

REPORT OF THE JAPANESE SURVEY MISSION
ON
AGRICULTURAL DEVELOPMENT COOPERATION IN THAILAND

DECEMBER 1968

OVERSEAS TECHNICAL COOPERATION AGENCY

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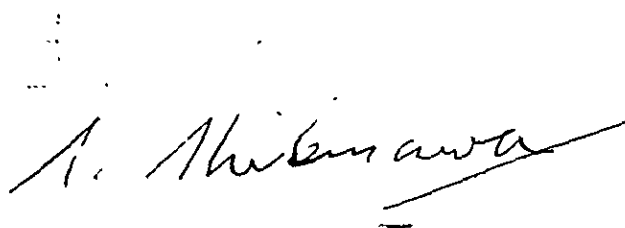
Entrusted by the Ministry of Foreign Affairs, this Overseas Technical Cooperation Agency dispatched a mission to Thailand headed by Dr. Hidetsugu ISHIKURA, Research Councilor of the Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture and Forestry. The group surveyed the basic facts on which Thai agriculture is to be developed for about a month from July 3, 1968.

Their main purpose was: to re-examine the present state of Thai agriculture which is changing rapidly under the remarkable advancement of the national economy, and define the possible and efficient way of Japanese agricultural cooperation with Thailand in the future. The mission closely observed the present conditions of sericulture on which Thai people had been asking for our cooperation since 1967, irrigation, rice growing, etc. and exchanged views with Government officials there for the sake of contributing to our future cooperation.

Their studies are now completed and sent to press. We sincerely hope that this report will be conducive to closer cooperation and more friendly relations between Thailand and Japan.

Finally, we would like to appreciate the endeavors of the leader and members of the mission, as well as express our cordial gratitude to the officials of the Government and F.A.O. in Thailand along with Japanese experts on the Colombo Plan there. Without their generous accommodation this report would have claimed much more time and energy.

December 1968

A handwritten signature in black ink, appearing to read 'S. Shibusawa', with a long horizontal stroke extending to the right.

Shinichi SHIBUSAWA, Director-general
Overseas Technical Cooperation Agency

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FOREWORD

Friendly relations between Japan and Thailand have a long history, let alone the services rendered by YAMADA Nagamasa (—1630). Friendship through agriculture dates back to 1902, when Dr. Kametaro TOYAMA visited Thailand and laid a foundation for the present-day silk industry of that country. And Thai agriculture supplied rice to Japan, when she was suffering from a shortage of foodstuffs immediately after World War II. Currently, it is providing us with a great quantity of Indian corn, which is indispensable for the development of our stock breeding industry.

Thailand, which is politically the most stable among the Southeast Asian countries, is vigorously promoting the modernization of her national economy. Being an agricultural country centering on rice cultivation since ancient times, the development of agriculture should play an important part in her economic modernization. Her Government is aware of it and attaching more emphasis on agricultural development in its second Five-Year Plan for the Development of Industries (1967–1971) than in its first Six-Year Plan (1961–1966); namely, it is planned to allocate more than 20 per cent of total expenditures for the Five-Year- Plan to agricultural development.

Following Japan's return to international society after the war, she joined the Colombo Plan in 1954 to give, along with other advanced nations, economic and technical assistance to developing countries. Since then, she has dispatched 23 experts and received 306 trainees for the development of Thai agriculture. In Japan's technical cooperation in agriculture to the Southeast Asian nations, that to Thailand ranks the first or at least the second in scale. Besides, Japanese agricultural experts are actively working for the development and improvement of agricultural technique in Thailand in their capacity as specialists of F.A.O. and other international organization.

Thailand is attaching importance to the development of agriculture and placing greater expectation in Japan's technical cooperation in agriculture, and its scale is accordingly increasing. In the light of these developments, it is necessary for Japan to possess an accurate knowledge of the state of Thai agriculture, clarify the sectors in which Thailand needs technical cooperation and Japan can cooperate, and to study a comprehensive and systematic manner of extending technical cooperation, with the mutual agreement and understanding of the two countries when in November 1967, Mr. Tadao Kuraishi, the then Minister of Agriculture and Forestry, visited Thailand and conferred with Mr. Phra Prakas, Minister of Agriculture, a request was made by the Thai side for Japan's technical cooperation in agriculture, particularly in sericulture. Accordingly, the Japanese side decided to make a survey on the spot, not only about sericulture, but also about rice cultivation, for which the Thai side had previously requested Japan's technical cooperation, and about irrigation, which will play an important part in the future development of Thai agriculture, and to explore the

possibilities of cooperation in these fields.

The survey was conducted according to the appended schedule, with the full cooperation and facilities extended by Thai Government officials, and completed with better-results than originally expected. However, the survey had to cover an extensive area and could not deal with all the problems involved in rice cultivation, sericulture, and irrigation.

In conducting this survey, officials in the Ministries of National Development and of Agriculture gave the survey team a wholehearted cooperation, despite their heavy official duties, by making up the survey schedule, guiding the members of the team in their visits, and collecting data for survey. Without their cooperation, it would have been impossible for the team to visit various places within a short period and study the manner of agricultural cooperation in future conforming to the actual conditions of these places. On behalf of the members of the team and myself, I express our profound gratitude to them.

We also owe much to Ambassador Ushiroku and the officials of the Japanese Embassy in Thailand, who conducted preparatory consultations with the Thai side and gave the survey team guidance and advice, for the considerable success we could attain, in spite of the fact that the survey was planned and put into practice in a short time. Given a little more time, we would have obtained a better result that would have matched the endeavours of the Ambassador and the officers. We apologize for whatever shortcoming we may have, and we thank them for their help.

Hidetsugu ISHIKURA

I. PURPOSE OF THE SURVEY

Our technical cooperation in agriculture has hitherto been lent to Thailand in the form of sending our technical experts and receiving trainees with appreciable results. However, integrated cooperation in development projects, namely, project cooperation, which is being carried out with high priority in other Southeast Asian countries, has not been extended to Thailand, since it has not been possible to find a suitable project in Thailand.

In recent years, there have been growing expectations and trust placed by Thailand in Japan's agricultural cooperation. In November 1967, Mr. Kurahashi, Minister of Agriculture and Forestry of Japan, met Mr. Phra Prakas Sahakorn, Minister of Agriculture of Thailand. The request of the latter for Japan's cooperation in the development of sericulture, occasioned the steady progress of preparations for her cooperation in various fields of agriculture, including rice growing and irrigation.

Under these circumstances, this survey mission had for its purpose to examine, in the light of the trend of the changing Thai agriculture, the possibilities of affording effective project cooperation and to study the best possible manner of our agricultural cooperation.

II. RESULTS OF FIELD SURVEY

1. Rice culture

(1) Position of rice culture in the national economy of Thailand

Thailand is an agricultural country like other Southeast Asian countries, and agriculture, particularly rice culture, occupies a high position in the national economy.

According to the 1965 agricultural statistics of Thailand, 58,160,000 rais (one rai is 16 ares), or 21.6 per cent of the land area, are devoted to farming. Out of these, 40,490,000 rais, or nearly 70 per cent of the farmland, are used for the cultivation of rice. The farm products in 1965 reached 243,700 million bahts in value (including rubber sheets, but excluding lumber and other forest products). Rice accounts for 111,200 million bahts or 46 per cent of this total. Since the farm products account for 32.9 per cent of the GNP, the rice production amounts to about 15 per cent of the GNP.

Rice is the staple food in Thailand. A fairly great part of rice is consumed domestically. On the other hand, it is the biggest agricultural product for export and contributes greatly to her acquisition of foreign exchange. According to the 1965 statistics of exports of her main products, her rice exports reached 4,334 million bahts or 33.5 per cent of her total exports.

Farming population of Thailand accounts for 74.6 per cent of her total population. Agriculture is the mainstay of the livelihood of Thai people. Though the percentage of rice income in the total income from farm products varies according to the scales of farming operation and the regions, it amounts to 60 to 75 in the northern, northeastern and central plain regions, where rice culture is extensively practised. In this sense, rice culture has great socio-economic significance.

Thailand imposes an export duty and rice premium when rice is exported. These are the important sources of revenue for the finance of that country. On the 1955–1962 average the rice premium accounted for 9.8 to 16.5 per cent (12.8 per cent on an average). As a result, the rice exports of Thailand contribute greatly not only to the maintenance and improvement of her balance of international payments but also to the improvement of her national finance.

(2) Trend and present condition of rice culture

Rice culture in Thailand has attained a remarkable development in the past 50 years.

The 1917 – 1967 statistics on rice indicate that the rice planting acreage increased from 2,200,000 hectares in 1917 to 7,300,000 hectares in 1966, and the production of paddy increased from 2,700,000 tons in 1917 to 11,850,000 tons in 1966, namely, an increase of 3.3 times and 4.4 times, respectively.

This development may be divided into four periods. The first period covers from 1917 to 1924 and showed an increase of yield from 1.6 t/ha level to nearly 1.9 t/ha, and an expansion of rice planting acreage from 2,700,000 hectares to 2,900,000 hectares. In this period rice production increased owing to the increase of yield and the expansion of rice planting acreage. This is a period when the rice cultural activities were upsurged chiefly by those in the central plain region. In the second development period (1924 to 1947) rice planting acreage showed a rapid increase centering around the eastern region, reaching some 4,300,000 hectares, but due to the decrease in the rice yield per hectare (from 1.9 t/ha level to 1.3 t/ha), the rice production showed only a slight increase to the level of 4,000,000 to 5,000,000 tons.

In the third development period (1947 to 1956), rice planting acreage continued to increase, reaching nearly 6,000,000 hectares and as per-hectare yield stopped to decrease, a total rice production reached 8,000,000 ton level. Finally, in the fourth development period covering recent 10 years, thanks to the continued expansion of rice planting acreage as well as to the restoration of per-hectare yield to 1.6 t/ha level, total rice production showed a rapid increase, exceeding 10,000,000 tons, and reaching as high as 11,850,000 tons in the year 1966.

(3) Rice production increase in Thailand and the measures therefor.

(a) Needs for rice production increase viewed from the supply-demand and export of rice.

As described in (1), rice production in Thailand is on the steady increase, but due to the ever-increasing population and partly due to the per-capita increase of rice consumption, her export availability of rice is on the decrease. The population growth in Thailand showed an increase from 19,640,000 in 1950 to 26,390,000 in 1960 or a 34 per cent increase, and the population in 1970 are expected to reach 36,400,000 or 43 per cent increase. On the other hand, rice consumption per capita per year showed a rapid increase from 218 pounds (98 kgs) in 1953 to 352 pounds (154 kgs) in 1962. Due to those two factors, domestic consumption of rice increased from 2,090,000 tons (in term of milled rice equivalent) in 1952 to 4,400,000 tons in 1963 or increase twofold. In view of this, despite the increase of rice production of 3,360,000 tons (milled rice) in 1952 to 6,120,000 tons in 1963, the milled rice exports increased from 1,000,000 tons in 1952 to 1,420,000 tons only. Though milled rice exports reached a peak of 1,900,000 tons in 1965, it began to decrease, amounting to a little less than 1,500,000 tons in 1967.

Rice consumption of as high as 154 kgs per capita per year in Thailand is regarded as the highest rate even among the rice-eating countries. In the future, therefore, it is not readily expected to continue to increase at this rate, but the population growth being expected to increase nearly at the aforesaid rate, the future domestic consumption of rice is expected to increase. In view of this, under the second 5-Year Plan (1967 to 1971) in Thailand the rice production target in 1971 is set at 13,700,000 tons (paddy). This rice production target exceeds the rice production record high in 1965, 11,070,000 tons (paddy),

or a 25 per cent increase. As a result, in order to attain such high production target, exceptionally great efforts will be required to be made.

Based upon the environmental conditions and the habitual rice growing practices, the rice growing area in Thailand can be divided into four regions, but the main region producing the long-grain nonglutinous rice (mainstay of exporting rice) is confined to the central plain region. As a result, in order to increase the production of export-purpose rice, it is primarily important to expedite the rice production increase in this region.

(b) Ways and means for rice production increase:- Expansion of rice planting acreage.

The increased production of farm products in general can be attained by the expansion of planting acreage as well as by the increase in yield per unit acreage. This is by no means confined only to the case of Thailand and to the case of rice production increase.

As the farming land in Thailand accounts for nearly 21.6 per cent of the total land area, it cannot readily be said that there is no room for expansion of farming acreage, but in the case of paddy rice fields it can safely be said that there is little room for expansion, because for the purpose of rice growing, paddy fields must always be brought under irrigation. Even now, irrigation water is by no means sufficient unless some measures are taken for irrigation water supply by building reservoirs, etc. In reality, during the 10 years from 1958 to 1967, paddy field acreage showed some 18 per cent increase (from 6,640,000 hectares to 7,840,000 hectares), but rice harvesting acreage showed only 11 per cent increase (from 5,750,000 hectares to 6,410,000 hectares). In view of this, if rice planting acreage is intended to be expanded, it is a prime desideratum to increase sufficient irrigation water. In Thailand, a great deal of works have been planned and implemented for the supply of irrigation water. Under the 5-Year Plan (1966 to 1971), it is planned to expand the irrigable acreage from 1,870,000 hectares to 2,400,000 hectares.

Moreover, there are many cases where rice crop ended in failure, though rice seedlings were planted on the fields. The paddy field acreage met with crop failures throughout the country reaches 6 to 9 per cent of the total acreage planted to rice, reaching more than 10 per cent in some areas. Great part of the rice crop failures are caused by droughts or floods (mostly due to the droughts). Taking such points into consideration, it is sincerely recommended that in order to increase the harvesting acreage, Thailand be put forth more efforts for attaining high utilization of existing paddy fields by improving water supply devices rather than for new paddy field reclamation works.

Besides the above, in order to increase the planting acreage, it is considered rather expedient to expedite double cropping of rice growing. From the viewpoint of the climatic condition, rice growing is permissible to be practised all the year round in every part of the country, but due to the uneven rainfall distribution, almost every part of the country is now being forced to practise single cropping of rice growing. Double

cropping of rice is now confined to the acreage constituting as low as 7 per cent of the total rice planting acreage. This can be said fairly low rate, as compared with 43 per cent in Ceylon, 31 per cent in Indonesia, 19 per cent in Malaysia, and 15 per cent in the Philippines. In Thailand there seems still more room for expansion of double cropping acreage. For this purpose, however, the completion of irrigation facilities and the breeding of superior rice varieties suitable for that purpose are the important requisites for success.

(c) Ways and means for rice production increase:- Increase in rice yields per unit acreage.

Rice yields in Thailand increased from 1,344 kgs to 1,725 kgs per hectare or a 30 per cent increase during the 10 years from 1958 to 1967. Rice yields in Thailand are somewhat higher than those in Burma and Cambodia, but lower than those in Viet Nam, Malaysia and Taiwan. There seems still more room for increasing the rice yields in Thailand. As a matter of fact, even in Thailand, the rice yield in the northern region reaches 2.5 tons per hectare on an average. In the case of the rice growing contest held in Thailand, a high yield of 7.85 tons per hectare was registered in 1967.

Among the major ways and means for the increased rice yields are included the breeding and extension of high yielding rice varieties; the establishment and expansion of rational fertilizer application methods; disease and insect pest control; and the improvements in irrigation and drainage facilities.

The rice variety improvement works in Thailand are now in progress on a large scale through the well-formulated organizations. The yields of the recommended rice varieties are as follows:

Number of varieties	Recommended regions	Rice yields
7 varieties	Northern region	465 – 569 kg/rai (2.9 – 3.6 t/ha)
9 varieties	Northeastern region	278 – 324 kg/rai (1.7 – 2.0 t/ha)
9 varieties	Central plain region	336 – 454 kg/rai (2.1 – 2.8 t/ha)
3 varieties	Southern region	302 – 335 kg/rai (1.9 – 2.1 t/ha)
7 varieties	Floating rice cropping area	394 – 634 kg/rai (2.5 – 4.0 t/ha)
Some varieties	Double cropping area	342 – kg/rai (2.1 t/ha)

The yields of the recommended rice varieties are fairly higher than the average yields in the respective regions. As it is the effective ways and means for rice production

increase to drive forward the popularization of the recommended rice varieties, it will be necessary to make general farmers acquire how to grow the recommended rice varieties.

The results of tests attempted recently by Dr. Jisuke Takahashi on the relationship between rice transplanting dates and the effects of the fertilizer applications made clear that even in the cases of the present high plant-height varieties which are likely to lodge due to the heavy fertilizer applications, if the transplanting dates be delayed so as to control the stem growth of plants, the lodging can be forestalled.

As a result, if the optimum quantity of fertilizer be applied, average yield of 600 kg/rai could be obtained. Thus the profit equivalent to three-time the fertilizer cost can be brought about.

(Note: the so-called optimum quantity of fertilizer application recommended by the Rice Bureau is 100 kg/ha of synthetic 16-20 fertilizer)

Thanks to the system to make loans available for the purchase of fertilizers to farmers' clubs, rice growers started to appreciate the value of the optimum fertilizer application practices. In view of this, in order to improve the fertilizer input, it is very important to give greater encouragement to farmers so as to expedite the extension of their scientific know-how in this field. In some regions including the northeastern region, there exist many an area where phosphate is extremely deficient. In such areas, as it cannot be expected to show any great rice production increase merely by the application of nitrogen alone, it is necessary to apply nitrogen in mixtures with phosphate. The effect of nitrogen will become greater if the split application of nitrogen be practised. Connected with the fertilizer application practices, high degree of techniques are required to be introduced.

In Thailand, despite of frequent occurrence of diseases and insect pests of various kinds, little or no survey has ever been made as to their occurrences, extent of their damage, and their control methods. Particularly, as the incidents of the disease and insect pest occurrences have not been clarified as yet, timely control of diseases and insect pests can not readily be practised. Therefore, it seems that any great effect of their control has not been achieved. Fortunately, the survey of the times of occurrence of diseases and insect pests is now under way at rice experiment stations. Such survey results will become significantly valuable to the disease and insect pest control.

In a country like Thailand where the yield and the price of rice are not so high,

it is by no means wise to rely exclusively upon the application of expensive agricultural chemicals for the disease and insect pest control purposes. Except for the abnormally great occurrences, it is doubtful that whether or not the cost of agricultural chemicals can be paid off or some profits can be obtained. In order to ascertain the economy of the use of agricultural chemicals in pest control, a further careful study is required to be made. For the purpose of increasing rice yield, heavier fertilizer application become necessary, but when heavier fertilizer is applied, the occurrence of diseases and insect pests will become more frequent. Such being the case, in order to obtain more income from rice production, the application of effective agricultural chemicals will become necessary for disease and insect pest control. In this sense, the study of the disease and insect pest control by the use of agricultural chemicals ought to be made in advance. Connected with this, however, the present circumstances should never be overlooked. Namely, at present, fish living in paddy field areas are the important protein source for the people living in the rural communities, and though the rain water is used for drinking purposes, much water in the places around the paddy fields is now being used by the people for the various purposes. Careful attention should, therefore, be paid so that fish may not be affected and the health of the rural community people may not be injured by the use of agricultural chemicals. When agricultural chemicals are to be used, it is important to make a careful study as to their selection and application practices, bearing in mind fully the attendant circumstances described above.

Besides the above, for the disease and insect pest control, it is also important to breed rice varieties resistant to diseases and insect attack and to make use of proper cultural methods so as to avoid the damage from diseases and insect pests by making ingenious adjustment of rice cultural season.

In recent years, as it has become possible for Thailand to obtain rice varieties resistant to blast, virus, rice stem borer and others from the inside and outside of Thailand. In case where the breeding plans is drawn out, Thailand should put forth the possible efforts for introducing such resistant varieties for breeding materials.

Either in the case of fertilizer application or in the case of disease and insect pest control, for the purpose of ensuring the increase of rice yield, it is the first requisite to prevent rice crop from being damaged by droughts or floods. The completion of irrigation and drainage facilities is, therefore, regarded as the important key to the attainment of the increased rice yield. In the central plain and northeastern regions in Thailand, large-scale irrigation plans have already been laid out, and the construction of dams and the main irrigation canals is now in progress, but not being constructed adequate branch canals or ditches as yet, the irrigation water has not been utilized efficiently. In order to supply

sufficient irrigation water to individual fields and to drain excessive water from them, it is necessary to make a further study to equip with the desirable irrigation branch canals and ditches but also drainage facilities separately from irrigation ones.

- (4) Right orientation in the technical cooperation projects for the rice growing improvement works in Thailand.

Expectations can be held for the productivity improvement of rice fields in Thailand to a fairly great extent, by means of full utilization of her existing paddy fields as well as by means of increased rice yields per unit acreage, as described already.

Full utilization of the existing paddy fields can be achieved by reducing the acreage, now unable to plant to rice or subjected to drought or flood damage, by means of improvements in the irrigation and drainage facilities, particularly by means of improved irrigation ones. For the purpose of irrigation improvement, Thailand could to secure Japan's technical cooperation for the engineering works in various stages ranging from the construction of dams to secure adequate irrigation water to the construction of the main and branch canals as well as ditches to conduct water into individual farmers' fields. Taking consideration the irrigation works under way in Thailand, it is deemed important for Japan to offer technical cooperation in planning the construction works of branch canals and ditches as well as in introducing the techniques for water management. Particularly in the case of the paddy field areas in the central plain region covering the extensive gentle sloping paddy fields, there are many technical problems to be tackled, e.g., how to conduct irrigation water into individual paddy fields; how to drain flooding water from paddy fields; how to estimate sufficient water requirements for mudding paddy field soil which is cracked due to the dry spell in the dry season; or how to estimate the optimum water requirements in the rice growing season. In solving such technical problems, it requires closely-cooperated research works between rice growing experts and agricultural engineering specialists.

For the purpose of increasing the rice yield per unit acreage, it will be required not only to breed high-yielding rice varieties but also to establish the comprehensive techniques involving the improved cultural methods, fertilization and care-taking suited for growing new high-yielding rice varieties. Connected with the rice improvement project in Thailand, many breeding specialists are now playing their role actively under the well-established breeding organization in Thailand. In this respect, any special technical cooperation of Japan will be needless, but it is possible for Japan to contribute much to expending breeding works in Thailand by offering the breeding materials or available information on breeding works experienced in Japan.

It may be said that rice culture in Thailand is now just at the important stage shifting from the extensive culture to the intensive culture by introducing the fertilizer applications and disease or insect pest control practices. Under the breeding project in Thailand, the breeding of high-yielding varieties grown with heavy fertilizer application is now

aimed at, and the trial culture of IR 8 (a high-yielding variety grown with heavy fertilizer application, now well known in every rice growing country) is being attempted in Thailand, though Thailand herself seems not to have any intention to adopt it as a recommended one.

With respect to the heavy fertilizer application techniques for the purpose of attaining higher yields, farmers in Thailand have come to appreciate fairly well thanks to the study attempted by Dr. Takahashi (staying at present in Thailand), but it is still more required to establish such fertilizer application techniques which may meet the environmental conditions and the changes in the customary cultural practices in each area, by studying the optimum quantity of fertilizer application suited for the soils in the respective areas, the times for the fertilizer application, and the fertilizer application practices in the respective areas, with due consideration about the physiology and nutrition of rice plants. The incidents of disease or insect pest occurrence is intensified by the heavier application of fertilizers. As a result, it is required to make clear the ecology of major insect pests; to predict such changes in occurrences of diseases and insect pests that may take place due to the changes in cultural methods and fertilizer application practices; and to establish the infallible control measures therefor. In those phases, it can be said that there is much room for offering technical cooperation of the Japanese rice physiologists, soil chemist, pathologists, and entomologist.

The above research works will be made at the Rice Protection Research Center located at Bangkhen for the time being, having for its object to study on rice culture in the central plain region. In the northern and northeastern regions differing widely in the environmental conditions and rice cultural practices from those in the central plain region, the same research works are also required to be started at the earliest possible time. For this purpose, some of the Thailand's research workers stationed now at Rice Protection Research Center at Bangkhen would preferably be stationed at rice experiment stations in Konken, Sampatong and other major places.

At the same time, some Japanese specialists will be despatched to these rice experiment stations at the request on the part of Thailand in order that they may render services in expediting the coordinated research works through their expert advices on the entire research items in relation to the rice cultural improvement works in Thailand. Such technical cooperation will surely contribute much to the more rapid development of rice culture in Thailand.

2. Sericulture

(1) Background of sericultural development project in northeastern region

(a) More cash income to farmers

Farmers in the northeastern region of Thailand are carrying on a self-supporting and self-sufficient agriculture centering in rice-growing. If this agricultural structure is to be broken through, it is necessary to introduce cash crops in order to increase farmers' cash income. In this area, farmers have, since old days, raised silkworms and reeled

raw silk which is consumed at home to supplement clothing requirements. The project for the development of sericulture in the northeastern region has for its purpose to stabilize the farm management by higher cash income through sustained sales of raw silk thanks to the traditional sericultural industry as combined with the developing Thai silk. Fortunately, the price for raw silk in the country is less affected by the international price level than other farm crops, facilitating the introduction of silkworm raising.

As there is little demand for labor in the area, labor is abundant. Especially, almost all practices in sericulture are done indoors and suited to women. We may, by means of sericulture, turn female labor to a steady and increasing source for cash income.

(b) Development of Thai silk

As is well known, Thai silk has been developed by an American after World War II, who made the most of the characteristics of the indigenous silk of Thailand. Distinguishing features of the textiles have been favorably received by overseas consumers and made Thai silk world-renowned. Although the consumption and exports of Thai silk are increasing year after year, we should maintain a stable supply of raw silk, if Thai silk is to expand its demand world-over.

As indigenous raw silk is not suitable for the warps of Thai silk, Japanese or Korean silk is to be employed. The Thai Government is prohibiting the importation of raw silk, so thrown silk is being imported to secure the warps. With the development of Thai silk, these imports are increasing. It is necessary therefore to endeavor to produce more raw silk that can be used as warps.

(c) Introduction of modern techniques

Generally speaking, the technology of silkworm raising and silk reeling in Thailand is rather backward and by far below the level of advanced nations. Cocoons are very fluffy, and produce less raw silk. Silkworm raising is so labor-intensive that it is very difficult to expand the scale of sericulture. Raw silk is reeled by hands. Parasitic flies and the root-rot disease of mulberry cause damages. These and others constitute a grave bottleneck to the development of sericulture. To break it through, it is to be hoped that on the one hand, advanced knowledge and technology are to be introduced from developed nations on which locally adapted, latest techniques are to be unfolded to raise the nation's technical levels, and on the other that researches centering in parasitic flies and the root-rot disease of mulberry should be advanced promptly so that some effective controlling method may be established.

(2) Problems in developing sericulture

(a) Poorly Equipped Research Institutes and Insufficient Technical Personnel.

It goes without saying that agriculture can be developed only on the foundation of techniques which in turn, rely on the research institutes and technical personnel working there.

There are six sericultural experiment stations in Thailand. At present, their principal tasks are: the production of silkworm eggs and mulberry scions and their distribution to requesting farmers. All the institutes are gradually building rearing houses in an effort toward their modernization. They have vast mulberry nurseries, but are not equipped with facilities, materials, or instruments for researches except for rearing houses for the production of silkworm eggs. Furthermore, only 2 to 3 technicians are, on an average, stationed at a research institute. They cannot afford to conduct researches to establish locally suited techniques. It is true that more and more people have learned advanced technology under the Colombo Plan and are trying hard to absorb more knowledge by a long-term training. But the present poor equipment of the research institute prevent them from demonstrating the acquired technique to the full and adapting them to the local requirements.

In the sector of the production and distribution of silkworm eggs, microscopes and other testing instruments are equipped and the technique of inspection is acquired so that the inspection of pebrine is being carried on.

At present, however, there is no extension agent. So, the experiment station itself is compelled to guide farmers. But the guidance is a very difficult job, since there is no established technique, and technical personnel is scarce.

The jurisdiction for sericultural experiment stations is not determined. So, in some cases, farmers are receiving silkworm eggs and mulberry scions from remote station instead of a nearby one.

(b) Shortage of extension agents

Although the extension agents are installed to diffuse agricultural techniques and guide farmers, their number is very few. Besides, they have little knowledge as far as sericulture is concerned. Even at a reclaimed district with a vast cultivated land and many farms settled down, only two agricultural extension agents or so are stationed. As stated above, there are few experts at the experiment stations and few technical technicians in the field. In case of trouble, farmers cannot but remedy it at their own discretion.

The Thai Government has produced a movie film for the extension of technique with the aid from the United States. At present, however, nobody can use it but the technical experts at the experiment station.

(c) Low technical levels

(i) Cultivation of mulberry

Mulberry trees are of indigenous race, yielding less leafage. They are planted directly, and are subsequently given no cultivation or manure. There is no definite method of training mulberry. Farmers do not prune stems, but let them grow freely. Yet, they reap leafage recklessly. As a result, trees produce less and less leaves both in size and in

quantity as they grow old. Their life is short, too.

(ii) Raising of silkworms

Silkworms now being used are of multivoltine, pure race, producing yellow cocoons. Cocoons are small, loose and fluffy. The yield of silk is low. They are raised densely, 7 to 8 times a year, in a labor-intensive way.

Silkworm eggs are produced by farmers themselves; there is no pebrine inspection of eggs.

(iii) Reeling of raw silk

Cocoons are not dried. Fifty to sixty cocoons are reeled together by hands. Raw silk is subjected to 2 crossings on so during reeling operation. Raw silk is irregular in size and nubby.

As silkworms are of multivoltine, pure race, cocoon filaments are thin in size. On the reverse of a coin, this and other factors build up the characteristics of Thai silk: 50 to 60 fine cocoon filaments are reeled together; no tension is put on raw silk while reeling because of manual operation; the size of raw silk is uneven; it has irregular nubbs, and so forth.

(iv) Root-rot disease of mulberry and parasitic flies on silkworms

The root-rot disease of mulberry breaks out widely. The disease attacks the trees in the second year of planting, and spreads rapidly. So far, its cause has not been made clear. Consequently, the method of its control has not been established, throwing a serious hindrance to the development of sericulture.

Multivoltine, parasitic flies cause a heavy damage all over the northeastern region. In order to keep flies away, farmers wrap rearing trays in cloth, or spread wire-netting on which wrapped-up rearing trays are put. So far as some positive controlling method is not set down, it would be difficult to expand the scale of silkworm raising in the district.

(d) Unorganized distribution routes

Farmers do not sell cocoons, but reel raw silk from them by themselves. Raw silk is first devoted to home use. Remaining silk, if any, is sold. In this case, farmers sell silk as soon as it amounts to a certain unit quantity. So, most of silk is fresh from reeling basins, containing much moisture. The system of sales and distribution has not been organized yet. Accordingly, there is danger that when sericulture is successfully developed, with more and more silk produced, some silk may remain unsold, or its prices are haggled down rudely.

(e) Statistics incomplete

The quantity and value of imported raw silk and exported Thai silk are precisely tabulated and made public every year. As for the actual conditions of sericultural technique and management, two sample surveys were conducted, with the results published.

However, necessary data for formulating a plan for increased production, such as the number of sericultural households, the area under mulberry, production of raw silk, are not yet assembled.

(III) Thai Government's plan for developing sericulture

Thai Government has compiled the following plan for the development of sericulture in the northeastern region:

(1) Establishment of Main Sericultural Research and Training Center

For the purpose of establishing modern, sericultural techniques and of training technical experts and extension agents, the Main Sericultural Research and Training Center is to be set up at Korat. Equipped with modern facilities, materials, instruments, class-rooms and dormitory, officials will conduct researches and train technicians under the guidance of Japanese experts.

(2) Local Sericultural Experiment Stations to be reinforced

Of 6 Sericultural Experiment Stations, three stations will become so many branches of the Center, with facilities, machinery and instruments reinforced. Officials there will try to establish locally adapted techniques and produce silkworm eggs according to a fixed plan, as well as train and lead extension agents.

(3) Build-up and demonstration of farmer's groups

At 4 places in the northeastern region, farmers' groups are to be formed. They will rear young silkworms jointly, and distribute among themselves silkworms at the 3rd stage to rear them at respective farms. The Center and its branch stations will provide modern techniques in the management of mulberry fields, rearing of young and grown silkworms and mounting. Furthermore, raw silk will be machine-reeled to raise productivity. These groups will be used for demonstration purpose, too.

(IV) Measures to be proposed

(1) The plan for the development of sericulture in the northeastern region of Thailand is to be carried out on the basis of the improvement of farm management and the development of Tahi silk. However, there is not established a system of technology. Compared with the technique of advanced nations, there are some noticeable differentials. It is dangerous and even impossible however to transplant techniques as they are. Introduction should be made step by step. For the purpose, we should, based on the present techniques in the region, formulate a system of technics which are suited to the locality and favorably received by farmers, and establish it as soon as possible to pave the way to the modernization.

For this task, the experiment stations in the region are too poorly equipped, and research workers are too few in number.

Six experiment stations are to be reinforced. Furthermore, the Center which controls over them and train technicians is to be set up at some proper place. The Center will be fully equipped with facilities, materials and instruments. Up till the day when technical staff is substantiated, Japanese experts will take charge of research works and the guidance of the technicians of Thai Government. With class-rooms, dormitory, materials and instruments fully provided, the Center will train technical personnels who are to be engaged in researches at branch station.

As for the branch station, it will have its own jurisdiction clearly defined, and set up techniques suitable to the locality, distribute good silkworm eggs, and train extension agents, with facilities, materials and instruments completely installed.

Also, each branch station should set up at least one pilot demonstration to adapt the established technology, train extension agents and demonstrate latest practices to farmers.

(2) In order to carry out the measures for the development of sericulture effectively, it is necessary to provide statistics at an earliest possible date.

(3) To secure stable supplies of raw silk in profitable transactions, the sales of raw silk by farmers should be organized. Furthermore, raw silk prices are to be stabilized in order to secure a stable income to farmers.

3. Irrigation

(1) Background and major problems at issue

If we would deal with something about the state of irrigation works in Thailand, it is convenient to start by dividing the entire land into four regions: central plain, northern, northeastern, and southern regions. Because these four regions vary widely not only in geographical and topographical settings but also in climatic conditions, historical development and current status of irrigation works. In the northern region centering around Chiang Mai and Lampang areas, irrigation projects have been introduced since olden times. Irrigation water is conducted into irrigation canals by installing weirs (low dams) on the four tributaries of the Menam River, including the Ping R. and the Wang R., and on other smaller rivers or streams, and then the water is conducted into the farmers, fields through the irrigation canals. Apart from the fact that whether or not the construction of weirs, diversion works and the irrigation devices are suited really for the modern agriculture, it can be regarded that somehow or other the water utilization system has been established and that farmers themselves have know-how and interests in the irrigation practices.

In the central plain region surrounding Bangkok, the construction works of irrigation and water utilization scheme are now under way steadily by the construction of Chaophya Dam and the main canals. In the area northeast of Bangkok, the construction of networks of irrigation canals have already been achieved early in the 20th century. In addition, thanks to

the level land, it can be said that irrigation activity and the know-how of the irrigation practices have come to be diffused steadily throughout the area, though not so extensively as compared with the northern region. As the major problems at issue in this area, two problems can be pointed out: (1) a problem how to connect the lateral water utilization facilities including branch canals with the main irrigation facilities now under construction with rapidity, and (2) a problem how to promote the works of construction of farmroads and drainage devices as the second step following the problem cited in (1).

In the northeastern and southern regions, the works for irrigation water source development and for the main water canal construction are now under way in earnest, but the irrigation works have not as yet come to formulate the desired system rooted firmly to the ground, and the farmers' understanding of irrigation works is poor. Particularly in the northeastern region, a broader area plan for water utilization scheme and irrigation system is required to be mapped out anew, and to introduce the systematic management of the irrigation water conducted from the water sources into terminal ditches through the main and branch canals. And it is important to set up a demonstration and pilot farm in every part of the region for the purpose of extension of scientific know-how of irrigation practices among individual farmers.

(2) Measures to be taken in the future

In promoting the irrigation works in Thailand, there is much room for dispute on the kinds of crops to be selected as target crops. The production of farm crops in Thailand can be regarded as satisfactory on the whole, though nay of the farm crops is not so abundant enough to meet the domestic requirements. Unless great changes occur in the future food life and in mode of living, the domestic food requirements would show no rapid increases. As a result, we cannot but consider that the irrigation works in Thailand should be promoted by selecting such farm crops which are consumed world-widely and are likely to run short of in Asia.

A great deal of rice is required still now in Asia and rice is regarded as one of the crops most adapted to Thailand. In view of this, it would safely be said that rice can be selected as one target crop in Thailand. Thailand is, needless to say, a rice producing country, but viewed from the irrigation activity, the rice production in Thailand can not always be regarded as stabilized enterprise. Because, the rainfall in Thailand does not continue throughout the months after the rainy season has set in, but is interrupted for a while during the period from late June to early August, and the time of interruption of the rainfall is irregular, thus affecting seriously the rice growing in Thailand. Under the present conditions, rice transplanting can not be permissible until after the interruption of rainfall has passed. When the time of interruption of rainfall has passed before mid-July at latest, the seedlings ready for transplanting can be made available and the stability in rice production is expected to be secured. In case where the time of interruption of rainfall is delayed, however, the seedlings ready for transplanting will become useless, thus resulting in the decrease in rice

planting acreage and in rice production.

Rice being the most important staple food in Thailand as in Japan, it is important to secure stability in rice cropping not only for the increased rice imports but also for the stabilization of the public sentiment in the country. Therefore, if the aforesaid interruption of rainfall during the rainy season could be overcome by means of irrigation water supply, farmers could grow rice at will without any anxiety about weathers. Thus in parallel with the breeding of improved rice varieties under the rice variety improvement works, the irrigation water supply will contribute greatly to the improvement of rice growing practices in Thailand. The rainy season in Thailand is usually over at the end of November, but when the rainy season should be over earlier, rice production would be decreased due to the poor ripening. In such case, if water can be secured by irrigation devices for about one month, the decrease in rice production could be forestalled. Moreover, double cropping practice of rice might become permissible, if irrigation water could be secured throughout the year and with a help of the wise selection of rice varieties as well as of the adequate fertilization and care-taking of paddy rice fields. The double cropping of rice is now actually practised in Chiang Mai area where relatively better irrigation facilities are available.

Moreover, in cases of upland crops including cotton, due to the uneven rainfall distribution and due to the long dry spell peculiar to the monsoon regions, the crops themselves will often suffer from droughts or the growing seasons will be limited frequently. Irrigation practices can, therefore, play a great role in the improvement and stabilization of the production of those upland crops.

(3) Discussions

We would like to pay great respect for the efforts put forth by Thailand in order to implement the works for the water source development and for the main canal construction by applying highly advanced techniques and by investing fairly large amount of funds. However, it seems to us that, in most of the regions, notwithstanding the sufficient irrigation water is reserved in the main canals, the irrigation water is not always made available to farmers efficiently. In the future, therefore, it is recommended that due consideration be paid so that individual farmers may make full use of the irrigation water in the main canals which have been constructed at a great cost, by building more branch canals and by establishing more efficacious devices for irrigation water management. It is also recommended that from the macroscopic viewpoint that the irrigation water system be established firmly and the plan be mapped out so that the efficient water balance may be kept.

Moreover, after the irrigation works have been accomplished well to a certain extent, the problem of drainage during the rainy season will be required to be tackled. In case of drainage works, two cases should be noted: (1) drainage of water from individual farms into drainage canals and (2) drainage of water from drainage canals into large rivers or into the sea.

In case of the northern, southern and northeastern regions, both devices (1) and (2) can be brought into practices comparatively readily, but in case of large-scale drainage device in the central plain region, a further specific study will be required to be made.

Moreover, in addition to the completion of drainage canal networks, the completion of ditches including farm-roads will also be required. In Thailand, tilling operation by the use of large-type tractors is becoming popularized with rapidity, but in order to cope with the labour shortage caused by the increased rice production and by the introduction of new practice to grow rice twice a year, special consideration should be paid to the promotion of farm mechanization. For this purpose, it is important to build farm-roads accessible to individual farms. At present, farm machines may be driven across others' farms and the harvested crops can be conveyed on the back or by ships, but with the progress in farmland adjustment and with the increase in crop production, the role played by farm-roads will become increasingly greater. At present, fine main roads are equipped well throughout Thailand. It is, therefore, sincerely recommended that due consideration be paid so that a further step may be taken in order to build the networks of secondary roads, farm community roads and roads within the farmland areas.

APPENDICES

1. List of members

Dr. Hidetsugu Ishikura	Leader	Research Councillor, Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture and Forestry.
Mr. Moriyoshi Kumamoto	Sericulture	Chief, Sericultural Section, Raw Silk and Horticulture Bureau, Ministry of Agriculture and Forestry.
Dr. Arata Masumoto	Irrigation	Senior Engineer, Kanto Regional Office, Ministry of Agriculture and Forestry.
Mr. Takaharu Hatanaka	Agricultural Economy	Overseas Technical Cooperation Officer, International Cooperation Section, Agriculture and Forestry Economic Bureau, Ministry of Agriculture and Forestry.
Mr. Hiroo Kondo	Liaison and Account	Agricultural Development Cooperation Office, Overseas Technical Cooperation Agency.

2. Schedule of survey

1968

- July 3 (Wed.) Leaving Haneda by JAL Flight 451, reached the Don Muang Airport, Bangkok.
- July 4 (Thu.) In the morning, greeted Ambassador Ushiroku, Minister Wada, Councilor Yamato and other officials at the Japanese Embassy.
- Then, listened to the explanation of the local situation by Secretaries Kawaguchi, Mizuno and Hanabusa.
- In the afternoon, discussed the survey plan, etc. at the Conference Hall of the Embassy.
- July 5 (Fri.) In the morning, all the members, accompanied by Secretaries Kawaguchi and Hanabusa, called on Dr. M. R. Chakratong Tongyai, Under-Secretary of State, Dr. M. G. Chakrabandhu, Director-General, Agriculture Department, and others at the Ministry of Agriculture. Leader Ishikura explained the purpose of the mission, and had a familiar talks with them.
- In the afternoon, discussed the survey plan, schedule, etc. with Thai officials at the Department of Agriculture.
- July 6 (Sat.) Legal holiday for the officials in Thai Government. Conferred with Japanese experts. Listened to the explanation of the present conditions of respective sectors by Sericultural Experts Kawai and Hashida in the morning, and by Experts Takahashi and Matsuo in F.A.O., Expert Numata on Colombo Plan, and Overseas Researchers Koyama, Hidaka, Matsuguchi and Tokuda on Tropical Agriculture Research Plan in the afternoon.
- July 7 (Sun.) Holiday
- July 8 (Mon.) In the morning, called on Mr. Boonrod Binson, Under-Secretary, at the Ministry of National Development. Conferred with officials in the Department of Technical and Economic Coopeation of the same Ministry.
- In the afternoon, conferred with officials in the Department of Agriculture and the National Energy Authority, Ministry of National Development.
- July 9 (Tue.) Visited and surveyed the Thai silk weaving mills, retailers and wholesale dealers in Bangkok.

- July 10 (Wed.) National holiday
- July 11 (Thu.) Discussed the schedule, plan, etc. of the survey of agriculture in the northeastern region from the 12th to the 17th with officials in the Departments of Technical and Economic Cooperation, Agriculture and Rice.
- July 12 (Fri.) Leaving Bangkok, inspected Thai-Denmark Dairy Farm at Pak Chong; Indian Corn Experiment Station, Department of Agriculture; and prospective site of Sericultural Research and Training Center (Korat Sericultural Experiment Station).
Surveying silk reeling in the domestic industry at farms around Pak Thong Chai, returned to Korat to lodge.
- July 13 (Sat.) Leaving Korat, inspected the Phimai Rice Experiment Station and Land-settlement. Stayed at Khon Kaen.
- July 14 (Sun.) Leaving Khon Kaen, inspected Khon Kaen Rice Experiment Station, Agricultural Experiment Station, Sericultural Experiment Station, University, Disease and Pest Controlling Station and Nam Phong Dam. Stayed at Udon.
- July 15 (Mon.) Leaving Udon, members were divided into 2 groups. Group A (Ishikura, Masumoto and Kondo) took charge of rice and irrigation, while Group B (Kumamoto and Hatanaka) sericulture. After inspecting Sakon Nakhon Agricultural Experiment Station, Silkworm Egg Experiment Station, Mukduhan Sericultural Experiment Station, and Nam Pung Dam. Group A lodged at Sakon Nakhon, while Group B at Mukdahan.
- July 16 (Tue.) Leaving Sakon Nakhon and Mukdahan, inspected Roi Et Agricultural and Sericultural Experiment Station, Mukdahan Land-settlement, Multicrop Experiment Center, F.A.O Kalasin Demonstration Farm and Lam Phao Dam, etc. Groups A and B joined at Khon Kaen to stay.
- July 17 (Wed.) Leaving Khon Kaen, inspected a filature run by Formosan capital at Ban Phai. Returned to Bangkok.
- July 18 (Thu.) In the morning, brief reported the outline of the survey of sericultural situations in the northeastern region to the officials concerned of the Department of Agriculture, and conferred about the survey in the Chiang Mai district from the 19th.

In the afternoon, reported to Ambassador Ushiroku and others about the

- outline of the survey at the Japanese Embassy.
- July 19 (Fri.) All members except for Masumoto left Bangkok by air for Chiang Mai. After inspecting San Pa Tong Rice Experiment Station, participated as guests in the Lam Yai Fruit Contest and observed the actual stage of an agricultural Product Fair in Thailand.
- Masumoto conferred with officials of the Royal Irrigation Department on the cooperation concerning irrigation.
- July 20 (Sat.) Inspected Chieng Mai Agricultural Experiment Station and Fisheries Experiment Station. Conferred with officials concerned on their reports of the progress of research works.
- Masumoto left Bangkok to inspect Chai Nat Dam on a day's trip.
- July 21 (Sun.) In the morning, returned to Bangkok by air from Chieng Mai.
- In the afternoon, conferred with officials in the Japanese Embassy and the Department of Agriculture on the compilation of facts found. Prepared an interim report.
- July 22 (Mon.) At the Department of Technical and Economic Cooperation, all members met officials concerned of the Thai Government in the presence of Secretaries Kawaguchi and Hanabusa. Submitting in interim report to them, conferred on the results of the survey.
- In the afternoon, Masumoto conferred with Dr. Boonrod Binson, under-secretary, Ministry of National Development, on irrigation.
- July 23 (Tue.) Leader Ishikura returned home. Kumamoto and other conferred with the officials in charge of sericulture in the Department of Agriculture on the plan for the development of sericulture in the northeastern region of Thailand.
- Listened to the report on the irrigation plan in the country by Expert Teranishi of the National Energy Authority, Discussed the plan, schedule, etc. of the survey of the Nam Sai Yai river.
- July 24 (Wed.) Kumamoto returned home. Masumoto and others left Bangkok for Prachine Buri to survey irrigation. Stayed at Kabinburi.
- July 25 (Thu.) Surveying the irrigation in Prachin Buri, came back to Bangkok.

- July 26 (Fri) In the morning, calling at the Dutch Embassy and the Danish Embassy in Thailand, listened to the explanation of the present state of their assistance to Thailand by respective officials in charge, and conferred with them.
- In the afternoon, discussed the plan, schedule, etc. of the irrigation survey of the Pran Buri river with the persons concerned.
- July 27 (Sat.) Masumoto and others left Bangkok for Pran Buri. At the prospective dam site, listened to the detailed explanation on the irrigation plan of the Pran Buri river by the officials concerned. Stayed at Hua Hin.
- July 28 (Sun.) Leaving Hua Hin, surveyed the prospective, beneficiary area from the irrigation plan of the Pran Buri river. Furthermore, surveying the operation of the Thai-Israeli Farm and its irrigated agriculture, came back to Bangkok.
- July 29 (Mon.) In the morning, calling at the Australian Embassy in Thailand, listened to the explanation of the present state of their assistance to Thailand by the secretary in charge of overseas cooperation and conferred.
- In the afternoon, heard the views of Expert Matsuo of F.A.O. on the present state of the rich growing and irrigation in Thailand, and conferred.
- July 30 (Tue.) In the morning, calling at the West Germany Embassy in Thailand, heard the explanation of the present state of their assistance to Thailand by the officials in charge of overseas cooperation, and conferred.
- In the afternoon, conferred with Mr. Boonrod Binson, under-secretary of the National Development on the possibilities of our technical assistance to the Thai irrigation plan.
- July 31 (Wed.) In the morning, calling at related Governmental agencies, collected data and compiled them.
- In the afternoon, calling on Mr. Manoo, Director-General, and Mr. Adul, Deputy Director-general, of the Department of Land Cooperative, Ministry of National Development, discussed the possibilities of our technical cooperation to the terminal ditch plan in Thailand.
- August 1 (Thu.) Hatanaka and Kondo returned home.
- In the afternoon, Masumoto discussed the possibilities of our technical

cooperation with Mr. Manoo, Director-general, Department of Land Cooperative.

- August 2 (Fri) Masumoto conferred with the irrigation experts of F.A.O. and the officials concerned in the Experiment Station.
- August 3 (Sat.) Holiday
- August 4 (Sun.) Masumoto conferred with the officials concerned in the Department of Agriculture on the upland irrigation plan in the northeastern region of Thailand.
- August 5 (Mon.) Listened to the detailed explanation of the terminal ditch plan by Mr. Adul, Deputy-Director-General, Department of Land Cooperative, and the officials in charge of irrigation in the said department.
- August 6 (Tue.) Continued the discussion with the officials in charge of the irrigation plan in the Department of Land Cooperative.
- August 7 (Wed.) Final conference with the directors of the Royal Irrigation Department and the Department of Agriculture on our technical cooperation in the irrigation of Thailand.
- In the afternoon, collected and compiled data on irrigation.
- August 8 (Thu.) Masumoto returned home.

3. Brief report

On July 22, 1968, when the field survey in the northeastern region of Thailand was completed, the mission compiled a brief report on the outline of the survey results so far obtained, which was presented to the officials concerned in Thai Government and in the Japanese Embassy there for understanding.

Here is the brief report:

Brief Report of the Japanese Survey Mission

for Agricultural Development Cooperation in Thailand

The Japanese Survey Mission for Agricultural Development Cooperation in Thailand, the members of which were listed on an attached sheet, stayed in Thailand from July 3rd to August 1st with an aim to seek for closer cooperation in the agricultural development of Thailand, particularly in such fields as researches on rice, improvement of sericultural industry and irrigation relevant to agricultural development.

The Mission had talked with officials concerned of Thai Government and visited research and experiment stations located in and near Bangkok and in northeastern and northern regions in order to study technical features to be considered in further cooperation. The Members of the Mission concerned with sericulture visited silk-weaving factories and those concerned with irrigation to water reservoirs and irrigation facilities respectively.

The Mission takes this opportunity to express its most cordial appreciation of the kind cooperation extended to the Mission by Thai Government by providing counterparts, transportation, etc.

The following are the brief record of discussions and observations made by the Mission.

1. Research on Rice

Through talks with technical staff of the Department of Rice and visits to Technical Division of the Department located in Bangkok as well as rice experiment stations in the northeastern and northern regions, the Mission observed that the improvement of rice varieties by hybridization was being conducted successfully, taking into consideration of local conditions and requirements in making breeding programs. The Mission, however, found shortage of research and technical personnel working at rice experiment stations in proportion to the area used in breeding and the number of laborers under the supervision of those personnel.

The Mission was informed that, in many places, a level of yield was fairly low in spite of the distribution of improved varieties and that this might be caused by lack of water management, fertilizing and protection of crops from pests and diseases. In order to increase per unit-area production which seemed very necessary for rice production increase in Thailand, the Mission was agreeable to the intention of the Department of Rice to intensify the research activity in rice plant physiology, disease and insect control. In this connection the Mission stated that, in response to the request raised by the Thai Government, the Japanese Government would send experts under Colombo Plan Technical Assistance Program to cooperate in promoting researches in those fields and suggestion of the candidates was made by the Mission.

Since conditions relevant to rice cultivation differ by region considerably and since Technical Division of the Department of Rice had established modern laboratories in a number of rice experiment stations, coordination of breeding program and research activity assumed by the Technical Division would become necessary in order to establish high yielding technique. The Mission felt that this would be another item in which Japanese cooperation might be useful.

2. Sericulture

The mission made a circuit trip for six days from July 12th to 17th to Korat, Pimai, Ban Pai, Khon Kaen, Udorn, Sakolnakorn, Mukdaharn, Kalasin and Roi Ed in order to study the present condition of agricultural development in the northeastern region with emphasis on sericulture. The Mission visited agricultural and sericultural experiment stations, seed multiplication stations, silkworm rearing farmers, silk mills, silk dealers and silk-weaving factories in the region and observed technics presently employed in order to identify problems to be considered in further promotion of sericultural industry.

Information collected at several sericultural experiment stations and seed multiplication stations indicated that the distribution of mulberry stocks as well as silkworm seeds have remarkably increased in recent years to the extent that it would be difficult to satisfy the needs of farmers. It was observed that farmers became more relying on sericulture in the region. This remarkable development of sericultural industry in the region is considered, with no doubt, to be attributed to the enthusiastic promotion of the industry conducted by the Department of Agriculture. The Mission would like to express its sincerest respects to the efforts made so far by the Department.

It was most clearly understood by the Mission that mulberry growing and silkworm rearing were, among many dry field crops cultivated in the region, becoming most profitable source of cash income to farmers. Further promotion of sericulture would no doubt contribute to the increase of farmer's income and help improve their living standard in the region.

further promotion of sericulture such as the shortage of technical personnel working at sericultural experiment stations with an exception of the one located at Mukdaharn, as well as those working at seed multiplication stations, small size of cocoons with high proportion of loose layer (Keba layer) presently harvested by farmers and which yield only small amount of silk yarn, occurrence of root disease on mulberry shrub in many places, lack of group organization among silk-rearing farmers, improper marketing of cocoons and instability of price of cocoons and silk products.

In order to overcome some of these problems through technical improvement, the Mission was quite agreeable to the proposal made by the Thai Government involving the establishment of a sericultural research and training center as soon as possible. The Mission felt that researches on root rot disease of mulberry shrub including the finding of control measure and the improvement of silkworm varieties in order to increase the yield of yarn and to improve the earning by farmers should be carried out with high priority together with the training. Realizing a remarkable shortage of technical personnels in sericultural industry with enough knowledges to advise farmers, the Mission agreed to the view of Thai Government that it was necessary to open a training course for education of technical personnels presently in service and those expected to serve at sericultural experiment station and silkworm seed multiplication stations.

The Mission further agreed to the proposal made by the Thai Government to place the training center at Korat in view of its position in the northeastern region, size of land available to open mulberry fields and soil condition prevailing in the region. However, the Mission observed that existing buildings and silkworm rearing shed in the sericultural experiment station located at Korat would be insufficient for carrying research works and training.

The Thai side explained that it was the intention of the Thai Government to improve facilities equipped at sericultural experiment station and seed multiplication station, and to encourage the silkworm rearing in certain farmer groups, so that the achievements to be obtained through cooperation research and training might be widely extended.

The Mission stated that it would recommend to the Japanese Government to favourably consider the cooperation with this project.

3. Irrigation

The Mission, availing itself of this opportunity to visit Thailand, exchanged view with Thai officials concerned with the development of irrigation facilities.

While no concrete result was achieved with respect to any specific irrigation project, the Mission made it clear that, subject to available budget appropriation, the Japanese Government was prepared to consider the possibility of cooperation in irrigation field. The Mission found the exchange of views most useful and hoped that contact should be maintained in future.

Members of Japanese Survey Mission for Agricultural Development Cooperation in Thailand.

Dr. Hidetsugu Ishikura	Leader	Research Councillor, Agriculture, Forestry and Fisheries Research Council, Ministry of Agriculture and Forestry.
Mr. Moriyoshi Kumamoto	Sericulture	Chief, Sericultural Section, Raw Silk and Horticulture Bureau, Ministry of Agriculture and Forestry.
Dr. Arata Masumoto	Irrigation	Senior Engineer, Kanto Regional Office, Ministry of Agriculture and Forestry.
Mr. Takaharu Hatanaka	Agricultural Economy	Overseas Technical Cooperation Officer, International Cooperation Section, Agriculture and Forestry Economy Bureau, Ministry of Agriculture and Forestry.
Mr. Hiroo Kondo	Liaison and Account	Agricultural Development Cooperation Office, Overseas Technical Cooperation Agency.

4. Map of itinerary

