INTERIM REPORT OF JOINT STUDY ON INTEGRATED SMALL-SCALE RURAL DEVELOPMENT IN NORTEHEAST THAILAND

PRESENT SITUATION

THE JOINT RESEARCH TEAM

(KYOTO UNIVERSITY, CHULALONGKORN UNIVERSITY
AND ROYAL IRRIGATION DEPARTMENT)

JAPAN INTERNATIONAL COOPERATION AGENCY

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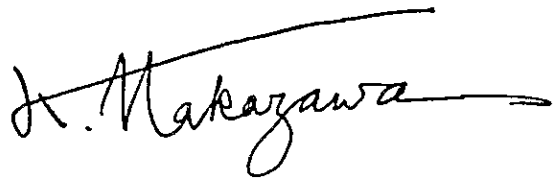
PREFACE

It is my great pleasure to present this report entitled Interim Report on the Joint Study on Integrated Small-scale Rural Development in North-east Thailand and Comparison with Toban Area in Japan. This report embodies the major findings and result of the Joint Study which was carried out in the first phase (April 1980 - March 1981) by Kyoto University in Japan in collaboration with Chulalongkorn University and the Royal Irrigation Department in Thailand.

I sincerely hope that this report will greatly contribute not only to this Joint Study project but also to the development of the North-eastern region of Thailand as a whole, and that the study will be carried out successfully from next year onward, too, based on the achievement obtained in the first phase.

I would like to take this opportunity to express my deep appreciation to the authorities and people concerned of both countries for their close cooperation extended to the Joint Study.

November, 1981.



Kazuto Nakazawa
Executive Director

Japan International Cooperation Agency

FOREWORD

The joint study on the integrated rural development in the Northeast Thailand was set up between the Faculty of Economics of Chulalongkorn University, Thailand, and the Faculty of Agriculture of Kyoto University. Through this study, we are developing an idea of integrated small-scale rural development in comparison with the development experience and history of the Toban district in Japan.

Recognizing the problems inherent in the large-scale irrigation projects in the Northeast Thailand, we have concentrated our focus on the usefulness of rural development on a small scale. This is because the integrated small-scale rural development can promote collaboration among villagers on a self-help basis, which will consequently minimize the government expenditure for rural development. To come to this recognition, we have had a variety of discussions among the sholars and officials concerned; especially with those from Chulalongkorn University, the Royal Irrigation Department of Thailand, the Japan International Cooperation Agency and Kyoto University.

We here present the interim report on the first phase of the total period of three years. In this report, we describe the basic idea for the integrated small-scale rural development in the Northeast Thailand comparing the development experience and history of the rural area in the Toban distict, Hyogo Prefecture, Japan.

In the second and third phases, we are going to present more detailed findings and results deriving from the joint study among the participating organizations.

Isao Minami,

Professor
Water Use Engineering
Faculty of Agriculture
Kyoto University.

INTRODUCTION

There have been a number of rural development projects planned and implemented in the developing countries in order to increase the welfare of the rural people. Yet the low standard of living still persists in the rural areas and the center-periphery inequality has been made even greater. From out point of view, most of the development models like the "growth poles concept" model, which have so far been applied in the projects, have too strong macro characteristics, and the development models imported from the Western world might be irrelevant to the Asian reality. This conclusion may or may not be true but it did convince us to look for an alternative in Asia, notably in Japan.

On the other hand, the concept of integrated rural development on a small scale has recently been highlighted as a means of developing efficient small-holdings. However, neither the theoretical base nor the practical method for planning and implementing the small-scale rural development has been fully explored yet.

At the initiation of this Joint Research Project last year, our common recognition was that the development process of rural areas in Japan is a successful case of small-scale development with the accumulation of knowledge and experience over the past hundred years and it could be a suggestive case in thinking out small-scale rural development model in the developing countries. Especially, the first stage of the Toban area is one of the outstanding examples of this case due to the fact that it has utilized a small-scale irrigation method, group scale reservoirs and water use association and developed integrated farmers cooperatives. In developing small-scale farms, the cooperatives have played a vital role in the continuous advancement of the rural area.

In the first phase of the Project, we analyzed the development process of the Toban area in Japan. Its characteristics can be briefly explained as follows:

1. Several farmers had set up one group.
2. With some help from government the farmers' group constructed small tank (group scale reservoir).
3. Farmers who had taken part in the construction of tank were allowed exclusive use of the tank water.
4. They were able to overcome the drought year's disaster for agricultural production.
5. They become very diligent and active in agricultural production.

6. They understood the importance of mutual cooperation, not only in carrying out agricultural production but also in resolving other kinds of problems occurred in the village.
7. They set up a water users' association and this organization was the origin of agricultural cooperatives.

We also reviewed and analyzed the rural development activities which have been implemented in the North-east Thailand. From the analysis, we can conclude that the policy of the Thai Government towards the development of the agricultural rural area has so far been the adoption of measures for public development with large- and middle-scale projects, and that there is a big delay in the construction of irrigation facilities for villagers. Therefore, it is convinced that the development effects of those projects have not been realized yet. Concerning the delay in the Thai rural development, the following subjects need to be studied before the adoption of modern irrigation developments in North-east Thailand:

1. New development policies which promote rural development from terminal rain-fed paddy to large area development.
2. Way of overcoming drought disasters by the means of mutual help among farmers to improve the poor rain-fed paddy fields with little assistance from the government.
3. Way of carrying out poor village development by cooperation among the poor, middle and rich villages in North-east Thailand.
4. Economic measures to be provided for development of the rural areas.
5. Research on the development methods of rain-fed paddy areas in comparison with the case of Toban area's group-scale rural development.

In addition, after the joint research work in 1980, the Japanese and the Thai teams agreed that it is very meaningful to set up an experimental village in order to check the applicability of the Toban model of integrated group-scale rural development to villages in North-east Thailand.

In the second phase (April 1981 - March 1982), we shall proceed to identify the similarities and differences in the factors involved in the Toban model and the situation of North-east Thailand, and to analyze the critical factors and their linkages inherent in the case of North-east Thailand in the highlight of the relationship between the water use/control patterns and farmers' cooperatives.

Contents

1. THE PURPOSE OF STUDIES ON INTEGRATED SMALL SCALE RURAL DEVELOPMENT IN NORTH-EAST THAILAND AND COMPARISON WITH THE TOBAN DISTRICT, JAPAN

(i) Research Objectives

The main research objective of this joint project is to explore the effective models for small-scale rural development based on the successful experience of the Toban area in Japan in order to formulate the appropriate development programmes in the North-east Region of Thailand.

The research objective above can be elaborated as follows:

(1) To analyze the development process of the Toban area in Japan and make up the Toban Model;

(2) To review and analyze the rural development activities implemented in the North-east Region of Thailand;

(3) To identify the similarities and differences in the factors invloved in the Toban model and the cases of North-east Thailand;

(4) To analyze the critical factors and their linkages inherent in the case of North-east Thailand in the light of the relationship between the water use/control patterns and farmers' cooperatives;

(5) To develop the appropriate models for planning and implementing small-scale development in North-east Thailand;

(6) To propose the model programmes of rural development on a small scale in North-east Thailand.

The research will cover the following hypotheses:

(1) The technical (natural and physical) and human (social and economic) aspects of the Toban area in Japan and of North-east Thailand are of the same sort.

(2) The Toban development model is appropriate and applicable to the technical and human conditions in North-east Thailand.

(3) There is a relationship between water use/control pattern and farmers' cooperatives which would be conducive to effective development.

(4) The development measures based on the model are generalized for all developing countries.

(5) The Toban Model will check after establishment of a Toban model Experimental village in North-east Thailand.

Concerning the rural development, the independent factors are numerous such as the climatic condition, the present level of agricultural development, land use, water use pattern, operation of irrigation, farmers' associations and water management, effect of group scale reservoir for the stability of production, farmer's activity, farmer's labour distribution and town works, agricultural cooperatives, etc.

(ii) Scope of the Study

This research work attempts to make an intensive survey of the technical and human situations in North-east Thailand. Four villages in the region have been selected for research sites, i.e., Khonkhen, Kalasin, and Nakornratchasima (Korat) provinces for the rural development research, projects based on the Toban experience. One Toban model experimental village has been established in Khonkhen province.

The rural development experience in Japan will only be confined to that of the Toban irrigation project in the Kinki area of Japan, concerning the development process of the irrigation system, agricultural cooperatives and sociological organization.

The rural development activities in the north-eastern region of Thailand, notably in four selected villages, will be reviewed and analyzed. All results will be compared with the experiences of the Toban project. After the comparative study has been carried out, it should be possible to deduce the most appropriate measures for the integrated rural development of North-east Thailand.

In particular, this research will compare various problems with the Toban Irrigation Project which has the same quantity of yearly precipitation as North-east Thailand. The Toban project has improved their traditional irrigation facilities, villagers' water use association, agricultural cooperatives, and farmer's income system through increasing agricultural product. They are also competently operating many small reservoirs through a farmers' association.

The outline of the study items are as follows:

(1) Systematic surveys of rainfed areas, especially for the stability of water utilization between the dry season and the wet season, crops and cultivation patterns, distribution of labour through the year, etc.

(2) Systematic surveys for irrigation agriculture, especially development through reservoir irrigation, comparison between large-scale water use development and small-scale agricultural development, development through improvement of water conveyance systems, development through land consolidation, and development through introduction of agricultural machines.

(3) Agricultural products and the price structure of products, especially the relationship between products and climatic variations, and the relationship between prices of agricultural products and the transportation situation.

(4) A look at the future of rural development through construction of small reservoirs and small-scale irrigation systems and through comparison with

the experiences of the Toban irrigation project, especially with regard to the possibility of independent development of small-scale villages and mutual linkages among the developed villages.

(5) The maintenance system of irrigation and social infrastructures used by farmers' organizations, especially for the present imbalance situation which exists among farmers concerning the opportunities for water utilization, and the effect of improvements of irrigation systems in making progress in agricultural cooperation.

(6) The effects of the construction of a social infrastructure, which is expected to be the fastest way to get benefits through small-scale development and stability of the villages in the area.

(7) The possibility of the setting up of agricultural cooperatives, especially regarding integration effects on agricultural, economic and sociological developments.

(8) Field surveys on family and rural economies at existing reserach sites.

In this research project, the research counterpart from Thailand will work mainly on the socio-economic problems in the research areas with consideration given to technical research results. Fig. 1 shows a map of Thailand and the location of North-east Thailand.

The expected benefits of this research are as follows:

(1) From the analysis of the development process in the Toban area, a new "integrated rural development" model will emerge. This model can reasonably be expected to be applicable not only to the north-eastern region of Thailand, but also to developing countries with the same characteristics as those of North-east Thailand.

(2) Practical reserach can be expected through case studies in North-east Thailand.

(3) The results of the research project would be the theoretical frame-work for future rural development.

(4) This project will be one of the pioneer works regarding interdisciplinary cooperation and cooperation between foreign universities.

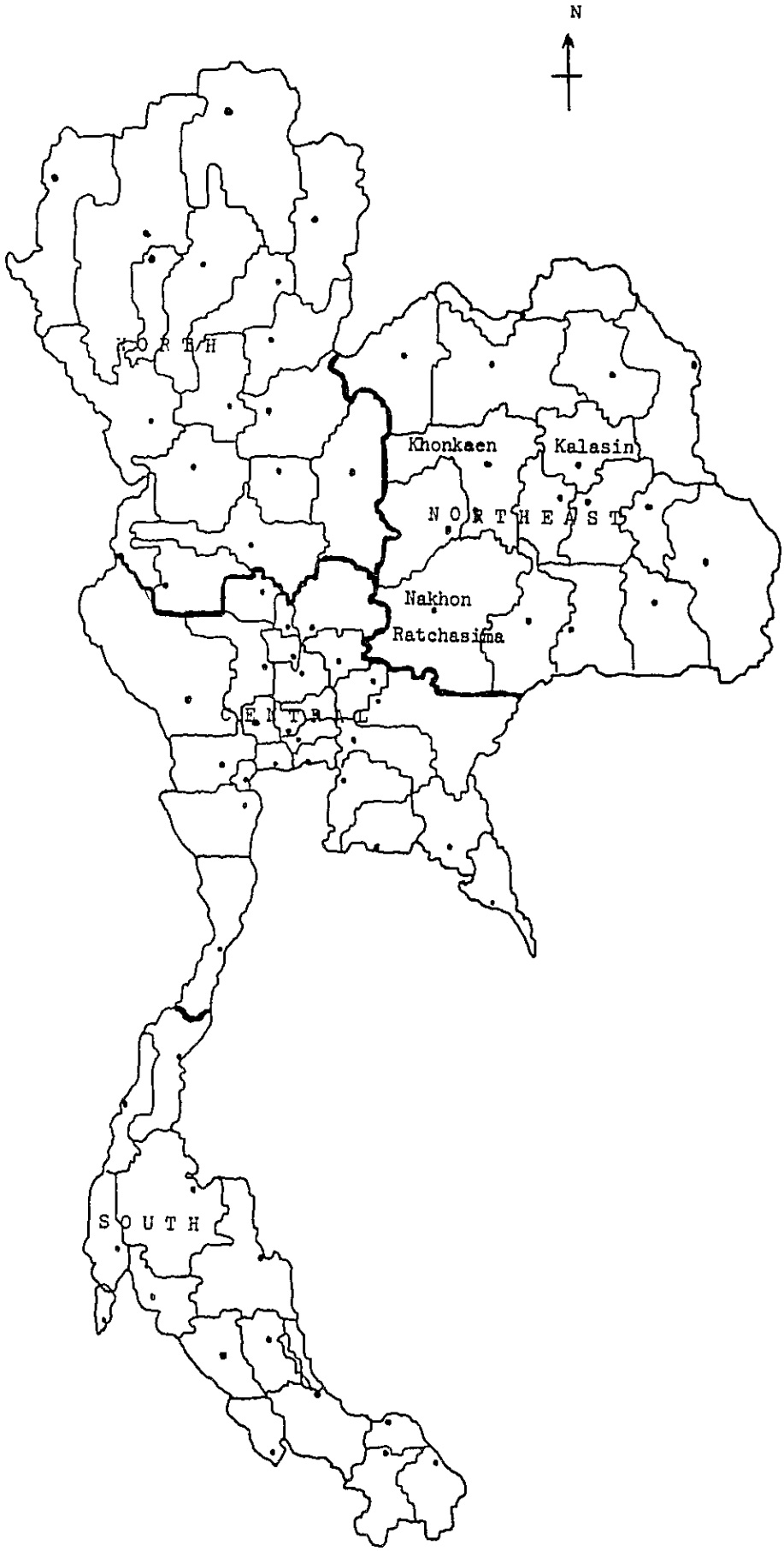
(5) The results of the research will be of great benefit to colleges and universities related to development planning.

(iii) Study Plan

The areas of investigation and the completion schedule are given in the following outline:

Phase One (1 April 1980 - 31 March 1981)

Fig. 1 MAP OF GEOGRAPAHICAL REGIONS



To begin with, the project work will be prepared during the first four months. The recruitment of the project secretary, of the driver, including the installation of necessary furniture at the faculty of Economics, Chulalongkorn University are included in these preparations. During August-October, preliminary surveys in the north-east region of Thailand will be intensively conducted in order to ascertain the general circumstances, especially in the field of rural development activities at all levels. In Japan, the researchers from Kyoto University will analyze the Toban Development Process during April-July; a brief report on the Toban model should be ready by August.

In November 1980, an intensive survey in the North-east, especially in the provinces of Khonkhen, Kalasin, and Korat, will be conducted. After a month's stay in Japan in the winter time, the main assumptions underlined in the Toban Development Process should be grasped. This makes it possible to select our research sites which should correspond to the circumstances in the Toban area.

By March 1981, the first Progress Report will be submitted.

Phase Two (1 April 1981 - 31 March 1982)

In this phase, analytical studies will only concentrate on selected sites, so-called "research villages". The acquisition of relevant data and information in the research villages regarding both socio-economic and engineering aspects, will take place. Field surveys at four selected research sites to obtain the primary information in depth are scheduled for Phase Two. Then 4 research villages are to be undertaken in connection with the Toban experiences, i.e., the improvement of water use, of land use and of crop pattern, all being small scale.

One Toban model experimental village will be added to make proof the availability of the Toban model in North-east Thailand. Progress Report No. 2 Will be prepared and made ready during March, 1982. A second research trip to Japan will take place in September, 1981.

Phase Three (1 April 1982 - 31 March 1983)

The analytical research on the 4 research villages and the study of the experimental village are to be carried out and completed by August, 1982. By November 1982, the proposal for the model project for integrated rural development in North-east Thailand will be carried out and then a third trip to Japan to compare the similarities of development models will take place in December, 1982.

The final report for the whole research work will be presented in published form, to the Japan International Cooperation Agency (JICA), to the Royal Irrigation Department in Bangkok, to the Faculty of Economics,

Chulalongkorn University in Bangkok, and to the Faculty of Agriculture, Kyoto University in Japan.

With regard to the means of accomplishing this research, Kyoto University, Chulalongkorn University and the Royal Irrigation Department will be giving wholehearted support to it and also the Japan International Cooperation Agency. Having several contacts with Japan Embassy in Bangkok and DTEC (Department of Technical Cooperation) which manages various problems about Thailand, a good mutual understanding was achieved and we will get the support to accomplish this research. This good supporting system will be an important factor in accomplishing this research.

(v) Research Staff

a) Researchers from Japan

(1) Dr. Isao Minami (Director of the Japanese Counterpart)
Professor, Kyoto University
Specialist in general and systematic research of agricultural water utilization.

(2) Dr. Eiichi Takahashi
Professor, Kyoto University
Specialist in fertilizers and crops.

(3) Dr. Masayoshi Miyoshi
Professor, Kyoto University
Specialist in agricultural history

(4) Dr. Kiyoshi Kamegai
Associate Professor, Kyoto University
Specialist in agricultural cooperatives.

(5) Dr. Yoshishige Furukawa
Associate Professor, Kyoto University
Specialist in crops.

(6) Mr. Kiyoshi Torii
Assistant Professor, Kyoto University
Specialist in irrigation.

b) Researchers from Thailand

(1) Dr. Vivat Shotelersuk (Director of the Thai Counterpart)
Assistant Professor, Chulalongkorn University
Specialist in Agricultural Economics.

(2) Mr. Prapant Svetanant
Associate Professor, Chulalongkorn University
Specialist in Regional Development Planning and Cooperatives.

(3) Mr. Kieatviboon Chomkhair
Senior Lecturer, Chulalongkorn University

(4) Mr. Damrong Jaraswathana
Director of Hydrology Division, Royal Irrigation Department

(5) Mr. Prasert Milintangul
Head of Research & Applied Hydrology Division,
Royal Irrigation Department.

2. THE IDEA OF INTEGRATED SMALL SCALE RURAL DEVELOPMENT IN NORTH-EAST THAILAND

2-1 The development measures to upgrade the poor areas to the average level of the country

The definition of rural development has various kinds of meaning among nationalities and agencies. Why is this? Integrated rural development is an idea which is suitable for application to small-scale projects. The very poor agricultural districts can be improved to reach the average level of the country in a short period. The measures of integrated rural development will be studied and this idea must be given attention with respect to the poor villages in North-east Thailand.

Integrated rural development includes various important aspects for developing districts in nations having various levels of living. Therefore, the special development measures have to be treated relatively. Suitable measures will vary depending on the country and district, and there is no absolute.

For the evaluation of the level of development, key items were selected, the research of actual water management and the agricultural cooperative for North-east Thailand, for comparison with the Toban area in Japan. A comparison of the history of rural developments in both areas for small-scale project development will be of significance. The farmers' group which has tanks will show the most important character in both villages. The other important item is the decision of the scale of development unit concerning present living situation from the standpoint of the distribution of the development effect, the level of water management and the level of uniformities of economic and social life.

Also the study of small-scale integrated rural development should contain consideration of the engineering, social and economic situations.

(1) INTEGRATION RESEARCH

This Joint Research team will revise existing textbook ideas concerning agricultural and rural development. To form a fairly practical development system of integrated rural development, if there is over generalization. Thus, "in North-east Thailand" is an important restriction for reality. Many important factors are involved but they will be weighted against each other to make the development idea realistic. Moreover, Integrated Rural Development in North-east Thailand has restrictions, such as:

a. This development method will rapidly develop the villages of the most undeveloped area up to the average development level of the country.
b. With regard to the above-mentioned research, "Water Use Associations" and "Agricultural Cooperatives" are main two research subjects.

c. The "Integrated Small-Scale Rural Development Project" is an idea for this research to set up the development unit in North-east Thailand.

d. Research into farm activity in development units from both "Establishment of agricultural cooperative associations" and "Establishment of farm Water Use Associations" shall be systematically investigated from both technical and human activity viewpoints.

e. This research will systematically describe the process of rural development in a border region comparing it with the Toban area and propose a scientific system for Integrated Small-Scale Rural Development.

f. This will be one of the development theories of a developing district and also offer a new general scientific basis for field research and will make a significant contribution not only to Thailand but also internationally.

The first reason why agricultural rural development is held back in North-east Thailand is the shortage of water resources, insufficient water management, insufficient activity of farmers' groups and insufficient agricultural cooperation.

It is felt that development units in the region should have a village with a tank providing the opportunity of equal Water Use. This is an example compatible with the present situation of the Toban irrigation project. The average size of tank in North-east Thailand is usually from 1,000,000m^3 to 2,000,000m^3 at present, benefitting from 50 to 100 families.

This unit village constitutes a development unit of small scale irrigation project by the Thai Government, then the sociology, farmers' economics and the conditions of irrigation will be studied. The area of North-east Thailand is large, and also its poverty is serious especially in remote villages. Poverty in this sentence is a relative conception and the level is expressed by the poverty defined by the Thai Government for each small village in that area. The theory of Integrated Small-Scale Rural Development is the development method which rapidly develops this relatively poor village to the average level of its country (in this case, the average level in North-east Thailand). The research village is certainly in an undeveloped area. The next sentence can explain this poor situation. "Many farmers in North-east Thailand go to Bangkok to work in the dry season, but the money which they get there is almost all spent on school uniforms and purchase of school things for the children."

In conducing the research on rural villages in North-east Thailand mentioned above, an impression is obtained that new development measures are necessary to support the farmer's system of self-production of food to survive and provide at least for minimum financial expenses.

Fortunately many farmers are land holders. This situation has specific significance for the research on Integrated Small-Scale Rural Development; also there is the likelihood that the development effect of small scale projects will not cause trouble for individual farmers, and the significant characteristics mentioned above will be solved through this research.

(2) PROBLEMS OF LARGE SCALE DEVELOPMENT

Concerning large scale development projects which were carried out through an expensive water system development in 1960 - 1980 in North-east Thailand, the following disadvantages were recognized.

a. The construction term was very long, and costs were high.
b. There was a delay in construction caused by financial problems during the construction period from water resource development to rural development.
c. Development benefits became more uneven among people the larger the area project.
d. As most of the projects were constructed using foreign currency, the plan demanded high benefit development.
e. As high-yield varieties were introduced in the plan, the farmers insisted on the adoption of new technology. This become a serious restriction in the development by farmer's level.
f. Until completion of technical transfer, Government service of the Water/ Control expenses attributable to specific technical transfer over a fairly long term become inevitable.
g. The stopping of extension service by the Government being attributable to a specific technical transfer, there was a tendency to revert to inefficient traditional production levels again, because the people of North-east Thailand eat glutinous rice.
h. It becomes very difficult for the farmers to gain a general understanding of public irrigation works and maintenance when the development scale becomes large.

2-2 Brief history of area development through water use in North-east Thailand

(1) The first step in development of rice production is construction of rain-fed paddy fields. Paddy field glutinous rice is raised on farms where there is enough rainfall in the rainy season.

(i) Water Resources

rainfull	yearly rainfull	1,000 - 1,500 mm/year (Fig. 2)
	daily rainfull	(Fig. 3 and Fig. 4)

Fig. 2 shows a map of average annual rainfall in Thailand.

(ii) Water Use Situation in the North-east

Rain-fed upland

Rain-fed paddy rice field

Flooded area rice field

(iii) Large scale Water Balance

a. Evapotranspiration from the land
(evapotranspiration = evaporation from water and soil + transpiration from crops) = 85%

b. River run off coefficient = 15%

c. Wide variation in preciptation

variation in a year	dry season
	rainy season
variation in a season	no rainfall (one month), in rainy season
variations in the start of the rainy season	

Fig. 3 and 4 show the daily rainfall distribution at Pong Need and Phol.

d. Agricultural products and variation of rainfall
Agricultural products have a close relation to the quantity of precipitation, thus creating some economic confusion in the area.

① Year with high rainfall, flooding, erosion, high production as a total.

② Year with average rainfall, normal production.

③ Year with low rainfall, drought, low production.

(2) Irrigated Agriculture in North-east Thailand

(i) low level Irrigated Agriculture
Irrigation systems with only main hydraulic structures and without detailed water use facilities are defined as low level irrigation here.

a. Utilization of river water

① wide variation in river discharge in a year,

② low efficiency intake,

③ variation of benefit area due to unstable intake,

④ changeable ratio of benefit area, planted area and harvest area during year

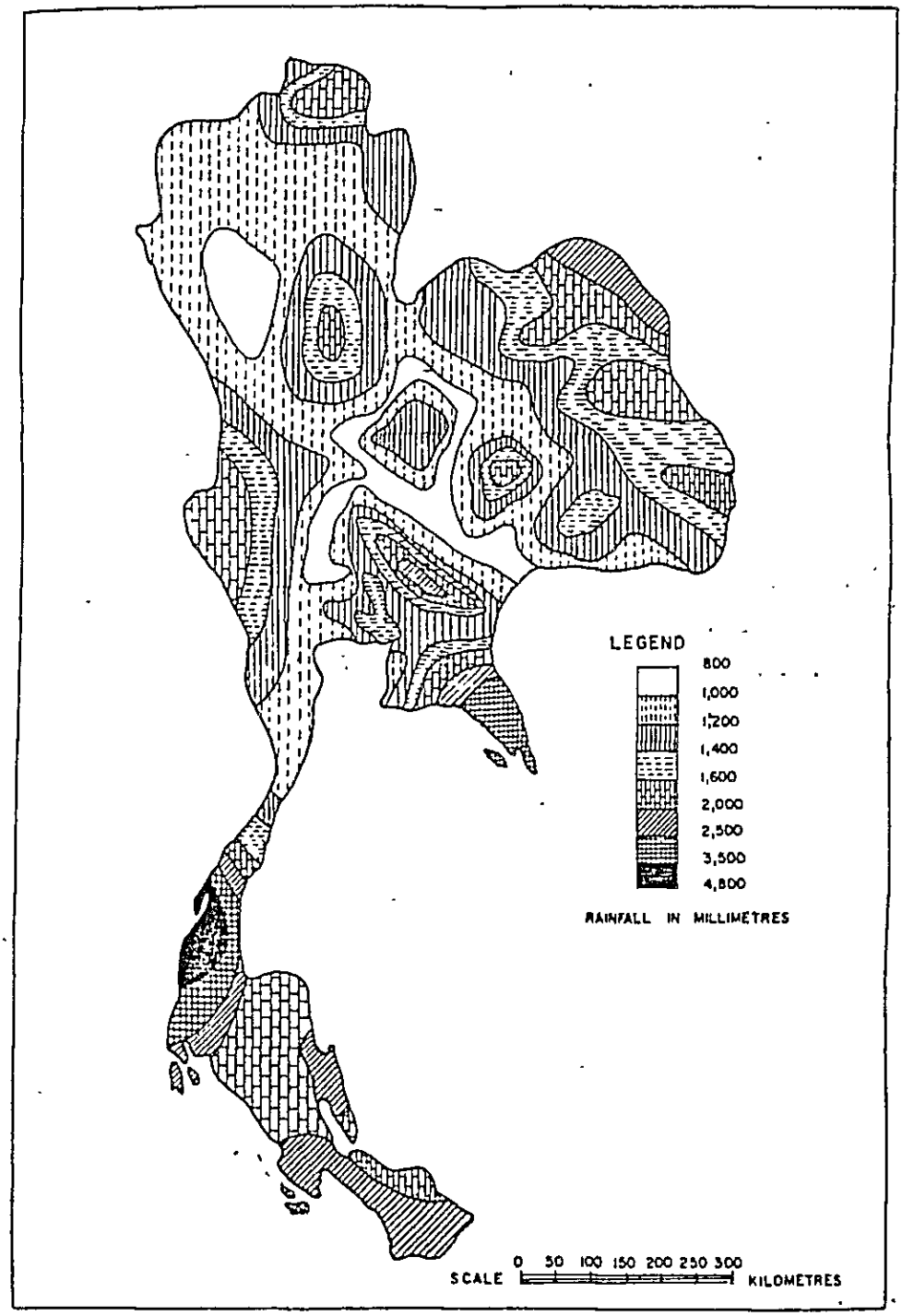


Fig. 2 Thailand : Map showing Average Annual Rainfall

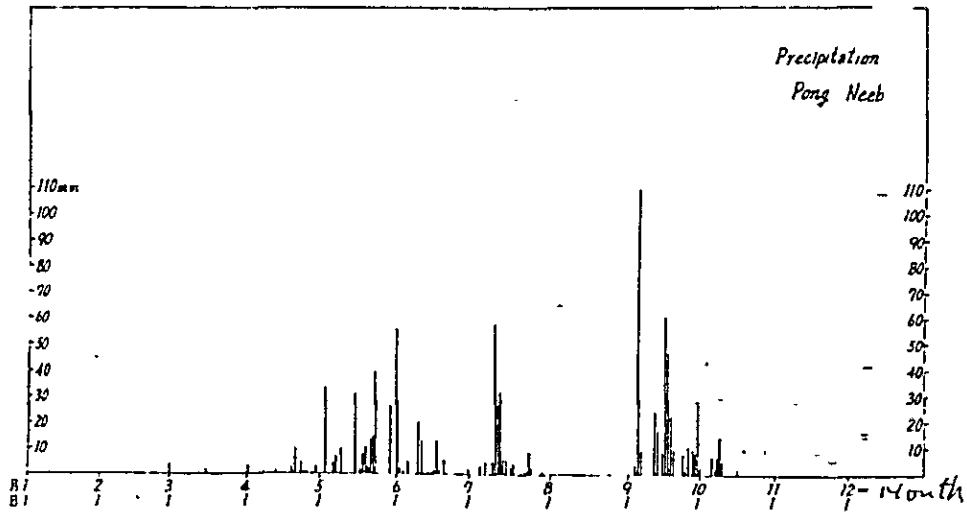


Fig3 Pong Need(daily rainfall)

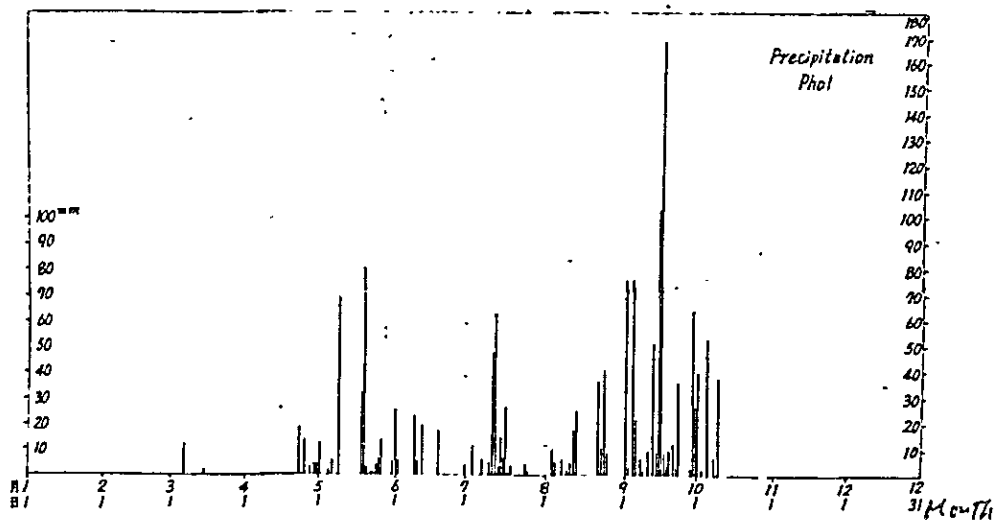


Fig4 Phol (daily rainfall)

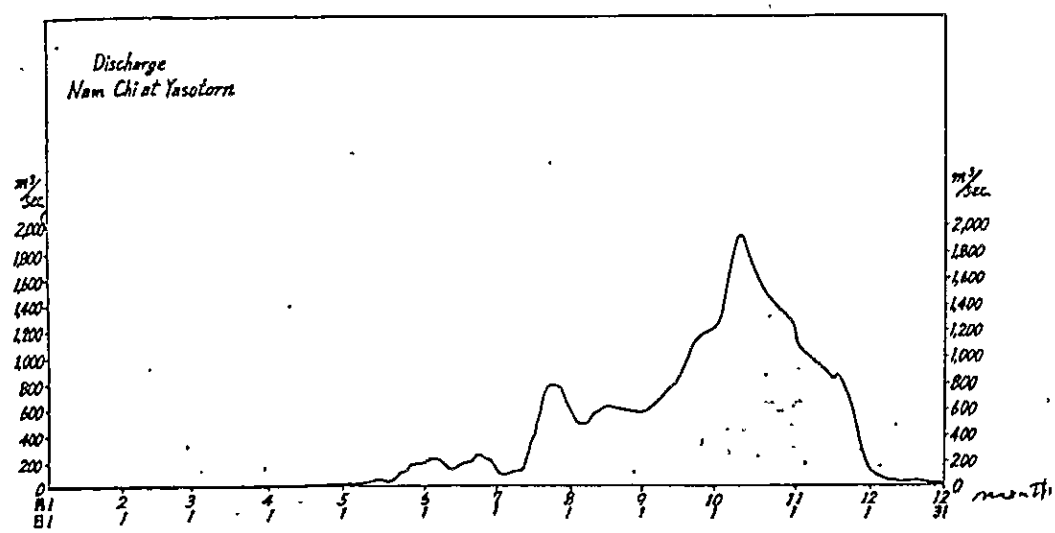


Fig5 Yasotorn of Nam Chi (daily discharge)

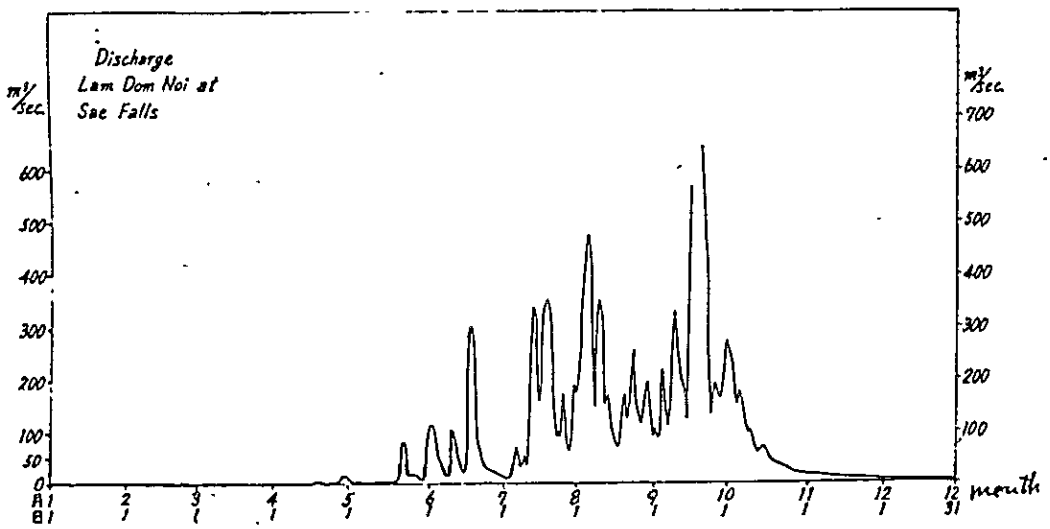


Fig6 Saea Falls of Lam Dom Noi (daily discharge)

Fig. 5 and Fig. 6 show daily discharge distributions at Yasotorn and Sear Fall.

b. Reservoir method

storage of discharge in flood season and use of water in rainy season and dry season.

1) Small reservoir (tank) method

small dam-easy to construct, sometimes farmers' group can construct, small benefit area-distributes the water uniformly from reservoir to each farmer's farm land,
number of family-convenient scale to communicate,
development cost-small,
efficiency of development-sometimes good
linkage system among small reservings-in the future.

2) Large reservoir system

big dam-planning and design need high level engineers
high cost-large and long canals,
project cost-high,
construction period-needs long period,
large benefit area-difficult to develop the water distribution, in all benefit area uniformly,
social and economic situation-in the benefit area there are complicated problems in respect of regions and farmer's groups.

c. Water use efficiency

Water use efficiency will be increased.
Water management and maintenance of irrigation facilities become especially important.
Linkage among water use projects will become very efficient in the future.

d. Increase of agricultural production

local variety-for food (glutinous rice)
high yield variety-for selling.
Market problem.
Table 2 shows the grain yield and products in Asia, and Fig. 7 shows paddy field, fertilizer and irrigation ratios in Asia by FAO.,

e. Water use association

Expected, but conflict among farmers due to insufficient facilities for water distribution.

f. Basic conditions for agricultural corporatives set up

Small farmers' group for water use

Linkage of farmers' group

Agricultural cooperatives getting the support of the government.

(ii) Importance of introducing the Toban model, integrated group-scale rural development.

The first stage of rural development from rain-fed paddy rice to economic irrigation development can be done easily by considering the experiences of the Toban district.

(iii) Intensive irrigation agriculture

a. Water problems

(1) Land consolidation works which are convenient for rain-fed rice fields in North-east Thailand.

(2) Detailed irrigation system from reservoir to each area of farmland.

(3) Investments (fertilizer, water management, high yield rice, cash crops, etc.).

(4) Effective water use association among farmers.

(5) Intensive operation and management by agricultural cooperative.

b. Sociological aspects

(1) Understand the importance of mutual cooperation in construction, water use and cultivation.

(2) Rural development (roads, meeting halls, etc.).

(3) Understanding the importance and meaning on public work

2-3 Present state of small scale rural development in North-east Thailand.

(1) Present patterns of irrigation development.

Concerning small-scale rural development for obtaining early development effects, the following aspects are described as features of integrated small-scale rural development in North-east Thailand.

(a) There are three small-scale rural development patterns: one in which a reservoir leads development, one in which a head works leads development and one in which a pump leads development, in North-east Thailand.

The example of small-scale rural development in which a reservoir is constructed would seem to be logical from the natural conditions of this area. Up to 1979 several hundreds reservoirs had been constructed in North-east Thailand for irrigation, domestic use and fishery.

With regard to rural developments based on reservoirs, some of them have shown fairly stable irrigation, but others have many problems such as lack of quantity of water in drought years in actual water operation.

Figure 7

Paddy Yield, Fertilizer Consumption (Nitrogen) and Irrigation Ratio for 1976.

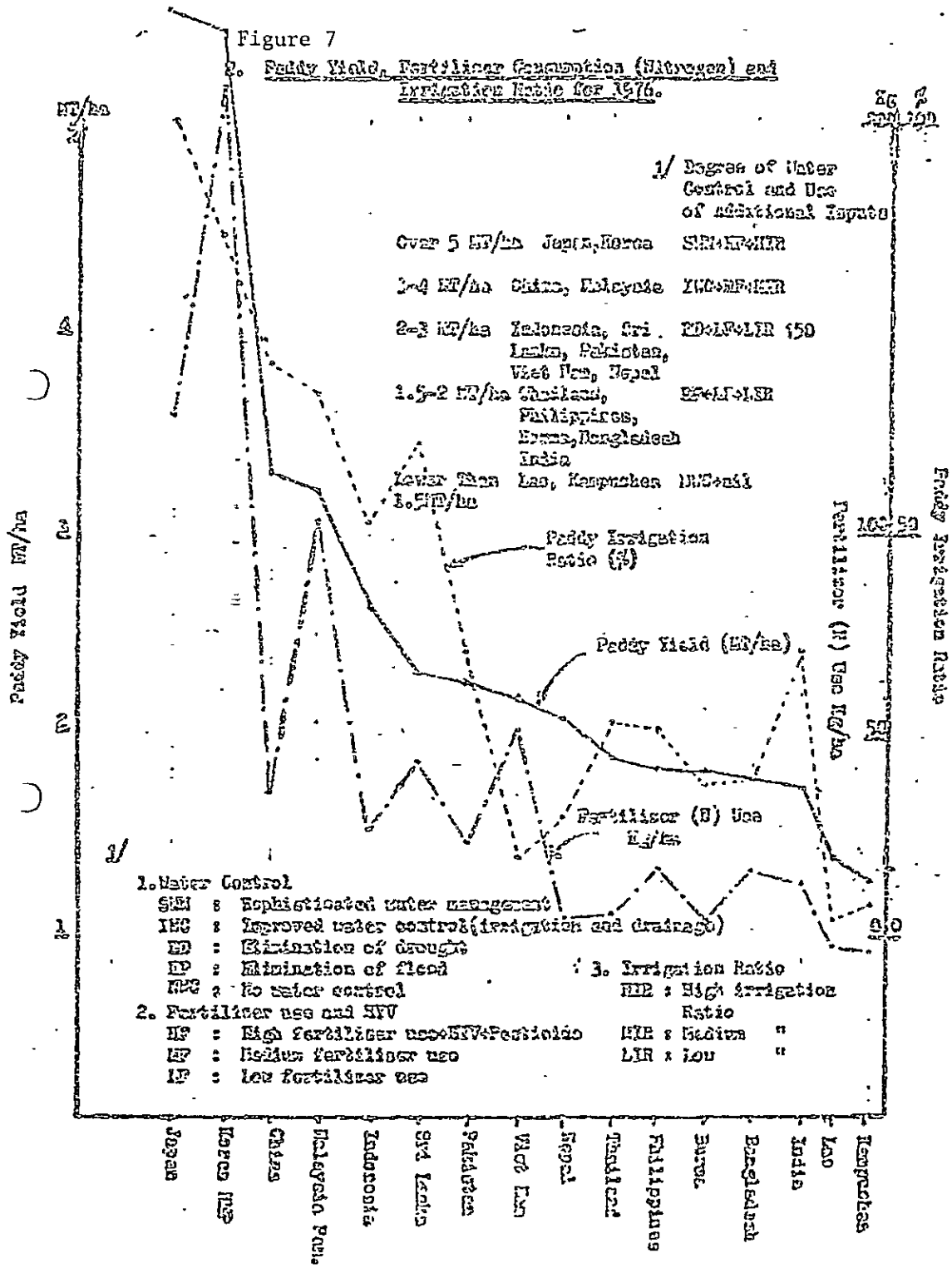


Table 1 GRAIN YIELDS AND PRODUCTIONS IN 1977 FOR ASIA AND THE FAR EAST

Area: 1,000 ha (Harvested) Yield: Kg/ha Production: 1,000 M/T

Country	Rice Paddy			Wheat			Maize			Barley		
	Area	Yield	Prodtn.	Area	Yield	Prodn.	Area	Yield	Prodtn.	Area	Yield	Production
1. Australia	92	5,733	528	10,500	881	9,250	55	2,651	145	3,000	1,000	3,000
2. Bangladesh	10,300	1,796	18,500	-	-	-	-	-	-	-	-	-
3. Bhutan	185	1,486	275	-	-	-	-	-	-	-	-	-
4. Burma	5,180	1,839	9,525	-	-	-	-	-	-	-	-	-
5. China	35,779	3,325	118,972	31,501	1,270	40,003	12,048	2,873	34,615	14,001	1,536	21,501
6. India	39,500	1,873	74,000	20,863	1,394	29,082	6,000	1,000	6,000	2,218	1,035	2,296
7. Indonesia	8,628	2,724	23,500	-	-	-	2,400	1,150	2,856	-	-	-
8. Japan	2,757	6,166	17,000	90	2,667	240	-	-	-	80	2,750	220
9. Kampuchea	1,500 (615)	1,200 (4,119)	1,800 (2,533)	-	-	-	- (700)	- (3,224)	- (2,257)	-	-	-
10. Korea DPR	760	5,000	3,800	-	-	-	726	2,947	2,138	185	1,514	280
11. Korea REP	1,220	6,262	7,640	40	2,250	90	-	-	-	720	2,500	1,800
12. Lao	690	1,024	700	-	-	-	-	-	-	-	-	-
13. Malaysia P.	570	2,632	1,500	-	-	-	-	-	-	-	-	-
14. Nepal	1,250	2,135	2,669	348	1,040	362	480	1,950	936	-	-	-
15. Pakistan	1,740	2,454	4,270	6,269	1,475	9,246	587	1,472	864	190	711	135
16. Philippines	3,650	1,945	7,100	-	-	-	3,445	881	3,037	-	-	-
17. Sri Lanka	846	2,017	1,706	-	-	-	-	-	-	-	-	-
18. Thailand	8,300	1,747	14,500	-	-	-	1,000	1,800	1,800	-	-	-
19. Viet Nam	5,100	1,863	9,500	-	-	-	-	-	-	-	-	-
Total/average	128,047	2,479	317,485	69,611	1,268	88,273	26,741	1,958	52,391	20,394	1,433	29,232

Source: Monthly Bulletin of Agricultural Economics and Statistics
12 Volume 26, November 1977
( ) Nae Oae News, 8 March 1978, in Korea

(b) Small-scale rural development which is based on head works can be adopted only in regions where river discharge is stable. But this case is a special case in North-east Thailand, where a big reservoir exists upstream.

(c) Small-scale rural developments which depend on lifting-water-pumps have recently approved. But there are still only a few, along the River Mecon. It is necessary to evolve a strong and fair Water/Control-system, but there have been imperfect so far, and it is difficult to collect Water/Control expenses from farmers.

(2) Small-Scale Unit Village for Development

Four research villages were selected in which a tank was to be adopted as the leading role in rural development.

Important research items in the village are: weather, irrigation level, water management, Water Use Association, and agricultural cooperatives including village sociology. Also research will be conduced on marketing, education, farmers' groups, and farm economics as background. According to the joint field survey, Water/Control data can be supplied from the Royal Irrigation Department. To carry out more scientific research many water level recorders at each tank and at several points along the canals, and various kinds of climatic recorders will be installed. Also several persons who are nominated by the RID should be appointed to collect data. Annual Water Use characteristics under actual conditions during the irrigation term, including farmers' activities must be obtained. There have been no analyses of basic weather characteristics concerning water use planning so far. The farmer's activity for setting up of farmers' groups and cooperatives will be studied, considering the stimulus effect of Water Use development by new reservoirs.

Through intensive research on water management and on agricultural cooperatives in four integrated rural development research villages the important factors concerning development of a Kokehn (one tank project and one rain-fed project), Karachin (tank project) and Korat (tank project) will be analyzed.

The comparison on the above-mentioned important factors among four research villages for the understanding of the potential of small-scale integrated rural development with a tank will be performed.

(i) Rural Development Through Improvement of Water Management and Agricultural Cooperatives.

For most areas tank construction is the ideal development method for farmers' groups in each village. As each farmer is an owner of farmland they can benefit from equal irrigation water from the tank. The irrigation

operation will be led by RID engineers. A farmer who lives in the area with a tank will become more dilligent.

For the next development, if a tank in the upper river basin can be linked with another tank a lot of water in the rainy season and the dry season, would be very effective in leveling up for middle scale development.

At present all tanks are constructed by the Royal Irrigation Department. An RID zoneman controls water operation of the tank. There are two to five zonemen in each tank project. The government controls operation and management. This attitudes of excessive government support will be a problem from the standpoint of self-development by farmers' groups in North-east Thailand.

(ii) Relationship between Large Scale and Small Scale Development in North-east Thailand.

There are several large scale water Use development projects in North-east Thailand. But the construction period for large reservoirs has been very lengthy. It is very difficult to give a uniform distribution of water to all farmland, and also to obtain uniform benefit, and the irrigation and agricultural technical transfer to respective farmers is delayed.

If a tank is given a leading role in a small-scale development there are some benefits, as follows.

a) The construction of Water Use equipment (tank, water conduits) will be completed in a short period.
b) The effect of the Water Use development will be distributed among farmers uniformly within a short period (from one to two years).
c) Farmers who live in a tank benefit area obtain benefit from the irrigation water supply equally.
d) The farmers themselves have gradually been able to use the new irrigation techniques.

(iii) The Model of Integrated Small-Scale Rural Development.

In order to deduce a general model of integrated rural development in North-east Thailand, the unit village of integrated rural development is defined as having one reservoir and a benefit area of about 100 rai, with 50 to 100 families. The Water Use association is independent in activity when there is only one tank in the area, but if the number of tanks increase in the area, and the level of rural development is raised, the mutual linkage of the Water Use system can be expected. Also there is a high potential of agricultural production and technical transfer, and the situation of agricultural cooperatives becomes basically active for extension of agricultural techniques, education of farmers, cash and banking facilities for farmers.

(iv) Integrated Rural Development research items in North-east Thailand.

The theoretical constitution on integrated rural development of North-east Thailand is considered here. Concerning general research items, there can be obtained from appropriate Thai general statistical publications, but there are some restrictions on small-scale rural development in North-east Thailand, such as: insufficient irrigation Water Use and the lack of knowledge of Water Use planning including drinking water. There is a very low level of accomplishment of farmers' Water Use associations and cooperative associations. There are considerable opportunities for increasing education to improve farming situations.

As North-east Thailand is aiming at a self-sufficient food production system, for glutinous rice, a small-scale development unit is an applicable idea. Because a long time is needed to become monetary economy with agricultural products increase due to farmer's present low proceeds. From the fact above-mentioned, it will be necessary to select a development unit village which is aiming to be the self-sufficient in food production. The improvement of Water Management becomes the first item to be solved before other political problems from the standpoint of integrated Small-Scale rural development.

The setting up of the basic association of farmers through a Water Management Group becomes a very important base in aiming to attain the level of the average rural area with agricultural cooperatives from the standpoint of integrated small-scale rural development.

(v) General Research Items on Small-Scale Integrated Rural Development.

a. Items of general information.

I-1 Historical view of rural development.
I-2 Various laws about general rural development.
I-3 Population.
I-4 Education.
I-5 Industry.
I-6 Regional environment.
I-7 Agriculture.
I-8 Marketing.
I-9 Dissemination of agricultural technology.
I-10 District organization and its performance.
I-11 Rural district inhabitant union.
I-12 Farmers' cooperative association.
I-13 Social activities in rural disticts.

I-14 Community improvement.

I-15 Life environment improvement.

b. Technical items.

II-1 Land use.

II-2 Water Use.

II-3 Soil and farm.

II-4 Crops, cultivation.

II-5 Transportation.

II-6 Machinery.

c. Small-Scale Integrated Rural Development Project.

III-1 Rural development level.

III-2 Topographical map.

III-3 Soil examination.

III-4 Land classification.

III-5 Present Water Use facilities.

III-6 Water rights.

III-7 Water Use/Control.

III-8 Catchment area conservation.

III-9 Irrigation control.

III-10 Degree of land consolidation.

III-11 Agricultural equipment.

III-12 Yield system.

III-13 Cultivation techniques.

III-14 Rural development plan.

III-15 Agricultural materials.

III-16 Agricultural finance, debts.

III-17 Local market.

III-18 Farmland holding form.

III-19 Relation to areal rural district development.

III-20 History of village development.

III-21 Management of farmers' incomes.

III-22 Farmers' system and management.

III-23 Rural service.

III-24 Phenomena in drought years.

III-25 Prices of products.

III-26 Measures to cope with drought years.

III-27 Estimation of integrated small-scale rural development.

2-4 The reasons for the introduction of the Toban integrated small-scale rural development model to North-east Thailand.

(1) Poverty of farm villages in North-east Thailand.

The Thai government's definition of poverty levels are as follows:

a. best village (No. 1)
b. good village (No. 2)
c. middle village (No. 3)
d. poor village (No. 4)
e. poorest village (No. 5)

Integrated small scale development would be adopted for the development of lower level villages, especially poor, and poorest level villages.

(2) Suitable development model of small-scale rural development in the Toban district.

Generally there are many irrigation projects and experiences concerning rural development in the world. The patterns of these irrigation projects can be classified in Asia with paddy rice as follows:

a. Modernized irrigation development on a large scale
b. Japanese irrigation development

For North-east Thailand rural development of rain-fed areas remote from highway and town, the pattern of Japanese irrigation development should be studied in detail from the standpoint of comparison.

(i) The problems of modernized irrigation development for rural development in North-east Thailand.

This pattern is very common internationally for regional development through big and medium scale irrigation projects.

The problems are as follows:

a. The benefit area for the irrigation project becomes very large from the standpoint of the maximum income from the regional development project.
b. The evaluation on modernized irrigation development, as shown in some places in this report, is unsatisfactory for actual development of poor rural areas.
c. The criticized items are generally at the farmer's level. Without adoption of reasonable measures to develop the level of farmers' techniques and economics, the rural development is successful.
d. The flow of development is from the construction of main facilities to terminal facilities, the flow being closely related to farmers'

activities. This flow of construction requires a long period to get development results, and can cause loss of interest.

(ii) The pattern of Japanese irrigation development

The Japanese have traditionally had special experience of rural development. The general description of Japanese irrigation development can be defined for regional development, it is from the terminal facilities that is closely related with farmer's activity to the construction of main facilities with middle and large scale.

a. The families group set up the development unit at first. There are scale of development unit becomes very small compared with the modern irrigation development above-mentioned.
b. The procedure for rural development is from family groups to village, from village to province, and province to nation.
c. The procedure for development project is from group project to village project, village project to provincial project, and provincial project to national project.

Each procedure for development was very satisfactory in the history of the development of the Toban area.

a. From group project to village project
   more than 100 years
b. from village project to provincial project
   = 30 years
c. From provincial project to national project
   = 20 years

(iii) The technical transfer in their progress

Major progress on irrigation for several traditional crops was acquired in the period of the first stage of development, group project, and many years were needed. In this period the basic techniques of irrigation at farm level, the introduction of suitable crops, water management at farm level and of the irrigation system, construction of small scale irrigation facilities, water use association for farmers' groups, mutual help in cultivation and construction, and in their day-to-day affairs (in rural) were acquired.

Through the above-mentioned history of development of agriculture in Japan, important suggestions can be obtained concerning the development of the rain-fed region in North-east Thailand, especially for the first step in development. The suitable scale of the model of rural development in North-east Thailand is small as shown in the first stage of development of the Toban district in Japan.

The importance for the unit of family groups should be recognized.

(3) The suitable unit of integrated small scale rural development in North-east Thailand.

According to the above-mentioned definition there are village level small scale development units in which the Thai-Government is setting great weight for rural development so far. But now the results of this village level small scale irrigation development show that it is not a satisfactory means of getting the fruits of rural development in a shorter period and with cheaper investment. The poorest area in North-east Thailand is a completely rain-fed area. The rain-fed paddy production is much affected by frequent droughts, for example, once every three years. To overcome this serious enemy the most important measure is the introduction of detailed irrigation at the farmer's level in the drought months in the rainy season. Now, the Thai-Government is performing small scale irrigation development. But this village scale is rather too large to get uniform and rapid development effects. They are experiencing unexpectedly long periods of several years to complete a reservoir and terminal ditch. The aim of this project is therotically very good for developed countries, but there are many restrictions to be avoided in North-east Thailand as follows.

a. The reservoir is actually constructed separately from the construction of distribution canals and ditches.
b. Farmers living upstream on the distribution canal do not agree to handing over farmland for common canal construction for a downstream benefit area, and farmers living downstream.
c. The cooperative public works are very difficult for the farmers in the village.
d. To get mutual help in construction and maintenance the adoption of a smaller scale of farmers' group is more reasonable.

In order to study the development in the poor rain-fed areas it is very beneficial to adopt the Japanese farmer's experience for rural development, especially the Toban area. There can be seen the family group projects which are being suggested to transfer into North-east Thailand. The model of family group projects should have the following characteristics.

a. The number of families for one family group projects is from one to several families.
b. For mutual understanding these families were organized by the relatives who had close relations.
c. Sometimes they can set up a common fund for irrigation improvement.
d. By mutual help they can construct several reservoirs specially for themselves.

e. There is a tradition of water rights. Farmers who do not join in with reservoir construction cannot use the irrigation water from these tanks.

Thus, this idea is to be adopted as the suitable model for North-east Thailand used in the cooperative research in chapter 8 in this report.

3. WATER MANAGEMENT AND INTEGRATED SMALL SCALE RURAL DEVELOPMENT

3-1 Water Management in North-east Thailand

The idea of setting up the Water User Associations for modern irrigation projects was initiated by the Royal Irrigation Department. The basic system for the construction of a tank* project is that the Department builds the dam, tank, control structures and the distribution system up to farm turnout only. The farmer has to build the farm ditch for taking the water from the farm turnout to his own land. This means that he has to sacrifice parts of his land and dig the farm ditch himself. Hence the Department has insisted the farmers whose farm lands are within the scope of the project are to form a water user association. The main objective is to cooperate and coordinate the water distribution at farm level between the common irrigator and the farmers. The association has to register at the District Office of the Ministry of Education. The function of the association also covers the maintenance of the system. When small damage occurs the member may help the canal keeper to repair the canal embankment by providing free labour. For greater damage, the Department provides material and equipment and an additional budget for repair with free labour of the members.

For water management of the Association the Royal Irrigation Department has set a rule that paddy groups are receiving the water from the same farm turnout. The farmers have to be member of the association and elect one headman to represent them in the Executive Committee of the Association. The Committee is elected every two years, and comprises 16 members. The Committee members elect among themselves one chairman, one deputy chairman, one cashir, one coordinator and one secretary, while the rest are members. The Committee considers and makes decisions for the equitable share of irrigation water to be distributed to all farmland within the project area.

To know the actual situation of water management in North-east Thailand the Research Team spent almost two weeks on a preliminary survey in order to select the most suitable sites for research study on integrated small-scale rural development in North-east Thailand, with the emphasis on the relationship between Water Use/Control and Agricultural Cooperatives. The fourth site, Huai Sap Pradu Tank Irrigation Project, appeared to be one of the best sites to meet the research objectives. For futher detailed investigation on water use/control and Water management in another three selected research projects, the proposal has been made to install the equipment and take flow measurements as well as other related climatic data after the equipment provided by JICA arrives in Bangkok in November 1980.

*tank = small scale reservoir with one Million cubic meters

Remarks

Conversion Unit : 1 rai = 1,600 m^2.
1 ha = 10,000 m^2. = 6.25 rai
100 kg/rai = 0.625 ton/ha.

Water management of irrigation can be understood us a typical problem to evaluate the integration between the development measures' engineering aspects and farmers' activity.

The project which has good water management would be a successful project of irrigation and rural development.

For development in North-east Thailand, up to now, various kinds of development measures have been carried out. This is especially true in villages in North-east Thailand where, on research, there were seen to be various kinds of projects.

According to the evaluation of development projects so far, the direct and indirect benefits are comparatively concentrated on farmers and the poorest farmers do not get any benefit.

Certainly good villages near big towns or highways in North-east Thailand have a population of not only farmers but also of merchants, workers, educationalists and other workers, but for most of them, 85 percent are farmers. These villages are comparatively rich.

The farmers' activities in the villages with the poorest farmers in the rain-fed region, have to be improved. The real situation in North-east Thailand will be studied from the standpoint of agricultural improvement which the Thai government and farmers can take on by themselves; namely, the idea of "Integrated Small-Scale Rural Development" will be recommended.

According to a scientific approach, positive research based on the present situation will be needed to get concrete measures including techniques, economics and human-activity.

Table (5) shows an annual rainfall (mm) of each province in North-east Thailand. Annual rainfall resembles the Toban area, with about 1000-1300 mm/year. But its distribution through the year is quite different from the Toban area as it exists in a monsoon climate. A tank is expected very much in the area. Good water management in the area will provide important items to enable integrated small-scale rural development. From now on, North-east Thailand will be studied using the Toban water use experience with regard to integrated rual development.

The study results will prepare the theoretical basis for enabling application to the developing South-east Asian countries which are paddy rice

production countries.

(1) Re-examination of water use and small-scale irrigation.

Generally, rural development is the most necessary in this area and this basically requires a re-examination of the water use development at first.

(ii) Gap between North-east rural district and the central district.

It is important to compare each with the average of Thailand in general. The level of present North-east Thailand rural development cannot be understood only through published statistics, but through actual survey farmers and villages at several levels. These variations depend on each rural village in the North-east region. The unit village which is defined for the research project has farmers' groups which have a fairly equal life style. The kinds of situation restricting the development of such farmers' groups must be studied, for example:

a) Rain-fed upland farming group.
b) Rain-fed paddy field.
c) Imperfect irrigation group.
d) Perfect irrigation group.

The above-mentioned patterns depend on the topography of the land, the climate and the distance from large towns and cities. After constructing a tank in the rain-fed area, integrated small-scale rural development can be started through a water use group. The new rural development measure can be easily introduced for such a village.

Generally an earth dam is constructed for a tank and many tanks are rather shallow. The dam height of the tank is about 2 m to 10 m, but the bank length is about several hundred meters to one km.

The Unit development village has the following characteristics.

a) An area which has an independent Basin and Benefit area.
   1. The rainy season crop is irrigated.
   2. The rainy season crop irrigation is sufficient and a part of the benefit area will be able to raise paddy rice in the dry season.
   3. Paddy-rice is raised in the rainy and dry seasons.
b) Various Uses of a Tank.
   1. Irrigation.
   2. Irrigation and rural Water Use.
   3. Irrigation and fresh-water fish farming.
   4. Irrigation, domestic Water Use and fresh-water fish farming.
   5. Keeping water buffalo and ducks.

c) Future development of Tanks.

The tanks linked with other tanks becomes the means of higher level rural development for medium scale or large scale projects in the future.

(ii) The Rain-fed Paddy-Rice Area.

Almost all of North-east Thailand paddy-fields that is, about 80%, are completely rain-fed. Almost all of the area is sandy soil, and in the area with paddy-fields the agricultural products are considerably affected by rainfall in the rainy season, and farmers' incomes have been unsteady so far. Also, the living conditions of farmers are strongly affected by the natural environment. The temperature is suitable for cropping as in other tropical areas. The other climatic factors, for example, sunshine, radiation, wind and humidity are not the only factors in crop production. Glutinous rice production from the rain-fed paddy-fields has a close relationship with the condition of rainfall in each rainy season, so analysis of the rainfall, as the most important control factor, is required. The average annual rainfall is nearly 1,000 mm/year - 1,600 mm/year, but the variation of rainfall is very wide from year to year.

In particular, a serious drought diaster was experienced in 1979 near the Korat area. Countermeasures should be considered through Water Use and Water/ Control. Almost all the people cultivate only in the rainy season and produce nothing in the dry season.

(iii) Water Use Planning and Water Use Association.

Small-scale development projects combine chiefly a tank with 50 ha - 200 ha irrigation area. Farmers' activity depends on the reliability of tank storage. The reliability of irrigation planning theory needs to be reexamined. Fortunately, at least there are some meteorological observatories in each province.

It will be an important part of the research work to do analysis of rainfall characteristics for each research project.

The study of analytical methods for runoff from river basin, tank behaviour, and survey on the benefit area including crop rotation shall be performed through the four research projects.

(iv) Present Water Operation.

Water Use Operation is controlled by a Zoneman who is a Royal Irrigation Department officer. Every morning the head of each farmers' group asks the Zoneman for irrigation water for the farm area which has crops. Before the Zoneman waters the required irrigation water the Zoneman has to check the paddy area to ascertain whether or not there are those crops which the farmers have

declared. In the farmers' group which has a water use association, the representative of the farmers' group always contacts a Zoneman who is selected by the RID. The Royal Irrigation Department manages the financial and technical problems necessary to operate the irrigation system.

(v) The Future of Water Management in North-east Thailand.

It is necessary to improve Water use efficiency by reciprocal improvement of irrigation facilities through the linkage of small-scale projects.

(2) Example of Water Use Association in North-east Thailand.

(i) Basic facts on selected water users' associations

Korat Province

1. Name of Tank: Subpradu Reservoir.
2. Construction year: Started 1969, completed 1970.
3. Capacity of Tank: 27.7 million M^3.
4. Irrigated area: 12,000 rai for paddy field, 4,000 rai for upland farms.
5. Name of water users' association: Subpradu Water Users' Association.
6. Date of registration: 9 November 1970.
7. Membership*: Right bank = 542 (1981 Figure), Left bank = 120 (0-0)
   *Double counting is possible since a farmer can own land is different places.

(ii) Khonkaen Province

1. Name of Tank: Bung La Loeng Wai.
2. Construction year: Started 1958, completed 1958.
3. Capacity of Tank: 2.80 million M^3.
4. Irrigated area: 5,000 rai (800 hectares).
5. Name of water users' association: La Loeng Wai Water Users' Association.
6. Date of registration: 16 November 1967.
7. Membership: 116.

(iii) Kalasin Province

These are two water users' associations in Lampao Agricultural Project, i.e., Yang Talard Section and Lerng Mark Dok Section water users' association.

Since Ban Don Kloi, the selected research site in Kalasin, is included in the latter, the Lerng Mark Dok Section Water Users' Association will be studied.

The details of this association have not yet been obtained.

Table 2 Annual Rainfall : Selected Location by Regions, 1973-1977.

Unit : m.m.

Region and Province	1973	1974	1975	1976	1977
B. North-Eastern					
Nong Kbai	1,266.6	1,298.5	2,119.3	1,484	1,150.0
Loei	1,340.6	1,334.6	1,261.1	1,058	990.1
Nakhon Phanom	1,820.5	2,170.6	2,783.8	1,997	1,652.0
Udon Thani	1,395.2	1,525.1	1,753.0	1,452	1,042.9
Sakon Nakhon	1,363.1	1,990.4	1,680.6	1,148	1,149.5
Khon Kaen	778.9	1,155.7	1,461.2	1,097	1,216.4
Roi Et	1,045.2	1,388.7	1,698.0	1,491	1,301.0
Chaiyaphum	1,015.6	811.1	1,447.1	1,206	1,029.1
Ubon Ratchathani	1,415.9	1,733.8	1,627.6	1.491	1,288.3
Nakhon Ratchasima	960.3	1,312.0	1,041.4	988	884.2
Surin	984.9	1,161.3	1,143.5	1,575	1,069.4

(3) Research Unit of Water Management.

(i) The political classifications in Thailand are as follows:

- Province
- District
- City
- Town
- Village

The project area does not coincide with those administration blocks and sometimes research projects include water resources, irrigation canals and farmland, connecting several villages. Those villages are connected by the water flow net and are closely related to each other through water management.

The characteristics of the research village are as follows:

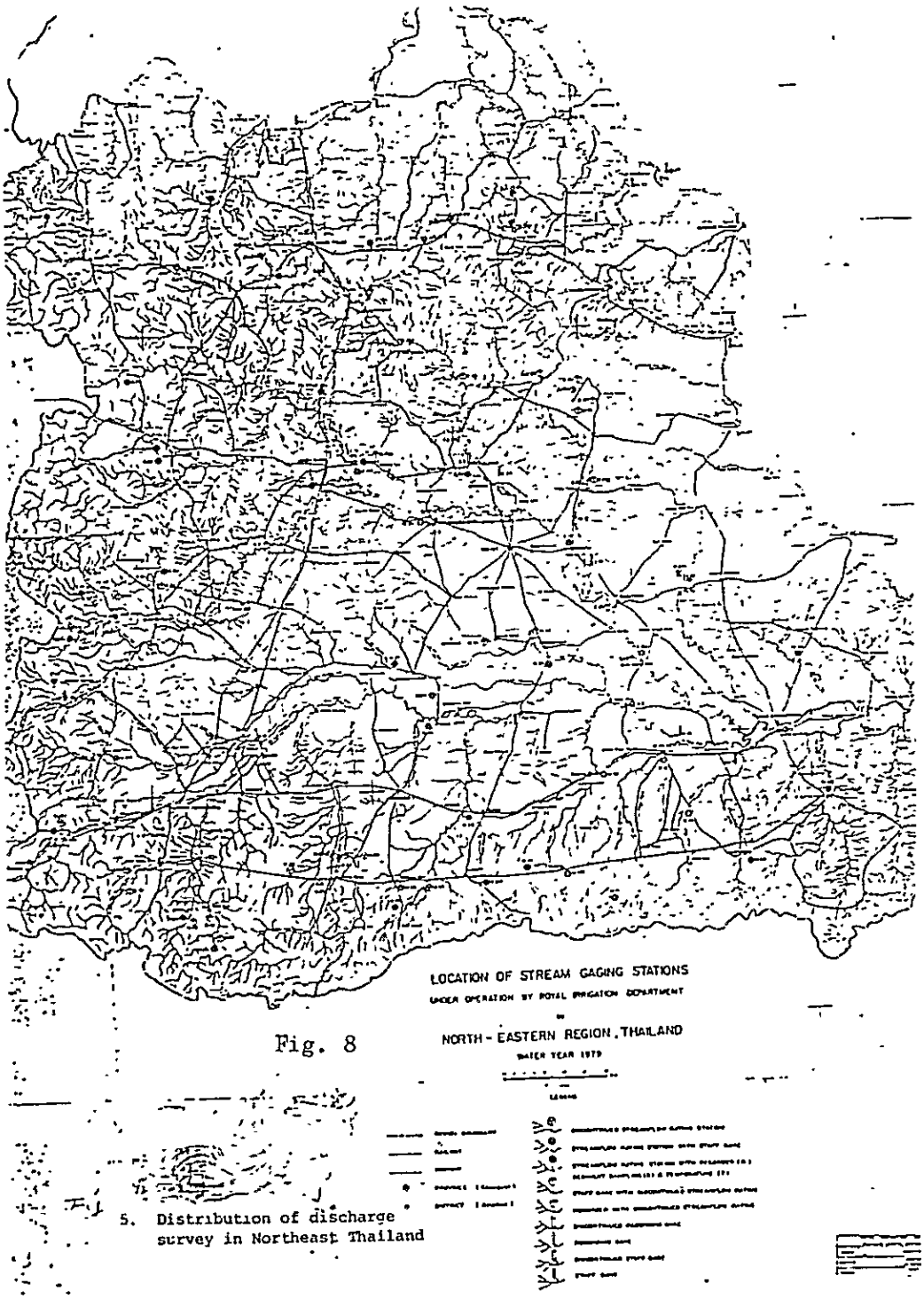


Fig. 8

5. Distribution of discharge survey in Northeast Thailand

(a) In the research village each inhabitant has a comparatively similar livelihood.
(b) Paddy-rice is the main crop in the development village.
(c) A reservoir is available to the development village.
(d) Farmers who live in the research village are comparatively poor but they hold their own land.
(e) The research project is supplied by water from one reservoir which belongs to the Thai government.
(f) The water supply system in the rain-fed paddy fields is operated by the headman of the water use association or the headman of the village.
(g) This village has set up a Water/Control Association.
(h) The farmers' group is organized in this village.

(ii) A Tank and research Village

There are several hundred small-scale rural development projects which are based on a reservoir, but the special characteristics are as follows:

(a) In the construction of the reservoir sometimes there is a lack of study on water use planning.
(b) On the Water/Control of a reservoir there are low level diversion facilities.
(c) There are not enough reservoirs.
(e) Water/Control is controlled by a Zoneman who belongs to the Royal Irrigation Department; the Water/Use association can request the Zoneman for water.
(f) Under the present situation, rain-fed paddy fields in many regions should be developed utilizing the natural resources and village man power.

Hereafter the most important development method idea for the poor rural areas in North-east Thailand is integrated small-scale rural development which is based on a reservoir. Basically in North-east Thailand where there is not enough activity to try faster development measures, as a result of modern irrigation development sometimes a great deal of social disruption will occur. Concerning the development-effect we must add consideration of social development adopting more small scale projects. Certainly, more small projects can easily be included in the idea of integrated small-scale rural development.

Integrated small-scale rural development unit is based on farmers' benefit improvements of Water/Control and farmers' cooperative activity.

There is a typical history of rural development, as above-mentioned, of independent Water/Use in the Toban area, Japan. It can be seen that rural development has been based on Water/Use. But under the present conditions,

Photo 1 Rain-fed paddy field in the dry season in North-east Thailand.

Photo 2 Irrigation tank in North-east Thailand

rural development in North-east Thailand is a government-leading form. Certainly the object of this thesis is not only concerned with the future, but also research of the method for step by step improvement from the present situation in North-east Thailand. On the completion of each integrated small-scale rural development of project, mutual linkage will be performed on the Water/Use association and villagers can refuse a large company's intervention.

The Government is undertaking the construction of tank project and the management of water distribution at farm level between the common irrigator and the farmers. The association has to register at the district office of the Ministry of Education. The function of the association also covers the maintenance of the system. When small damage occurs the member may help the canal keeper to repair the canal embankment by providing free labour. For greater damage, the Department provides material and equipment.

3-2 Gauging Installation for Water Use Data in the experimental Project.

According to the research plan, the first phase of the implementation schedule should begin with installation of the gauging equipment. The purpose of the trip to North-east Thailand was to carry out a detailed survey and design gauging installations at suitable locations within the proposed projects for the purpose of collecting both hydrological and water use data.

(i) Detailed Survey

The detailed survey was concentrated only on the locations that had been selected by the Japanese and Thai researchers during the trip to North-east Thailand made in August 1980. The survey included selection of appropriate points in the field and irrigation canals, measurement of exact cross-sections of the canals, and selection of locations for hydrometeorological stations in the Huai Sap Pradu Pasin.

The results of the measurements at selected points of 18 stations are shown in Appendix I.

(ii) Design of Gauging Installation

Design of gauging installation comprises:

3.1) Bench Mark for each gauging station.

3.2) Staff gauges (plate to be supplied by RID).

3.3) Hardwood bridge (crossing irrigation canal).

3.4) Steel pipe (to connect the equipment from base plate and canal bottom).

3.5) Base plate (to connect housing equipment and steel pipe).

3.6) Net steel cover (to protect equipment from damage).

3.7) Fence for hydrometeorological equipment (in Puai Sap Pradu Basin).

(iii) Cost Estimate

The cost estimate of gauging installation at various stations in the selected projects are as shown in the following table:

Project	Installation cost (฿)	
No. 1 Rain-fed Agriculture (Ban Nong Ya Phrack Village)		
Station 1.1 and 1.2 on farm plot	14,500	..... (1)
No. 2 Huai Si Thon Tank Irrigation Project		
Station 2.1 - at feeder canal	9,300	
Station 2.2 - at head of left main canal	8,500	
Station 2.3 - at head of 1R-L canal	8,500	
Station 2.4 - at crossing point of 1R-L canal with highway No. 213	8,500	
Station 2.5 - at crossing point of 1L-1R-L canal with highway No. 213	8,200	
	43,000	..... (2)
No. 3 Laloeng Wai Tank Irrigation Project		
Station 3.1 - at head of left main canal	7,950	
Station 3.2 - at the spillway bridge	8,400	
Station 3.3 - at head of right main canal	7,750	
Station 3.4 - at the highway bridge	11,800	
	35,900	..... (3)

No. 4 Huai Sap Pradu Tank Irrigation Project

Station 4.1 - at head of left main canal	8,500
Station 4.2 - at head of right main canal	9,980
Station 4.3 - at head of 1L-R canal	7,500
Station 4.4 - at head of 2L-R canal	7,500
Station 4.5 - at head of 3L-R canal	8,020
Station 4.6 - at Km.18 of right main canal	8,850
Station 4.7 - hydrometeorological station in the Huai Sap Pradu basin	8,000
	58,350 ..... (4)

Other

Accessories, Paint, Bench Mark, (include labour cost) 11,000 ..... (5)

Total cost = (5)
(1)
= 162,250 ฿

Add. 10% = 16,250 ฿ for contingency

Grand total = 178,500 ฿

The details of the estimation are shown in Appendix II and also summarized in Table 1.

(iv) Map and Drawing

iv 1) Maps Fig. 1 to Fig. 4 show the network of gauging installation as selected and listed in Appendix I.

iv 2) Drawings Fig.5 & Fig. 6 show the design of the net steel cover and housing of the water level recorder instrument.

Table 3 Detail of material list

Station	Material					
	Hardwood	Pipe	Plate	Net cover	Concrete	Fence
	m^3	m	unit	unit	m^3	unit
1.1	0.201	1.50	1	1	L^1 0.25	-
1.2	0.201	1.50	1	1	L^2 0.25	-
2.1	0.075	4.50	1	1	L^1 0.25	-
2.2	0.200	1.50	1	1	L^1 0.25	-
2.3	0.200	1.50	1	1	L^1 0.25	-
2.4	0.200	1.50	1	1	L^1 0.25	-
2.5	0.162	1.50	1	1	L^1 0.25	-
3.1	0.134	1.50	1	1	L^1 0.25	-
3.2	0.075	3.00	1	1	L^1 0.25	-
3.3	0.106	1.50	1	1	L^1 0.25	-
3.4	0.090	5.40	1	1	L^1 0.25	-
4.1	0.200	1.50	1	1	L^1 0.25	-
4.2	0.348	2.00	1	1	L^1 0.25	-
4.3	0.112	1.00	1	1	L^1 0.25	-
4.4	0.112	1.00	1	1	L^1 0.25	-
4.5	0.140	1.50	1	1	L^1 0.25	-
4.6	0.244	1.50	1	1	L^1 0.25	-
4.7	-	-	-	-	L^3 1.00	1
Total	2.799	33.40	17	17	5.50	1

Remark L^1 = Bench mark construction

L^2 = Foundation

L^3 = Floor & Fench foundation

Fig9 Appendix I Measurements of Gauging Installation

Project No.1 Rainfed Agriculture (2 stations)

Station 1.1 and 1.2 Ban Nong Ya Phraek Village

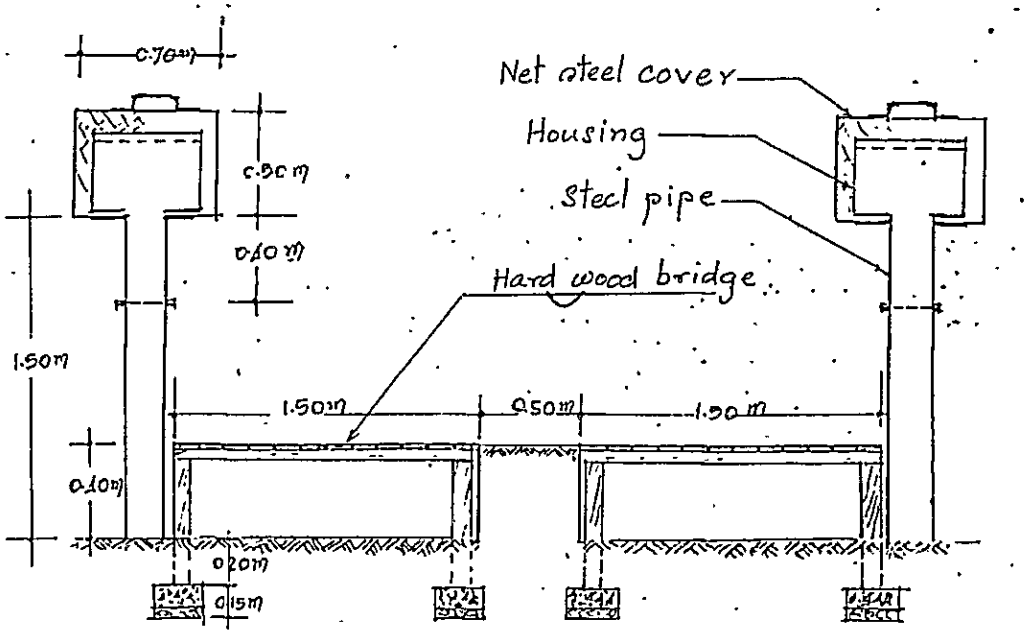
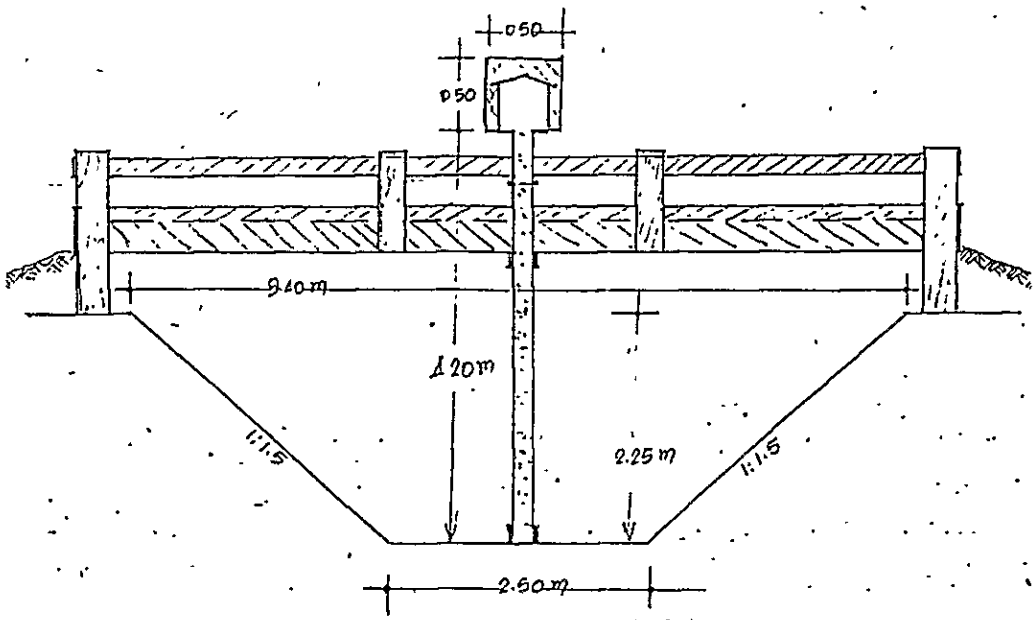


Fig 10

Project No. 2 Huai Si Thon Tank Irrigation Project (5 stations)

Station 2.1 – at feeder canal



Station 2.2 – at head of left main canal.

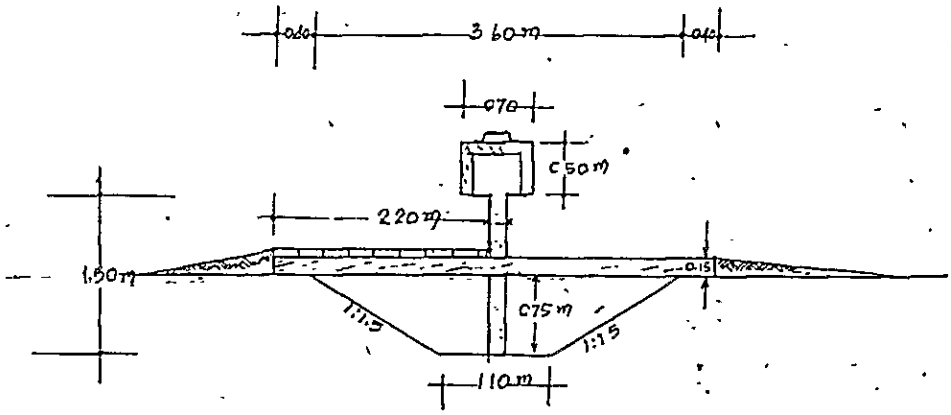
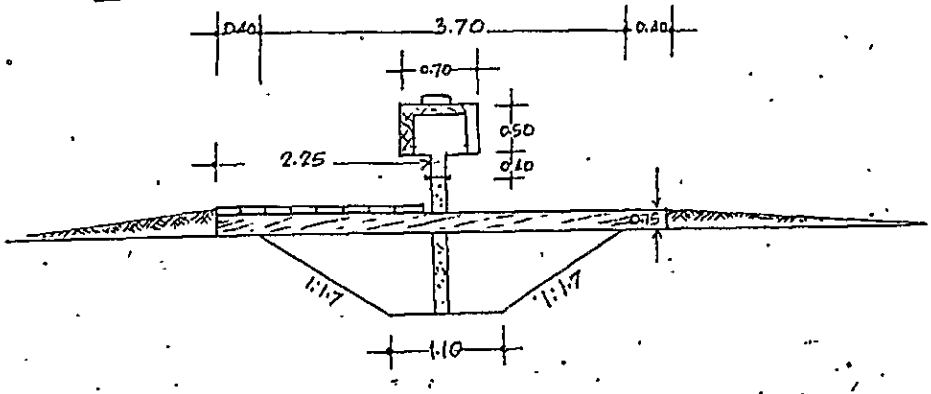
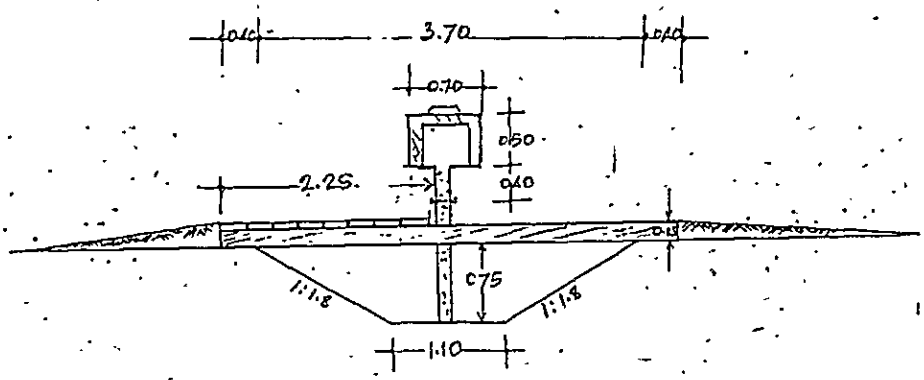


Fig 11

Station 2.3. - at head of 1R-L canal.



Station 2.4 - at crossing point of 1R-L canal with Highway No-2



Station 2.5 - at crossing point of 1L-1R-L canal with highway No.

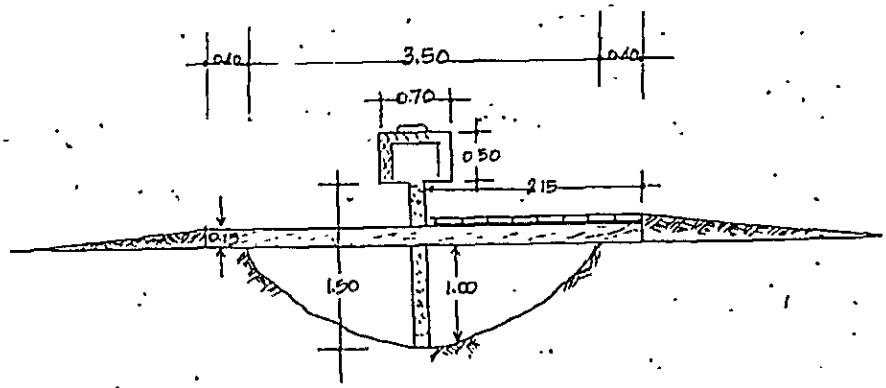
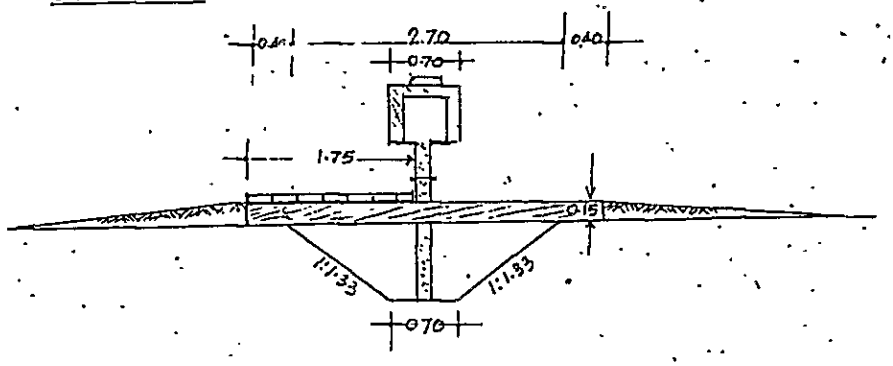


Fig 12

Project No. 3 La-Loeng-Ubai Tank Irrigation Project (4 stations)

Station 3.1. - at head of left main canal.



Station 3.2. - at the spillway bridge.

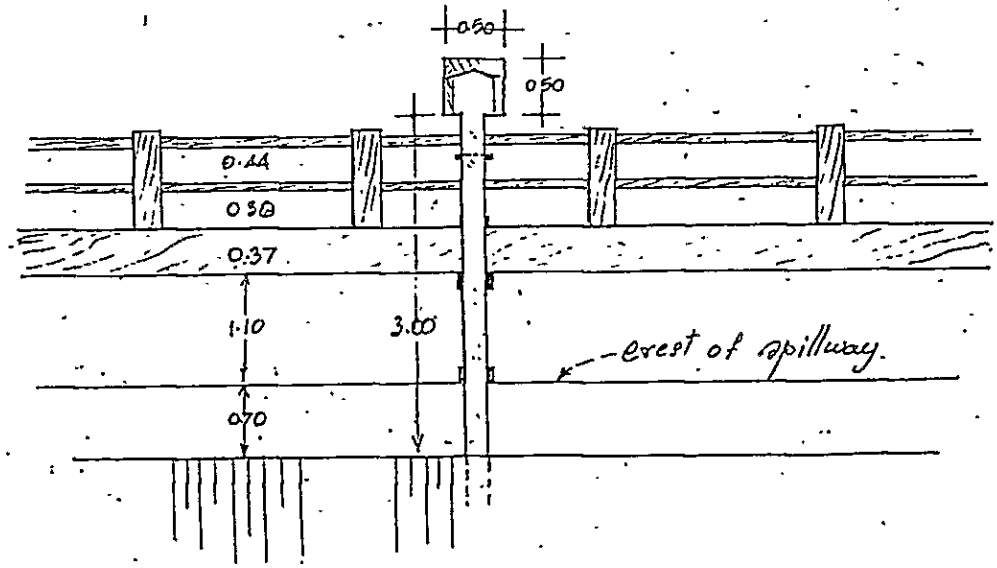
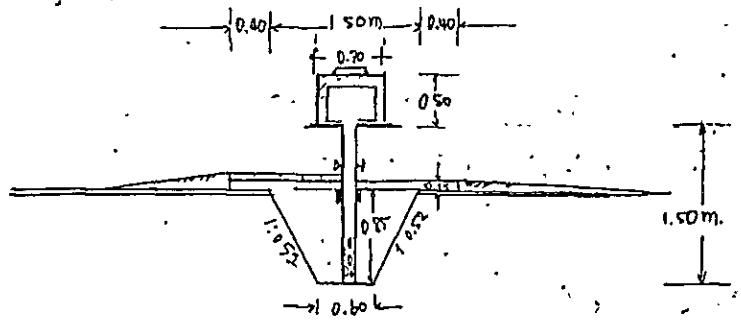


Fig 13

Station 3.3 - at head of right main canal



Station 3.4 - at the highway bridge.
(downstream of outlet and spillway)

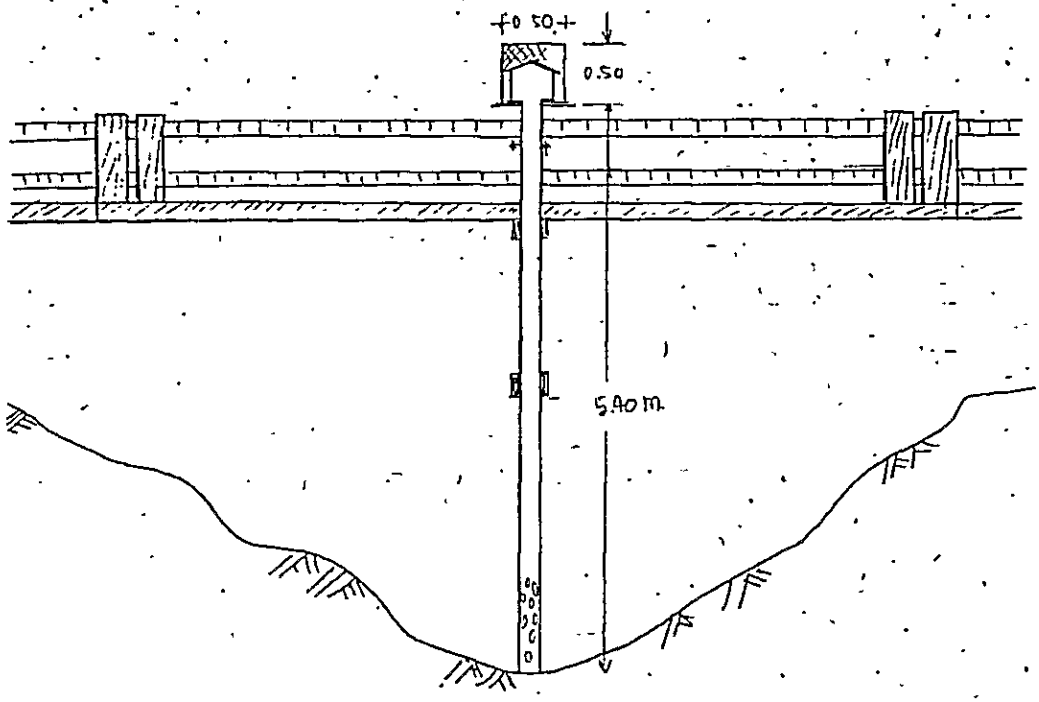
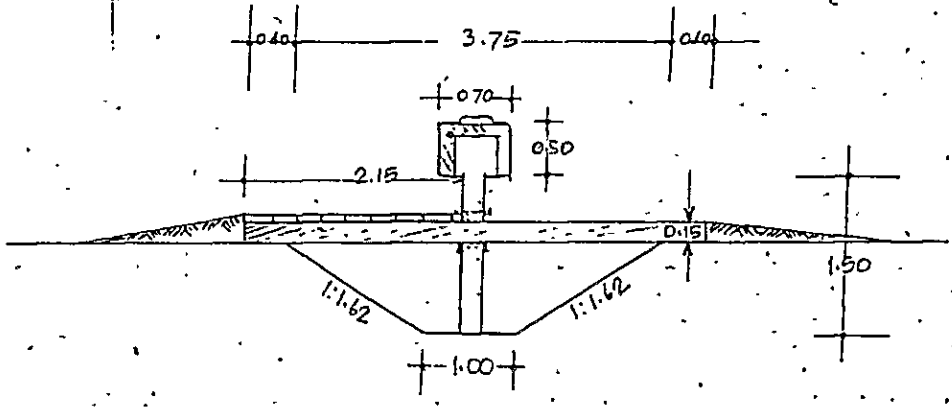


Fig 14

Project No. 4 - Huai Sap Pradu Tank Irrigation Project
(6 stations and 1 hydrometeorological station)

- Station 4.1 - at head of left main canal.



Station 4.2 - at head of right main canal.

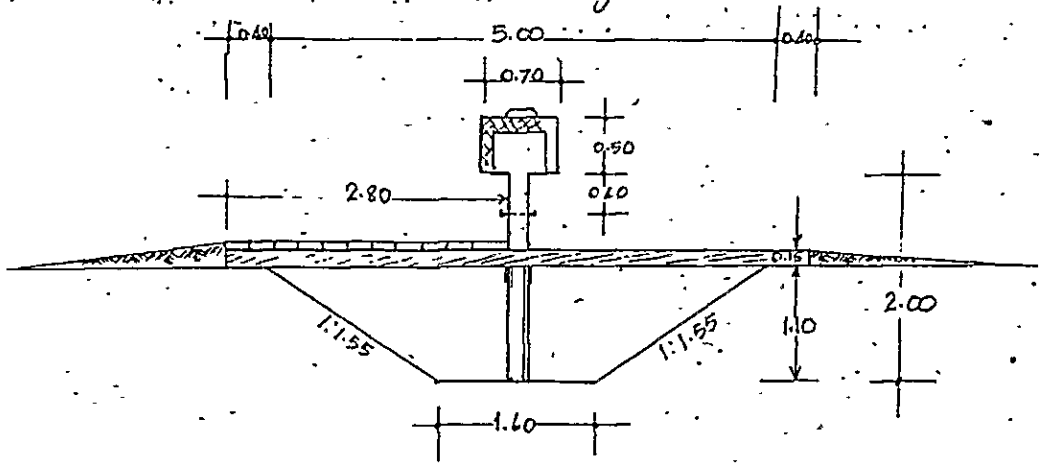
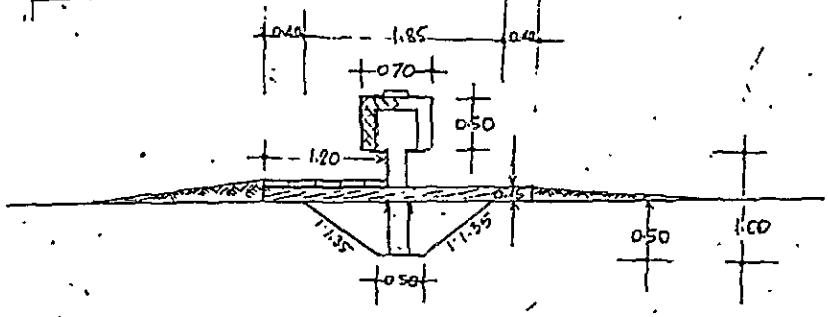
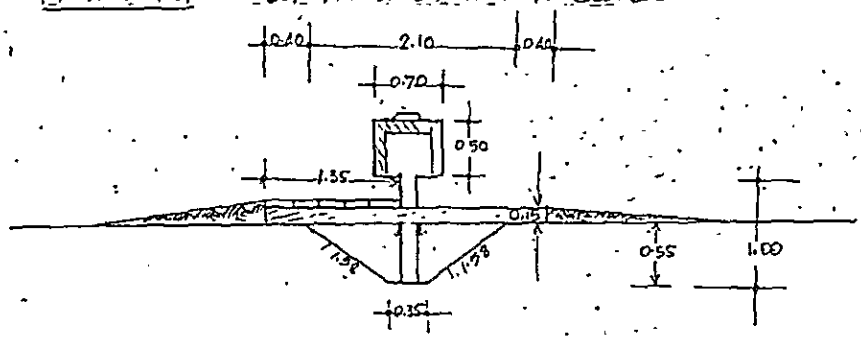


Fig 15

Station 4.3 - at head of 1L-R canal



Station 4.4 - at head of 2L-R canal



Station 4.5 - at head of 3L-R canal

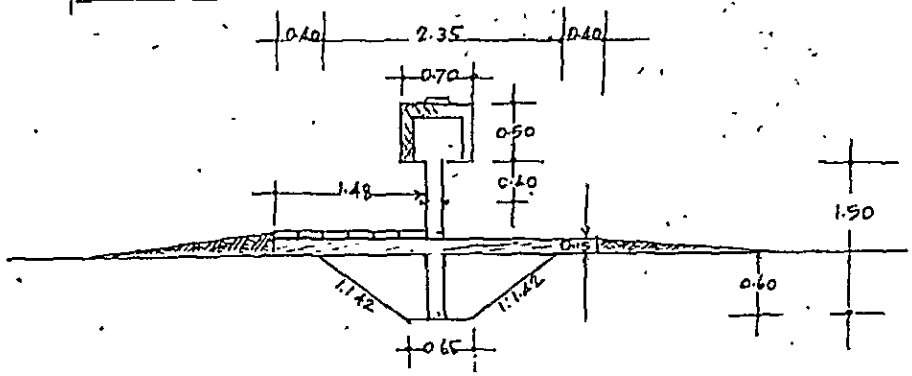
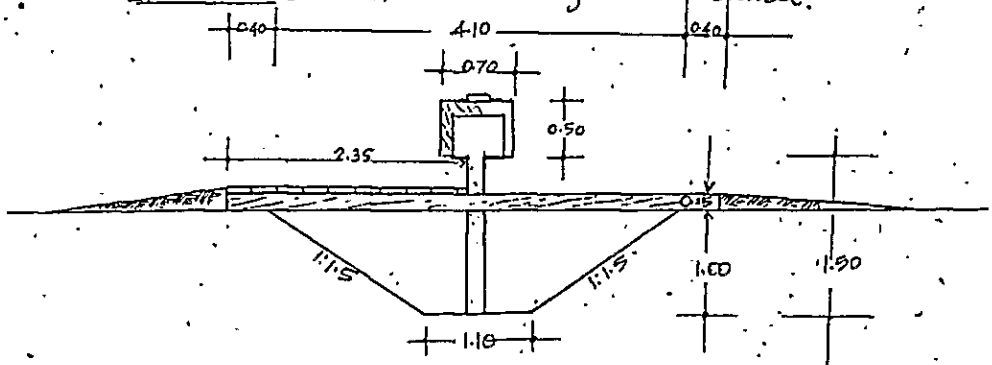
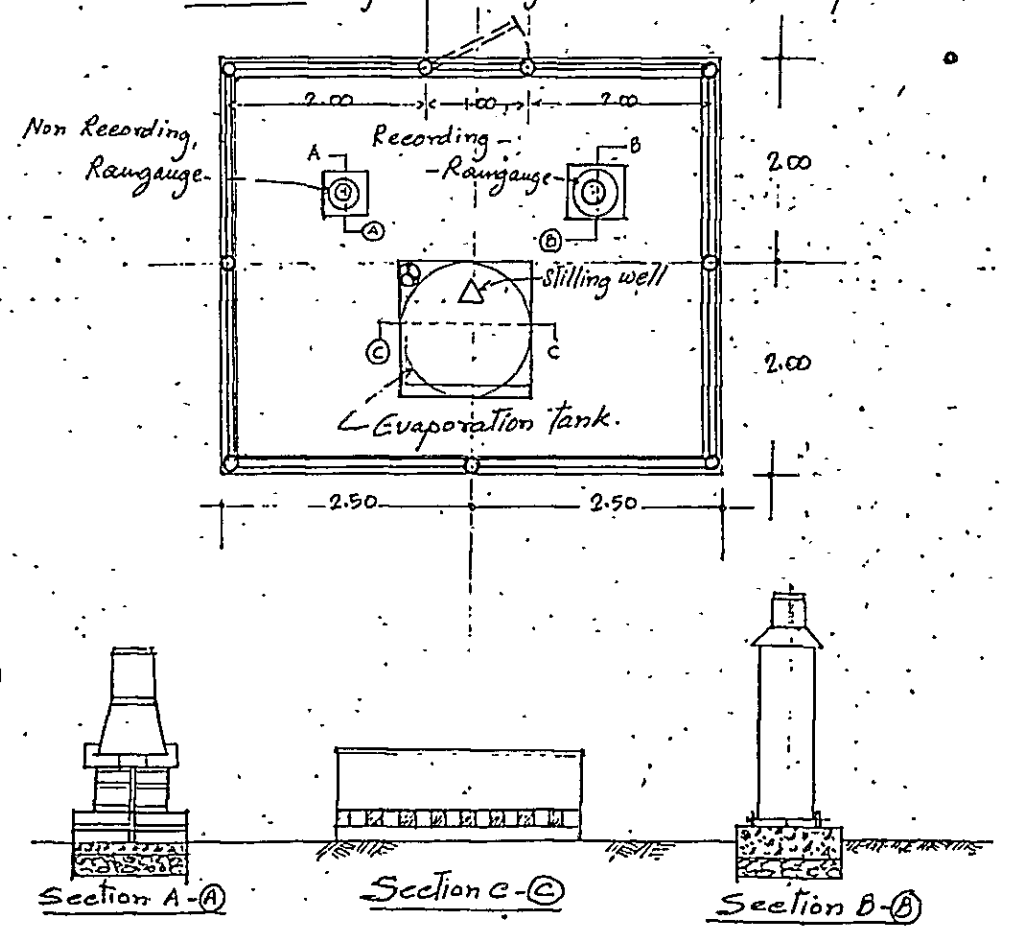


Fig 16

Station 4.6 - at km. 18 of right main canal.



Station 4.7. - hydrometeorological station in Huai Sap Pradu basin



Section A-Ⓐ Section C-Ⓒ Section B-Ⓑ

Appendix II Detailed Cost Estimate of Gauging Installation

Project No. 1 Rain-fed Agriculture

Station 1.1 and 1.2 Ban Nong Ya Phrack Village

1)	Steel pipe Ø 8", 1/8" thick - 2 × 1.50 m. long		=	1,800 ฿
2)	Base plate 1/8" thick = 2 pieces		=	800 ฿
3)	Net steel cover = 2 pieces		=	2,200 ฿
4)	Hardwood bridge		=	3,220 ฿
	- 5" × 5" × 2 m - 8 pieces	0.258 m^3		
	- 1 1/2" × 6" × 3 m - 2 pieces	0.036 m^3		
	- 1" × 6" × 4 m - 6 pieces	0.096 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces	0.012 m^3		
		0.402 m^3		
5)	Foundation		=	480 ฿
6)	Labour cost			
	6.1) Technician @ 300 ฿ / day for 4 days		=	1,200 ฿
	6.2) Carpenter @ 250 ฿ / day for 4 days		=	1,000 ฿
	6.3) 3 labourers @ 450 ฿ / day for 4 days		=	1,800 ฿
7)	Transportation for 4 days		=	2,000 ฿
	Total			14,500 ฿

Project No. 2 Huai Si Thon Tank Irrigation Project

Station 2.1 - at feeder canal

1.1)	Steel pipe Ø 8", 1/8" thick - 4.50 m. long	=	2,700 ฿
1.2)	Base plate 1/2" thick	=	400 ฿
1.3)	Net steel cover	=	1,100 ฿
1.4)	Hardwood 1 1/2" × 3" × 2.5 m - 10 pieces (0.075 m^3)	=	600 ฿
1.5)	5 Labourers cost @ 1000 ฿/day for 3 days	=	3,000 ฿
1.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	9,300 ฿

Station 2.2 - at head of left main canal

2.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	≈	900 ฿
2.2)	Base plate 1/8" thick -	≈	400 ฿
2.3)	Net steel cover	≈	1,100 ฿
2.4)	Hardwood bridge - 0.20 m^3	≈	1,600 ฿
	- 1 1/2" × 6" × 5 m - 2 pieces 0 058 m^3		
	- 1" × 6" × 4 m - 8 pieces 0 128 m^3 } 0.20 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0 012 m^3		
2.5)	5 Labourers cost @ 1,000 ฿ / day for 3 days	≈	3,000 ฿
2.6)	Transportation for 3 days	≈	1,500 ฿
	Total		8,500 ฿

Station 2.3 - at head of 1R - L canal

3.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m long	≈	900 ฿
3.2)	Base plate 1/8" thick	≈	400 ฿
3.3)	Net steel cover	≈	1,100 ฿
3.4)	Hardwood bridge - 0.20 m^3	≈	1,600 ฿
3.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	≈	3,000 ฿
3.6)	Transportation for 3 days	≈	1,500 ฿
	Total	≈	8,500 ฿

Station 2.4 - at crossing point of 1R-L canal with highway No. 213

4.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m long	≈	900 ฿
4.2)	Base plate 1/8" thick	≈	400 ฿
4.3)	Net steel cover	≈	1,100 ฿
4.4)	Hardwood bridge 0.20 m^3	≈	1,600 ฿
	- 1 1/2" × 6" × 5 m - 2 pieces 0.058 m^3		
	- 1" × 6" × 4 m - 8 pieces 0.128 m^3 } 0.20 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0.012 m^3		
4.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	≈	3,000 ฿
4.6)	Transportation for 3 days	≈	1,500 ฿
	Total	≈	8,500 ฿

Station 2.5 - at crossing point of 1L-1R-L canal with highway No. 213

5.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
5.2)	Base plate 1/8" thick	=	400 ฿
5.3)	Net steel cover	=	1,100 ฿
5.4)	Hardwood bridge - 0.162 m^3	=	1,300 ฿
	- 1 1/2" × 6" × 4.50 m - 2 pieces 0.054 m^3		
	- 1" × 6" × 4 m - 6 pieces 0.096 m^3 } 0.162 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0.012 m^3		
5.5)	5 Labourers cost @1,000 ฿/day for 3 days	=	3,000 ฿
5.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	8,200 ฿

Project No. 3 Laloeng Wai Tank Irrigation Project

Station 3.1 - at head of left main canal

1.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
1.2)	Base plate 1/8" thick	=	400 ฿
1.3)	Net steel cover	=	1,100 ฿
1.4)	Hardwood bridge 0.134 m^3	=	1,070 ฿
	- 1 1/2" × 6" × 3.5 m - 2 pieces 0.042 m^3		
	- 1" × 6" × 4 m - 5 pieces 0.080 m^3 } 0.134 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0.012 m^3		
1.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
1.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	7,970 ฿

Station 3.2 - at the spillway bridge

2.1)	Steel pipe Ø 8", 1/8" thick - 3.00 m long	=	1,800 ฿
2.2)	Base plate 1/8" thick	=	400 ฿
2.3)	Net steel cover	=	1,100 ฿
2.4)	Hardwood 1 1/2" × 3" × 2.50 m - 10 pieces 0.075 m^3	=	600 ฿
2.5)	5 Labourers cost @1,000 ฿/day for 3 days	=	3,000 ฿
2.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	8,400 ฿

Station 3.3 - at head of right main canal

3.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
3.2)	Base plate 1/8" thick	=	400 ฿
3.3)	Net steel cover	=	1,100 ฿
3.4)	Hardwood bridge 0.106 m^3	=	850 ฿
	- 1 1/2" × 6" × 2.50 m - 2 pieces 0.030 m^3		
	- 1" × 6" × 4.0 m - 4 pieces 0.064 m^3 } 0.106 m^3		
	- 1 1/2" × 3" × 2.0 m - 2 pieces 0.012 m^3		
3.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
3.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	7,750 ฿

Station 3.4 - at the highway bridge

4.1)	Steel pipe Ø 8", 1/8" thick - 5.40 m. long	=	3,600 ฿
4.2)	Base plate 1/8" thick	=	400 ฿
4.3)	Net steel cover	=	1,100 ฿
4.4)	Hardwood 1 1/2" × 3" × 2.50 m - 12 pieces 0.09 m^3	=	720 ฿
4.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
4.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	11,820 ฿

Project No. 4 Huai Sap Pradu Tank Irrigation Project

Station 4.1 - at head of left main canal

1.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
1.2)	Base plate 1/8" thick	=	400 ฿
1.3)	Net steel cover	=	1,100 ฿
1.4)	Hardwood bridge - 0.20 m^3	=	1,600 ฿
	- 1 1/2" × 6" × 5 m - 2 pieces 0.06 m^3		
	- 1" × 6" × 4 m - 8 pieces 0.128 m^3 } 0.20 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0.012 m^3		
1.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
1.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	8,500 ฿

Station 4.2 - at head of right main canal

2.1)	Steel pipe Ø 8", 1/8" thick - 2.00 m. long	=	1,200 ฿
2.2)	Base plate 1/8" thick	=	400 ฿
2.3)	Net steel cover	=	1,100 ฿
2.4)	Hardwood bridge - 0.348 m^3	=	2,780 ฿
	- 1 1/2" × 6" × 6 m - 2 pieces 0.072 m^3		
	- 1" × 6" × 4 m - 12 pieces 0.192 m^3 } 0.348 m^3		
	- 1 1/2" × 3" × 2 m - 4 pieces 0.024 m^3		
	- 6" × 6" × 1.25 m. for 2 pieces 0.060 m^3 (column)		
2.5)	5 Labourers cost @1,000 ฿/day for 3 days	=	3,000 ฿
2.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	9,980 ฿

Station 4.3 - at head of 1L - R canal

3.1)	Steel pipe Ø 8", 1/2" thick - 1.00 m. long	=	600 ฿
3.2)	Base plate 1/8" thick	=	400 ฿
3.3)	Net steel cover	=	1,100 ฿
3.4)	Hardwood bridge - 0.112 m^3	=	900 ฿
	- 1 1/2" × 6" × 3.0 m - 2 pieces 0.036 m^3		
	- 1" × 6" × 4.0 m - 4 pieces 0.064 m^3 } 0.112 m^3		
	- 1 1/2" × 3" × 2.0 m - 2 pieces 0.012 m^3		
3.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
3.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	7,500 ฿

Station 4.4 - at head of 2L - R canal

4.1)	Steel pipe Ø 8", 1/8" thick - 1.00 m. long	=	600 ฿
4.2)	Base plate 1/8" thick	=	400 ฿
4.3)	Net steel cover	=	1,100 ฿
4.4)	Hardwood bridge - 0.112 m^3	=	900 ฿
	- 1 1/2" × 6" × 3 m - 2 pieces 0.036 m^3		
	- 1" × 6" × 4 m - 4 pieces 0.064 m^3 } 0.112 m^3		
	- 1 1/2" × 6" × 2 m - 2 pieces 0.012 m^3		
4.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
4.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	7,500 ฿

Station 4.5 - at head of 3L - R canal

5.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
5.2)	Base plate 1/8" thick	=	400 ฿
5.3)	Net steel cover	=	1,100 ฿
5.4)	Hardwood bridge - 0.140 m^3	=	1,120 ฿
	- 1 1/2" × 6" × 4.0 m - 2 pieces 0.045 m^3		
	- 1" × 6" × 4.0 m - 5 pieces 0.080 m^3 } 0.140 m^3		
	- 1 1/2" × 3" × 2.0 m - 2 pieces 0.012 m^3		
5.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
5.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	8,020 ฿

Station 4.6 - at Km 18 of right main canal

6.1)	Steel pipe Ø 8", 1/8" thick - 1.50 m. long	=	900 ฿
6.2)	Base plate 1/8" thick	=	400 ฿
6.3)	Net steel cover	=	1,100 ฿
6.4)	Hardwood bridge - 0.244 m^3	=	1,950 ฿
	- 1 1/2" × 6" × 5 m - 2 pieces 0.072 m^3		
	- 1" × 6" × 4 m - 10 pieces 0.160 m^3 } 0.244 m^3		
	- 1 1/2" × 3" × 2 m - 2 pieces 0.012 m^3		
6.5)	5 Labourers cost @ 1,000 ฿/day for 3 days	=	3,000 ฿
6.6)	Transportation for 3 days	=	1,500 ฿
	Total	=	8,850 ฿

Station 4.7 - hydrometeorological station in Huai Sap Pradu Basin

7.1)	Material (fence)	=	5,000 ฿
7.2)	5 Labourers cost @ 1,000 ฿/day for 2 days	=	2,000 ฿
7.3)	Transportation for 2 days	=	1,000 ฿
	Total	=	8,000 ฿

Others

Bench mark for staff gauge 16 units @ 500 ฿/unit	=	8,000 ฿
Paint & Posts	=	2,000 ฿
Accessories	=	1,000 ฿
Total	=	11,000 ฿

Staff gauge plate to be supplied by RID.

Summary of Installation Cost

Materials	=	84,250 ฿
Labour	=	52,000 ฿
Transportation	=	26,000 ฿
Total	=	162,250 ฿
Add 10% for contingency	=	16,250 ฿
Grand total	=	178,500 ฿

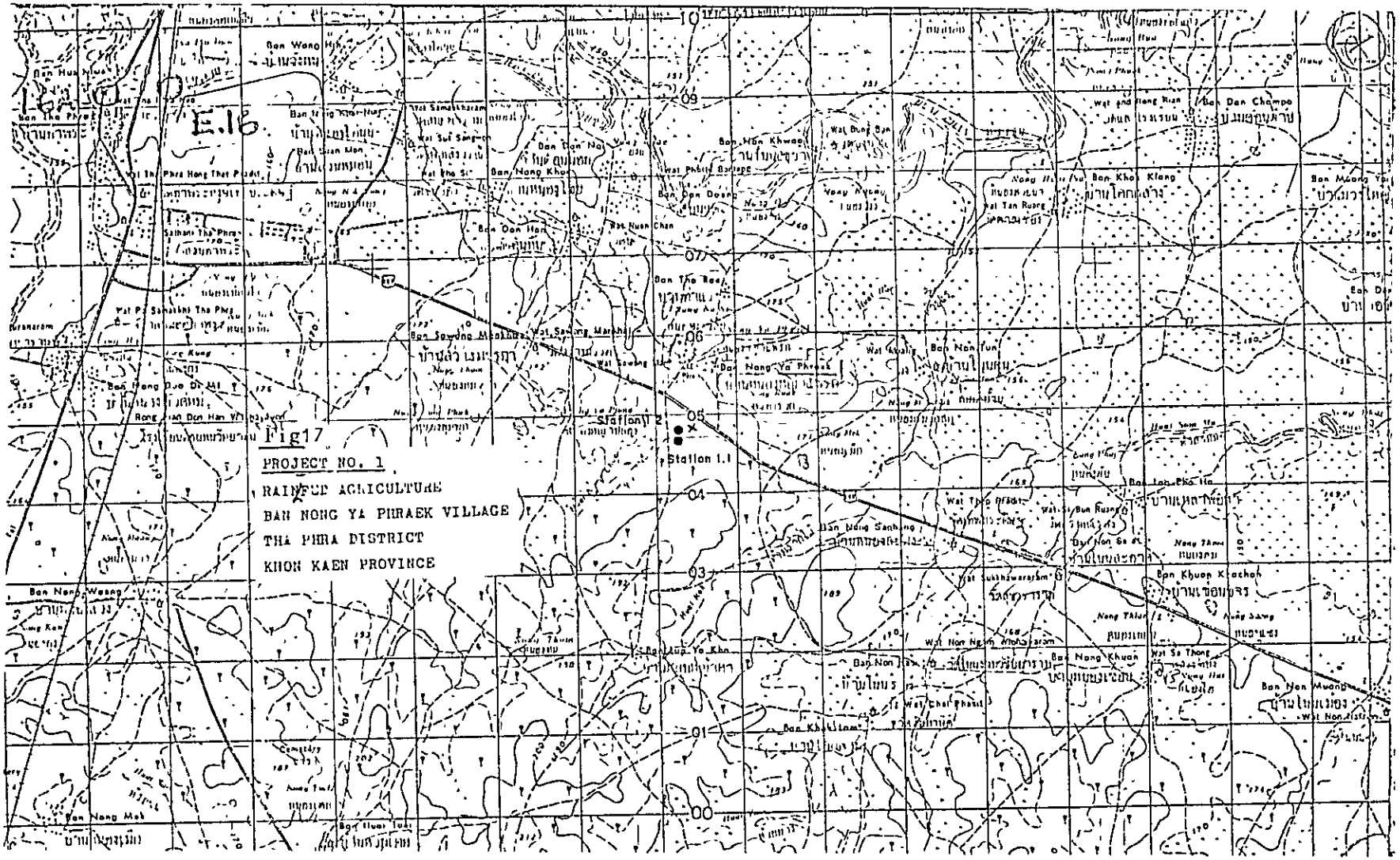


Fig17

PROJECT NO. 1

RAINFED AGRICULTURE

BAN NONG YA PHRAEK VILLAGE

THA PHRA DISTRICT

KHON KAEN PROVINCE

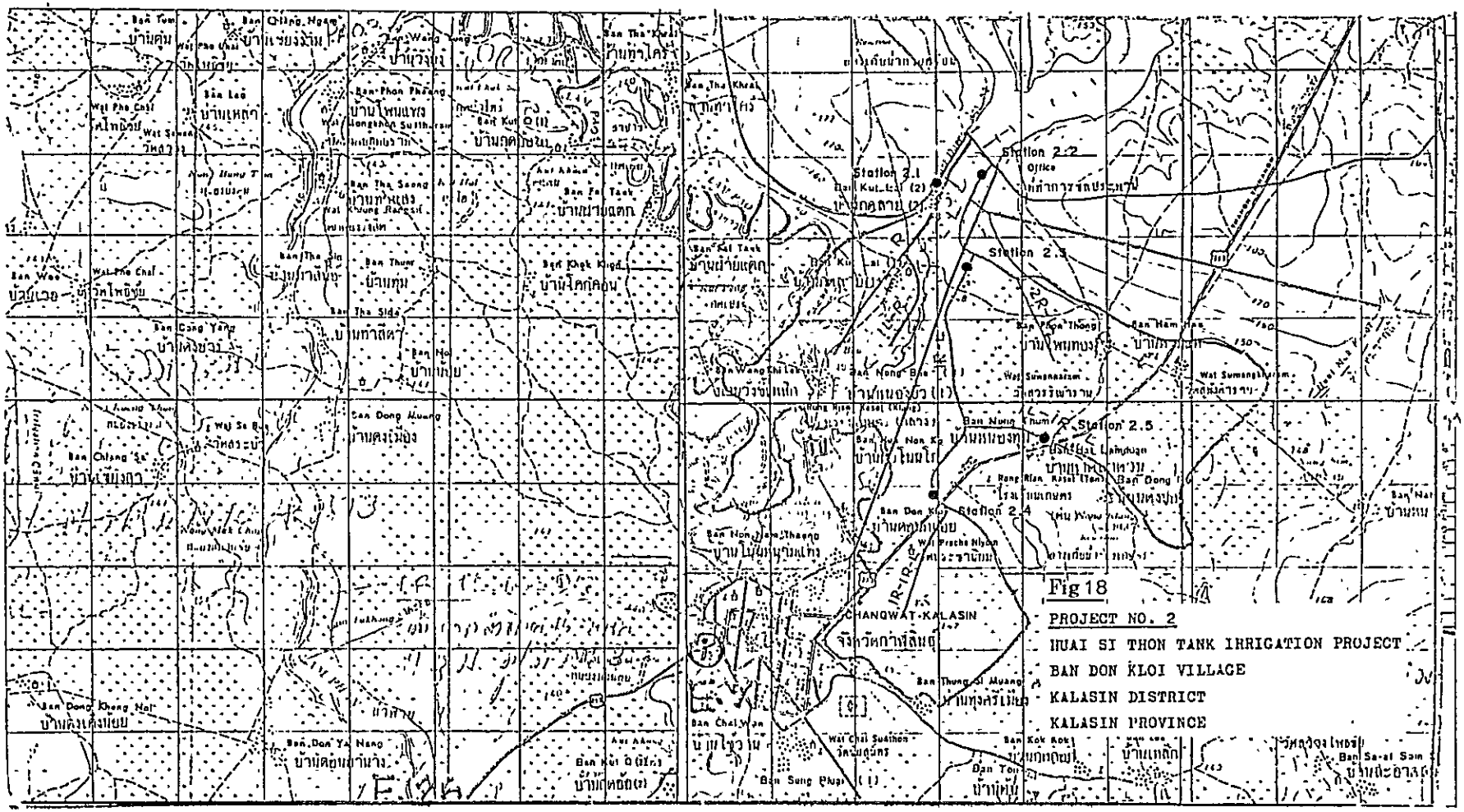


Fig 18

PROJECT NO. 2

HUAI SI THON TANK IRRIGATION PROJECT

BAN DON KLOI VILLAGE

KALASIN DISTRICT

KALASIN PROVINCE

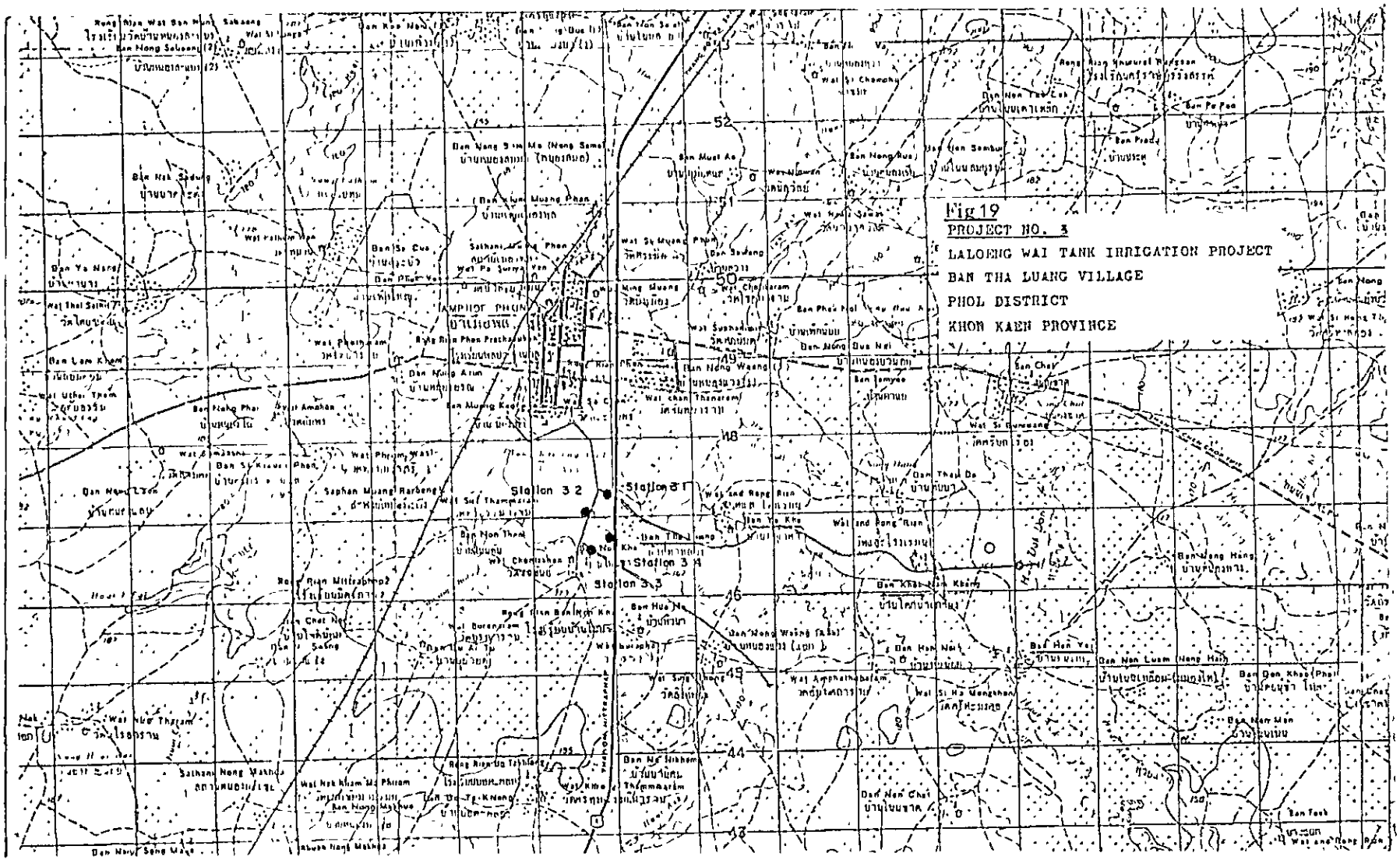


Fig 19

PROJECT NO. 3

LALOENG WAI TANK IRRIGATION PROJECT

BAN THA LUANG VILLAGE

PHOL DISTRICT

KHON KAEN PROVINCE

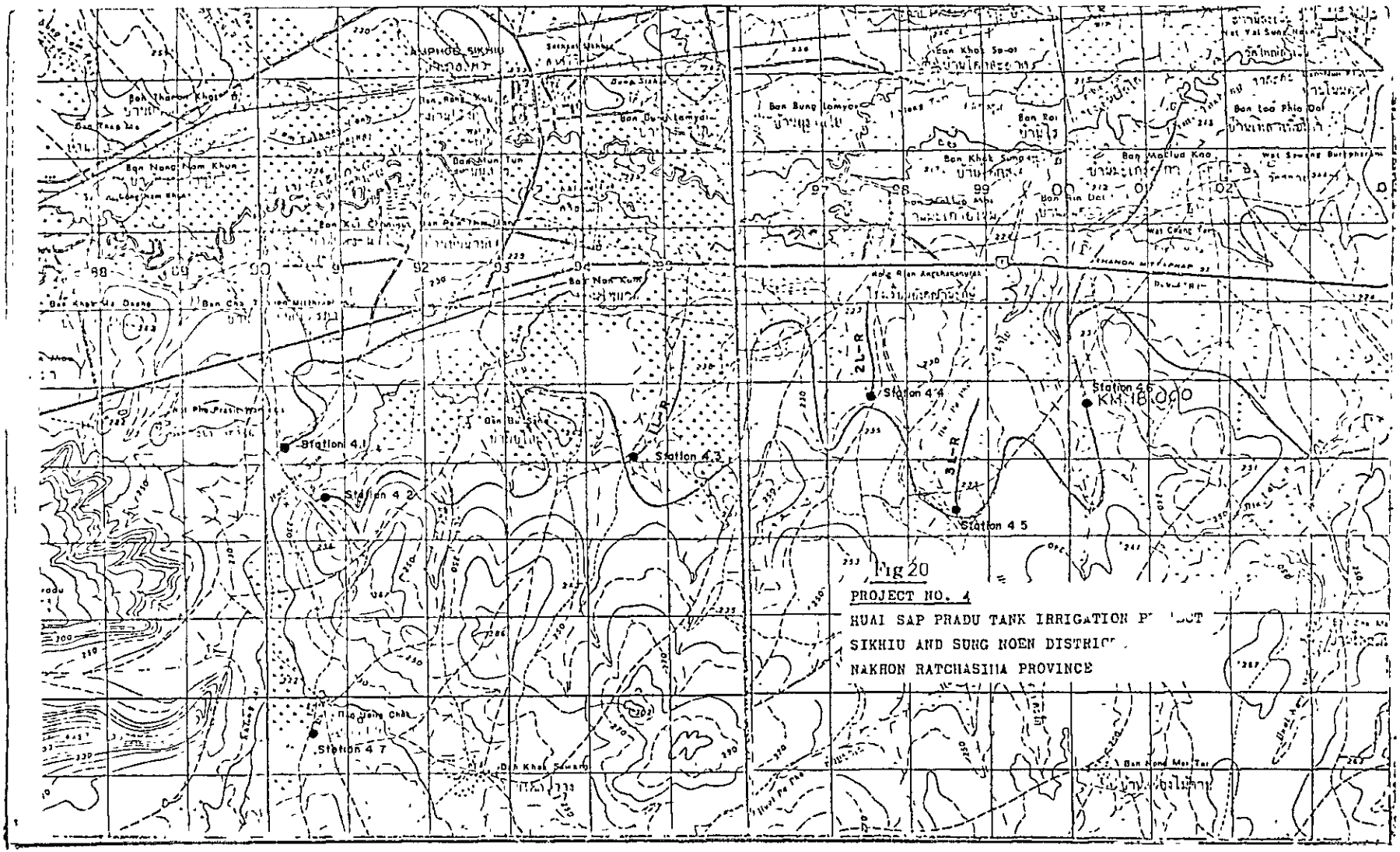


Fig 20

PROJECT NO. 4

HUAI SAP PRADU TANK IRRIGATION P[illegible]OJECT

SIKHIU AND SUNG NOEN DISTRICT

NAKHON RATCHASIMA PROVINCE

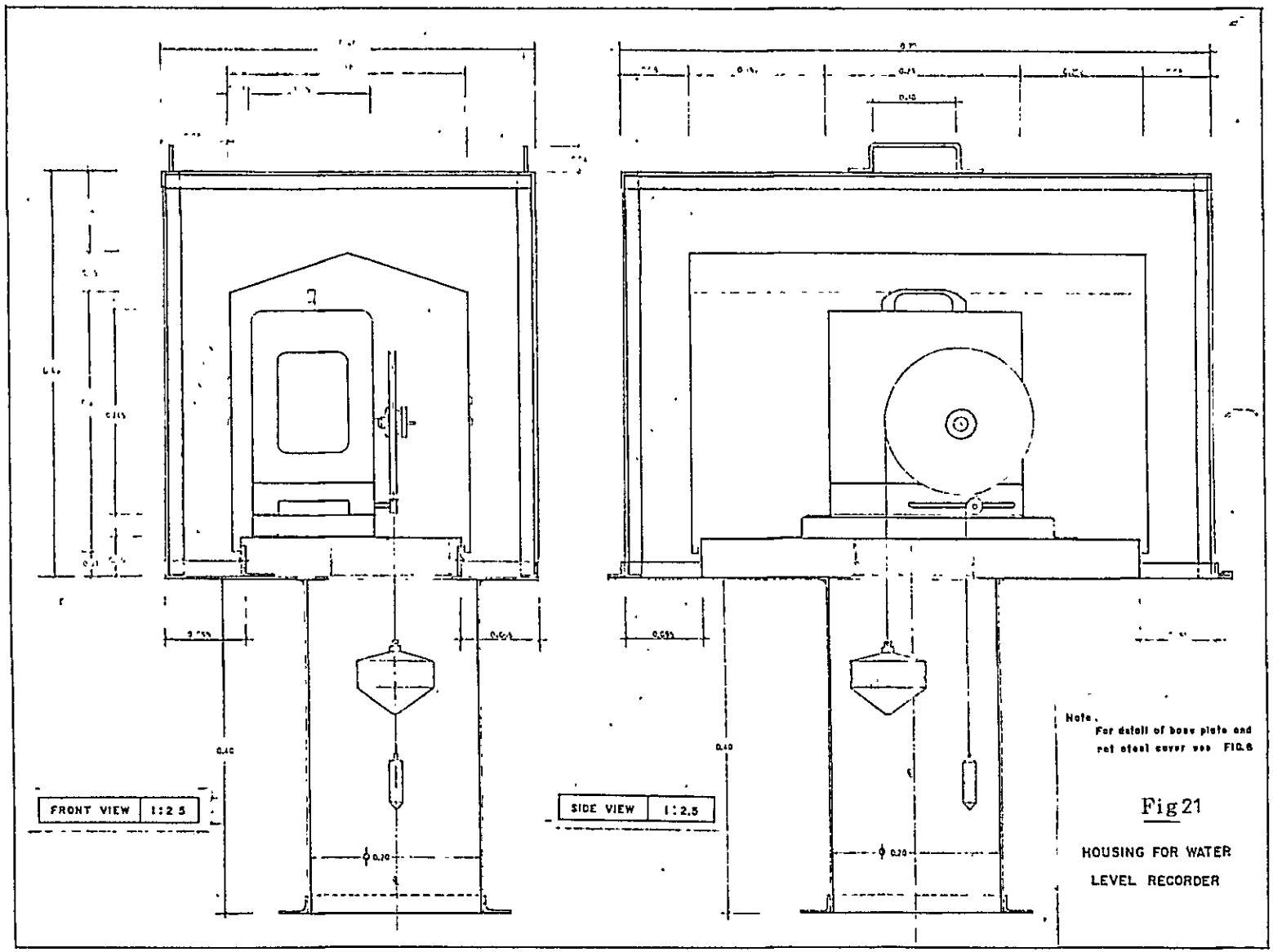


Fig 21

HOUSING FOR WATER LEVEL RECORDER

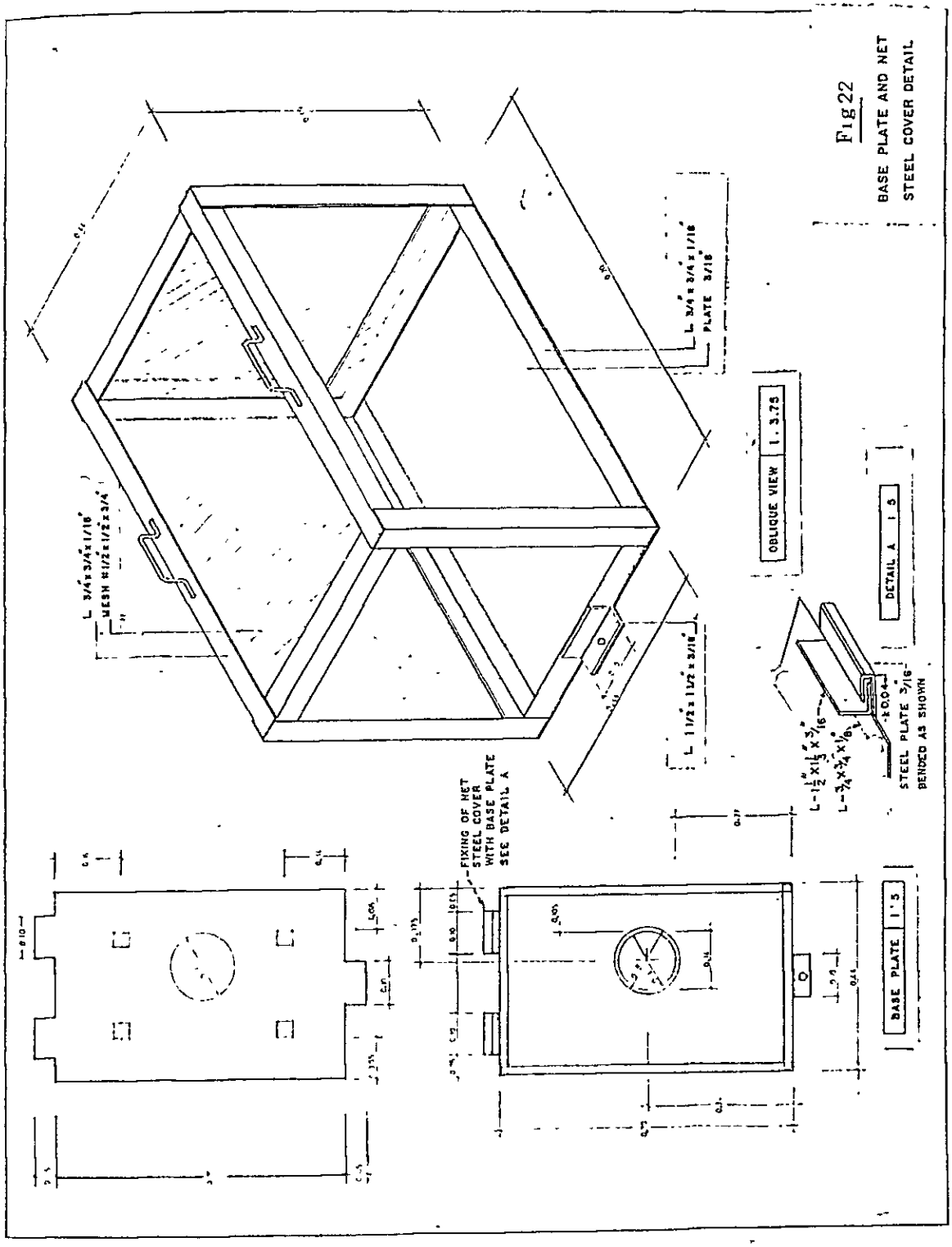


Fig 22

BASE PLATE AND NET STEEL COVER DETAIL

(1) Inspection of Gauging Installation

Hydrological equipment was installed during February and completed at the end of February 1981. The total number of hydro-meteorological equipment comprises 19 units of water level recorders, one automatic raingauge, one evaporation recorder, one sunshine recorder, one humidity instrument and one wind velocity recorder.

The network of Hydro-Meteorology instruments was immediately installed at the areas adopted for the four research projects. Before the installation was completed the estimated cost of installation for all projects was 178,500 Bath. (See the report on survey and design of gauging installations during the trip to the North-east 19-27 December 1980 by Damrong Jaraswathana and Prasert Milintangul). After completion of the work, the actual cost of installation for all projects came to 137,638 Bath. Therefore the average cost for installation of all projects was approximately 7,500 Bath per one station.

One of the purposes of the Japanese and Thai research trip to North-east Thailand during 10-21 March 1981 was to inspect hydro-meteorological installations at various stations for the four selected projects. At present the operation to obtain hydro-meteorological data has been set-up. The data obtained will be useful to analyze the water use/control and water balance study in the next phase, phase two, of this research project.

3-3 An annual meeting of the Water Users' Association.

This was originally aimed at the participation of the annual meeting of the Water Users' Association at Subpradu Reservoir which was scheduled to take place at Ban Makluamai Amphur Sung Neon on the 25th of February 1981. The researcher was actually invited during the last trip by the President of the Association himself. Since this meeting only takes place once a year and its members are in fact the target group for the whole Korat it was considered most valuable to go and join them. At the meeting the researcher was presented to the whole meeting and given a chance to explain briefly the objectives of the Toban N.E. Thai Project so that the villagers could be more aware and, as a consequence, be more cooperative in the future. The size of the meeting was approximately 500 people.

Many government officials and many village leaders, especially the whole group of the Executive Board of the Water Users' Association at Subpradu, attended. The agenda of the meeting was as follows:

(i) Scope of Irrigation

Scope of Irrigation work and its coordinating problem with the association.

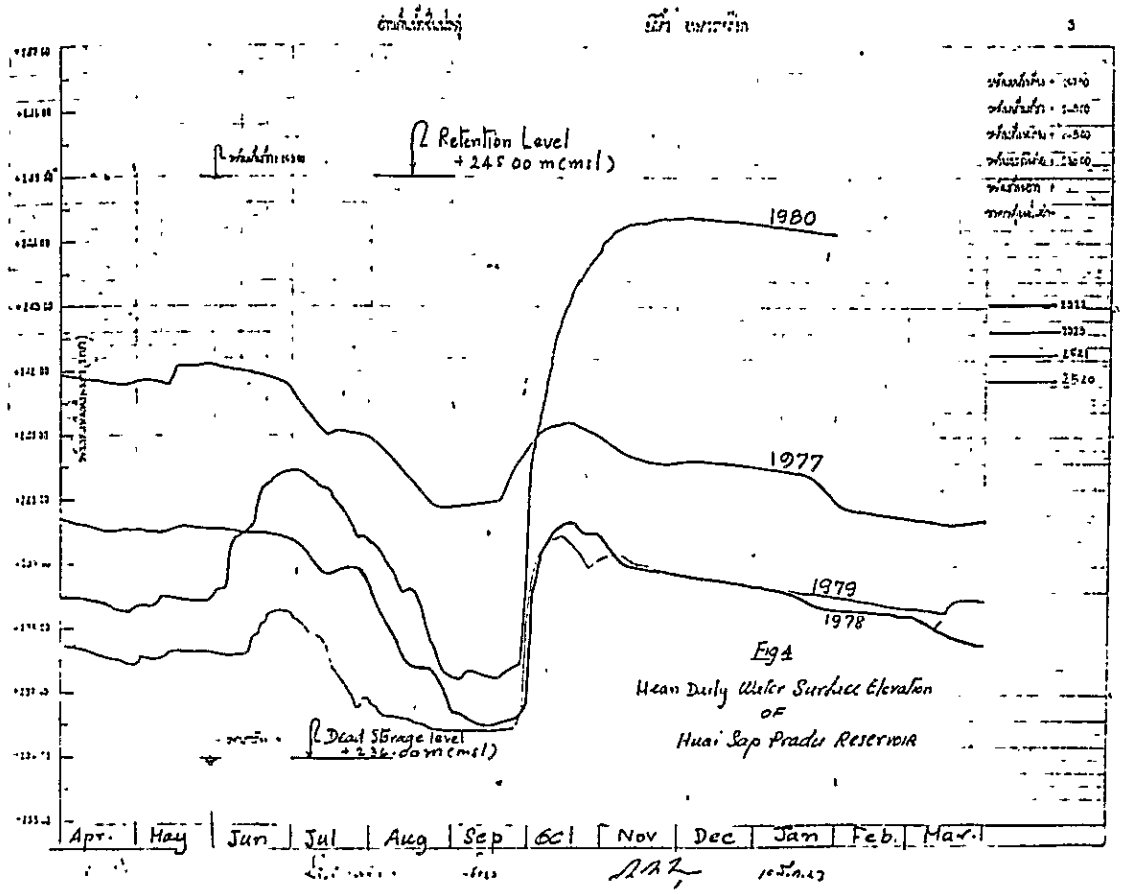


Fig.23 Record paper

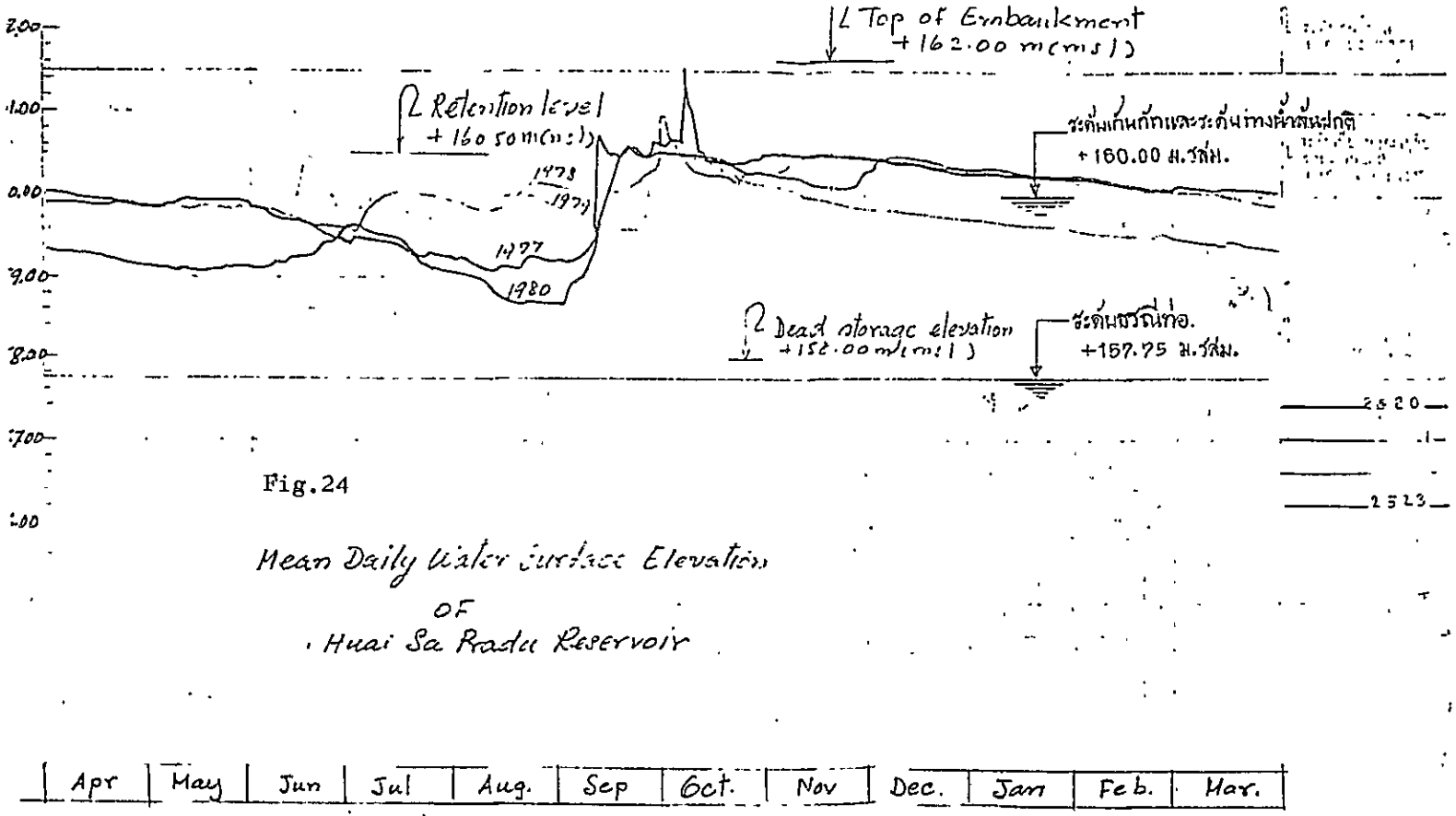


Fig.24

Mean Daily Water Surface Elevation

OF

Huai Sa Rade Reservoir

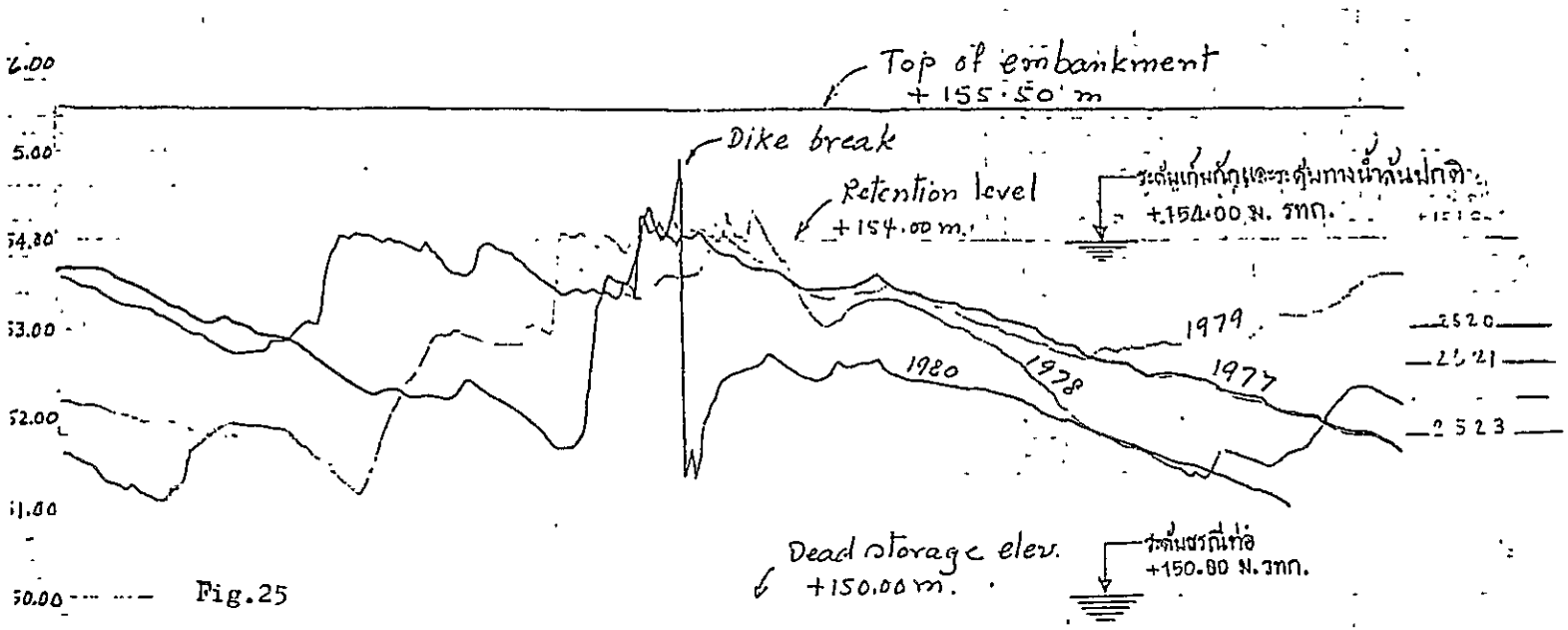


Fig.25

Mean Daily Water Surface Elevation

OF

Huai Si Thon Reservoir.

This was explained by the Director of Irrigation Project, Region 6 (Korat office)

(ii) Agricultural Extension

An agricultural Extension Project concentrating particularly on a special technique of rice-farming, called in Thai, Na Num Tom. It was learned here that Na Num Tom would lower the cost of rice production and at the same time help increase rice productivity in terms of the amount of paddy gained per rai. What is most interesting is that Na Num Tom will consume much less water compared with the traditional rice-farming technique. The researcher therefore suggested that Na Num Tom will be emphasized in the production study. There are now many demonstration farms organized by the Department of Agricultural Extensions.

(iii) Newly Established Water Users' Association

This was explained by the President of the Association, Mr. Yos Perleumpa. This water users' group can be legalized by registration with the Royal Irrigation Department. The Main objective in having water users' groups is to be effectively able to have a water charge from water users for production purposes. However, the water users' groups which are newly established by the Government are not at all in conflict with the Association since the Association will from now on be divided into many groups. For example, in the Subpradu Association it has been divided into 86 groups, therefore it is clear that the groups are very small (including sometimes 5-6 members) and every group will be under the administration of the Water Users' Association. With regard to the water charge of a maximum of ฿ 20 per rai, the members agreed to pay only ฿ 1 per rai since the bottom rate is not fixed in the regulations.

(a) Property holding of Irrigation Faculties.

After completion of the irrigation project construction, all facilities belong to the Government's Royal Irrigation Department. An RID member is participating in maintenance and operation at present.

If this situation continues in the future, the number of operater's, RID officers, will become very large, and this will create a heavy burden on the financial budget.

The proposal to solve this problem is that although the property belongs to RID, the right to operate those facilities belongs to the Water Users' Association. There would be a new stimulus for cooperation among all farmers to maintain the facilities in good condition.

(b) Multipurpose Utilization of Irrigation Facilities.

In order to strengthen the function of the Water Users' Association, multipurpose utilization of tanks is being considered, as follows:

ⓐ Drinking water.

The irrigation facilities, tank and canal, become reliable facilities for supplying drinking water for humans.

The other Utilization is for animal raising and for miscellaneous use in farmers' activities.

ⓑ Irrigation water.

Irrigation for rainy season irrigation and for dry season irrigation can be expected as in the original plan.

(c) Natural disaster.

This will be dealt with in the following item.

ⓐ Salinity accumulation on upland crop area.

ⓑ Instatility of Water in drought season.

(iv) Setting up of Water rights for the farmers in the benefit area.

So far water is used by farmers like air, without any constraint, but naturally there are large peculiarities concerning flow characteristics of river flow.

These peculiarities can be easily understood if the flow characteristics of a river in North-east Thailand are compared with Japan, for example, the Toban district in Japan.

a) The difference of direct flow intake between North-east Thailand and Japan.

The comparison of annual run-off rate, 0.8 Japan and 0.15 Thailand, shows a large difference in effective rainfall.

Also, in the dry season sometimes there is no flow in rivers in North-east Thailand, but in Japan some discharge occurs all year round.

Japanese water rights can be defined at the 10th from lowest discharge in a year. This discharge has become the reliable discharge.

Then, irrigation projects designed actually utilizing these discharges can guarantee water all year round. If this discharge is defined in a drought year, once per 10 years, drought disasters in irrigation projects can be avoided almost completely.

But in North-east Thailand, there are large differences of discharge between the rainy season and the dry season. There is discharge in rivers only in the rainy season, but there is no discharge in the dry season, in small tributaries.

The Thai Government is conducting irrigation planning by using the mean flow of rivers in drought years. Then, there are sometimes drought disasters even though the irrigation plans have been completed.

Thus, reservoir planning should be employed. Then, with regard to the water rights of the river water for direct utilization, there are large differences between Japan and Thailand.

The reliability on water rights in North-east Thailand is very unstable so far.

(v) Water rights for reservoirs

In North-east Thailand the only method of setting up reliable water rights is to construct reasonable scale reservoirs.

Concerning agricultural reservoir construction, there are large differences between Japan and Thailand.

a. Agricultural reservoirs in Japan

The design for irrigation planning of reservoirs is performed according to a special method, namely, the water balance for reservoirs are calculated for the large reservoirs and the carry-over over 10 years are checked.

b. Agricultural reservoirs in North-east Thailand

The variation of discharge of river has seasonal variation in dry and rainy seasons and also there are large variations from year to year. To develop water resources for irrigation these variations must be resolved.

To complete these year scale variations the carry-over method using year-to-year is the basic analysis method.

According to these characteristics the planned storage for each reservoir becomes comparatively larger than for Japan.

Thus, for large reservoirs the year-to-year carry-over method can be adopted, and farmers can raise paddy rice in the rainy and dry seasons.

But for small reservoirs the main season is the rainy season, and in the dry season only some parts of paddy fields can be irrigated.

4. AGRICULTURAL CO-OPERATIVES AND SMALL SCALE RURAL DEVELOPMENT

Photo 3 Office of Agricultural Cooperative

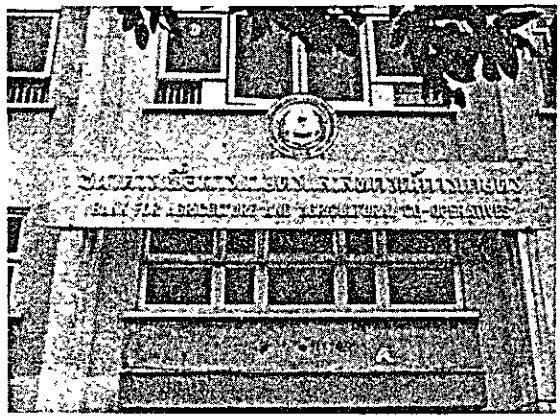


Photo 4 B.A.A.C.

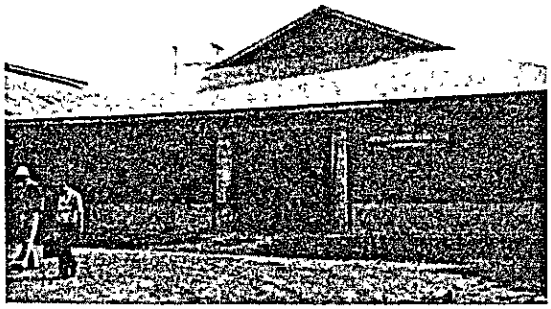


Photo 5 Mill factory

Photo 6 Mill machine

4-1 The Significance of Agricultural Cooperatives for Small-Scale Rural Development in North-east Thailand.

(i) General problem.

The economic-marketing situation for agriculture is underdeveloped in North-east Thailand, and the transaction and transportation of commodities such as agricultural products and fertilizer is under the control of middle-men. This region is located at a great distance from Bangkok, and there is no large consumption city, only scattered small cities of tens of thousands of people, therefore, the economic-marketing conditions in the location are not good. But it is possible to transport agricultural products to consumption areas at a distance if developed main roads are developed.

Water use conditions in the North-east region are not effective but most of the region is a rain-fed area, therefore agricultural production is always unstable and risky owing to problems caused by drought and flood.

In these conditions, the peasant farm is dominant, and it is mainly rice farming, and though many farmers are land-owners, they are generally subsistent and poor. The agricultural productivity such as rice productivity per hectare is low and unstable, therefore the settlement of farm families is not stable; they sometimes leave their village as a result of natural disasters and the economic deppression, and this phenomenon is responsible for lack of cooperative activity.

The agriculture in North-east Thailand is unfavorably low level with respect to the natural, economic and social situations. So, this region is virgin land for developing agriculture, therefore the rural development problem in this region is a most meaningful and fresh problem, as if drawing a picture on a blank sheet.

(ii) Tank Irrigation and Development of Agricultural Production.

There are already a few small irrigation areas using tanks scattered around North-east Thailand, and the agricultural production is quite stable in these areas. Some cases of tank irrigation were seen, so the effects of tank irrigation are pointed out as follows: By irrigation, unstable farms as rain-fed rice farming progress gradually to get increasing and stabilizing farm productivity, in order to use the land more and labour more intensively by (1) increasing rice productivity per hectare (2) increasing cropping (3) rotation of cropping. Additionally, the selling of agricultural products and purchasing of productive materials keeps up at the same time, and the farm economy develops from the subsistence farming to commercial farming. Because of this, the farmer's income and their standard of living increases and becomes stable.

The development of such farming and farmer's economy by tank irrigation can be seen in unit area such as a small village with 50 to 100 farm families, and by its measure strengthens the settlement of farm families in this area. Therefore, a cooperative activity of farmers could begin through the formation of rural organization such as a water use group. But the development and the management of the tank irrigation system is done by the government, and the water use cost has the characteristic of public cost, tax.

(iii) Possibility of Agricultural Cooperative's formation.

Even in the tank irrigation area, the agricultural cooperative does not generally still exist, but some of its early formation was seen in parts of the tank irrigation areas. The formation of agricultural cooperatives depends on developments of various external economic factors, and the following internal factors in the tank irrigation area: (1) establishment of the farmer's settlement, (2) Progression of cooperative activity through the formation of a water use group, (3) commercialization in the transaction of agricultural products and materials, (4) stabilized and decreased risks in farming. These factors together are necessary for farmers to co-operate in their economic activities.

A representative case was observed in Sap Pradu agricultural co-operative near Korat, and its functions covered the range of finance, selling, supply, and training. The power of membership, functions and management in the agricultural cooperatives are not necessarily strong now, but if this turning point is reached, a long-term increase of farmers' family welfare by co-operative activity of agricultural co-operatives can be expected.

(iv) Significance of Small-scale Rural Development.

The following conclusion was reached. The method of small-scale rural development is the suitable method applied to a small unit of water use area. In this method, the farmers' opinions and desires are respected, and instant effectiveness is expected for the development, further, an increase in the farmers' merits can be expected, while avoiding the pressure of middle men and the capitalist sector by the formation and the activities of agricultural co-operatives. Therefore, this method as against the large scale method has more important merits that go to improve more rapidly the farmer's socio-economic situation. The theory and method of small-scale rural development have to be established for similar developing regions such as South-east Asia.

(v) Future Research Planning (1980-1982) in North-east Thailand and the Toban area.

a. Farm and Farm family items.

(1) Actual activity of Farm management.

(2) Actual activity of Household and Family life.

(3) Consciousness and attitude of Farmer
(to Irrigation development, Water use association, Land use rotation, Agricultural cooperative, Rural consolidation, Drinking water service, Disaster, etc.).

(4) Materials and Reference.

b. Agricultural cooperative items.

(1) Case study of agricultural co-operatives
(Organization, Function, Management).

(2) Institution, law, articles, accounting, inspection, of agricultural co-operatives.

(3) Agricultural co-operative federation (Organization, Function).

(4) Institution and actual activity of agricultural finance.

(5) Necessity, formation conditions and method of agricultural cooperative.

(6) Materials and Reference.

c. Rural society and Rural history items.

(1) Conditions of agricultural location.

(2) Village construction.

(3) Land ownership and land use.

(4) Organization and management of water development and water use association.

(5) Transaction organization.

(6) Disasters and farmers' behaviour.

(7) Material and Reference.

4-2 The Essentials of The Co-operative Society Act, 1968

A "Co-operative Society" means a group of persons who jointly conduct affairs for mutual assistance and are registered under this Act (section 4).

There are two kinds of co-operative societies:

① A limited co-operative society is a co-operative society, the liability of a member of which is limited to the amount of money remaining unpaid on the shares held by him;

② An unlimited co-operative society is a co-operative society, the liability of all members of which is joint and unlimited for all its obligations (section 7).

The type of co-operative society accepted for registration shall be prescribed by Ministerial Regulations (section 8)*.

* [According to the Ministerial Regulations which were notified on the 2nd of October, 1973 and have since come into force, the types of co-operatives acceptable for registration are as follows:

1. Agricultural co-operatives.
2. Fishery co-operatives.
3. Settlement co-operatives.
4. Consumers' co-operatives.
5. Service co-operatives.
6. Savings co-operatives.

A group of not less than ten persons which may be registered as a limited co-operative society must have capital which is divided into shares of equal value and each prospective member must hold at least one share but not more than one-fifth of the total number of shares (section 11).

Any limited co-operative society having more than five hundred members may specify in its regulations that the general meeting may be attended by the representatives of members (section 26).

Each member, regardless of the number of shares that member holds, shall have one vote. In case of an equality of votes, the chairman of the meeting shall have an additional vote as a casting vote (section 30).

At a general meeting, a member or representative of members may not appoint another person his proxy (section 30).

In appropriating the annual net profit of a limited co-operative society, at least ten percent of the net profit shall be set aside as reservers and five percent but not exceeding 5,000 baht of the net profit shall be subscribed to The Co-operative League of Thailand (section 31)*.

* ["The Co-operative League of Thailand" is an institution consisting of members which are co-operative societies having the objective of promoting throughout the country without sharing profit or income (section 104)].

[The Co-operative League of Thailand is a justic person (section 105). Usually it will promote and propagate the activities of co-operative societies as well as conduct research and compile statistics concerning such activities. Sometimes it may provide technical study and training on the activities of co-operatives (section 106). There is an Executive Board of the Co-operative League of Thailand consisting of not less than 12 representatives of co-operative societies elected by a general meeting of the Co-operative League of Thailand and not more than 5 persons appointed by the Ministers as directors (section 108). The Board shall elect a chairman and a vice-chairman or vice-chairmen from its directors (section 108). The Board shall appoint a person whom it thinks fit Director of the Co-operative League of Thailand. The Executive Directors of the Board of the Co-operative League of Thailand shall be in office for a term of two years. A director who vacates office may be reselected.]

The balance of the annual net profit, after deduction of and of subscription to the Co-operative League of Thailand, may be appropriated by the general meeting as follows:

① as divided on paid-up shares;
② as rebate to members in proportion to their business done with the limited co-operative society during the year;
③ as bonus to members of the Board and officials of the limited co-operative society, which cannot exceed 10 percent of the net profit;
④ as accumulated fund for operation of any activity of the limited co-operative society (section 31).

* The reserves under section 31 may be withdrawn from the reserve account only for the purpose of compensating a loss (section 32).

Those who have the power to supervise co-operative societies are as follows:

① The Registrar of Co-operative Societies and his deputy;
② The Inspector of co-operative societies;
③ Auditor entrusted by the Registrar;
④ Competent official entrusted by the Registrar*.

* ["Competent official" means a person appointed by the Minister to carry out this act.]

According to section 35, these persons can issue a written order instructing the Board, examiner, other official, member or representative of members of any limited co-operative society to appear for enquiry concerning the activities of the limited co-operative society or to send a document concerning the operation or minutes of the meetings of the limited co-operative society. They can also enter and inspect the office of any limited co-operative society during its working hours, and the person concerned must provide facilities or assistance or give explanation to such persons as may be appropriate (section 36).

In the case where the Board has caused undue performance of its duties to the extent that it becomes prejudicial to the interest of the limited co-operative society or its members, or the limited co-operative society has caused any mistake concerning its finance or accounts according to the auditing report, or the activities of financial conditions, the Registrar of Co-operative Societies, auditor or inspector of co-operative societies, as the case may be, who has knowledge of or found the mistake, shall give notice to the Board to rectify the mistake in accordance with the methods prescribed by the Registrar within thirty days from the date of receipt of notice. If the rectification has not been made within the prescribed period without justification and the Registrar has the opinion that it is yet inappropriate to order the dissolution of the limited co-operative society under section 51, he shall have the power to issue a written order with which the limited co-operative society must comply, as follows:

① Dismissing the entire Board or the member of the Board who is involved therein;

② Suspending certain acts which cause the mistake or are prejudicial to the interest of the limited co-operative society or its members;

③ Stopping operation for the time being in order that notification of the mistake may be carried out in accordance with the methods and within the period prescribed by him (section 47).

In the case where the Registrar dismisses the entire Board, he shall appoint an interim Board having the same powers and duties as the Board, which shall hold office without delay from the date of appointment. Before vacating office, the interim board shall call a general meeting for the election of new members of the Board in accordance with the procedure prescribed in the Regulations (section 48).

In certain members of the Board are dismissed, the Registrar shall appoint members of the co-operative society members of the Board, and the new members of the Board shall hold office for the term of office of the

persons they replace.

The Registrar has the power to order the dissolution of a limited co-operative society when it appears that:

*① More than one half of the total number of members notify the Registrar in writing that the limited co-operative society be dissolved, and give reasons thereof in detail;

② It has not commenced operation within one year from the date of registration or has ceased its operation for a continuous period of two years from the date of cessation.

③ It is unable to operate successfully, or its operation will be prejudicial to itself or common interest (section 51).

A limited coop. society which is dissolved by the order under section 51 (2) or (3) is entitled to appeal to the Minister within 30 days of the date of receiving the order. The decision of the Minister shall be final (section 52).

4-3 State of Agricultural Co-operatives in North-east Thailand.

(i) Number of Co-operatives and Members in North-east Thailand.

The present status of Agricultural Co-operatives and its members is shown for reference in Table 1 and the Number of registred Agricultural Groups is shown in Table 2.

(ii) Outline of 4 Agricultural Co-operatives in Korat Province and Khon Kaen Province.

Some basic information on the selected Agricultural Co-operatives in the research area, Korat Province and Kohn Kaen Province, is given in Table 3 and Table 4.

Table 5 shows the rural population in Khon Kaen Province.

(iii) A case study of Sungnern Agricultural Co-operative Ltd. in Korat.

One of the most successful agricultural co-operatives in Korat is undoubtedly "Sungnern Agricultural Co-operative Ltd.". This co-operative society was the very first to be awarded the prize by the Ministry of Agriculture and Co-operatives in 1974. Since then, its assets have increased tremendously from 7.6 million baht in 1973 to 21.5 million baht in 1980, or around a 183% increase. As regards the membership, it has increased from 838 to 1,547 during the same period, or an 84.6% increase. The profit is up from 504,248 baht to 887,867 baht or a 76.1% increase, also during the same period.

Table 4. Number of Cooperatives and Members by Type of Cooperative at December 31st 1977

Agro-Economic Zone	Cooperative Federations		Agricultural Cooperatives		Fishery Cooperatives		Land Cooperatives	Services Cooperatives		Industrial Cooperatives		Consumers' Cooperatives		Thrift and Credit Cooperatives	
	Number of Federations	Number of Cooperatives	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members	Number of Cooperatives	Number of Members
Zone 1	1	–	61	49,002	–	–	1	221	11	26,107	5	7,973	2	395		
Nakhon Phanom	–	–	14	10,424	–	–	1	221	2	5,498	1	2,649	–	–		
Loei	–	–	9	6,463	–	–	–	–	2	2,816	1	1,352	–	–		
Sakon Nakhon	1	–	14	12,434	–	–	–	–	2	5,402	1	2,821	1	77		
Nong Khai	–	–	9	6,480	–	–	–	–	2	2,877	–	–	–	–		
Udon Thani	–	–	15	13,201	–	–	–	–	3	9,514	2	1,151	1	319		
Zone 2	1	–	27	22,034	–	–	1	472	8	14,383	4	3,980	1	191		
Yasothon	–	–	7	3,067	–	–	–	–	2	2,700	1	178	–	–		
Ubon Ratchathani	1	–	20	18,967	–	–	1	472	6	11,683	3	3,802	1	191		
Zone 3	2	–	53	54,710	–	–	–	–	11	21,205	6	7,559	–	–		
Kalasin	–	–	11	10,601	–	–	–	–	2	5,194	–	–	–	–		
Khon Kaen	1	–	19	20,059	–	–	–	–	5	6,639	4	3,027	–	–		
Maha Sarakham	1	–	9	12,653	–	–	–	–	2	4,116	1	633	–	–		
Roi Et	–	–	14	11,397	–	–	–	–	2	5,256	1	3,899	–	–		
Zone 4	2	–	39	34,673	–	–	1	882	10	19,369	3	1,748	3	300		
Buri Ram	1	–	15	11,606	–	–	1	882	4	6,638	2	253	2	257		
Si Sa Ket	–	–	11	11,928	–	–	–	–	2	5,993	1	1,495	1	43		
Surin	1	–	13	11,139	–	–	–	–	4	6,758	–	–	–	–		
Zone 5	1	–	40	37,665	–	–	2	2,601	5	16,612	5	4,612	1	21		
Chaiyaphum	–	–	15	9,359	–	–	1	1,423	2	5,271	1	308	–	–		
Nakhon Ratchasima	1	–	25	28,306	–	–	1	1,178	3	11,341	4	4,304	1	21		

Table5 Number of Registered Agricultural Groups by Occupation at December 31st 1977.

Agro-Economic Zone	Total number of agricultural groups	Number of Agricultural Groups							
		Rice farming	Upland farming crop	Gardening orchard	Livestock raising	Silk worm raising	Fisheries	Fresh water fisheries	Mush room nursery
Zone 1	249	170	64	2	13	–	–	–	–
Nakhon Phanom	29	26	1	–	2	–	–	–	–
Loei	40	2	34	1	3	–	–	–	–
Sakon Nakhon	21	19	1	–	1	–	–	–	–
Nong Khai	41	32	8	–	1	–	–	–	–
Udon Thani	118	91	20	1	6	–	–	–	–
Zone 2	122	112	8	2	–	–	–	–	–
Yasothon	24	23	1	–	–	–	–	–	–
Ubon Ratchathani	98	89	7	2	–	–	–	–	–
Zone 3	262	209	23	–	24	6	–	–	–
Kalasin	49	39	8	–	1	1	–	–	–
Khon Kaen	(103)	(75)	(15)	–	19	4	–	–	–
Maha Sarakham	35	30	–	–	4	1	–	–	–
Roi Et	75	75	–	–	–	–	–	–	–
Zone 4	198	180	12	–	4	2	–	–	–
Buri Ram	53	50	2	–	–	1	–	–	–
Si Sa Ket	88	74	10	–	4	–	–	–	–
Surin	57	56	–	–	–	1	–	–	–
Zone 5	202	137	49	1	14	1	–	–	–
Chaiyaphum	94	63	19	–	12	–	–	–	–
Nakhon Ratchasima	(108)	(74)	(30)	(1)	(2)	(1)	–	–	–

Table 6 Agricultural Cooperatives in Korat Province (Supradu Area).

Information	Sungnern Ag. Coop. Ltd.		Sikhiew Ag. Coop. Ltd.	
	1979	1980	1979	1980
Farmers groups	20	20	20	21
Total members	1,623	1,547	1,138	1,406
Assets (million ฿)	24.65	21.54	13.73	16.61
Purchasing volume (million ฿)	4.00	1.38	2.04	1.38
Selling volume (million ฿)	5.29	0.23	3.97	1.58
Net profit/loss (million ฿)	0.72	0.89	0.61	0.84

Table 7 Agricultural Cooperatives in Khon Kaen Province.

Information	Muang Kohn Kaen Ag. Coop. Ltd.		Muang Pol Ag. Coop. Ltd.	
	1979	1980	1979	1980
Farmers groups	136	136	42	43
Total members	3,568	3,447	1,966	2,119
Assets (million ฿)	29.27	28.49	10.59	14.30
Purchasing volume (million ฿)	0.94	0.01	1.28	1.46
Selling volume (million ฿)	0.24	0.05	0.86	0.76
Net profit/loss (million ฿)	1.01	0.97	0.30	0.51

Table 8. Rural population in Khon Kaen province.

Amphurs	Rural Pop.(1)	Total Pop.(2)	$\frac{(1)}{(2)} \times 100$
Muang Khon Kaen	55,280	158,290	34.9
Ban Pai	99,851	125,930	79.3
Muang Pol	51,403	63,234	81.3
Chumpae	56,754	103,548	54.8
Num Pang	72,468	87,787	82.5
Phu Vieng	88,247	94,219	93.7
Manchakeeree	77,942	83,749	95.5
Nong Rua	69,885	76,920	90.9
Kra Noan	65,941	77,174	85.4
Nong Song Hong	53,133	59,881	88.7
Channabot	34,881	44,199	78.9
Si Chompu	45,570	52,000	87.6
Wang Noi	35,375	38,043	93.0
Ubolrat	26,570	34,891	76.2
Ban Fang	48,858	48,858	100.0
Pra Yoen	29,073	29,073	100.0
Wang Yai	26,160	26,160	100.0
Puey Noi	17,066	17,066	100.0
Kaosuankwowng	20,406	27,983	72.9
Total	985,883	1,249,005	78.9

In a preliminary analysis, the progress of this co-operative considered both in terms of its membership and of the annual profit has not been so impressive. One reason is certainly the poor management. Corruption certainly loomed up in the society. The co-operation from the members is very good, evident from the fact that almost 100% of paddy products by members are sold through the co-operative.

This co-operative has been one of those which were chosen for the management audit during Phase II.

4-4 Socio-economic status of villages, agricultural production and farmers' organizations in North-east Thailand.

———Outcome of the field survey in villages of project site———

The field survey in 5 villages in North-east Thailand was conducted over the period March 10th to 21st 1981. The 4 villages were research project sites but other one village was not a project site.

The main objectives of the survey were to consider the following items;

ⓘ The present status of village, agricultural production and farmer's organizations

ⓘⓘ The relationship between these.

The questionnaire Form A was used in the survey. Through the information, the data in the survey may be rough and insufficient, especially on No. 3 village, but it is possible to carry out problem finding and make a first approach to the subject. The outcome and the problem are as follows:

(i) Present status of village and agricultural production.

(a) Village location and year of establishment.

The name, the location and the year of establishment of 4 villages and the other one village are as follows.

No. 1 : Ban Nong Ya Phraek, Kohn Kaen Province
Amphur Kohn Kaen, Tanbon Don Hun
established 74 years ago.

No. 2 : Ban Don Kloi, Kalasin Province, established
Amphur Muang, Tanbon Nua
in 1914-5.

No. 3 : Ban Nong Ya Kha, Kohn Kaen Province
Amphur Phol, Tanbon Muang Phol.

No. 4 : Ban None Kum, Korat Province, established 64 years ago
Amphur Sikiu, Tanbon Sikiu.

No. 5 : Ban Nong Sroung, Roi Et Province, established
Amphur Pone Sai
more than 400 years ago.

(b) Village area and Households

The village area and the number of households in each village are given in Table 1 and Table 2. Typically, the village map of No. 1 village Ban Nong Ya Phraek is shown as Figure 1. As shown in Table 1, the total area of each village varies between the largest village No. 1 and the smallest village No. 2. Table 2, the total number of households in each village varies between the greatest village No. 4 and the least village No. 5, and the ratio of part-time farmer households to the total number of farmer households varies between the greatest in village No. 3 and the least in village No. 5.

Table 9 Village Area

(Rai)

No. of Village		1	2	3	4	5
Land for housing and garden		225	85	120	300	40
Farm land	Paddy land	3,300	1,300	2,100	2,200	1,000
	Upland	2,500	100	100	(3,000)[x]	300
	Orchard	-	-	-	-	-
	Pasture, Meadow	-	-	-	xx	-
	Total	5,800	1,400	2,200	5,200	1,300
Other land		-	-	-	-	800[xxx]
Total		6,025	1,485	2,320	5,500	2,140

Note: x Other crops 400 t, ( ) tapioka cropping area

xx Soybean 300 t

xxx Public land

Table 10 Number of Households in Villages

(Number of households)

No. of Village		1	2	3	4	5
Agriculture	Full time farm household	149	60	-	140	35
	Part time farm household	30	10	80	150	2
	Total	179	70	80	290	37
Non Agriculture	Farm labourer's household	4	-	30[x]	24	-
	Household operating business	-	5	4	6	-
	Household whose members are hired by others .	4	-	x	-	-
	Total	8	5	34	30	-
Total		187	75[xx]	114	320	37

Note: x Sum up

xx One village in two village

(c) Land-ownership and Tenant.

Table 3 shows the status of land-ownership and tenant, as the household number of landowner operator and land tenant. In village No. 1, No.2, No. 5, there are no tenant households, but 3 full tenants in village No. 3 and 25% of all farm households are tenants in village No. 4.

The size of land-ownership is shown in Table 4. It is scattered over a wide range among the villages. The factors involved in this difference are believed to be according to the differences in natural conditions, socio-economic conditions, etc. In village No. 4, having a large number of tenant, the average size of cultivated land per farm household (owner operator households plus tenant households) is smaller than the average owned land size per landowner.

Table 11 Number of owner operator households and Tenant households.

(Number of households)

No. of Village		1	2	3	4	5
Farm household		179	70	80	290	37
Owner operator household		179	70	77	218[x]	37
Tenant household	Full tenant	-	-	3	18[x]	-
	part tenant	-	-	-	54[x]	-
	Total	-	-	3	72[x]	-

Note: x Approximately 75% (25%, 75%)

Table 12 Size of Land-ownership (Paddy land)

No. of Village		1	2	3	4	5
Land size per farm household	Minimum size	x	6	x	0	0[xxx]
	Maximum size	x	40	x	100	50
	Average size	19 xx	19 (20)	27 (29)	10 (10)	27 (35)
	Family supported size	x	20-25	x	10	
Number of farm households classified by land size	-10 Rai	20%	x	-	x	x
	10-20	70	x	33%	x	x
	20-30	9	x	6	x	x
	30-50	1	x	61	x	x
	50-	-	x	-	x	x

Note: x Unknown

xx ( ) = paddy + upland

xxx 3 farm households use public land

(d) Irrigation, Drought and Flood ----- stability of Agricultural Production

The situation of irrigation in each village is shown in Table 5. The village No. 1, is in the non-irrigated area, and villages No. 2, No. 3, No. 4, are in the irrigated area, and village No. 3 is in the saline area. In the 3 irrigated villages, the type of irrigation is decided by the RID, and the source of irrigation water is mostly from the tank water. The irrigation months a year are regularly May-Aug. in No. 2, May-Sept. in No. 3, and July-Aug. in No. 4, and sometimes according to the request of farmers in the dry season, etc.

The reliability of irrigation water supplies is shown in Table 6 as the ratio of cultivated area to which irrigation water supplies are reliable. It is noticed that the water supplies are insufficient partially and seasonally even in the irrigated villages, and are hardly reliable in the non-irrigated villages.

Table 7 shows drought and flood occurrence in each village over 10 years. Droughts and floods do not occur in the same year. The frequency of droughts and floods is 7 times in village No. 1 and No. 5, 4 times in No. 3, twice in No. 2, and once in No. 4. This frequency is almost contrary to the water supply reliability. This is clear when comparing Table 6 and Table 7. The degree of damage (in the meaning of rice yield per rai) by drought and flood is very severe, especially in village No. 5 and No. 1.

It is understood, then, given the above-described facts, from the relation between Table 5, Table 6 and Table 7, the irrigation and the water supply reliability lead to at least the stability of agricultural production, and it is shown in this survey that the irrigation is effective in increasing the productivity, as rice yield per rai.

As shown in Table 5, the source of drinking water in each village is mainly from rainfall and wells, and scarcely from tank and river. Villagers used the pipe system for supplying drinking water from small tank in only one research project.

Table 13 Irrigation and Drinking water

No. of Village		1	2	3	4	5
Paddy land (Rai)	Irrigation area	-	1,300	x	2,200	-
	Non irrigated area	3,300	-	x	-	1,000
	Total	3,300	1,300	x	2,200	1,000
Upland (Rai)	Irrigated area	-	100	x	x	-
	Non irrigated area	2,500	-	x	x	300
	Total	2,500	100	x	x	300
Type of irrigation	RID	m	RID	RID	RID	
	Local	m	-	-	-	
Source of irrigation water	Tank	(Tank)[xx]	Tank	Tank	Tank	
	River	m	-	-	-	
Irrigation Calendar	Month		May-Aug.	May-Sept.	July, Aug.[xxx]	
	Request		Request	-	Request	
Source of drinking water	Rainfall	R	-	R	R	-
	Well	W	-	W	W	W
	River, tank	-	-	-	-	-
	Others	-	0[xxxx]	0[xxxxx]	0[xxxx]	-

Note: x Unknown; xx Tank for vegetables; xxx Supradu is July and August, but Lum Trakorn is unknown; xxxx Pipe water; xxxxx Tank water in the village.

Table 14 Water Supply Reliability

(Ratio of cultivated area in which water supplies are reliable.)

No. of Village	1	2	3	4	5
Year round	-	2	-	50	-
Rainy season	-	98	50	20	-
Not rainy season	100	-	50	30	100
Total	100	100	100	100	100

Table 15 Frequency of Drought and Flood, Degree of Damage

No. of Village		1	2	3	4	5
Frequency in 10 years	Drought	5	-	2	1	6
	Flood	2	2	2	0	1
Degree of drought damage (%)	1971	x	-	50	-	-
	1972	x	-	-	-	50
	1973	10	-	50	-	80
	1974	x	-	-	-	?
	1975	x	-	-	30	-
	1976	80	-	-	-	90
	1977	x	-	-	-	-
	1978	x	-	-	-	-
	1979	x	-	-	-	60
	1980	x	-	-	-	50
Degree of flood damage (%)	1971	-	-	x	-	-
	1972	-	-	x	-	-
	1973	-	-	x	-	-
	1974	-	-	x	-	-
	1975	-	-	x	-	-
	1976	-	-	x	-	-
	1977	-	-	x	-	-
	1978	50	85	x	-	95
	1979	-	-	x	-	-
	1980	10+	30	x	-	-

Note: x Unknown

(e) Crop production ----- Productivity of Agricultural Production.

The cultivated land is made up of paddy land and upland in each village. In the former, the crop production of the paddy land was observed. Table 8 shows how the paddy land is utilized from the standpoint of variety, irrigation and fertilization. However, the paddy land is usually used in the rainy season, but scarcely used in the dry season in each village. The high yield variety is used a little in the irrigated area of village No. 2, No. 4, but not used in the other villages. Though fertilizer is used everywhere, the degree of its use is different in each village. The utilization of fertilizer is not well correlated to the irrigation condition, the ratios being fertilized paddy area 19% to irrigated paddy area 100% in village No. 4, but 100% to 0% in No. 5, 100% to 100% in No. 2 and 40% to 0% in No. 1. The average quantity of chemical supplies used per rai are shown in Table 10. The fertilizer quantity is in the range of 7 to 30 kg per rai among the villages.

Pesticides are not usually used except in flood years in each village.

Here are listed the important problems. See Table 9.

(i) The level of average rice yield per rai in paddy land is very different in each village.

(ii) But, in each village, the rice productivity is more in fertilized areas than in the non-fertilized areas.

(iii) In the irrigated area, the levels of rice productivity of H.Y.V. and Local variety are the same, not different. It is supposed that this phenomenon is due to the fact that H.Y.V. is used a little in the irrigation area. But this conclusion should be reinvestigated with the data of Table 9 in the next survey.

It should be pointed out as a very important problem that the utilization of fertilizer is not correlative to the irrigation as above described. It is considered that the one main cause is the reliability of water supplies, so that, if the water supplies are reliable timely in the season, the use of fertilizer is carried out even in rain-fed areas, and if not reliable, it is not carried out even in irrigated areas.

Irrigation is helping potentially a possibility in the progression of productivity and stability of production, and if the water supplies become reliable and fertilizers become used, the irrigation is apparently effective for the progression of productivity and stability of production. Additionally, even in the non-irrigated area, if the water supplies become reliable and fertilizer starts to be used, the productivity and the stability is progressive. Therefore, it is necessary and indispensable to construct a small tank as the one measure to obtain water reliability in the rain-fed area, and even in the

irrigated area.

Table 16 Area of Variety, Irrigation and Fertilization in Paddy land

			1	2	3	4	5
Variety area (Rai)		H.Y.V.	-	390	-	440	-
		Local V.	3,300	910	2,100	1,760	1,000
		Total	3,300	1,300	2,100	2,200	1,000
Area (Rai) (%)	Irrigated area	H.Y.V.	-	390(30)	-	440(20)	-
		L.V.	-	910(70)	x	1,760(80)	-
		Total	-	1,300(100)	x	2,200(100)	-
	Non irrigated area	H.Y.V.	-	-	-	-	-
		L.V.	3,300(100)	-	x	-	1,000(100)
		Total	3,300(100)	-	x	-	1,000(100)
Fertilized area	Manure	H.Y.V.	-	-	-	-	-
		L.V.	660(20)	-	x	-	-
		Total	660(20)	-	x	-	-
	Chemical	H.Y.V.	-	390(30)	-	300(14)	-
		L.V.	660(20)	910(70)	x	100(5)	1,000(100)
		Total	660(20)	1,300(100)	x	400(19)	1,000(100)
Non fertilized area (Rai) (%)		H.Y.V.	-	-	-	140(6)	-
		L.V.	1,760(60)	-	x	1,660(75)	-
		Total	1,760(60)	-	x	1,800(81)	-

Note: x Unknown

Table 17 Average yield per Rai in paddy land

(Tang/Rai)

No. ov Village			1	2	3	4	5
Irrigated area	Fertilized area	H.Y.V.	-	30	-	60	-
		L.V.	-	30	40	60	-
	Non-fertilized area	H.Y.V.	-	-	-	40	-
		L.V.	-	-	20	40	-
Non irrigation area	Fertilized area	H.Y.V.	-	-	-	-	-
		L.V.	40	-	20	-	30
	Non fertilized area	H.Y.V.	-		-	-	-
		L.V.	25	-	10	-	-

Table 18 Chemical supplies used on paddy land (average quantity per rai)

(Kg)

No. of Village		1	2	3	4	5
Fertilizer	H.Y.V.	-	12.5	-	xxx	-
	L.V.	7	12.5	xx	30	12
Pesticide	H.Y.V.	-	-[x]	-	xxx	-
	L.V.	-	-[x]	xx	xxx	-

Note: x exept, xx unknown, xxx unknown

With regard to the latter, see Table 11 in respect of the crop production of the upland. The main crops are tapioca, water melon, jute, and corn. In particular topioca is very dominant, its productivity being 2,000 kg per rai in 3 villages, but is 3,000 kg of non-fertilized area and 6,000 kg of fertilized area per rai in No. 3 village. Beside this it should be noticed that other food vegetables are few.

Table 19 Cropping area and Average yield per Rai in Upland

No. of Village		1	2	3	4	5
Cropping area (Rai)	Tapioca	2200	100	100	3000	-
	Water melon	250				60
	Jute	125				
Average yield per rai	Tapioca(kg)	2000	2000	3000 6000	2000	
	Water melon (฿)	2 00				600
	Jute (฿)	1500				

Note: x unknown

(f) Farm labourer, Non farm labourer and Wage rate

See Table 12, omitted the explanation.

Table 20

(Baht)

No. of Village			1	2	3	4	5
Farm labourer	Day labourer (per day)		25+L	30+3M [x]	25+L.B	35+L	- [xx]
	Season labourer		-	x	-	-	-
	Year labourer		-	-	3000 [xxx]	-	-
	Operator with draft animal		-	-	-	-	-
	Operator with tractor		120฿/rai upland	-	-	130฿/rai [xxxx] tapioca	-
	Charge of draft animal		100Tong/ rai (per season)	50Tong/ rai (per season) [xxxxx]	60Tong/ rai (per season)	-	1000฿/rai (per season)
Non farm labourer	In Village	Skilled labourer	-	-	35∿40	°	-
		Unskilled labourer	25+L	30	25	°	-
	In town of Neighbor-hood	S	50∿60	50 [x]	40∿50	°	-
		U	30	30	30	35°°	-
	In Bangkok	S	50∿60	60	100	100∿200	40∿50°°°
		U	30	40	50	°	20∿30

Note: L=Lunch, B=Breakfast, M=Meal.

x In this village No. 2, no hired labourer, so example in surrounding area, and season labourer is the same.

xx In Nong Sroung No. 5, no hired labourer, so exchange labour for planting are harvest.

xxx 4 5 cases

xxxx Hired labourer planting tapioca 200฿/rai

xxxxx Few cases

° Unknown; °° less than 10 persons; °°° now go to Bangkok, 5 6 persons,

(g) The Main problems in agricultural production and improvement for villages in the future

The villagers have a lot of difficult problems in agricultural production and rural life in each village. Concerning the survey, the items of the main problem in agricultural production and the improvement for the village in the future are given by the informants (1) Road (2) Water and Irrigation condition (3) Soil condition (4) Agricultural technique (5) Price problem (6) Finance (7) Drinking water (8) Electricity (9) Family planning, as Table 13. It is probable that these items are important in the all villages.

Table 21 Main Problems in Agricultural Production and Improvement for Villages in the Future

No. of Village	1	2	3	4	5
Road	road			road	road
Water and Irrigation Condition	water	water	water shortage	crop and irrigation schedule not consistent. Tapioca water-shortage	drought water resource development
Soil Condition		low fertility = sandy soil	saline soil		
Agricultural Technique		crop diversi-fication	rice pest	improvement of agricultural technique	
Price Problem					rice selling, fertilizer price
Finance	financing				
Drinking Water				pipe water	well
Electricity				electricity	
Family Planning					family planning

(ii) Present status of Farmers' organizations and Credit, Marketing, and Purchasing.

(a) Kinds and Establishment of farmers' organizations.

The kinds of the establishment of farmers' organizations in each village are shown in Table 4. This table is incomplete in the survey, but it is temporarily useful. The kinds of farmers' organizations in the village are the member groups of the following organizations: Agricultural Co-operative, Farmers' Group (Farmers' Association), Water Use Association, the Bank of Agriculture and Agricultural Co-operatives (BAAC), the Credit Union, the Rice Bank, the Fertilizer Bank, so on.

The agricultural Co-operative is a multi-purpose agricultural co-operative and usually the district (Amphur) unit extends over a comparatively large area including many villages. Therefore, there are a large number of members in each group but no branch system in each village. The farmers' Group is called besides in addition to the Farmers' Association. It is usually a sub-district (Tanbon) unit that involves several villages, therefore there are branches in each village. The membership of the BAAC in each village is sometimes identical to the membership of the Farmers' Group. The functions of the Farmers' Group are mainly extension activities, but also providing credit supported by the BAAC and marketing supported by the MOF (Marketing Organization for Farmers). The Water Use Association is a unit of the irrigated area that is established by the RID. It exists in irrigated areas, but does not exist in the non-irrigated areas; therefore there are branches of water use Associations only in each village of the irrigated area.

The Credit Union, Rice Bank and Fertilizer Bank are not generally popularized, and are newly set up in the rural development project areas by the government, and so on. These farmers' organizations are notable because of the new idea or the new type of farmers' organization.

Table 22 The state of Farmers' Organizations.

Village (Household)	Kind	Name	Number of members	Joining rate
Ban Nong Ya Phraek (179)	Co-operative	Muang Khon Kaen Agr. Coop	43	24%
	Farmers' Group	-	-	-
	Water Use Association	-	-	-
	BAAC	x	8	5
	Credit Union	x	40	22
Ban Don Kloi (70)	Coop	Muang Kalasin Agr. Coop	xx	xx
	FG	-	-	-
	WUA	-	-	-
Ban Nong Ya Kha	Coop	Muang Pol Agr. Coop	30	38
	FG	xxx	10+	13
	WUA	x	50	63
None Kum (290)	Coop	Si Kew Agr. Coop	22	8
	FG	x	30	10
	WUA	x	100+	34
	BAAC	x	30	10
Nong Sroung (37)	Coop	-	-	-
	FG	x	16	43
	WUA	-	-	-
Ban Nong Ya Phraek (179)	Rice Bank	x	x	x
	Fertilizer	x	x	x
	Bank	x	x	x

Note: x unknown
xx few
xxx Agricultural group

Table 23 Credit.

Village	Kind	Purpose of Credit	Location of Lender	% of farmers involved	Interest rate and collateral conditions
Ban Nong Ya Phraek	Agricultural Co-operative	Agriculture Livehood	Muang	20%	10%/month, land title, 3 years
	BAAC			5	
	Credit Union			22	1%/month, 6 months
	Rice Bank	Rice A L	in village	x	12%/year, in term of rice
	Middleman		Middleman for Tapioca, Jute	50	15% - 25%/month, land title
	Fertilizer Bank		in village	x	x
	Other				Varies
Ban Don Kloi		no credit no credit			
Ban Nong Ya Kha	Agr. Coop	A L	Muang	30	12%/year
	M	A L	Middleman of rice, tapioca, out of village	20	5%/month
None	Agr. Coop			8 (18)	12%/year, Coop+BAAC
Kum	M			x	x
	BAAC			10	
Nong Sroung	Agr. Coop	A L	in District	16	10%/month, landtitle
	M	A L	neighbour	x	5% month, less than 1,000 Baht, no interest
	Other				

Note: x unknown, xx ( ) = Agr. Coop+BAAC

Those are the self-reliant and mutual aid organizations for saving and credit, the lending and borrowing of rice, and the purchasing of fertilizer for farmer households within the village. They were evident in village No. 1 Ban Nong Ya Phreak, another village, Ban Kambai, and village Ban Dong Bung in the Amnart Charoeng District, Ubon Province (belonging to the Rural Community Development Project by the government). In these villages, the farmers' group was set up and its activities promoted the setting up of the Credit Union, Rice Bank and Fertilizer Bank within their village.

Again, see Table 22 which indicates the present state of farmers' organizations in each village. Though this table is incomplete, it indicates that the state of each village is different. In addition, the labour exchange custom among farmers is disappearing in each village now, except village No. 5.

(b) State of credit.

According to the survey, credit for farmers is offered by the following organizations: Agricultural Co-operatives, Farmers' Groups, the BAAC, middlemen, the Credit Union, Rice Bank, Fertilizer Bank, neighbour, and so on. As shown in Table 15, there are several kinds of credit organization for each village farmer, but the reality is a little different in each village. The main problems are as follows:

(i) The credit from middleman is dominant in each village, because the marketing of rice and cash crops are mostly arranged by the middleman.

(ii) The utilization of credit from Agricultural Co-operatives, Farmers' Groups and the BAAC is usually adopted by some of the upper class farmers, therefore the lower class farmers are well off in middleman credit.

(c) State of marketing and purchasing.

See Table 24. The marketing of rice, tapioca, jute and water melon is mostly arranged by the middle man, the rice mill and the factory, so only a little is arranged by the agricultural co-operative in each village. The purchasing of fertilizer is mostly arranged by the middleman in 3 villages, but performed by the agricultural co-operative in village No. 4, and by the Farmers' Group and middleman in village No. 5. The main problems are as follows:

i It is noticed that the rate of amount of rice sold to total products is low, and it is zero in village No. 1 and 40% in village No. 2.

ii The farmer's price of products given by the middlemen is very low, because of money borrowing before the harvest and easy selling of products on the spot by farmers.

iii The marketing of agricultural co-operatives is complicated and too slow in paying the farmers, even if the price is higher. For this reason, the

credit of agricultural co-operatives is not useful for farmers who need the cash, and the location of the agricultural co-operatives is too far from the farmland to transport the products for selling.

Table 24 The state of Marketing and Purchasing

Crop Fertilizer	Kind	1	2	3	4	5
Rice	Agr. co-op.	-[x]	-	1	10	
	Middleman	-[x]	100	99	30	95
	Other	-[x]	-	-	Rice mill 60	Farmers' group 5
	Total	-[x]	100	100	100	100
Tapioca	Agr. co-op.	-	-	-	-	
	Middleman	100	100	100	-	
	Other	-	-	-	Tapioca factory 100	
	Total	100	100	100	100	
Jute	Middleman	100				
Water melon	Middleman	-				100
	Other	Self selling on street 100				-
Fertilizer	Agr. co-cp.	-	-	90	1	
	Middleman	100	100	10	99	50
	Other	-	-	-	-	Farmers' group 50
	Total	100	100	100	100	100

(iii) Some notes on the promotion of farmers' organizations at village level for small-scale integrated rural development.

From the observations mentioned above and other information, some problems should be mentioned regarding the present state and the promotion of farmers' organizations at village level, especially from the viewpoint of this project for small scale integrated rural development. The notes on these problems are as follows:

(a) Regarding the present state of agricultural co-operatives, the scale is too large in area (district area in the unit) for the activity itself and too inconvenient for the farmer in the village. Its functions are too restricted and too weak in the area of finance, marketing, purchasing, and so on, and the ratio of new members joining to all farmers is too low and the membership is not open equally to all farmers. It is controlled by the government and may be bureaucratic, therefore it cannot be a self-reliant and mutual aid organization by the farmers themselves. It is felt that these weaknesses have to be countered gradually in the future.

(b) Regarding the state of Farmers' Groups, the scale is as in the Toban (sub-district) area unit, but their functions are complex, are not systematic or efficient, and are especially weak in comparison with the functions of agricultural co-operatives in respect of credit, marketing, purchasing, and so on. The relationship between Farmers' Groups and the agricultural co-operatives have to be improved systematically and complementally regarding the organization and the functions at village level.

(c) It is believed that the self-reliant and mutual aid organizations such as the Credit Union, Rice Bank, and Fertilizer Bank, have to expand at village level. In addition, it is important to set up a new type of farmers' organization uniting a large number of farmers within the village, especially with the enthusiasm of young farming men.

(d) The intention is to create a new self-reliant and mutual aid organization which can take upon it the multi-functions needed for small-scale integrated rural development at village level. This organization shall include all farmers joining different organizations of farm households and shall become the activity unit of the village. This is an organization made up by farmers themselves and should be a "grass roots" organization. It could be named "rural activity co-operative village organization".

(e) It should be noted that the project sites may be representative of the average situation area in North-east Thailand. So, a poorer situation area should be chosen as the new site of an experimental village and a study made to promote its development, from the standpoint of an integrated small-scale rural development project. An attempt will be made to set up a new site for this objective.

4-5 Marketing of Agricultural Products and Agricultural Co-operatives in North-east Thailand.

(i) The agricultural products and marketing points in 3 provinces.

From the data given by provincial officials for trade and commerce in Kalasin, Khon Kaen and Korat, it is found out that agricultural products in these three provinces are quite similar, and the main economic crops are tapioca, rice and maize, their values accounting for not less than 80% of the total value of agricultural output in each province.

Table 25 The value of agricultural products in Korat Province.

Agricultural products	1977		1978		1979	
	Value	%	Value	%	Value	%
Tapioca	950.0	34.2	1,139.8	27.4	3,666.2	59.9
Paddy	988.9	35.6	1,873.9	45,0	1,386.8	22.7
Maize	497.8	17.9	690.4	16.6	734.4	12.0
Groundnut	54.7	2.0	122.4	2.9	55.9	0.9
Soya bean	3.8	0.1	3.5	0.1	7.1	0.1
Sesame	5.5	0.2	6.3	0.2	4.3	0.1
Jute	60.2	2.2	70.3	1.7	56.8	0.9
Cotton	81.2	2.9	125.8	3.0	166.2	2.7
Castor seeds	6.8	0.2	16.4	0.4	18.2	0.3
Pineapple	3.0	0.1	4.5	0.1	9.4	0.2
Sugarcane	-	-	-	-	4.0	0.1
Others	127.8	4.6	108.6	2.6	3.3	0.1
Total	2,779.7	100.0	4,161.9	100.0	6,112.6	100.0

Therefore, from production as well as marketing points of view, it is vividly clear that this Project must concentrate on tapioca, rice and maize. These three economic crops generate major income for the people in the Kalasin, Khon Kaen and Korat provinces.

So far as middlemen are concerned, it is discovered that all agricultural merchant middlemen in Kalasin, Khon Kaen and Korat are Chinese, except at the village level for which the number is very small. The businesses owned by these Chinese middlemen may be classified under four categories as follows:

① Totally owned by local Chinese middlemen.

② Owned by Chinese middlemen who have moved from other provinces and settled down in the research area.

③ Joint venture between Bangkok and local middlemen.

④ Totally owned by businessmen in Bangkok.

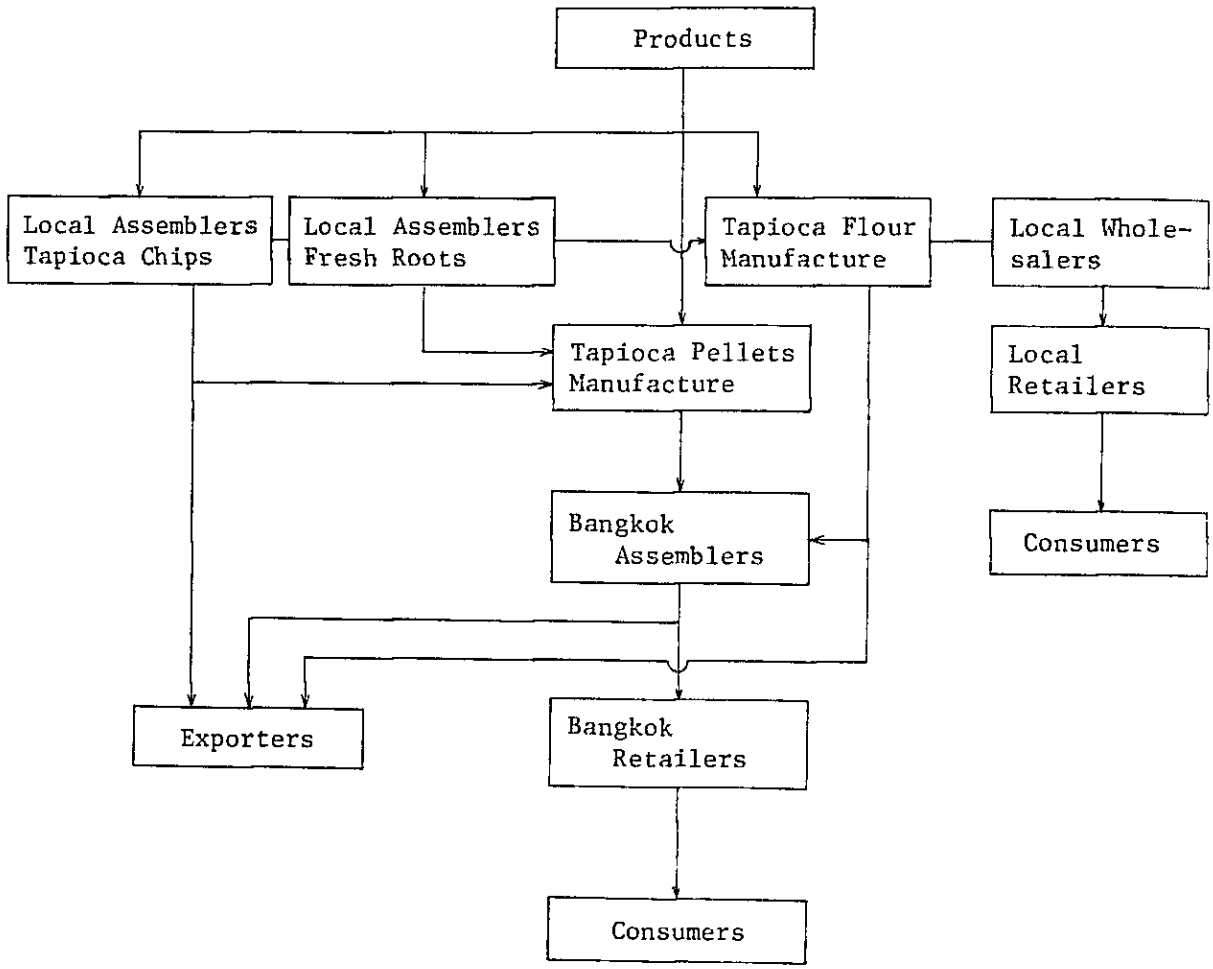
There are few middlemen at the village level because middlemen at Amphur and provincial levels in most cases provide transport services when they buy agricultural products from farmers. The marketing structures of tapioca, rice and maize in Kalasin, Kohn Kaen and Korat are similar. Agricultural co-operatives normally market rice and maize, but never handle tapioca though their

members regularly produce a large volume of tapioca roots.

(ii) Market Structure for Agricultural Products.

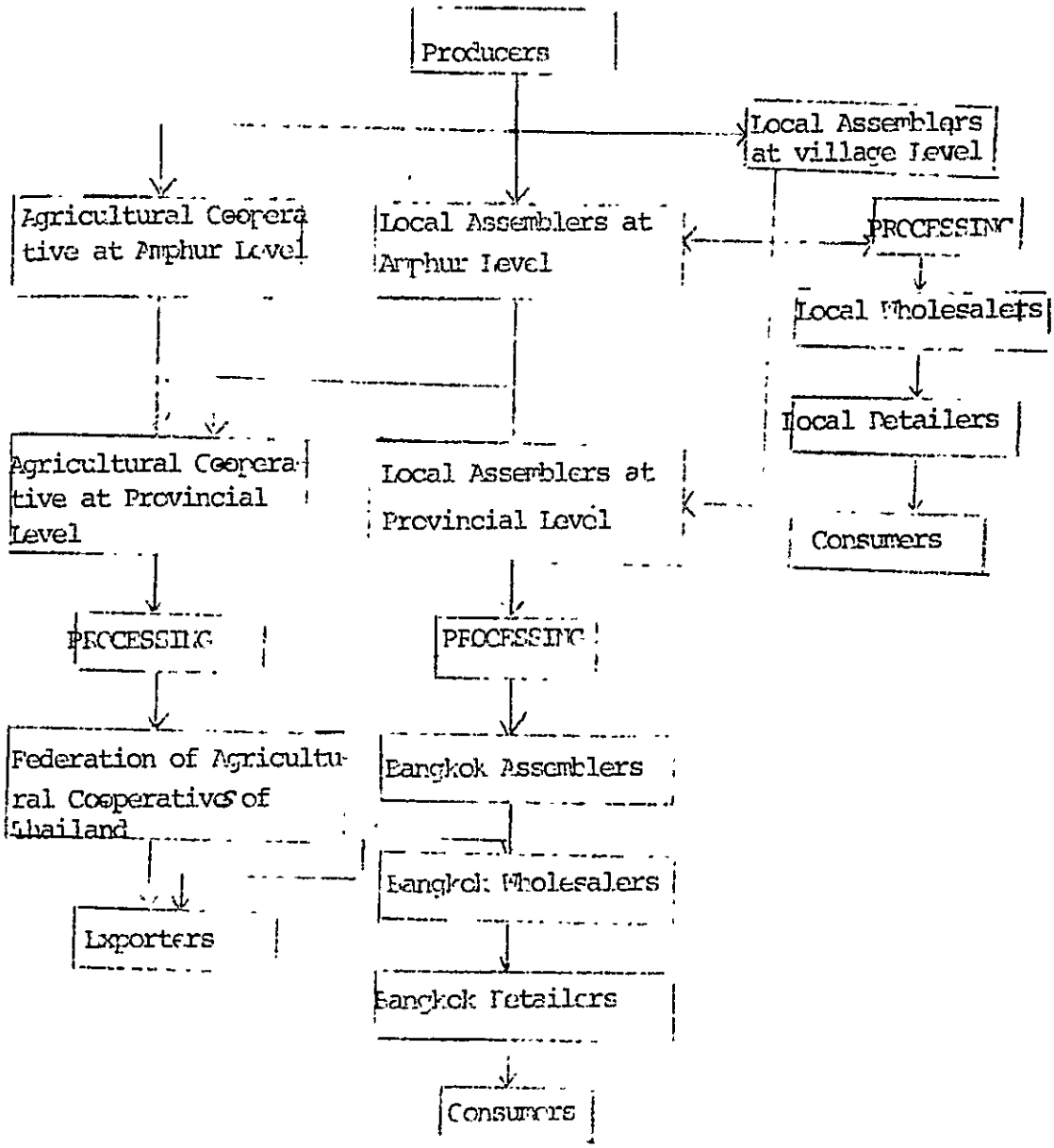
The marketing of tapioca, rice and maize is quite complicated due to the multiple channels of distribution and there are a number of middlemen involved. Most of the middlemen do not provide credit but they do perform other functions of the middlemen such as storage, processing, providing transport services, and standardization.

Figure 1 Market Structure for tapioca*.



* Northeast Regional Office of Agriculture.

Figure 2 Market Structure for Rice and Maize.



The marketing of tapioca, rice and maize, having rather long channels of distribution, causes a lot of difference between prices to farmers and consumer prices or export prices. The marketing costs at each level and the middlemen's margins must be analyzed for justification.

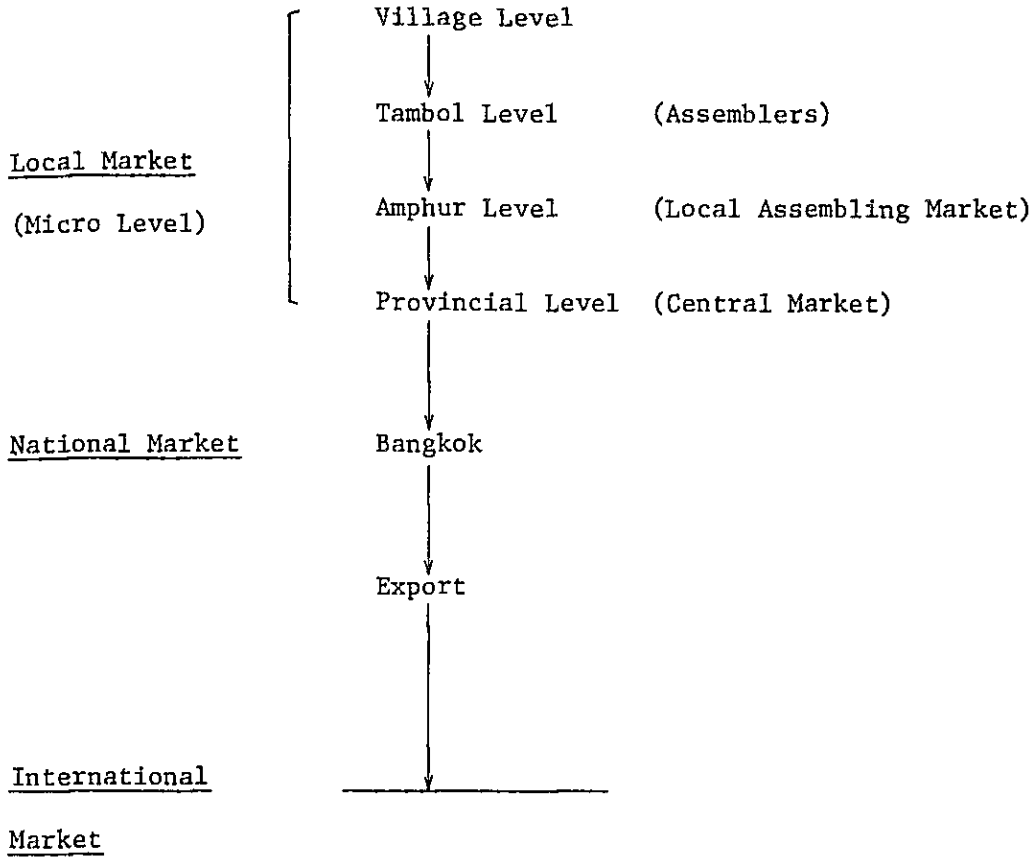
Literature surveys on rural development at the North-east Regional Office of Agriculture and literature surveys on small-scale reservoirs and technological know-how for rural development at Khon Kaen University have proved to be very useful. Lots of data, reports, and documents have been obtained.

The objectives of these two trips have been fully realized. Tapioca, rice and maize are the main crops which contribute major income to the farmers in the research areas; they are also potential crops for exports for which the government adopts the "Price Guarantee Scheme". Moreover, it is possible to identify market structures, middlemen involved, and the flow of agricultural products. All this information will make questionnaire design and operation plans for Phrase II possible. It is hoped that in Phrase III the major causes of marketing problems will be identified and analyzed in order that recommendations can be made to solve the existing problems.

(iii) Marketing problems of Agricultural products and Agricultural Co-operatives.

In North-east Thailand the market structure for agricultural products may be divided into 3 levels as follows:

1. Local Market (Micro Level).
2. National Market.
3. International Market.



As a Macro approach, prices in the local market are partly determined by the national market and international market. But so far as small scale rural development is concerned, the emphasis is on local market at micro level, in other words the national market and international market are assumed to be exorgeneous variables. The marketing of agricultural products in North-east Thailand in the local market may be divided into 4 levels as follows:

1. Village level.
2. Tambol level
3. Amphur level
4. Provincial level.

The local market may be defined by the following characteristics:

1. The distance between buyer and seller normally does not exceed 50 kilometres.
2. The volume of agricultural products at each transaction is not very large.
3. Most agricultural products have low unit value.
4. Most agricultural products are perishable.

The local market structures in Khon Kaen, Kalasin and Korat have similar patterns. What farmers grow are normally determined by the quality of the soil, climate, amount of water available and other factors beyond their control. In

the long run, farmers, to a great extent, respond to market demand. The supply of agricultural products is inelastic, it responds very slowly to changes in price and also changes in demand. In the short run, when the prices of agricultural products increase, it is impossible for the farmers to increase the output; on the other hand, when prices decline, farmers cannot withhold their supplies from the market because they need cash. Farmers may turn to agricultural co-operatives, if they are members, but so far agricultural co-operatives buy only paddy and maize in small quantities and the services are very slow, so farmers are forced to sell their output to middlemen. Consequently prices of most agricultural products fluctuate seasonally, frequently and considerably. In the research areas, the average land holding is small, with the result that the scale of operation in agriculture is small and specialized, but with numerous producers at each level of the local market. So middlemen are needed to assemble the output of small producers and transport it to consumers or industrial users.

In the local market at the village level there are hardly any middlemen, the reason being the short distance between farmers and assemblers at Tambol level. Under some circumstances, the village headman performs the functions of middleman. In the research area Ban Nong Ya Phraek in Khon Kaen a barter system or direct exchange and payment in kind still exists. At Tambol level, there are a few small assemblers, most of them grocers, who buy and sell in small quantities. At village and Tambol levels there is no proper grading and warehousing. The local assembling market at Amphur level represents a larger scale of operation, middlemen consisting of:

1. Local assemblers for paddy, maize, ground nuts, soya beans, sesame, jute, cotton, castor seeds, etc.
2. Manufacturers for tapioca flour, sugar, gunny bags, etc.
3. Processors for tapioca chips, tapioca pellets, milled rice, etc.

Middlemen at Amphur level normally have better storage facilities, and grading for quality control; they also provide transport facilities. The primary function of middlemen at Amphur level is to assemble agricultural products so that they may be transported in economical units, such as bags or truckload. They also provide immediate cash for farmers. In the case of tapioca flour they sell directly to middlemen in Bangkok and bypass middlemen at provincial level. The central market at the Provincial level serves as a terminal market for fresh consumer farm products such as fruit and vegetables. The central market is normally located in Amphur Muang. Amphur Muang Korat, Amphur Muang Khon Kaen, Amphur Muang Kalasin are good examples of central markets, and they provide better facilities for storage, grading, handling,

transport, market information services, packing, etc. Being located in Amphur Muang, middlemen at the Provincial level prefer to deal in carload or truckload quantities, they enjoy good financial services from commercial banks, and in the case of sending agricultural products to Bangkok they also enjoy good transportation servinces with a favorable freight rate structure. Middlemen at the Provincial level receive price quotations directly from Bangkok assemblers (known as "yong"), the negotiations between these two parties determining the price structure in the local market at micro marketing level. So the prices of agricultural products at village level, Tambol level and Amphur level are directly influenced by the central markets at the Provincial level. The trading volumes of agricultural products at the Provincial level, to a great extent, reflect the local supply and national demand as well as international demand for agricultural products.

At the local market or micro level, in Khon Kaen, Kalasin and Korat, about 20% of the total value of all agricultural products are consumer farm products which are sold to household consumers in the same form in which they were produced, for example, eggs, fresh fruit and vegetables. The remaining 80% are industrial farm products which are sold to assemblers, manufacturers or processors, for example, paddy, maize, tapioca, jute, cotton.

In the past, the Thai Government has tried to avoid direct intervention regarding the farm problem, except in the case of economic crops such as paddy for which the Government employed the "Price Support Scheme". Effective from the 1980-81 production season, the Thai Government has been employing the "Price Guarantee Scheme" for three economic crops, namely paddy, fresh tapioca roots, and maize. In practice the "Price Guarantee Scheme" is just a price support measure. The guaranteed prices for fresh tapioca roots and maize are below average existing prices, so the problem does not arise. But in the case of paddy, the existing prices are lower than guaranteed prices. So far as small scale rural development is concerned, the present price guarantee for paddy is very important because the actual operation of the scheme is in the local market at the Provincial level. The Thai Government has set up a "Price Guarantee Committee for Agricultural Products". When the supply of paddy in any province increases due to seasonal production or any other reasons, the price of paddy will decline. This committee stimulates demand for paddy in that particular province by appointing an ad hoc Committee to organize "open bidding". This ad hoc Committee consists of representatives from the Prime Minister's Office, the Price Guarantee Committee for Agricultural Products, the Ministry of Commerce, the Agricultural Marketing Organization, the Governor of that particular province and the Provincial officer for Trade and Commerce.

This open bidding is organized at the Provincial Office for Trade and Commerce. The ad hoc Committee announces the quantity of white rice to be delivered to the Local Public Warehouse Organization. Most of the bidders are rice mill owners in that particular province. The person who wins the bidding must deliver the white rice within 18 days after signing the contract. In order to deliver the white rice on time, large quantities of paddy must be purchased. The result is that the price of paddy in that province moves up. So far open biddings have been organized 3 times in Korat, 2 times in Khon Kaen and only once in Kalasin. The result of these biddings affect prices of paddy at Amphur, Tambol and village levels. As this measure has been adopted since December 1980, it is too soon to evaluate the effectiveness of this measure, but monthly statistics in Korat and Khon Kaen show a slight improvement in the prices of paddy. If a great number of farmers join together to market their output, they will be in a much better bargaining position with respect to price determination. The problem is how to convince them to become members of co-operatives for their own benefits.

Some basic information (Khon Kaen)

1. The paddy distribution of farmers in Khon Kaen

1.	Household consumption	84.20%
2.	Keeping for future cultivation	3.05%
3.	Given to relatives	1.03%
4.	Given as wages	2.68%
5.	Given for rent	0.69%
6.	Repayment for debts	0.96%
7.	Feeding animals	0.12%
8.	Direct exchange	0.15%
9.	For sale	6.89%
	Total	100.00%

(Source of information: Research work of the North-east Regional Office for Agriculture 1979)

2.

	Household Consumption	For Sale
Jute	0.40%	99.60%
Tapioca	--	100.00%
Maize	0.50%	99.50%

(Source of information: as above)

3.

			Transport Cost	
			Tapioca	Jute
Local Market	Village, Tambol, Amphur, Province		21.25%	27.19%
National Market	Bangkok		78.75%	72.81%
		Total	100.00%	100.00%