6. WATER MANAGEMENT OF RICE FIELDS IN THAILAND

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1. Geography

Thailand is a country of rivers, vast plains, and forest-covered mountains. It is located in Southeast Asia, and is bordered by Cambodia on the southeast, Laos on the east and north, and Burma on the west and Malaysia on the south tip of the Malaysian peninsular area. It extends in latitude from 6° N to 21° N and in longitude from 98° E to 106° E.

The land area of Thailand is 514,000 square kilometers, about the size of France, with a present population of 41 million inhabitants. Thailand's greatest length is 1,770 kilometers including the long narrow portion on the peninsula, the country is 770 kilometers at the widest point and has a coast line of 2,630 kilometers. Land elevations range from sea level on the Gulf of Thailand to 2,576 meters at Doi Inthanon, the highest peak on the northern border.

Physiographically, the country can be divided into four regions:

(1) Northern Mountain region;
(2) Central Plain region;
(3) Peninsular region; and
(4) Northeastern Plateau region.

The Central Plain region is often referred to as the "rice bowl" of the country.

Thailand is essentially an agricultural country. About 80 percent of the population are engaged in agriculture. The country's economy is chiefly in agriculture with rice the main crop and the staple food of her population. However, maize, cassava, kenaf and rubber, other major export crops, play an important role in Thailand's agriculture.

2. Climate

The climate of Thailand is subtropical, although the northern and northeastern regions are occasionally penetrated by cold air masses from China during the winter months. The climatic seasons are primarily dependent upon two major wind systems, the northeast and southwest monsoon, each with its own weather characteristics. The northeast monsoons are associated with the northern hemisphere winter, and in Thailand, usually begin in late October or November and continue until mid-March. The predominate feature of the northeast monsoon is the dry, cool or cold air mass that is forced in a southwestern direction from over the northern Asian land area by the high pressure system that develope during the cold winter months.

The southwest monsoon is usually initiated in mid-May and extends through September. This flow of air brings a moist warm air mass out of the Indian Ocean (Andaman Sea) and the Gulf of Thailand across Thailand and Laos.

Quite frequently, during the southwest monsoon season, tropical cyclones, classified as depression, enter the country from the east. This cyclone has a great influence on the supply of water in Thailand. Once it moves northward beyond the watershed of Thailand, usually in July, a temporary period of drought lasting from 3–4 weeks occurs, mostly towards the end of the southwest monsoon and during the post-monsoon in

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September–October. If this tropical cyclone arrived regularly and frequently, it would bring a large amount of water supply for the country. On the other hand, should the cyclonic rain occur towards the end of September, drought can be expected.

During the transitional period between the two monsoons, the Intertropical Conveyance Zone (ICZ), which divides them, flows back and forth over portions of Thailand several times due to the lulls and surges of the monsoons. During this period, and to a lesser degree during the October–November recession period, high intensity convective type storms can be generated.

3. Rainfall

From 85 to over 90 percent of the annual precipitation falls in the six months of the rainy season from May to October. Rainfall averages about 1,100 to 1,300 mm. in the northeast and northern section, and in the Central Plains area it increaes by about 100 to 200 mm. because of the two monsoon conditions mentioned in the proceeding section. In the Southern peninsular area the precipitation increases to about 2,000 to 4,000 mm. on the east coast and 3,500 to 4,000 on the west coast, where it rains during all months of the year. However, there are certain areas, such as the western edge of the Central Plains, where the rainfall is reduced to about 950 to 1,000 mm. due to the shielding effects of the mountain ranges; similarly, some areas in the mountains will receive 25 to 30% more rainfall than the adjoining low lands. In general, the mean annual rainfall in the North areas, including the northern and eastern Central Plains, is about 1,200 mm. plus or minus 5 mm. There is a tendency towards an increase to about 1,500 mm. in the Bangkok and upper gulf area. Directly to the west of Bangkok and northward along the mountains, the precipitation is about 1,000 mm. or less. All these areas receive from 85 to 93% of their annual precipitation during the rainy season, with the higher percentage attained in the northern mountains along the Burma and Laos borders.

Since the northeast monsoon is more effective in the peninsular area, subjecting it to the two monsoons, the rainfall is more constant, there being not a great difference in precipitation from month to month. However, maximum yearly rainfall may vary as 40% above the mean, while the minimum may be as low as 50% of the mean in extremely dry years.

4. Historical Note on Water Management in Thailand

In the old days, the people in Thailand have been quite familiar with the construction practice of the diversion irrigation system, but there are no other chronological records available to substantiate this statement, except the one which indicates that under the suzerainty of the late Khun Mengrai, who had full influence over the Me Ping Valley in B.E. 1820, there had been legislations enacted by him for the diversion irrigation system, with heavy penalties being inflicted on the offenders. Besides, excavation of the ruins of a deserted town under the late Phya Yeeba, the Feudal Lord of Lampoon before the establishment of Chiengmai, confirms such chronological record.

Although such laws are no longer effective, it has become the traditional practice among the northerners to co-operate in their effort to construct the diversion irrigation systems and repair the works every year. There has also been elected an senior member of the community as chief of the system called "Gae Muang". He is a manager who operate the project and called upon the members to contribute their share of man-power in maintenance. In some cases the people have been asked to contribute pieces of bamboo or other kinds of hardwood to be used as piles for the weir. On the other hand there has been a voluntary requisition of man-power from among the water users to re-dredge the shallow part of the irrigation channel. When water shortage occurs, the "Gae

Muang" is the person to apportion the water to meet the individual requirements.

Since 1903, the new technology has been introduced into Thailand. Many irrigation projects which have been considered as parts of the Great Chao Phya Project were constructed in the lower part of the central plain region to conserve the water in the existing canals for rice cropping in the rainy season. In the year 1924, the first gravity irrigation project was completed with 108,800 hectares of irrigable area.

Major Water Control Works

Over the past twenty years, considerable efforts have been made to improve water control in the wet season and to provide irrigation water for crop cultivation in the dry season. For example the Chao Phya Diversion Dam, which was completed in 1956, in the Chao Phya River just South of Chainat can be regarded as the first step towards regulating the flows of the Chao Phya River. Further upstream, the Bhumiphol Dam (1964) and the Sirikit Dam (1972) serve power generation, flood control and water storage for irrigation in the dry season. Especially after the completion of the Sirikit Dam water became available for dry season crop cultivation in the Northern part of the Central plain.

In this area of about 600,000 Ha. a complete main irrigation system has been constructed, serving not only irrigation but also flood control.

Minor Water Control Works

After the completion of the major works, there still remains a highly unsatisfactory situation on the on-farm and inter-farm leveles. Improving this situation, very often a rather neglected field of activities in large irrigation projects, should be considered a necessary complement to the major control works. Such improvement would call for a relatively small investment compared with that in the major works, but without it the agricultural development potential would be limited and certainly not match the investment in the major water control projects.

5. Present Water Management in Rice Fields and the Existing Problems

As for the operation of each project, the purpose is to supply and distribute water to the cultivation areas within the scope of the project. The Officer in charge of the operation should have the following responsibiilties:

1. Determinning the timing for irrigation water to be supplied from the canals to the areas in each unit.
2. Checking the amount of water passed through canals according to the amount of water required by crops in each month according to the cropping pattern already laid down.
3. Regulating the distribution of irrigation water.
4. Recording an statistical studying of actual consumption of irrigation water.
5. Investigating and measuring losses of water in main canals and laterals.
6. Supervising and arranging for work of working stations and working groups.
7. Maintaining the irrigation regulations and settling disputes.

To carry out the above-mentioned responsibilities and the water management in the rice fields, the personnel of Royal Irrigation Department work in such the manner as described below.

Command Structure

In Thailand, each irrigation project is managed by a regional engineer, who is assisted by tract inspectors. Each project, which is part of a tract, is headed by a project engineer, who is assisted by one or more watermasters. A watermaster is in charge of

COMMAND STRUCTURE AND INFORMATION FLOW
UNDER PRESENT CONDITIONS

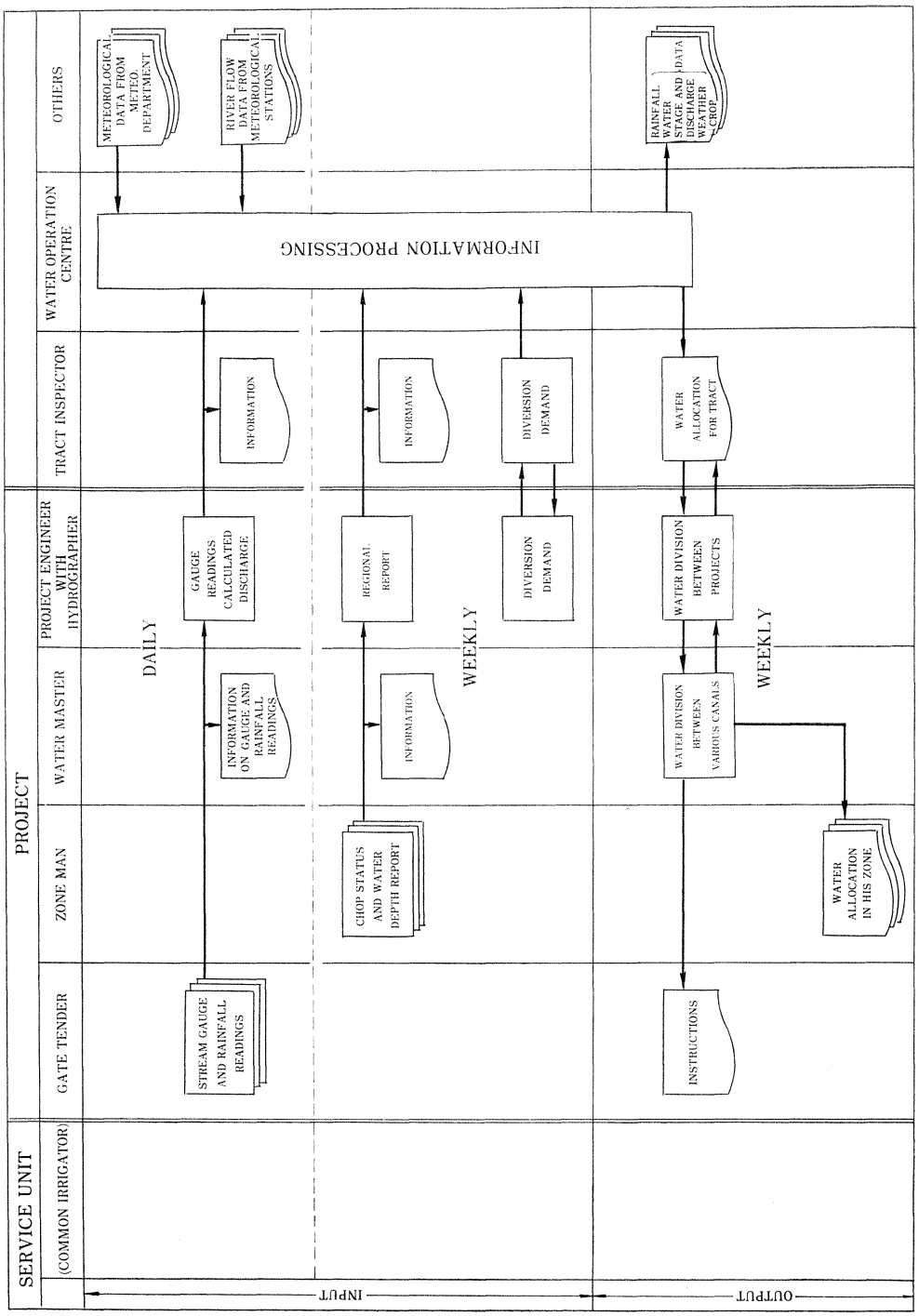

Fig. 1.

a region and supervises a number of zonemen and gate tenders. Zonemen supervise irrigation in a zone of approximately 1,000 rai and gate tenders are in charge of a structure, e.g. a headwork, a cross-regulator or an offtake regulator.

Besides the zonemen and gate tenders, there is administrative and maintenance personnel. Special mention is made of the hydrographer, a clerk charged with the inventorying and processing of hydrological data.

The regional engineer and the tract inspectors have their headquarters in the regions. The project engineer, watermasters and clerical staff of a project are stationed at the project headquarters located near a headwork. Zonemen and gate tenders are housed near the zone of gate under their command.

A new development is the institution of common irrigators. Originally it was planned that common irrigators would be selected by farmers from among themselves to supervise irrigation and maintenance of the service units. To promote this development, a number of common irrigators were paid by the Government in the years 1966–1969. As from 1970 this support has been stopped in some projects. An exception has been made, however, for the land consolidation project. In the future ,the selection and payment of common irrigators should be the sole responsibility of the farmers, who should be organized in irrigation associations or the like.

The Royal Irrigation Department tries to stimulate the establishment of such water users' associations. The technical command structure of each irrigation project is shown in Fig. 1.

Water Operation Centre

As the operation of the system also depends on conditions outside the project area, e.g. flooding of Bangkok, power generation and irrigation releases from the Bhumiphol and Sirikit Dams and salinity control flow, the need was felt for a central organization which would take the major policy decisions based on systematic information. Therefore, the Water Operation Centre (W.O.C.) was established in 1967. The W.O.C. is the executive agency which collects and processes data on climate, hydrology, crop conditions and salinity of river waters. Based on these data, the diversion of the river flow at Chainat over the main watercourses and the Chao Phya river is decided upon.

With the existing infrastructures and present water management in the rice fields, there are some problems. The ditches, excavated at mutual distances of 300 to 500 m., are connected to the laterals or to the main canal either directly or by means of a head ditch, as the ditches have been drawn as straight as possible according to the slope of the land, the pattern of the holdings and the boundaries of the parcels have, generally, not been taken into account. Thus many holdings are up. Moreover, holdings situated between two ditches and not adjointing them cannot receive water directly from the ditch.

Although the ditches have a beneficial effect, the condition of the present irrigation system including the ditches gives rise to a considerable waste of water and an unequal distribution, resulting in shortages when water is scarce. Uneven land requires more water for rice cultivation, which aggravates the the water shortage problem. Another difficulty in the present situation of water distribution is that many areas cannot be drained adequately; farmers in the lower-lying parts receive more water than they like, while at the same time the higher-lying fields along the same ditch have a shortage of water.

6. Proposed Future Water Management in the Rice Fields in Thailand

Royal Irrigation Department introduces more and more improvement at the inter-farm and on-farm levels known as "land consolidation". In the area where land con-

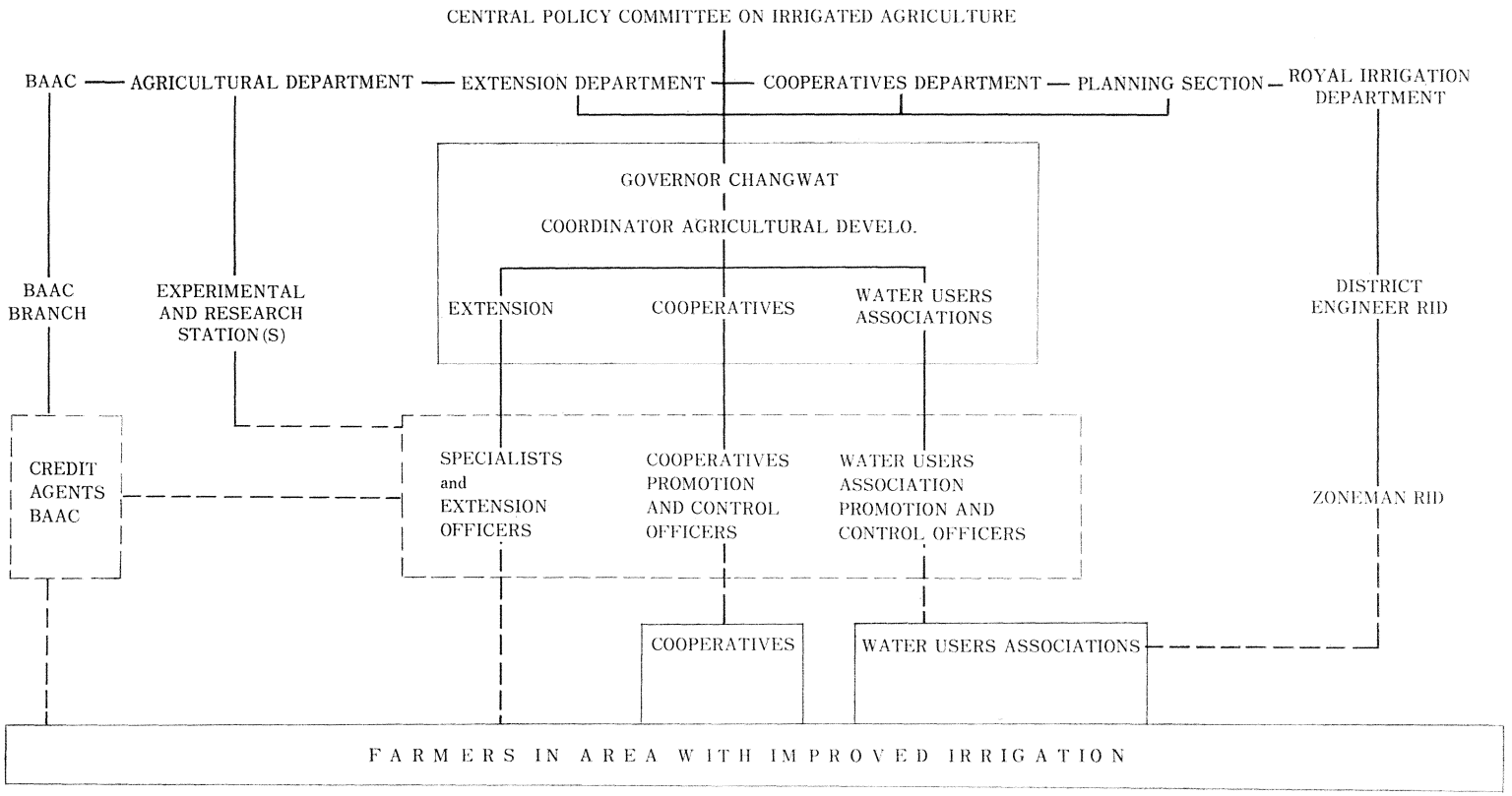

Fig. 2. The assistances from goverment agencies to farmers in the improved water management area.

solidation and improvement of water management in rice fields are achieved, an effort is made to organize the farmer for water management, known as "water users association." Water management of the main system, down to the level of the constant head orifice, which is the inlet to the service unit, is completely in the hands of RID. The farmers of the service units as a group, or as a water users association will have the freedom to use the water which is delivered at the intake by RID, the way they want it. In other words, the water management in the rice fields in land consolidation area is carried out by farmers themselves through water users associations with the help of RID through the district engineer, water master and zoneman as shown in Fig. 2.

As the water users association play the increasing important roles in water management in the rice fields, as shown in Fig. 2, much more attention should be paid to water users associations. Water users associations should be established and adapted for the water management in the rice fields with the following principles and suggestions:

1. Farmers' interests in influencing the operation and maintenance will not go beyond the boundaries of the service-unit in which they have their land.
2. If one wants to organize farmers in order to get them to take responsibility in operation and maintenance, this should be done at the level of the service-unit.
3. Water-users associations should be set up only after the farmers in the service-unit have some experience in working together as an informal group and after they have been thoroughly informed of the purposes and way of working of the water-users association.
4. The water-users associations depending on one lateral should be grouped together in loose association. The objetcive is to discuss water management policy and and procedures of RID and common experiences in the water management of the service-units. The meeting would be used to assure regular communication between RID staff and the water-users associations.
5. Formally the association will be responsible for operation and maintenance in the service-unit. It will be notified by RID of its water-right and of the need for maintenance. In day to day practice the watermaster and the zoneman of RID will present the common irrigator with a rotation schedule and with instructions for its application. In the future the committee should however play an increasing role in drawing up plans for operation and maintenance.
6. These water-users associations will have to have simple identical charters. This will faciiltate official approval.
7. The desirability of an obligatory membership of all farmers in the service-units will have to be examined. The same holds for giving the association powers to enforce on the members certain rules of operation and maintenance.
8. In any case the legal right of RID or the Nai Amphur to ascertain the breaking of the rules of operation and maintenance and to punish tresspassers should be worked out more clearly in a law and be backed up by executive power.
9. The association will have a committee of a chairman, a secretary/treasurer and a common irrigator.
10. The water-users associations will have their own budgets, mainly for the purpose of maintenance and of paying the common irrigators' salaries and they will manage their own funds, collected from their members, for that purpose.
11. The water-users association will be assisted by watermaster and the zoneman from RID. RID will help in the daily management of operation and maintenance.
12. One RID zoneman per 10 water-users associations is required in water management in the rice fields.

In the area with improved water management, a zoneman is the RID personnel who directly contacts the farmers through the water users association.

To avoid any confusion in water management in the rice field, tasks of zoneman should be clearly specified.
The tasks of the zoneman are as follows:

—to collect data on a periodical basis on the situation in each service-unit concerning the following topics:
- landuse,
- actual cropping pattern and intentions of the farmers regarding their future cropping pattern,
- field activities of farmers and development stages of the crops,
- water depth, functioning of irrigation and drainage canals,
- state of maintenance of dikes, checks and farm roads,
- irrigation and drainage problems of the farmers; in these activities he is normally assisted by the common irrigator and the whole committee of the water-users association and supervised by the watermaster, during the first few years he is also coached by the sub-section "evaluation, extension and training in water management", he regularly communicates his findings to the watermaster;

—to advise in making schedules for rotational irrigation in the service-unit and to instruct the common irrigator in its application;

—to solicitate the help of the committee of the water-users association in order to get farmers to apply the rotation schedule, to inspect the activities of the farmers in this respect;

—to notify the committee of the water-users association of the need for maintenance and to advise them on plans for maintenance;

—to operate the constant head orifice.