REPORT OF THE JAPANESE SURVEY MISSION FOR THE EXECUTION OF SERICULTURAL DEVELOPMENT COOPERATION IN THAILAND

MARCH 1969

OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

派遣事業部　管　理　課

FOREWORD

Entrusted by the Ministry of Foreign Affairs, this Overseas Technical Cooperation Agency dispatched a servey mission headed by Dr. Seinosuke Ohmura, auditor, the Japan Raw Silk Corporation, to Thailand concerning the execution of sericultural development cooperation there for 3 weeks from February 18, 1969.

The purpose of this mission was to bring our technical cooperation in Thai sericulture in the concrete along the lines of the report submitted by the preceding survey mission, dispatched last summer, to find the basis for the development of sericulture, and especially formulate a definite plan for our adequate, effective technical cooperation in the development of Thai sericulture. For the purpose, the mission investigated the state of affairs on the spot, held many conferences with Thai people concerned, and prepared the Record of Discussion to summarize the contents of our concrete cooperation before they came home.

This report shows the contents of the plan of our cooperation which the mission has formulated together with Thai people.

We wish sincerely that in the very near future the projects for the cooperation in sericultural technique between Japan and Thailand will be materizlized on the basis of this report.

In concluding, we must express our cordial gratitude to the leader and the members of the mission, and all those who had provided every facility for their survey, a especially the officials concerned of the Thai Government and the Japanese Embassy there, as well as the experts dispatched by the F.A.O. and on the Colombo Plan.

March 1969

S. Shibusawa

Shinichi Shibusawa, Director-general
Overseas Technical Cooperation Agency

CONTENTS

PREFACE

A glance of displays at the National Museum in Bangkok clearly shows us that Thai people produced quality silk fabrics in very old days, bearing evidence to the fact that silkworm rearing in Thailand has been handed down from ancient times.

Among many agricultural segments, sericulture requires comparatively complicate technique. So, it is extremely difficult to develop it on a land where they have no experience in rearing ailkworms. Fortunately, Thailand has accumulated many haundred years' experience in sericulture, which should afford the basis for receiving new technology. This is a very favorable condition.

It appears to be very timelu that Thailand is planning to set up a Research & Maining Center to promote silkworm rearing. We have, through the recent survey, been led to believe that the establishment of this Center would play an important role in the development of sericulture.

Thanks to the hearty cooperation of Thai people, the survey was carried out as scheduled. In order to build a better Center, furthermore, we could discuss the matter unreservedly with interested Thai people. It was a great pleasure for us to sign the Record of Discussion. We wish to convey our special thanks to them. Also, we are deeply thankful to the officials in the Japanese Embassy and the Bangkok Office of the Overseas Technical Cooperation Agency for their supreme assistance and cooperation.

Seinosuke Ohmura, auditor,
Japan Raw Silk Corporation

I. PURPOSE OF SURVEY MISSION

The previous survey mission dispatched in July 1968 for the investigation of the basis on which we cooperate in the development of Thai agriculture was presented by Thai officials their draft plan for the promotion of sericulture to the following effect:

1) To establish a Sericultural Research and Training Center in the northeastern region. In the Center, they will study sericultural technique, improve silkworm varieties, train and educate research workers, and train extension agents.

2) Of 6 local Sericultural Experiment Stations in the northeastern region, 3 Stations will become so many Branches of the Center. In a Branch, they will experiment on the new technique which has been developed at the Center to determine if it is adaptable to the locality. They will multiply the eggs of the silkworm variety which has been improved at the Center for distribution among farmers. They will also train local extension agents.

3) Prior to the distribution of the new technique which has passed the test of local adaptability and the improved silkworm variety, the Center and Branches will conduct trial practices at selected farms to determine precautions and so forth for farmers. For the purpose, each Branch selects a village where a few farms are assigned the task. Furthermore, these farms are expected to become the core of technical extension in the locality. The task we were assigned was, on this draft plan, to give adequate advices, and formulate a concrete plan, exchanging views with Thai people, to cooperate in the construction and operation of needed facilities. Accordingly, we conducted necessary surveys on the spot, and based on our findings, held many discussions with the persons concerned about the construction of the Center, etc. As a result, we came to an agreement on the cooperation plan, and its contents were consolidated in the Record of Discussion, which was duly signed by Dr. Phit Panyalakshana, Deputy Director-General, Department of Agriculture, Ministry of Agriculture, and Dr. Seinosuke Ohmura, head, Survey Mission, and exchanged between the two parties.

II. LIST OF SURVEY MISSION

Seinosuke Ohmura,	head (Overall control)	Auditor, Japan Raw Silk Corporation
Moriyoshi Kumamoto,	member (Silkworm rearing)	Chief, Sericulture Section, Raw Silk and Horticulture Bureau, MAF
Sadaji Ogawara,	member (Raw silk reeling)	Chief, Cocoon Testing Research Laboratory, Sericultural Experiment Station, MAF
Tatsuji Ishiiye,	member (Parthology)	Chief, Mulberry Disease Research Laboratory, Sericultural Experiment Station, MAF
Hiroo Kondo,	member (Business co-ordination)	Agricultural Development C-operation Office, Overseas Technical Co-operation Agency
Yasuhide Hayashi,	(attendance)	Secretary of Foreign Affairs, Southwest Asian Section, Asian Bureau, MFA

* MAF : Ministry of Agriculture & Forestry
MFA : Ministry of Foreign Affairs

III. SCHEDULE OF SURVEY

Feb. 18 (Tue.) Leaving Tokyo aboard the AZ775, arrived at Bangkok Airport at 16:45, local time. Made arrangements with Mr. Takeda, Chief of Bangkok Office, O.T.C.A. and others.

Feb. 19 (Wed.) Calling at the Japanese Embassy, greeted Minister Wada, Secretaries Kawaguchi and Kobata, etc. Had a talk with them. Successively, in the Embassy, made arrangements about the schedule and so forth with the participation of Mr. Chote, Thai Agriculture Department.

Feb. 20 (Thu.) Calling at the D.T.E.C., greeted Deputy Director-General Xujati and others. Had a talk with them. Successively, called at the Department of Agriculture, where greeted and talked with Dr. Phit, Deputy Director-General, Mr. Samai, chief of Research & Experiment Station division and others. Our leader presented the Record of Discussion (draft) for their examination.

Feb. 21 (Fri.) Calling at the Bangkhen University, heard the opinion from Experts Dr. Takahashi and Dr. Matsuo, F.A.O., on the soil condition, etc. of the proposed site for the Korat Sericultural Research & Training Center. Also heard the results of researches made by Thai people on the root-rot of mulberry from Dr. Winit. Member Ishiiye reported the results of our researches on the sample that had previously been sent to Japan, and exchanged views.

Feb. 22 (Sat.) Took a rest.

Feb. 23 (Sun.) – Mar. 4 (Tue.) Survey of the northeastern region of Thailand.

Feb. 23 (Sun.) Leaving Bangkok, stayed at Korat, where Experts Hashida and Kawai joined us and expressed their views.
Made an inspection of the proposed site for the Center. Investigated the experts' lodging in the city and its life environment, etc.

Feb. 24 (Mon.) Leaving Korat, stayed at Khon Khaen.
Visiting the land settlement, Pimai, proposed place for the pilot farms, inspected the farms.
Visiting Chonnabot, inspected sericultural farms and weaving operation at farms. At the County Office, talked with about 20 local, agricultural

leaders. Investigated wholesale dealers in silk fabrics in Ban Phai.

Feb. 25	(Tue.)	Leaving Khon Khaen, stayed at Nong Khai. Visiting the Northeastern Agricultural Center at Khon Khaen, inspected the Experiment field for mulberry root-rot, and exchanged views. Made inspection of Khon Khaen University, Khon Khaen Sericultural Experiment Station, and the mulberry field and the equipment for experiment at Udon Seed Multiplying Station, and exchanged views with officials concerned.
Feb. 26	(Wed.)	Leaving Nong Khai, stayed at Sakolnakhon. Visiting the Nong Khai Sericultural Experiment Station, inspected its mulberry field and the equipment for experiment, and exchanged views with the officials concerned.
Feb. 27	(Thu.)	Leaving Sakolnakhon, stayed at Mukdahan. Visiting the Sakolnakhon Seed Multiplying Station and Mukdahan Sericultural Experiment Station, inspected the mulberry field and equipment for experiment, and exchanged views with the officials concerned.
Feb. 28	(Fri.)	Leaving Mukdahan, stayed at Roi Et. Inspected the Mukdahan Land-Settlement and the Roi Et Sericultural Experiment Station. Investigated the state of silkworm rearing and the mulberry field on a Land-Settlement, and exchanged views with the persons concerned.
March 1	(Sat.)	Leaving Roi Et, stayed at Korat. Inspected the weaving of quality silks at Roi Et, and visited the silk reeling mill at Ban Phai.
March 2	(Sun.)	Successively stayed at Korat. Started the work to compile the results of survey and the annex to the Record of Discussion (draft). In the afternoon, at the Korat Sericultural Experiment Station, exchanged views on the results of survey and the preparation of the Annex to the Record of Discussion, with the participation of Dr. Phit, Deputy Director-General, and Mr. Samai, chief of the Research & Experiment Station division, Department of Agriculture. Mr. Hayashi, secretary, Ministry of Foreign Affairs, and Mr. Kawaguchi, secretary, the Japanese Embassy, attended.

March 3	(Mon.)	Stayed at Korat. Continued the compilation of the results of survey. In the afternoon, discussed the layout of the Center, with the participation of Messrs. Chote and Somchard, Department of Agriculture and the persons concerned in the plan for construction.
March 4	(Tue.)	Leaving Korat, returned to Bangkok. In the morning, continued the work. In the afternoon, returned to Bangkok by train.
March 5	(Wed.)	Calling at the Japanese Embassy, made a report on the results of survey, etc. to Ambassador Ushiroku, Minister Wada and others. Successively, discussed the draft of the Record of Discussion with the participation of the officials concerned of the D.T.E.C., Department of Agriculture and Budget Bureau.
March 6	(Thu.)	At the D.T.E.C., consulted on the Record of Discussion with Mr. Xujati, Deputy Director-General, Dr. Phit, Deputy Director-General, Department of Agriculture, Mr. Samai, chief of Research & Experiment Station division, Chief of Division in the Budget Bureau and other officials concerned. On our side, were present, besides the members of the Mission, Secretary Hayashi, First Secretary Kawaguchi, Mr. Takeda, Chief of O.T.C.A., Bangkok office, Mr. Shinoda, Deputy-Chief of O.T.C.A. Agricultural Cooperation Office. Asked the home Government for instructions on the revised parts of the Record of Discussion through the Embassy.
March 7	(Fri.)	At the D.T.E.C., deliberated on the Record of Discussion, which was duly signed by Dr. Phit, Deputy Director-General, Department of Agriculture, and Dr. Ohmura, head of our Mission, with Mr. Xujati, Deputy Director-General, D.T.E.C., and First Secretary Kawaguchi, the Japanese Embassy, attending as witnesses. In the afternoon, tendered greetings to the Embassy and other quarters concerned.
March 8	(Sat.)	Supplementary survey. Surveyed the state of mulberry cultivation in the southern Thailand, and collected soil from places where root-rot disease breaks out in the outskirts of Korat.

March 9	(Sun.)	Supplementary survey. Successively, surveyed the state of mulberry cultivation in the north-eastern Thailand, and the places where root-rot disease breaks out in the outskirts of Korat.
March 10	(Mon.)	Returned home aboard the JAL425.

IV. RECORD OF DISCUSSION

RECORD OF DISCUSSION BETWEEN THE JAPANESE SERICULTURAL SURVEY MISSION AND THE COMPETENT AUTHORITIES OF THE GOVERNMENT OF THAILAND

On instructions of the Government of Japan, the Japanese sericultural Survey Mission organized by the Overseas Technical Cooperation Agency and headed by Dr. S. Ohmura visited Thailand from 18th February to 10th March, 1969, exchanged views on and discussed matters concerning sericultural development in Thailand with the competent authorities of the Government of Thailand and, consequently the Japanese Survey Mission and the Thai competent authorities, promising mutual cooperation for the implementation of technical cooperation in the field of sericulture, have reached an understanding through discussion as recorded hereunder;

1. It was mutually agreed to recommend that the two countries shall cooperate with each other in implementing the following for the purpose of developing sericulture in Thailand, expecially in the northeastern region.

(1) Establishment of a main sericultural research and training center at Korat for the purpose of introducing modern sericultural techniques and training Thai technicians and extension workers.

(2) Consolidation of the three existing local sericultural stations, under the guidance of the above-mentioned center, which shall formulate techniques adaptable in the region and engage in the production and the distribution of well selected silkworm-eggs and mulberry scions.

(3) Extension of modern techniques to certain villages which shall become the core for technical extension to sericultural farmers.

2. In accordance with laws and regulations in force in Japan, the Japanese authorities shall take necessary measures to provide at their own expense the service of the required Japanese experts as listed in Annex I through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

3. In accordance with laws and regulations in force in Japan, the Japanese authorities shall take necessary measures to provide at their own expense equipment and machinery as listed in Annex II through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

4. In accordance with laws and regulations in force in Japan, the Japanese authorities shall take necessary measures to grant training in Japan to Thai technicians engaged in this Project through the normal procedures under the Colombo Plan Technical Cooperation Scheme.

5. The equipment and machinery referred to in Annex II shall become the property of the Government of Thailand upon being delivered c.i.f. at the port of Bangkok to the competent authorities. The equipment and machinery referred to above shall be utilized exclusively for the purpose of the Project under the technical guidance of the Japanese experts.

6. The Thai competent authorities shall take necessary measures to provide at their own expense;

(1) Thai technical and administrative staffs.

(2) Land and buildings as well as incidental facilities.

(3) Supply or replacement of equipment and machinery necessary for the implementation of the Project by mutual agreement between the two parties concerned.

(4) Means of transportation in Thailand for the equipment and machinery provided by the Government of Japan.

The Thai competent authorities shall also bear the expense necessary for the installation, operation, and maintenance of the above equipment and machinery as well as all running expenses necessary for the implementation of the Project.

7. The Thai competent authorities shall be responsible for operation and all administrative matters pertaining to the function of the Project, while the Japanese experts shall closely cooperate with the Thai competent authorities and give technical guidance pertaining to the implementation of the Project.

8. To lead this Project successfully, there shall be frequent consultations between the Thai and Japanese competent authorities.

9. The period of the Japanese cooperation in the implementation of the Project will be for three years. The above period may, however, be extended for a further specified period by mutual agreement of the two parties concerned.

10. The understandings as recorded heretofore shall, subject to formal review by the respective competent authorities, serve as the rules on which the present cooperation is to be implemented.

Bangkok, March 7, 1969.

Seinosuke Ohmura

Dr. Seinosuke Ohmura,
Head,
Japanese Survey Mission

Phit Panyalakshana

Dr. Phit Panyalakshana
Deputy Director-General,
Department of Agriculture
Ministry of Agriculture

Keizo Kawaguchi

Witnessed by Mr. Keizo Kawaguchi
First Secretary,
Embassy of Japan

Xujati Pramoolpol

Witnessed by Mr. Xujati Pramoolpol
Deputy-Director-General,
Department of Technical and
Economic Cooperation,
Ministry of National Development.

ANNEX I JAPANESE EXPERTS DISPATCHED BY THE GOVERNMENT OF JAPAN TO WORK IN THAILAND ON THE FOLLOWING FIELDS:

1. Silkworm breeding
2. Mulberry cultivation
3. Silkworm rearing
4. Pathology
5. Filature

Note: 1) Each expert will work for three years.

2) Extension of staying for each expert may be made, if necessary, under the consideration of both parties concerned.

3) Additional experts may be available at request.

ANNEX II EQUIPMENT AND MACHINERIES

1. Colling machineries for: -
   a) Seed storage rooms
   b) Rearing rooms
   c) Incubation rooms
   d) Laboratories

2. Silkworm Rearing and Egg Producing Equipment:-
   1) Mulberry leaf cutting machines
   2) Floss removers
   3) Steel rearing trays and stands
   4) Sizing reels
   5) Power sprayers
   6) Others

3. Pathological laboratory equipment:-
   1) Pepbrine identification equipment
      a) Moth grinders
      b) Electric centrifuges
      c) Phase microscopes
      d) Others

   2) Equipments for Mulberry and Silkworm diseases
      a) Microscopes
      b) Autoclaves
      c) Electric incubators
      d) Drying sterilizers
      e) Microtomes
      f) Automatic distillation apparatus
      g) Microscopic projector
      h) Others

4. Equipments for mulberry culture:-
   1) Farm machineries
      a) Tractors with accessories
      b) Trailers
      c) Others

2) Irrigation equipment
   a) Sets of sprinkler
   b) Others

3) Soil laboratory equipment
   a) Set of soil survey equipment
   b) Set of soil analysis equipment
   c) Others

4) Meteorological equipments
   a) Recording thermometers
   b) Rain gauges
   c) Others

5. Filature machineries:-
   1) Coccon drying machine
   2) Cocoon boiling machine
   3) Selectary reeling machine
   4) Multiple-ends reeling machine
   5) Automatic reeling machine
   6) Rereeling machine
   7) Set of raw silk testing machine
   8) Thread-plying machines
   9) Boiler
   10) Others

6. Calculation machines

7. Audio-visual equipment:-
   1) Cameras
   2) Movie camera
   3) Tape recorders
   4) Movie projector
   5) Others

8. Reference books and periodicals

9. Transportaion facilities:-
   1) Microbus
   2) Mini-trucks
   3) Others

Note: Necessary items not mentioned in this Annex may be requested later.

V. SUGGESTIONS CONCERNING THE MAIN PROJECTS OF THE SERICULTURAL RESEARCH AND TRAINING CENTER AND ITS BRANCHES

We have investigated actual places with interested Thai people, and discussed the matter with them. As a result, we have come to the following conclusion on our resarch task for the improvement of techniques to develop sericulture in Thailand:

1) Improvement of Silkworm Varieties

2) Improvement of Silkworm Rearing Method

3) Improvement of Mulberry Cultivation Method

4) Establishment of Preventive Methods of Silkworm and Mulberry Diseases

5) Establishment of Silk Reeling Technique to Study the Nature and Performance of Cocoons produced by Improved Silkworms (this will lead to the establishment of silk reeling technique in the future)

VI. ROLE OF SERICULTURAL RESEARCH & TRAINING CENTER AND IT'S BRANCHES

The studies of all the projects shown in the preceding chapter will be, based on the plan which has been prepared by Thai officials, pursued by the Center. So, experts to be dispatched from Japan will stay in the Center and engage in research works together with the counter parts offered by the Thai side. Through this process, the counter parts will accumulate their experience and training in research works, and are expected to become regular researchers in a few years. The Center will also receive extension agents at an appropriate time to train them for a certain period.
On this occasion, they will help Japanese experts with their researches to acquire techniques. Lectures and experiments necessary for their training will be given properly in parallel with the practice mentioned above.

The eggs of the silkworm improved by the Center will be multiplied at the Center for the distribution to Branches and seed farms.

At the Branch, they will, as mentioned above, examine the new technique which the Center has developed as to its local adaptability, and multiply the improved silkworm eggs sent from the Center to distribute them among farmers. In addition, extension agents will be trained here through their assistance in the works assigned to the Branch, which will enable them to acquire new techniques.

All the businesses concerning the administration and operation of the experiments to be conducted at selected farms for the purpose, such as liaison between the Center or the Branch and the farms, the execution and the guidance of the experiment, the compilation of the results of experiment, will be managed by the research organ concerned.

VII. BASIC WAY OF THINKING ABOUT THE STRUCTURE OF FACILITIES AND ABOUT THE EQUIPMENT AND MACHINERY TO BE INSTALLED AT THE CENTER, BRANCHES OR PILOT FARMS

In order for the Center and the Branch to fulfil the role mentioned above, they will have to install the equipment, machinery and instruments as follows:

1. In the Center

(1) Main building

This houses the Director's room, study rooms of experts and counter parts, laboratories (including the balance room, aseptic room, dark room, etc.), the laboratory and lecture room for trainees, conference room, library, exhibition room, office and so forth. Laboratories will be air-conditioned.

Machinery and instruments to be equipped in this building will be: microscopes with accessories, machinery for chemical analysis, centrifugal separators, autoclaves, culture vessels, thermostats, cameras, calculating machines, type-writers, etc. which are necessary for the study of the physiology and pathology of the silkworm and the mulberry and the soil analysis, together with the audiovisual aids for the trainees. As for the reference books to be installed at the library, those published in Japan will be obtained at the provenance as far as possible.

(2) Rearing room

The existing rearing room is so wide that we can remodel the walls and windows to partition it into a few small rooms which will be devoted to the study rooms of silkworm rearing methods. In addition to it, the new rearing house will be built for the study of silkworm diseases and the research room. The works of silkworm improvement and egg multiplication includes a series of operations, such as hatching, brushing, rearing, mounting, pupation, egg laying, arrangement of eggs, after adjustment, cleaning-up and disinfection. It will take 50 – 60 days, which extends over and above the days required by a generation of the silkworm in Thailand. So, it is not possible to use the rearing house continuously for 2 rearing periods or more. Therefore, 2 houses respectively will be built for the improvement of silkworm varieties and for the multiplication of eggs of improved varieties, which will be used alternately. Between two rearing houses making a set, will be built rooms for research workers, which will serve as research rooms. The rearing house for the variety improvement and that for the egg multiplication will be built just in the same type.

As for sericultural instruments to be equipped in these remodelled or newly built rearing houses, we will select the best of those currently in use in Japan. In all research rooms, furthermore, we will equip the measures, meters, calculating machines and other instruments necessary to compile the results of experiments.

(3) Pebrine inspection house

For the purpose of conducting the pebrine inspection on the eggs produced at the Center, and of instructing the trainees in the inspecting method, we will build a house, where 3 sets of machinery and instruments for the inspection will be equipped. One set is used for the eggs for variety improvement, another for multiplied eggs, and the third for the training.

(4) Low-temperature house

This is a special house including the following 6 rooms: 3 small refrigerating rooms, maintaining 3 different temperatures, perhaps at 2.5°, 5° and 10°C, will be used for the research of the method by which live eggs can preserved for a long time, and for an actual preservation. Another small room perhaps at 25°C will be used to hatch eggs at a fixed temperature. Other 2 small rooms kept perhaps at 20°C and 80% and 25°C and 80% will be used for the experimental rearing of silkworms at fixed temperature and humidity.

The machinery to keep the temperature and humidity at required levels will be installed in the building.

(5) Silk reeling research house

This will accommodate the cocoon drying machine, the cocoon boiling machine, several kinds of reeling machines, rereeling machines, silk throwing machines, and a complete set of silk conditioning apparatus. This building houses a boiler room, too, where a large autoclave is installed for convenience sake.

(6) Mulberry field management house

This house is used by experts, counter parts, etc. to manage and survey the mulberry field.

(7) Garage

(8) Warehouse for agricultural machinery and tools

(9) Substation which houses a 100 KW transformer.

(10) Power house, where a 30 KW generator is set.

(11) Water tanks

A tank with a capacity of 20 tons will be installed underground, and another, 5 tons, at 15 meters high. As it may be necessary, in the dry season, to pump up water from a well and store it in the underground tank, its capacity needs a big one.

(12) Storehouse of gasoline and other fuels and combustible chemicals

(13) Building covering compost sheds and fertilizer stores

(14) Small ponds to wash tools

To wash sericultural tools, etc. a small, square, concrete pond will be made by the side of the existing rearing room, between 2 rearing houses for the improvement of silkworm varieties, and between 2 rearing houses for the multiplication of eggs, respectively.

(15) Plumbing for sprinklers

Since silkworms must be reared and research work kept up even in the dry season, part of the mulberry field must be irrigated in the season to let mulberry keep on growing. Furthermore, it is necessary to conduct the study of the economic effect of the irrigation in the dry season. Since the irrigation by sprinklers seems the most economical and the handiest, pipes are to be laid down for them.

(16) Pavement of road

In order to protect the laboratories from dust, and keep the compounds clean, the main roads in the compounds are all paved. Other roads are hardened with red clay for an easy passage of cars and tractors.

(17) Residence, dormitory and guest house, etc.

There will be constructed the residence for experts, counter parts and other staff, the dormitory for the trainees, and a guest house for the experts of short staying.

(18) Others

Besides, we will need, for example, a hut for conducting artificial hatching of eggs, small, concrete sections in the mulberry field to experiment on fertilizers, root boxes in the mulberry field for the study of root-rot disease. However, these are not so expensive that we may build them as occasion arises.

2. In the Branch

(1) Rearing rooms

Existing rearing rooms will be used to examine the local adaptability of the new technique which the Center has devised and the new silkworm variety the Center has distributed. For the multiplication of eggs to distribute them among farmers, 2 rearing houses and a research room will be newly built. Their structure and size are the same as that built in the Center. Sericultural instruments used in the Branch are just the same as those in the Center.

(2) Pebrine inspection house

A set of inspecting apparatus will be equipped in the Branch for the inspection of pebrine in the eggs multiplied in the Branch.

(3) Low-temperature house

In order to store silkworm eggs produced in the Branch, 2 small rooms kept at fixed low temperatures, perhaps at 5° and 10°C, and another small room to hatch eggs under a certain temperature, perhaps at 25°C, are needed. The machines to maintain these low temperatures are housed in the building like those installed in the Center.

(4) Building to house transformer and generator

In order to maintain the temperature of the low-temperature room constant, it is necessary to install a transformer and a generator. Hence a small building to house them.

(5) Small, square, concrete ponds to wash sericultural tools, etc.

(6) Building to house compost sheds and fertilizer stores

(7) Plumbing for installing sprinklers

Just like in the Center, it is necessary to install sprinklers in part of the mulberry field. So, pipes are to be laid down at a Branch where water is available in the dry season.

3. At Pilot Farms

(1) Young silkworm cooperative rearing house

The scale may vary with the condition of the site, but the structure is to be the same in all the houses. Of rearing tools currently in use in Japan, the most suitable ones will be selected for Thailand.

(2) Sprinklers

As silkworm rearing will be conducted even in the dry season, sprinklers are to be installed in part of the mulberry field.

VIII. ON THE STRUCTURE OF MAIN BUILDING, ETC.

Of the buildings mentioned in the preceding chapter, we will pick up here some special ones that need most careful attention.

1) Main building of the Center

Its structure is not different from that of ordinary buildings, requiring no especial care. But the largest machine to be set in the balance room is the incubator equipped freezer, 1.3m wide, 0.8m deep and 2.0m high. So, its doors should be lerge enough to permit of the machine.

Likewise, the largest machine to be installed in the aseptic room is the aseptic box 1.0m wide, 0.7m deep and 0.7m high, demanding big enough doors.

In addition, if the reception room, or the lobby, is large enough to hold an exhibition there, an exhibition room may be saved.

In order to protect the Main Building from dust, its surroundings are to be turfed as wide as possible, and planted with as many trees as possible.

2) Rearing room (see Figure 1)

As for the rearing room, we should take care to prevent the invasion of parasitic flies, keep it as cool as possible and prevent the invasion of ants.

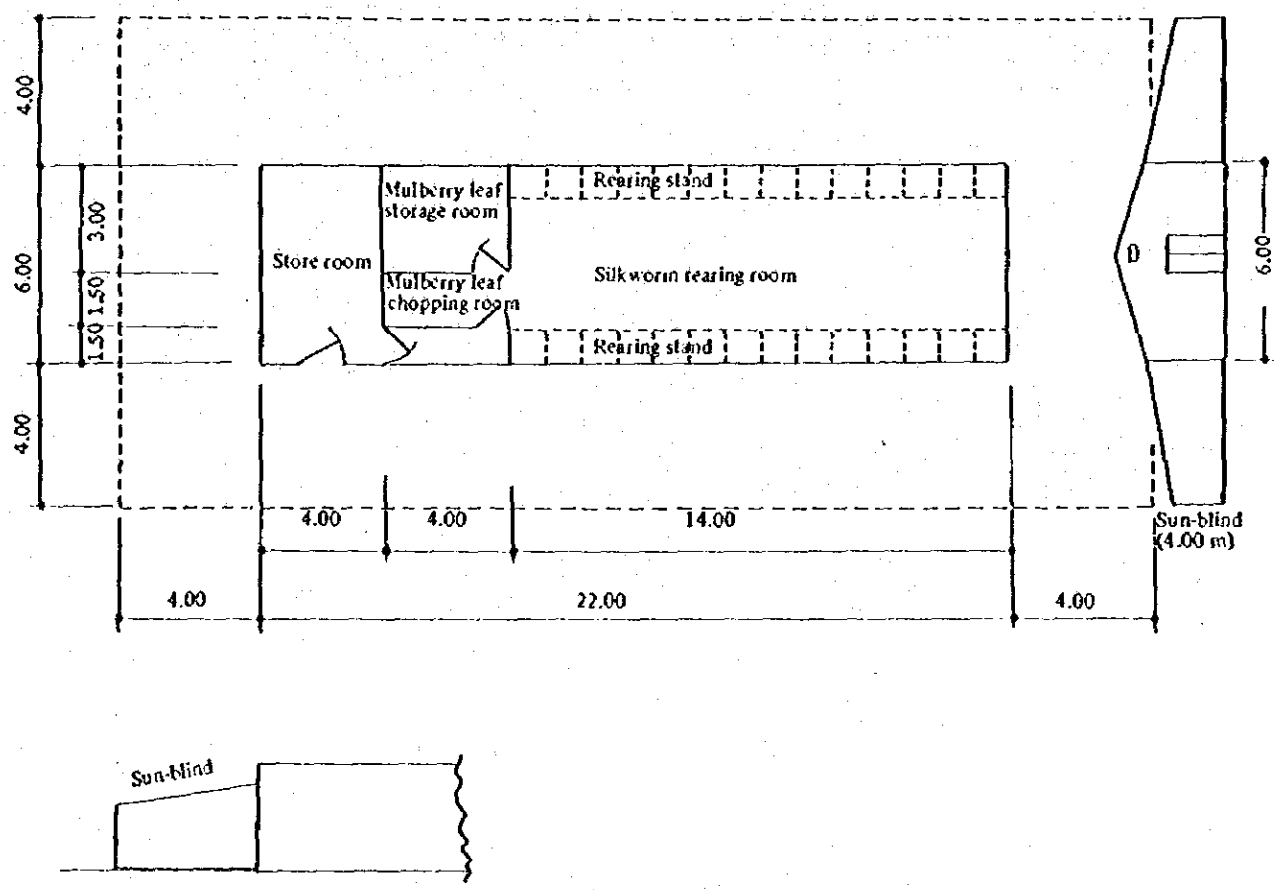
In order to protect silkworms against parasitic flies, heretofore, windows of rearing room have been covered with wire-netting. Furthermore, to protect silkworms from a few intruders, wire-netting has enclosed rearing stands on which silkworms are reared. That is to say, two-step defense has been set up.

New rearing room will be absolutely free from flies. For the purpose, walls will have no crevices, and windows will be covered with the net of stainless steel exactly, and fastened completely. Access to the rearing room is made by a passage, 1m wide and 4m long. The ceiling, floor, walls and doors will be painted black to make it dark. In the wall facing the outside, a small window, 20 cm x 20 cm, is set for lighting. In case intruders should be found in the passage, we will take measures to lure them into the small window. Such structure would be enough to protect the rearing room against flies. If it should not afford a perfect protection, it would be necessary to study a better structure of the passage. Because the prevention of the inroads of flies constitutes one of important problems to solve.

In order to keep the room cool, the eaves, 4 m wide, will be held out on the four sides of the building. To get a good ventilation, windows are to be set as many as possible, with the widest possible opening, from the floor level to the ceiling level. As the room must be closed during the disinfection or the night time in the dry season, wooden-doors are provided outside the windows. These wooden-doors will be opened or closed from outside. The surroundings of the rearing room will be turfed more than 20 m wide to prevent dust and the reflection of the sunshine. In the turf, as many trees as possible are planted to secure the most shade possible.

For the prevention of the inroads of ants, we will dig ditches, 25 cm wide and 20 cm deep, below the eaves of the rearing room. This is the method which is used by the Experiment Stations in the northeastern region of Thailand.

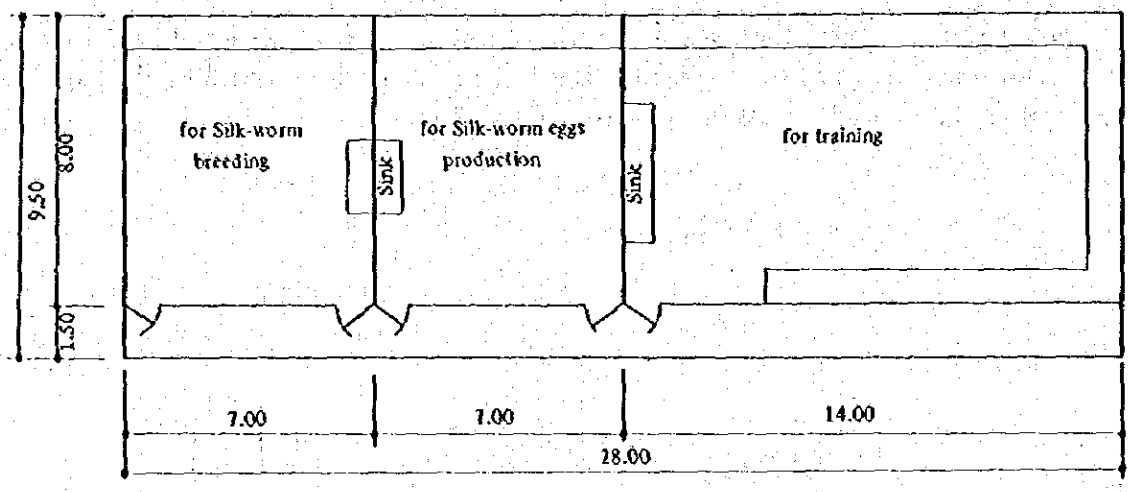
Fig. 1 Rearing room



3) Pebrine inspecting room (see Figure 2)

There is no point which requires our special attention. Although much water is used during the inspection, all used water must be led to sink into the ground, as it may contain the pathogen of pebrine. The surroundings of the building are turfed widely for fear of dust.

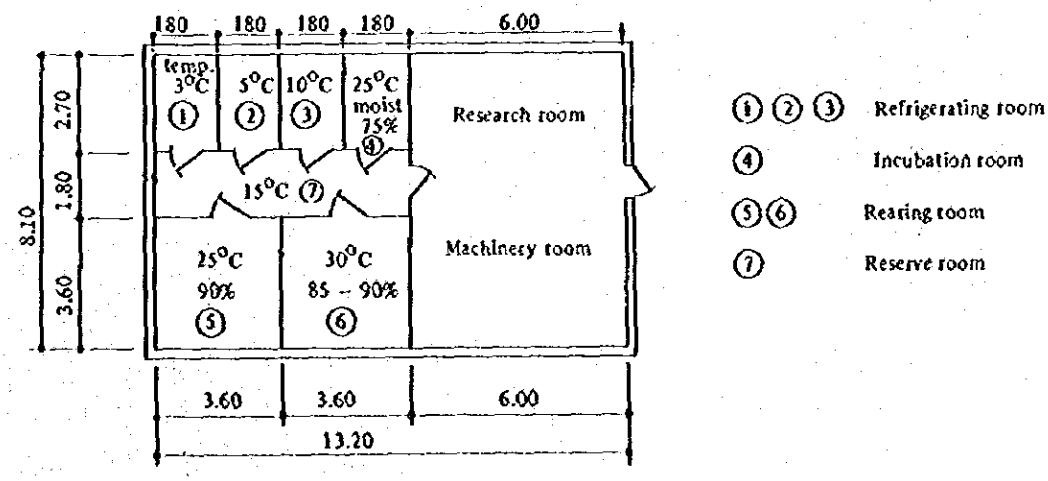
Fig. 2 Pebrine inspecting room (266 m^2)



4) Low-temperature house (see Figure 3)

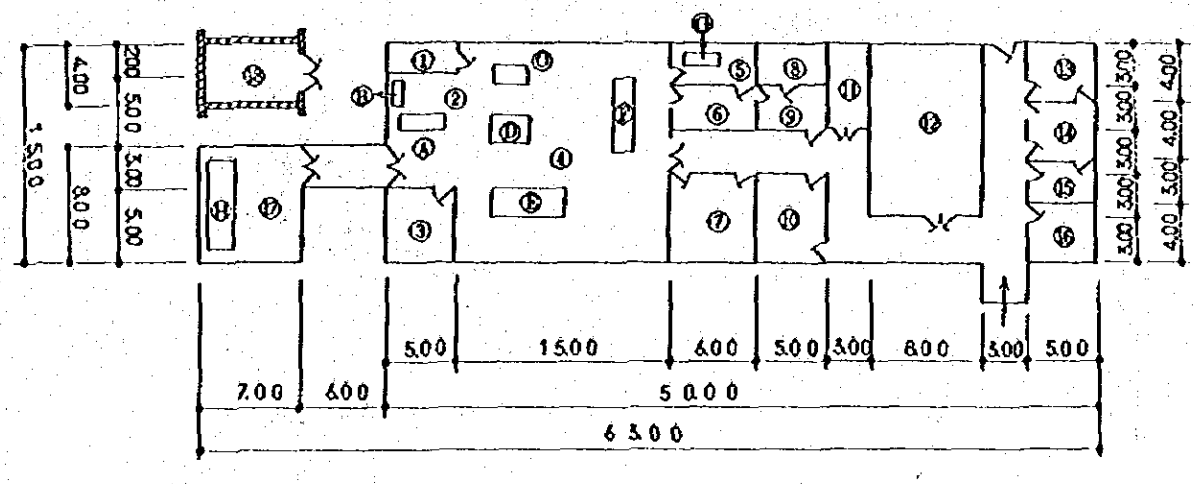
As this building must be prevented from the conduction of heat from without, its structure should observe the specifications closely. Its surroundings will be turfed and planted with trees like other buildings. We should take care that this building may be provided with especially large shade.

Fig. 3 Low-temperature house (106.92 m^2)



5) Silk reeling house (see Figure 4)

The temperature in this building is likely to rise higher than the outside, as we use steam and hot water inside. So, we set many windows from the floor level to the ceiling level to secure a good ventilation. The surroundings are turfed and planted with trees like other buildings.



1. By-product silk room
2. Cocoon boiling room
3. Cocoon stock room
4. Reeling & rereeling room
5. Twisting room
6. Raw silk finishing room
7. Raw silk inspection room
8. Seriplane testing room (dark room)
9. Seriplane testing room
10. Workshop
11. Raw silk stock room
12. Laboratry
13. 14. Robing room
15. W.C. & Shower room
16. Parts & materials room
17. Reserving room
18. Boilers room

A Cocoon boiling basin
B Cocoon boiling machine
C Reeling machine of siting system
D Multiend reeling machine
E Automatic reeling machine for cocoon testing
F Rereeling machine
G Twisting machine
H Drying machine

APPENDIX

Map of Survey Itinerary