East Pakistan. Their services are significant in that they can provide a sort of social education (the so-called Friendmental Education) through their direct contact with farmers in their extension work with UAA and inspectors.

Key to the successful implementation of the Accelerated Rice Production Programme lies in the farmers' understanding of the programme and their willingness for increased rice production. Accordingly, UAA and inspectors who are in close contact with farmers must play a positive role in inciting farmers to this end, providing suitable guidance and solution to problems raised by them and propelling their enthusiasm for rice production.

Considering the existing state of rice cultivation in East Pakistan, and of the extension of cultivation techniques among farmers in particular, it is apparent that farmers should be furnished with practical knowledges and techniques rather than too specialized and specific techniques. For example, farmers should be enlightend on the need of levelling and adjustment work if it is neglected, or should be given an explanation on the need of irrigation for paddy cultivation if their fields have no convenience of water supply. A point to be always borne in mind in giving guidances to farmers is that if the explanation is given in an intricate manner using technical terms, they would not be readily be brought to full understanding because of their generally low standard of education. Actual demonstration of what is to be instructed is therefore necessary to assure their understanding.

* * * * *

APENDICES

(1) Tentative Memorandum of the Japanese Preliminary
Survey Mission for Agricultural Development in East Pakistan

September 1, 1970.

1. After arriving in East Pakistan, the Delegation had a lot of chances of talking with the authorities and the farmers who are striving to increase the production of foodstuffs.

The Delegation could understand the situation being urgent, and has been expressing its profound respect to the efforts done to overcome the difficulties they are facing.

2. The delegation has been looking for a rational and fascinating balance between the newly expected technical cooperation of the two countries, and the results and influences born from the Japanese expert's activities which have been done in East Pakistan in these 15 years.

This is due to the Delegation's desire to find the most efficient form of co-operation to match the urgent need of increase of rice production.

3. The Delegation could visit many promising areas and compared their characteristics with each other, resulting in the following conclusion which is just tentative and should submit to further review.

(1) In some favourable Thanas in Comilla and Chittagong districts, a group of junior experts will be sent to one Thana, which contains about 4 members of agronomist (inclusive of soil, fertilizer, farm machinery etc.) and irrigation personnel (inclusive of surveying, land preparation etc.)

The Thanas the Delegation visited such as Patia, Rangunia, Laksham, Chowddagram are for example expected to be favourable.

(2) A senior expert stays in a district, who is to keep intimate contact with some groups of the junior experts in the district, and advise them. So 2 senior experts are expected to stay in Comilla and Chittagong districts.

(3) A senior advisor stays in the Department of Agriculture, East Pakistan who advise the Government in the field of agriculture development in general, including the activities of ADC and other related

sections. He also leads the above mentioned senior experts and the junior experts as an organized body and takes care of other agricultural experts sent here from Japan.

(4) Pakistan Government is expected to provide agricultural experts and extension service personnel who are fully responsible for the extension of agricultural techniques among the farmers, whose number should be good enough to co-operate efficiently with each kind of the Japanese personnel and to achieve the fruitful target.

It seems quite essential for them to devote themselves to the extension works on the field.

(5) Those who are fully responsible for making the efficient extension of agricultural techniques among the farmers are the Pakistan experts, with whom Japanese personnel must keep intimate co-operation.

To promote the effective extension,

(a) Extension farm,

(b) Extension plot

are to be established.

Extension farm is of representative features of soil born from one geological character and one farm will presumably be set in one district. In this farm, fundamental data necessary to guide the farmers are obtained under the intimate co-operation between Pakistan and Japanese personnel. Extension plot is of small size and has a representative features of soil born approximately from the same history of land use, and is set at a progressive farmer's land, thus some number of this type of plot being fixed in the area governed by one extension farm.

In this plot, Pakistan extension personnel mainly or sometime both of Pakistan and Japanese are presumed to guide the farmer.

(6) Technical co-operation of Japanese experts in the activity of Farm Mechanization Training Institute, and the improved production of vegetables etc. are expected to continue further under the circumstances in which both-side experts can work more efficiently.

(7) It should be considered that advices by an additional Japanese expert in Comilla Academy might be useful for the further advancement in Kotwari Thana, which has already established a fairly great pro

(2) Itinerary of Japanese Preliminary Survey Mission for
Agricultural Development in East Pakistan

Date and Day	Description
Aug. 10 Mon.	Departure of Leader Fukuda and other 5 members from Haneda International Airport by LH649, and arrival at Bangkok on the sameday.
Aug. 11 Tue.	Arrival at Dacca by TG303. Courtesy call on the Consult General of Japan in Dacca. Arrangement on survey itinerary with Mr. Hunakoshi, a Sabu Consult.
Aug. 12 Wed.	Courtesy call to Secretary of Agriculture Dept. Courtesy call to Officer Special Duty - Accelerated Rice production programme. Mr. A.R. Choudhury.
Aug. 12 Wed.	Courtesy call to chairman, Agricultural Development Cooperation. Courtesy call to director of Agricultural Dept.
night:	Partly at Hotel Intercontinental by Consulate General of Japan.
Aug. 13 Thu.	Visit to Farm Mechanization Training Institute at Tejgaon. Visit to East Pakistan Rice Research Institute at Joydebpur.
Aug. 14 Fri.	Free
Aug. 15 Sat.	Collect the data at Government Publication Center in Dacca. Meeting with Mr. Kuriyama, a Dacca Branch manager of World Bank.
afternoon:	Visit Agricultural Development Estat at Kashimpur, Mr. Kinoshita, C.P. Expart working.
night:	Reception by Consulate-General of Japan at residence.

Aug. 16 Sun.
 morning: Meeting with Mr. Kinoshita, C. P. Expart.
 afternoon: Free

Aug. 17 Mon. Leave Dacca by PK481 to Chittagong. Courtesy call to Dy. Commissioner.
 afternoon: Visit Agricultural Development Estate at Patiya.
 Visit Haidgan Accelerated Rice Production Programme project.

Aug. 18 Tus. Visit Rangunia Thana Central Cooperative Association and sight seeing the 400 acres block.
 night: Dinner given by E. P. A. D. C.

Aug. 19 Wed. Leave Chittagong for Comilla by the train.
 Arrive Comilla and taken to Pakistan Academy for Rural Development. (PARD). Meet the director of PARD., Dr. Muyeed, Dr. Rahim, Messrs. M. Rahman, M. Mohsen, and A.M. Bhuiya.
 afternoon: Visit Kotwali Thana Central Cooperative Association (KTCCA), Machine Station, Cold Storage, Creamery and Rice Mills of KTCCA.

Aug. 20 Tue. Visit Laksam Thana Central Cooperative Association. Meet project officer, irrigation officer, and enlightened farmers.
 afternoon: Attend Faculty Concil meeting. Visit the village supervised by the Colombo Plan Japanese Exparts Mr. K. Misawa and Mr. J. Adachi.

Aug. 21 Fri. Visit Chowddagram Thana Central Cooperative Association. Meet project officer, irrigation officer, and enlightened farmers.
 afternoon: Meet the deputy commissioner at 16:00 in his chamber.

Meet the officers of Agricultural Department and EPADC at 17:30.

- Aug. 22 Sat. Leave Comilla for Dacca by jeep.
afternoon: Dr. Fukuda and Mr. Nakamura visit the Water Power Development Assority (WAPDA).
Mr. Okabe and Mr. Saito visit Food Department. .
- Aug. 23 Sun. Meeting about subject of survey by survey team in the morning.
afternoon: Free
- Aug. 24 Mon. Leave Dacca by PK421 for Ishurdi. arrive Ishurdi and then Nator by jeep.
Arrival Agricultural Extension Training Insutitute (AETI) at Nator and discussion with faculy member of AETI.
Visit to Training Farm of AETI and Office.
afternoon: Visit Rural Development project. Same discussion with Colombo Plan Japanese Expart Mr. Odachi and Mr. Iguchi.
- Aug. 25 Tue. Courtesy call to deputy commissioner Rajshahi, in the morning.
afternoon: Leave Ishurdi by train for Khulna. arrive Khulna at 17:10.
- Aug. 26 Wed. Leave Khulna by jeep for Jessore, visit ADC Office East Barandipara. Introduction with the EPADC and Agricultural Department.
Meet the Dy Commissioner at 10:30 in his chamber.
Visit the site selected for ADE Demonstration Farm
afternoon: Meet the Agricultural Department and EPADC Officials.
To attend vegetable growing cooperative society at

Morolly.
 Leave for Khulna by jeep at 18:00.

Aug. 27 Thu. Visit the Moder Farm and market in the town.
 afternoon: Visit the AETI Daulapur. Same discussion with the
 principal and other staff.
 Visit to Training Farm of AETI. and Office.
 night: Leave Khulna for Narayanganji by ship (Rocket Steamer)

Aug. 28 Fri. Arrive Narayanganji at 18:30. Arrive Dacca from
 Narayanganji by jeep at 2:00.

Aug. 29 Sat. Arrangement of datas and materials.
 night: Meeting with C. P expart (Mr. Kinoshita, Mr. Iguchi,
 Mr. Odachi, Mr. Adachi, Mr. Terada and
 Mr. Yukitoshi), sabu Consulate (Mr. Funakoshi) and
 resident representative of OTCA (Mr. Mochizuki).

Aug. 30 Sun. Arrangement of datas and materials.
 Meeting for Survey Team.
 night: Meeting with C. P expart (Mr. Odachi, Mr. Iguchi and
 Mr. Misawa)

Aug. 31 Man. Meeting for survey team.
 afternoon: Discussion with Consulate General of Japan.

Sep. 1 Thu. Discussion with the East Pakistan Government authori-
 ties concerned, Chief secretary of East Pakistan.
 Secretary of Agricultural Dept.
 Visit to registrar of Cooperative Societys East Pakistan.

Sep. 2 Wed. Free in the morning.
 afternoon: Call on Consulate General of Japan and leave Dacca by
 PK-733 for Rawalpindi, arrival same day.

- Sep. 3 Thu. Courtesy call to Embassy of Japan and report on the progress of survey at East Pakistan.
And arrangement on schedule at West Pakistan.
- Sep. 4 Fri. Courtesy call to secretary of Agriculture, Central Government, and discussion with him and other staff.
afternoon: Leave for Pishawar by car with Mr. Igarashi, 2nd secretary of Japanese Embassy.
- Sep. 5 Sat. Visit Agricultural Research Center Pishawar.
- Sep. 6 Sun. Mr. Okabe leave for Bangkok to study of rice cropping in IR Station at Bangkok.
Dr. Fukuda and 4 members visit Mangura Dam and Irrigation System in Rasul.
- Sep. 7 Mon. Dr. Fukuda and Mr. Nakamura visit Tarubela Dam and irrigation system.
Other 3 member arrangement of data and materials.
- Sep. 8 Tue. Leave Rawalpindi by PK-734 arrival Dacca and leave by TG304, arrival Bangkok same day.
- Sep. 9 Wed. Leave Bangkok by JL-452 arrival Tokyo same day.

(3) Reference Figure re

A. East Pakistan: Population, Foodgrains Production and Import, 1955/56 to 1970/71

	Population		Production of foodgrains				Import of foodgrains			
	Number (million)	Index (percent)	Rice (1,000tons)	Wheat (1,000t)	Total (1,000t)	Index (percent)	Rice (1,000t)	Wheat (1,000t)	Total (1,000t)	Index (percent)
1955/56-59/60 (mean)	52.1	100	7,514	24	7,538	100	414	89	502	100
1960/61	55.9*	107	9,519	32	9,551	127	464	234	698	139
1961/62	57.5*	110	9,465	39	9,504	126	206	202	408	81
1962/63	59.3*	114	8,730	44	8,774	116	542	894	1,436	286
1963/64	61.1*	117	10,456	34	10,490	139	346	656	1,002	200
1964/65	63.1*	121	10,337	34	10,371	138	95	250	345	69
1965/66	65.0*	125	10,335	35	10,370	138	360	529	889	177
1966/67	67.0*	129	9,424	58	9,482	126	432	647	1,079	215
1967/68	69.0*	132	10,995	58	11,053	147	308	712	1,020	203
1968/69	71.0*	136	10,900	92	10,992	147	236	884	1,120	223
1969/70 (Estimated)	73.0*	140	11,710	100	11,810	157	465	1,235	1,700	339
1970/71 (Plan)	75.0	144	-	-	12,100	161	-	-	1,400	279

Note: 1. * As per revised tentative population projections by the Planning Commission.

2. + 1960/61-1964/65 Actual number and amount: Population 59.4 million, foodgrains production 9,738 1,000tons and foodgrain import 778 1,000tons.

3. Availability for domestic consumption from Provincial production is estimated by deducting 10% from production for seed, feed, wastage, etc..

Sources: 1955 - 1970 Planning Department, Government of East Pakistan.

1970/71 Food Department, Government of East Pakistan.

Indices have been obtained on the basis of statistics above mentioned.

B. Production of Boro during Third Plan

(Lakh tons)				
Year	Total	Boro	Percentage of total rice	Percentage of total rice
Base Year				
1964/65	103.37	5.74	5	-
Third Plan				
1965/66	103.34	6.18	6	8
1966/67	94.24	8.31	8	45
1967/68	109.95	11.14	11	94
1968/69	111.65	16.11	14	181

Source: ARPP, 1970-71, Department of Agriculture, East Pakistan.

C. Programme for Production of Additional 46 Lakh Tons of Rice During the Fourth Plan

Crop	Variation and Cultivation	Additional Yield and Acreage	Additional Production
Aman crop (July - December)	High yielding varieties (IR20 and others) with supplement irrigation and under rain-fed condition	Transplanting 50 lakh acres with 1/2 ton per acre	25.00
Boro crop (November - May)	(a) IRR1 8 with expansion of irrigation coverage	Additional 5 lakh acres with 1.25 ton per acre	6.25
	(b) IRR1 8 by replacement of local Boro	Additional 5 lakh acres with 1/2 ton per acre	2.50
Aus crop (March - August)	(a) IRR1 Aus varieties (IR 8 and others) in the irrigated areas	Additional 8 lakh acres with 1 ton per acre	8.00
	(b) Improved Aus varieties	17 lakh acres with 1/4 ton per acre	4.25
Total Additional Rice Production			46.00

Source: ARPP, 1970-71, Department of Agriculture, East Pakistan.

D. Area (in acres) under rice crop

(Lakh acres)

Year	Aus (% of total)	Aman (% of total)	Boro (% of total)	Total
1965/66	73.20	146.72	11.37	231.29
1966/67	69.65	140.59	13.90	224.14
1967/68	82.21	146.82	15.34	244.37
1968/69	76.58	144.00	20.35	240.93
	(32%)	(60%)	(8%)	(100%)

Source: ARPP, 1970-71, Department of Agriculture, East Pakistan.

E. Detail observation on the varieties IR20, Latisail and Nizersail grown at 5 different locations in Transplanted Aman, 1969-70

Station	Variety	Date of		Plant height (cm)	Panicle length (cm)	No. of fertile grains per		Yield per		Pests and diseases	Floods with date and period of sub-mission	Remarks
		Seed- ing	Trans- planting			Pani- cle	Ounce	Clump (gms)	Acre (mnds)			
1. EPARRI Farm, Joydebpur	IR20 (V1)	Jun. 26	Jul. 27 to 31	101.0	27.8	145	1,523	22.68	53.0	High infestation of leaf roller, low stem borer attack, and low bacterial leaf streak.	Nil	
	Latisail(V2)	Jun. 26	Jul. 24	117.5	22.1	91	1,127	15.87	33.4	Bacterial leaf blight and streak.	Nil	
	Nizersail(V3)	Jun. 26	Jul. 30	137.4	24.5	103	1,615	13.50	28.8	-do-	Nil	
2. Comilla Farm	V1	Jun. 26	Jul. 23 to Aug. 5	101.2	28.4	188	1,405	26.98	40.5	Leaf roller, cutting and swarming caterpillar, stem borer.	Aug. 19	The crop did not lodge.
	V2	Jul. 18	Aug. 31	142.0	23.5	103	1,038	20.18	31.3	Bacterial leaf blight and streak.	Sept. 2	Life span varied from 136 to 147 days. The variety may be suitable for medium land, T. Aman.
	V3	Jul. 1	Aug. 15	146.0	25.9	122	1,700	17.01	28.0	Leaf roller, cutting and swarming caterpillar, stem borer.	Nil	

3. Dinajpur Farm	V1	Jun. 29	Aug. 2	86.1	22.2	87	1,917	26.64	31.5	Bacterial leaf blight and streak.	Jul. 7 to Jul. 11	IR20 seems to be promising. Low yield is due to natural calamities and lack of irrigation. The condition was in no way better than ordinary farmers.
	V2	Jun. 29	Jul. 29	93.1	20.0	84	1,222	21.40	31.5	-do-	Oct. 25 to 29	
	V3	Jun. 29	Jul. 29	132.3	22.7	86	2,143	13.32	30.0	-do-		
4. Pahartali Farm	V1	Jun. 24	Jul. 27	95.0	22.1	109	1,360	31.00	37.6	-	Nil	Yield of IR20 is low in comparison to local standards due to non-application of basic fertilizer and low rate of top dressing.
	V2	Jun. 19	Jul. 21	114.1	23.0	91	1,020	32.00	23.0	-		
	V3	Jul. 7	Aug. 9	132.0	25.0	115	1,650	26.00	33.6	-		
5. Jamalpur Farm	V1	Jul. 3	Aug. 10	86.7	25.4	177	1,574	16.62	28.8	-	Aug. 19 to 23	
	V2	Jun. 26	Jul. 29	-	-	-	-	-	-	-	-do-	
	V3	Jul. 1	Aug. 16	133.3	26.8	168	1,940	18.71	21.8	-	Aug. 19 to 26	
Average of all locations	V1	-	-	94.0	25.2	141.2	1,556.0	24.47	38.3			
	V2	-	-	116.7	22.1	84.7	1,101.7	22.35	29.6			
	V3	-	-	136.2	24.9	118.6	1,809.6	17.71	28.8			

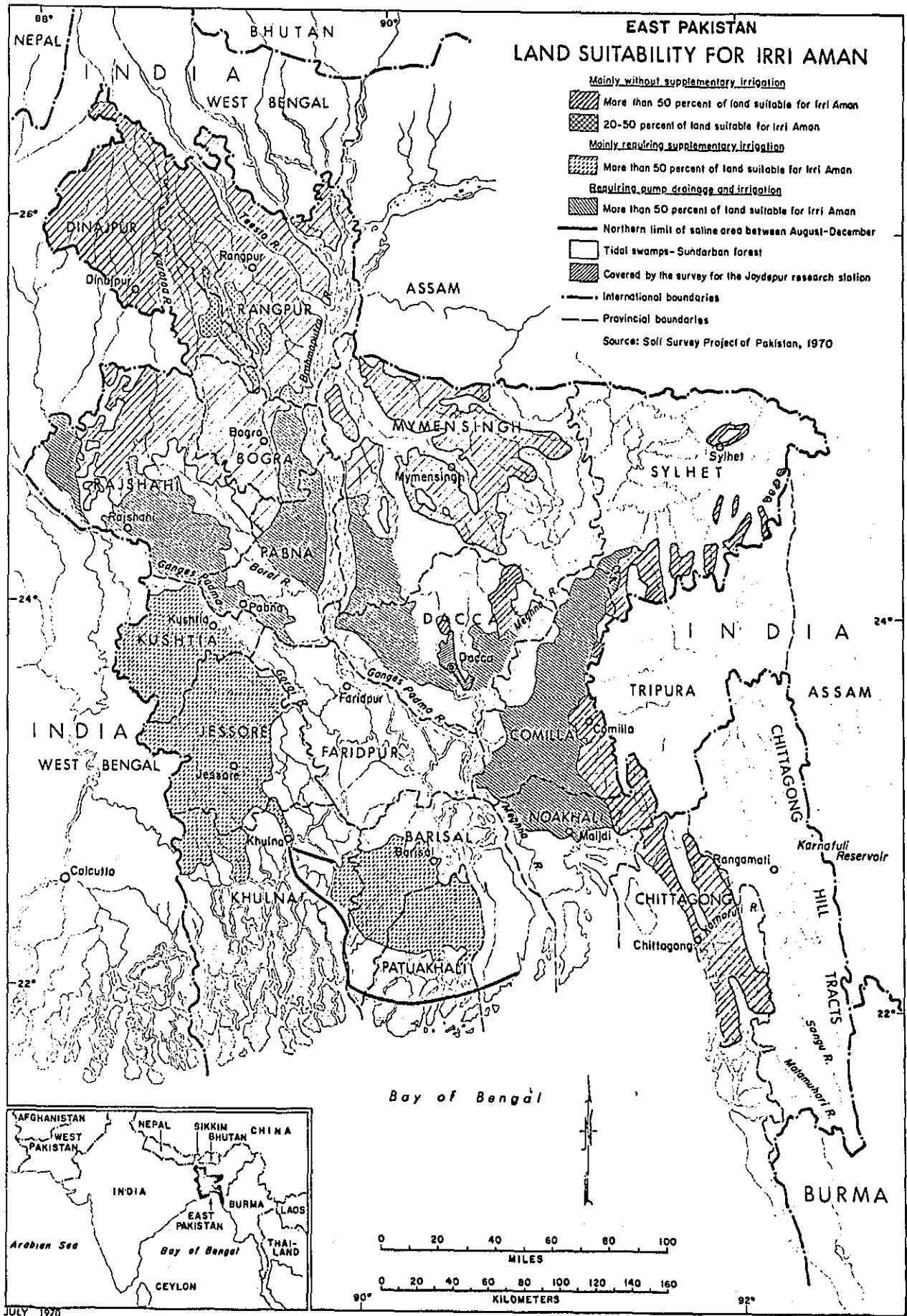
Source: Department of Agriculture, East Pakistan, 1970, (mimeograph).

F. Districtwise seed programme in the Accelerated Rice Production Programme, 1970/71,
Department of Agriculture, East Pakistan

(Figures in maunds)

Name of the district	2 lakh acres IR-20 and 3 lakh acres local improved varieties			Total
	5 lakh acres IR-20	IR-20	Local improved varieties	
Dacca	12,500	3,200	2,325	5,525
Mymensingh	12,500	5,400	1,775	7,175
Chittagong	17,500	6,600	2,663	9,263
Noakhali	5,000	1,000	1,000	2,000
Cornilla	12,500	2,800	2,425	5,225
Sylhet	600	2,800	800	3,600
Bakerganj	11,250	2,600	2,162	4,762
G. K. Area (Kushtia and Jessore)	10,500	5,600	1,225	6,825
Rangpur	12,500	4,100	2,100	6,200
Bogra	12,500	4,100	2,100	6,200
Dinajpur	12,500	11,800	175	11,975

Note: For local improved varieties 25 per cent of the seed requirement will be supplied.



Source: International Bank for Reconstruction and Development, IDA, Proposal for an Action Program, East Pakistan Agriculture and Water Development, 1970.

