

PARTICIPATORY INTERVENTIONS IN FARMER MANAGED IRRIGATION SYSTEMS IN NORTHERN THAILAND: DYNAMISM IN RESOURCE MOBILIZATION

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Abstract

Agriculture and water development in Thailand in general and Northern Thailand in particular has long historical perspectives as the country depends on agriculture, both for subsistence and economic growth. Although, the country comprises of 25 large river basin, water shortage during dry season has often restricted farmers to intensify and diversify their farming system and assist in the national economy by producing surplus grain for export. Water development for agriculture therefore becomes crucial in several region of the country.

There were several small-scale irrigation systems operated and maintained by farmers some 700 years ago, particularly in Northern Thailand, through customary regulation as autonomous unit. These systems were efficient and stable to regulate water for wet season crop but insufficient for intensive dry season cultivation. In order to manipulate water resources to meet the great demand for rice export and to promote economic growth, Canal Department was established in 1903, which later on was named the Royal Irrigation Department (RID). In the beginning days, the primary objective of RID was to design large and medium scale irrigation systems to increase the productivity of rice mono crop in central plain region. Given the situation of political and economic transformation, almost all the farmer managed irrigation systems (FMIS) were technically improved and taken control by state government in the northern region. As a result, the FMIS lost their autonomy and were forced to greater dependence on state mainly through technological intervention. Moreover, local communities also lost many traditional sources of revenue such as water tax and rice tax. The state intervention on water development gradually expanded throughout the region until 1946.

The post 1946 period saw significant changes in terms of new technology intervention in production system and water resource development. The farming systems were increasingly diversified and farmers started to grow non-rice crops such as maize, cassava, kenaf, and sugarcane which are considered to be the periods of agricultural transformation. As the commercial crop production started, dispute on land issue increased considerably. The traditionally formed committees were gradually broken down and had significant impact on the rural development in general and water development in particular. No land entitlement documents were ever issued until the Land Act was officially proclaimed in 1954. Most of the farmers in northern part enjoyed only usufruct rights over land although they formulated their own principles of land inheritance. The property right issue directly effected the efficiency of land use and consequently the total agricultural productivity of the region.

However, in recent years, the government has realized the importance of farmer's participation in water development activities and initiated several small-scale people's managed irrigation systems throughout the country. In order to retain farmers' ownership of the systems intact, the government adopted a participatory mode of interventions especially formulated to help FMIS of smaller area coverage. The government also specified participatory management framework where the government and user farmers can undertake action in mutual understanding.

With these perspectives of irrigation management by farmers, the paper documents the history of water development and management with special reference to FMIS organization, rules, roles and regulations of operation process. Then the paper discusses the evolution of public intervention process in FMIS and their implications on property right issues and on consequent management conflicts arising there of. With the change of government policy of promoting export during 1946-70 period, its impact on the mode of operation of FMIS in Northern Thailand has also been reviewed. Finally, the paper discusses recent participatory intervention process in the changed economic context based on a case study of before-after intervention in FMIS and suggest policy implications of these process on the management of FMIS.

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Background

Thailand, a tropical country centered in the Indo-China peninsula within the latitude 21⁰N and 8⁰N and 98⁰E and 106⁰E longitude is bounded by Laos in North, Vietnam and Cambodia in East, Gulf of Thailand and Malaysia in south and on the west by Union of Myanmar. The total land area is about 513,000 sq. km with the total population of 60.3 million (FAO, 1998). The altitude varies from the sea level on the Gulf of Thailand to a maximum height of 2,576 m at Doi Inthanon in the north. The climate of Thailand in general is warm and moist, governed by tropical monsoon. March and April months are transition period, which are usually the hot season. Monsoon starts usually from May and lasts until October. From November to February, the weather is dry and cold. Due to different tropical zones, the annual rainfall is observed ranging from 1000 mm (western part) to 1600 mm towards the far eastern end.

Thailand is divided into six major regions; the central plain, southeast coast, northeast plateau, central highlands, north and west continental highlands, and peninsular Thailand. The physiological conditions vary significantly among regions. Central plain is located in the lower Chao Phraya Basin within 175 km width and 450 km length. Different river basins from north and west have resulted in siltation in these plane areas. Southeast coast region is an undulating terrain with small marine terraces with low potential of water for irrigation. Northeast Plateau comprises of several small watersheds and two large rivers, namely, Chi and Mung which drain into Mekong river. Central highland is situated in between northeast plateau and central plain with various landforms. Pasak river valley is the largest one that divides the region longitudinally. Water comes in this region from north, east and west sides. North and west continental highlands can be divided into the two main sub regions i.e. western mountain range and northern hills and valleys. There are several river systems, in which Ping, Wang, Yom and Nan are the major one. These rivers join together and have formed the Vhao Phraya river, flowing through the central plain toward the Gulf of the Thailand. The Peninsula runs in the south direction to Malaysia with many small watersheds of flat and undulating terrains. All together there are 25 river basins in Thailand (see Figure I-1).

Current water demand in the country according to FAO estimate is 39 billion m³ per year, where 90% of the demand is only for irrigation, 4% for domestic consumption and the rest for industrial uses. The water demand has been increasing by 3% annually over the last decade. Central region has the highest water use in the country as this region consists of large irrigated paddy land. Eastern region on the other hand has the lowest position in water availability and use.

Agriculture is an important sector contributing both for subsistence and for commercial purposes of many developing countries in general and Thailand in particular. Out of the total 51.31million

hectare area of the country, nearly 45% is devoted to agriculture (Koninck and Dery, 1997). More than 80 percent of the population are engaged in agriculture. Rice, maize, cassava, kenaf, sugarcane and rubber are the major exports commodities. These farm commodities have been produced under low-input, low technology and low-cost practices therefore growth in agricultural output is mainly resulted from expansion of the productive area (Uppatum, 1992).

History of Water Development (*Jalaprathan*) and Management

The historical perspectives of water development in Thailand varied from region to region as the country was not unified and regions were under several colonial regimes. Only in the year 1939, the north and northeast regions were released from colonial power and officially changed the country name from Siam to Thailand. The farmer managed irrigation systems (FMIS), also referred as traditional or people's managed irrigation systems, were mostly found in northern part of the country, which were established as early as seven hundred years ago (1296), in the period of king Mengrai (RID, 1970). The king had instituted some detail and rigid law code for proper use and management of the irrigation systems. In the early days, more than two thousand FMIS existed in the northern parts of Thailand alone (Surarook, et.al. 1980). These systems were classified into two categories, based on systems capacity; small system of the mountain type with a coverage area of less than 1000 rai (160 ha.) and the large systems with coverage area between 1000 to 10,000 rai mainly found in plain area.

Given the condition of farming systems in steep slope in northern region, gravitational flow of water was quite rapid and water shortage even in monsoon season was common. Farmers therefore started to build weir and watercourses with the help of available local resources such as bamboo, wood materials and stones. The King Mengrai was the first to build a tank or small reservoir as a source of water resource for irrigation purpose during dry season. In the central plain region on the other hand, there were very limited number of water development activities done in the past, although several Kings of the region made effort to construct irrigation systems but they were washed away due to torrential monsoon annually. Thus there were less effort made to construct and manage irrigation systems in the plain region of Thailand than in the North.

In the early 20th century, most of the irrigated land were cultivated and there was growing demand for rice to export in the nearby countries. The need of water development for agriculture and bringing more land under irrigation was crucial to meet the export demand and to promote economic growth of the country. With this realization, in the reign of H. M. late King Chulalongkon, Canal Department was established in the year 1903, which was later named as the Royal Irrigation Department (RID). The immediate objectives of water resource development was to increase agricultural production, particularly the production of rice crop. At the beginning stage, the department constructed several large and medium-scale irrigation systems throughout the country with principle objective of increasing agricultural productivity. South Pa Sak was the first large gravity irrigation completed in the year 1916, which took almost 13 years of construction period. However, the first construction work of large irrigation system started around 1912 in lower Chao Phraya basin. Due to financial limitation, the construction work was divided in to several sub units which were completed only in the year 1950. The diversion dam was however constructed in 1957 and only at the end of 1964 all water distribution canals were complete.

In general, Thailand irrigation systems are categorized into three scales i.e. large, medium and small, based on the level of investment and area of coverage. The institutional arrangement for the operation and maintenance of these different scale irrigation schemes also vary. The large scale irrigation systems, for example, are under aegis of RID except the multi-purpose reservoirs, which are governed by the Electric Generation Authority of Thailand (EGAT) at both construction and operation phases. Similarly, the medium-scale irrigation schemes are also planned and implemented by RID, but the development of on-farm work is generally undertaken at the operational stage from the local budget systems. The small-scale systems which mostly comprised the FMIS were basically intervened by the RID including design and implementation (Konoksing, 1991).

Currently, RID manages, operates and controls almost all the irrigation systems of the country upto tertiary level. The farmers under current participatory management mode are allowed to maintain and operate their systems only at the field channel level.

Farmer Manage Irrigation Systems (FMIS) before the Establishment of RID (Before 1900)

Irrigation organization was considered an essential institution for ensuring sustainable water development for agriculture and for providing legitimate imposition of social control and conflict resolution in contemporary northern Thailand until the beginning of 20th century. The irrigation institutions before the state intervention in northern Thailand were fully autonomous unit of farmers group, they came together and performed activities to achieve common goal i.e. water development for irrigation. The FMIS were typically developed, operated and maintained communally by groups of water users (farmers). The systems were mostly of small scale, optimum to maintain (100-1000 rai). The organizational objectives were to provide water for good harvest of main rice crop, to prolong water available period so that second rice or other crops could be grown during dry season and to expand cultivated areas.

In the organizational process of the committee, first the district head arranged meeting with different sub-district heads and discussed on the most possible and feasible way for supplying water to different sub-district and villages. The sub-district head then discussed with village head and finally planned work strategies. In order to operate and maintain the system, farmers were organized and formed water user committees, based on canal network. In most cases, a FMIS committee was divided into two levels for efficient management of water resource i.e. at system level and at canal level organizations. The former organization was the main body for operation and maintenance of the entire systems, while the later consisted of small group of members mainly responsible for the management of individual canal (secondary canal – *muang soi*). There were several canal level organizations that functioned under co-ordination with a system level organization comprising 10-20 villages depending upon the distance of the river. The district head was the chief of system level organization and the sub-district head become deputy chief at village level. Village heads worked as assistants to the sub-district head. At all level there were some other positions such as messenger and water man.

At operation level, the village headman had full authority to allocate and deliver water to different canals, organize members for repair and maintenance, sanction punishment and reward. There were several village headmen under the main system committee to assist the system

committee head for proper functioning of the irrigation systems. However, the exact organizational process in that period is still the question of further investigation, because it is not yet clear what type of irrigation systems and what types of organizational process were best for increased agriculture production and in improving people's living standard. However, it was mentioned that FMIS were functioning in an economically efficient and more equitable fashion by serving rural areas over the current system of state managed irrigation systems (Surarerks and Chulasai, 1982).

The FMIS were primary operated based on socially and culturally embodied custom and norms. The irrigation systems were constructed communally with the help of available local materials such as bamboo, logs and stones. As the need for irrigation water arose, the community along with community head identified the source of irrigation water and constructed weir on river. Water flows were held back by artificial weirs. Since the weir as well as entire irrigation system was considered as common property, the households had therefore common rights and responsibility for repair and maintenance and hence was governed by customary rules and regulations. Each household was obliged to contribute labor, construction materials, and tools based on their landholding and economic status. Given traditionally oriented belief, the households had to collect some funds for annual ritual rites to the weir spirit for the protection of entire irrigation systems.

In general, all households gathered, cleaned and repaired the weir and canals just before the start of monsoon season. They developed their own rules and regulation for the labor and tools contribution which every household followed not as imposed legislation rather as social obligation. At the first time of water delivery into canal, farmers performed ritual rite and pray for good harvest and for preventing their weir from destruction.

Organization and Operation Process of FMIS: From Customary Practice to Legal Adoption

Given the historical background of different farmers managed irrigation system (FMIS) in Thailand, several FMIS prevailed in different time and space variation. The operation and maintenance rules and regulation therefore varied at operational level. However, almost traditional systems at early stage were operated with customary regulation, there were some common mutual understanding on their contribution to operate and maintain irrigation systems.

- 1. Proportionate relationship between labor contribution and land holding size:** For maintenance of the irrigation systems, labor contribution was guided by the principle of more land, more labor contribution. This was later incorporated into the "People's Irrigation Code (1939), clause 30" states for example "*calling up of labor for irrigation work in the people's system will vary according to the amount of land over which an individual has rights or owns. In general, one person day of labor contribution for ten rai of irrigated land will contribute for maintenance*".
- 2. Proportionate relationship between tools contribution and land holding size:** since the people's managed irrigation systems were fully constructed and repaired by local materials, farmers were obliged to bring necessary tools and material during maintenance time. The

amount and types of tools and materials were brought either by the decision of weir headman or, in most cases, already agreed upon rules of proportionate of landholding size.

- 3. Contribution for ritual ceremony (weir spirit):** As a traditional society is bounded by several belief systems, their mutual understanding and community solidarity has often reflected in some ritual form therefore, each household had to contribute for ritual offering either cash or kind whatever was convenient.

Role of FMIS Committee members

Weir Chief (*kae muang* or *hua na muang*) was the main position established at system level even after intervention of RID, who were also named “leader” and possessed highest authority and made final decision in all affairs. Their major responsibilities were as follows which was later incorporated in the Peoples’ Irrigation Code, 1939.

- Inspect and regulate activities according to weir code amended by the district chief and by the government.
- Allocate water to members according to limit set by the codes.
- Periodic survey of the condition of weirs and canals.
- Setting up time, day and tools for the repair and maintenance of the systems.
- Conflict resolution among water users.
- Decide the level of dues and fines to be paid by defaulters.
- Set the time and venue of meeting.
- Establish the authority of vice-chief, assistants and water managers.
- Co-ordinate works with pertinent government officials.

The deputy chief of weir committee assisted in overseeing water usage by member of the system, allocating water through zone man, help in repair and maintenance by checking labor and equipment during repair work, and also assisted zone man in conflict resolution.

The assistant on the other hand kept and maintained account books for various expenses of the systems, assisted water headmen to allot water and served as representative of the chief in asking water from other systems.

The main responsibility of Messenger was to deliver messages from chief or deputy chief of Weir Community to water users and report back to the chief. The messages were related to scheduling of meeting, water delivery, repair and maintenance and amount and type of equipment to be brought by each household.

The water man was supposed to deliver water in the rice field during transplanting as well as seed bed preparation time. All the uses were supposed to abide by the distribution mechanisms of water man which are endorsed in the committee meeting.

Water users comprised the households who use irrigation facility and contribute labor, tools and cash for sustainable operation and maintenance of the systems. There were several groups of water users based on number of field canal.

Thus, FMIS in northern Thailand possessed the following salient characteristics:

- The traditional irrigation systems provided an efficient basis, in terms of technology and social organization for wet season rice cultivation.
- This efficiency was achieved only through heavy demands on labor and a complex social organization.
- The entire weir community acted as an autonomous unit, technologically and organizationally, without state support. Consequently, the communities had easy access to and control over means of production as well as enforcement of norms such as acquisition, regulation and allocation of water and dispute settlement.
- The autonomy and unity was often expressed symbolically in the weir spirit cult. (Cohen and Person, 1998).

Recent initiation in Participatory Intervention of Government in Water Development and the Future

The first attempt of participatory intervention of government started in the year 1962. The government emphasized Common Irrigators' Organization framework to integrate local people (beneficiaries) into the irrigation systems. Then it was followed by the model of "head irrigators", which was borrowed from indigenous irrigation systems of Northern Thailand. In 1967, RID introduced the concept of Water User' Association (WUA) in Northeast Thailand and in 1968 in Central Thailand. During the time, it was expected that farmers were to take control over operation and maintenance activities at farm level.

The association was initially established as multipurpose organizations to deliver production inputs and mobilize manpower and funds for irrigation operations and maintenance. The key person in WUA was the common irrigator, who was responsible to supervise and control water distribution among farmers, maintenance of irrigation canal, and to act as intermediary between farmers and RID. In some irrigation systems, *chaek* (area served by one inlet) organization has been established with single propose i.e. operation and maintenance of irrigation systems. Since then, several farmer's organizations have been organized such as Peoples' Irrigation Association and Land Co-operative Association which have the common objective of providing mutual help in common resource management.

For the effective implementation of irrigation project and encouraging people participation, the government initiated land consolidation program in the year 1969, under the leading role of RID. This was the most advanced stage in the progressive intensification of participatory intervention of government for water resource development in the country. The main objective of the program was to delegate irrigation and drainage control to farmers. The program involved constructing minor irrigation systems to supply and remove excessive water from individual plots, constructing road along irrigation canal to improve access to farmer's field and cleaning and leveling land to improve water control. The cost of construction of small canals were covered from three main sources; government development budget, donation from different persons and organization and cash collected from water users from whole irrigated areas.

Moreover, the government tried to reduce the time and work load of farmers by appointing irrigation technicians and staff for better water allocation and distribution at the farm level.

The government emphasis on irrigation systems development can be manifested by its huge budget allocation and investment. In the year between 1977 and 1991, the total budget allocation to the RID has been increased five fold from US\$ 130 million to US\$ 646 million (Kanoksing, 1991). This increased investment was also contributed by government emphasis on the development of small-scale irrigation systems (began in 1977), after realizing the water requirement for irrigation and domestic purposes.

In the changing economic context, in order to improve the agriculture situation and to assist mutual benefit for government and private sectors in providing information and co-ordination, including production, trade, research technology, and regulation for importation of agricultural commodities, the government has also established Offices of Agricultural Affairs, in seven developed countries since 1981. Similarly, In 1986, the RID organized a workshop on “Irrigation Improvement in Thailand” to review past activities and to get recommendation for further improvement. On the recommendation, socio-economic and institutional factors were highly emphasized as the future strategies for irrigation improvement (Anukularmphai, *et al.*, 1986). However, the government still lack on providing clear guidelines on water resource development (Aekaraj, 1997). There are more than 30 agencies in nine ministry working for water resource development, and due to lack of effective co-ordination and clearly defined authorities and responsibilities, implementation of water resource development activities are still far from satisfactory.

The farmer-managed systems in the country have been facilitated and supported only after the well recognition of people’s participation and governance on irrigation systems operation and maintenance by the government. As a result, the Office of Co-operation and Accelerated Water Resources Development have been involving local people, at all stages – planning, implementation and operation and maintenance, in irrigation projects and issuing rules, regulation and guidelines to carry out activities in long-run. Similarly, government owns the large and medium scale irrigation systems, but management responsibilities are divided into both government and farmers at two different levels. The farmers are responsible to manage on-farm irrigation canals, while government organizations managed the main systems such as reservoir and head works maintenance, discharge and allocation of water into different irrigation systems.

Another government agency that undertake responsibility of water resource development for irrigation as well as domestic uses is the Department of Local Administration, under the Ministry of Interior. There are two offices under this department, namely, Provincial Administration Office (PAO) and District Administration Office (DAO). DAO is mainly responsible for the development and management of small-scale irrigation through local groups’ participation. They facilitate the water user’s groups in village level for proper utilization of water resource and link the villagers with government authorities. The farmers are involved in operation and maintenance of irrigation systems at on-farm level.

In recent decade, the country has been growing as a newly industrialized country. As industrialization and urbanization have been taking place in faster rate in one hand, the irrigation system is in a transition state on the other hand. Most of the earlier constructed irrigation

structures have already been obsolete. However, rice export is still the country's largest foreign exchange earner. The government, therefore, have been emphasizing decentralization policy in the operation and management of water resources, particularly in irrigation systems. More and more involvement and participation of local farmers is one of the main thrusts of decentralization policy. As a result, the RID has been delegating more responsibility to farmers' organizations for on-farm operation and maintenance of irrigation systems. However, a study argued that the principle factor of farmers modest willingness to participate was undependable water delivery in main irrigation systems, which is controlled by government agencies (Duncan, 1978).

King's New Theory on Helping Poor Farmers through Small Scale FMIS Intervention

Thailand government has been organizing and facilitating, time to time, local groups and their participation in the operation and maintenance of irrigation systems at farm level. However, at the first time a serious attention was granted in the construction of small-scale farmers managed irrigation systems (FMIS) development only under the King's New Theory on helping poor farmers. Along the release of the government policy "Farmers must have water" in line with King's New Theory, major focus of water development has been on small-scale water resource projects throughout the country. Consequently, the government has instructed all water resource stakeholders to follow basic working principles and established sound co-operation among each other in order to increase water use efficiency and reduce possible conflict and mismanagement. The basic principle was to integrate village level small-scale irrigation project with national economic and social development plans. Therefore, the major guidelines were to adopt prescribed formal procedures for requesting and implementing small-scale irrigation project; to help in developing sense of belonging in the part of farmers so that they can take over the operation and maintenance aspects of the project; and to define the objectives of the project based on needs of all sectors.

As the theory has been executed, several shortcomings were identified in the part of line agencies in planning and implementing small-scale irrigation project. It was necessary therefore to enhance planning and implementation capabilities of many line agencies both in district and local levels. Consequently government started to launch several level training programs in capacity building and management.

Revised Code of Conduct for Participatory Intervention in Development Process

Code of conduct is the rules and regulations set down by government body for effective and efficient development of irrigation system. However, the specific rules and regulations were set under the mutual understanding between weir committee and the government body based on village condition. Following are the general code of conduct:

1. Water fee Collection

Previously, there were no legal provisions for collection of water fee from water users. Given the condition of government financial limitation and for long term sustainability of the systems, each water user must now pay water fee. The type and rate of fee vary from area to area based on

agreement between weir committee and water users. For every 3 rai (0.48 ha) of rice field, for example, water users had to pay 1 tang (1.5 kg) of rice as a water fee (depends on agreement). Most of the time, the rate of water fee vary from area to area

2. Labor Contribution

After realization of high management cost of irrigation systems, the government established code for labor contribution from each water user household. The number of labor to be contributed for maintenance of the systems depends on the proportion of land, and also varies from area to area. For example, a farmers with land up to 5 rai have to contribute one labor, 6-8 rai, two labor, 8 to 10 rai, 3 labor and so on.

3. Tools Contribution

Similar to the labor contribution, water users also have to carry agreed upon and prescribed sizes of tools and equipment during maintenance time.

4. Code of Punishment

For the defaulters who do not contribute labor during repair and maintenance work, the fine imposed varies from 1st time from 1 *thaeb* (old coin that equals to US\$ 3.00), 2nd time to 2 *thaeb* and the 3rd time the case is forwarded to the court with formal petition by the Irrigation Committee. For stealing water, the same level of gradation of penalties are observed. However, the level of punishment also vary from area to area, but the level of punishment is same once the case is filed in the district court.

Property Rights Issues and Management Conflict in the Changing Economic Context

The issue of property right, particularly land titling, holds significant role in the past and present political and economic stability of the country. In Thailand, previously, all land was regarded as government property and Thai law recognizes three classes of land claimed i.e. title deed, exploitation testimonial and reserve license. People first had to apply for reserve license to have claim over public land. After getting and making satisfactory use of the land, they had to apply again for exploitation testimonial, which was more permanent in right, at the district office. Finally, they had to apply for title deed in provincial office which gave them full, permanent ownership. However, it took long time, sometime generations, to get full title on land due to bureaucratic procedure. Household, therefore, holds different titling over land and upgrading the title is still a major issue. Despite such titling systems, there persisted socially accepted principles of land inheritance from one generation to another. In most cases matrilineal inheritance of land prevailed i.e. from parents to daughters, in many kinship communities. Sons inherited only movable properties such as money, livestock etc. (Ganjanapan, 1994). However, the system of inheritance gradually transformed and at present, land is shared equally among both male and female children in the family. There are still several unwritten traditional principles of land inheritance in the country.

With the parallel increase in population and increase in level of production and income, the property right issue has become more and more apparent as a cause of social conflict and dispute among villagers, and between villagers and outsider. Infrastructure development such as road, railway, irrigation structures, new market place etc. has accelerated farming systems towards more intensive commercial production. The usufruct right let farmers to cultivate more intensively with heavy use of water, fertilizer and pesticide. At the same time dispute over land boundary and water resource use become much apparent and frequent with the coming of an irrigation projects (Ingersoll, 1969). Increased productivity and limited land resources created another social dispute among household family member on the issue of land inheritance, whether the land is held under traditional principle or under the formal legal system.

Given the situation of increased dispute over land title as well as mismanagement of land resource, the Thai government established Land Titling Project in 1986 with an aim to enhance the security of agricultural landholding and to promote more rational use of farmland to increase productivity. The program has both negative and positive impact as it influences all aspects of rural life (Ganjanapan, 1994).

The existence and effectiveness of traditional institution for irrigation and land management are in near collapse stage due to changing economic and government policies. Although the code of conduct for participatory intervention in FMIS have been clearly spelled out in terms of water fee collection, labor contribution, tools contribution including code of punishment, there is hardly any initiatives for the farmers to continue maintaining their systems due to availability of other economic opportunities. Also the dependency syndrome developed by RID over last 80 years, the traditional mobilization of resources and assigning specific responsibilities to the specific group of expert people have been practically non-existent. This has further been exacerbated by stringent property right criteria to be fulfilled as required by the government. This does not match with the changing land ownership pattern in the region and the world. The industrialization and urbanization process has further substantiated property right issue, especially related to land and water resources.

A Case Study

Below we present a brief summary of a case study result as an example from a research work conducted by Viriyasakultorn (1994) to illustrate the farmers' response over state intervention on traditionally managed irrigation system in Mae Ai district of Northern Thailand. A total of 103 sampled households were interviewed from 10 villages where 82% responses were collected from household head and the rest from relatives of the head.

There were significant changes noted on the activities related to irrigation operation and maintenance with a reduction in labor requirement in the activities such as building of weir, repair and cleaning of weir after RID intervention. Similarly, in agricultural activities, clearing and repairing of ditches were reduced from 98% to 60%. These activities made positive impact on the water management (See Table 1, 2 and 3). However, there was also reduction on the cultural and spiritual activities, participatory involvement of the community members in water management committees including conflict resolution. Therefore, the social capital of mobilization was replaced by the physical improvement. But there are still large ignorant village

community about government law, and the construction of the new weir was not accompanied by an effort to propose to the water users that they conform to the laws. In the brighter aspect on the composition and functioning of water user functionaries, the traditional *de facto* rights are maintained and hence there is less conflict.

Table 1 Participation of farmers in Irrigation activities Before and – After Intervention

Irrigation Activities	Participation (percentage)	
	Before	After
Building of weir	86.4	10.7
Allocation of water	74.4	74.0
Diverting water into paddy field	97.0	95.0
Reconstruction or repair & cleaning of weir	93.2	73.8
Membership of water management committee	4.8	1.9
Participation in the resolution of conflict about water use	8.7	2.9
Meeting to elect weir leader	93.2	73.8
Requesting water from another weir	1.9	1.9

Table 2 Participation of farmers in Paddy Cultivation activities Before and – After Intervention

Activities	Participation (in percentage)	
	Before	After
Clearing and repairing the ditch	98.0	62.2
Offering to the spirit of weir	37.9	2.9
Preparing seed bed of rice	99.0	97.0
Allocation of water	74.4	74.0
Plowing for transplanting paddy	98.0	97.0
Sowing	87.4	83.0

Table 3 Involvement in the systems management

Variables	Response (Before) in percentage		Response (After) in percentage	
	Yes	No	Yes	No
Position hold in committee				
- Household head	66	4	61	10
- Relatives	17	11	16	10
Participation by Sex				
- Male	67	4	61	11
- Female	16	11	16	9

Conclusion and Implication

While the process of public intervention in FMIS in Northern Thailand started nearly a century ago, the traditional customary practices and indigenous management regimes were incorporated in the intervention process. This helped the FMIS to maintain the community character of mutual and communal resource mobilization for operation and maintenance of the irrigation systems. Due to major emphasis of government investment decision in the productive flood plains and river basins to increase export crop production, little attention was paid on the improvement of small-scale FMIS in Northern Thailand. But with the focussed targeted poor area and people development program initiated by the king of Thailand, a participatory mode of intervention in FMIS started during early 80's but with the consolidated land titling project of 1986 and new economic opportunities, there are both positive and negative visible impacts on the organization and management of FMIS in Northern Thailand. While the price of land has increased due to secured land titling, at the same time there are several alternative uses of land and water identified in the production of cash crops requiring high capital and fetching high price, industrialization and urban uses of water other than irrigation. Similarly, there are changes in resource mobilization criteria from labor based mobilization to cash based mobilization. This leads to less availability of man-days for repair and maintenance of system as compared to earlier. There is reduction in the cultural activities which means there are less arena now for social gathering where conflict resolution takes place in different forms. There are more formal cases than earlier. Due to economic opportunities availability other than farming, many people are moving out and new people coming in with diverse interest and less concerned about community resource such as water and its use in irrigating the field. Due to multiple and conflicting uses of water, irrigation activity many times becomes less profitable and individual economic benefits are gained at the cost of FMIS.

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Appendix

Appendix Table 1 Socio-Economic Status and Land Use Pattern in Thailand

Indicator	Unit	1980	1985	1990	1993	1994	1995
Population	Millions	46.72	51.58	55.84	58.01	58.71	59.40
Growth Rate	%	2.8	1.9	1.1	1.3	1.2	1.2
Employment in agriculture	%	70.8	68.4	64.0	56.7	56.0	NA
Total land area	'000 hectares	51089	51089	51089	51089	51089	NA
Arable land and land under permanent crops	Thousand hectares	18298	19847	20603	20800	20800	NA
Irrigated area	Thousand hectares	3015	3822	4238	4400	4800	NA
Forests and woodland	Thousand hectares	16547	15087	13998	13500	13500	NA

Source: Statistics Division, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP, 1996)

Appendix Table 2 The Surface Water Sources in different Regions of Thailand.

Regions	Total drainage area (km ²)	Average annual run-off (million m ³ /yr)	Water Use (m ³ / capita/ yr)*	Basins
Northern	148,868	36,440	257	Ping, Wang, Yom, Nan, Pai, Khun-Yuam, Kok, Chan
Northeastern	168,846	43,469	173	Chi, Mun
Central	73,459	21,804	1,777	Lower Chao Phraya, Sakae Krung, Lower Pasak, Tha Chin, Mae Klong (Quae Yai and Quae Noi), Lower Mae Klong
Eastern	36,448	21,218	59	Rayong, Prasae, Chonburi, Khlung, Weru, Bang Pakong
Southern	84,450	75,660	258	Peninsular-East Coast, Tapi, Thale Sap Songkhla, Pattani

Source: Aekaraj, 1997

Note: * = in the year 1989

