A CAPABILITY STUDY OF WATER USERS' ORGANIZATIONS IN WATER MANAGEMENT: A CASE STUDY OF MAE – TAENG IRRIGATION PROJECT

CHUTIWAN SITTILERT

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE (ENVIRONMENTAL
PLANNING FOR COMMUNITY AND RURAL DEVELOPMENT)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2003**

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Entitled

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was submitted to the Faculty of Graduate Studies, Mahidol University
For the degree of Master of Science
(Environmental Planning For Community and Rural Development)
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ACKNOWLEDGEMENT

The success of this thesis can be attributed to the extensive support and assistance from my family, especially my mom and dad, who have always given me their complete love and devotion. Both of them are my inspiration. I would like to thank my grandmother and my brother for their cheerfulness and encouragement, and also my aunts and uncles. I wish to thank grandfather, who passed away, for his constant love and kind support. I will never forget him.

I would like to express my sincere gratitude and deep appreciation to my major advisor, Asst. Prof. Dr. Kampanad Bhaktikul and my co–advisors, Assoc. Prof. Dr. Anuchat Poungsomlee, Prof. Dr. Yos Santasombat and Lecturer. Paitoon Palayasoot. I give them my heartfelt thanks for their valuable advice and guidance in this research.

I am also grateful to Por Ai and Mae Sai, who provided me with knowledge from their experience and to all the water users. In addition, I would like to thank the irrigation officials from Mae – Taeng Irrigation Project for providing me with water management data.

I would like to thank Dr. Bonnie Brereton, who sacrificed her time to check and correct the language in this thesis. She was like an advisor who always made my thesis more complete. And I would like to thank Na Wee, who helped in the translation.

I am grateful to all the lecturers and staff of the Faculty of Environment and Resource Studies for their valuable advice. I could not be a good master without their help. I would like to thank Wi and Aon, my best friends, who are always willing to help and give me good advice. I would like to thank my friends in the RD6 and YRC 606 for their kind support.

Finally, I dedicate the usefulness of this thesis to my family and all the teachers who have taught me since my childhood.

Chutiwan Sittilert.

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A CAPABILITY STUDY OF WATER USERS' ORGANIZATIONS IN WATER MANAGEMENT: A CASE STUDY OF MAE–TAENG IRRIGATION PROJECT.

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ABSTRACT

This field research study was done to understand ideas, social organization and implements that water users' organizations use to manage water. It was conducted by studying organizations as an open system and studying their capability through five basic activities of irrigation i.e. water usage, water allocation, system maintenance, labor and resource mobilization, and conflict management. The sample group was the Water Administration Group, Zone 2. Data were collected by surveying, in–depth interview and group discussion.

Resulted revealed that a water users' organization had different ideas in water management according to the objectives of production and type of crop, but had no different ideas in types of land ownership because those ideas depend on water allocation from each irrigation project. As a consequence, the social organization had more formal aspects and reflected the different organizations in the Muang – Fai system and were related to the old water users' organizations. The basic activities of irrigation revealed that the organization had the capability to manage water by themselves, while their implementation of water management was a sense of ethics and conscience.

These findings suggested that irrigation projects should allow water users' organizations to participate in water management at every step and supporting the capability of those existing to become more empowered, including establishing strategies to move water management over to water users' organizations in the future.

KEY WORDS: IRRIGATION / WATER USERS' ORGANIZATIONS / WATER MANAGEMENT

173 P. ISBN 974-04-3870-9

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การศึกษาศักยภาพการบริหารจัดการน้ำโดยองค์กรผู้ใช้น้ำ กรณีศึกษา องค์กรผู้ใช้น้ำในเขตโครงการส่งน้ำและบำรุงรักษาแม่แตง จังหวัดเชียงใหม่ (A CAPABILITY STUDY OF WATER USERS' ORGANIZATIONS IN WATER MANAGEMENT: A CASE STUDY OF MAE – TAENG IRRIGATION PROJECT)

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บทคัดย่อ

การศึกษานี้เป็นการวิจัยภาคสนาม เพื่อทำความเข้าใจวิธีคิด การจัดองค์กรและเครื่องมือที่ใช้ในการจัดการน้ำขององค์กรผู้ใช้น้ำ ใช้การศึกษาองค์กรในมิติที่เป็นระบบเปิดและศึกษาศักยภาพผ่านกิจกรรมพื้นฐานทางชลประทาน 5 ประการ ได้แก่ การได้น้ำชลประทานใช้ การจัดสรรน้ำ การบำรุงรักษา การระดมแรงงานและทรัพยากร และการจัดการความขัดแย้ง โดยเลือกกลุ่มบริหารการใช้น้ำชลประทานโซนที่ 2 เป็นกลุ่มตัวอย่างในการศึกษา เก็บข้อมูลโดยการสำรวจพื้นที่ศึกษา การสัมภาษณ์ เชิงลึกและการสัมภาษณ์ระดับกลุ่ม

ผลการศึกษาพบว่า องค์กรผู้ใช้น้ำมีวิธีคิดในการจัดการน้ำที่มีความแตกต่างกันตามวัตถุประสงค์ในการผลิตและชนิดพืช ไม่มีความแตกต่างตามลักษณะการถือครองที่ดิน ซึ่งเป็นวิธีคิดที่ขึ้นอยู่กับวิธีการจัดสรรน้ำของโครงการชลประทาน การจัดองค์กรผู้ใช้น้ำจึงมีลักษณะเป็นทางการ และสะท้อนให้เห็นถึงความแตกต่างในการจัดองค์กรผู้ใช้น้ำในระบบเหมืองฝายซึ่งเป็นองค์กรในรูปแบบเก่า อย่างไรก็ดีเมื่อศึกษาถึงกิจกรรมพื้นฐานทางชลประทานขององค์กรผู้ใช้น้ำแล้ว พบว่า องค์กรผู้ใช้น้ำมีศักยภาพเพียงพอที่จะจัดการน้ำเองได้ ในขณะที่เครื่องมือที่ใช้ในการจัดการน้ำได้แก่ ศีลธรรมในจิตใจ

จากการวิจัยครั้งนี้มีข้อเสนอแนะว่า ควรให้องค์กรผู้ใช้น้ำเข้ามามีส่วนร่วมในการบริหารจัดการน้ำกับโครงการชลประทานทุกขั้นตอน โดยเสริมสร้างศักยภาพที่มีอยู่แล้วให้มีเข้มแข็งมากขึ้น และเตรียมกำหนดยุทธศาสตร์เพื่อถ่ายโอนอำนาจบริหารจัดการน้ำให้องค์กรผู้ใช้น้ำต่อไป

173 หน้า. ISBN 974-04-3870-9

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CHAPTER I
INTRODUCTION

1.1 Statement of the Problems

Water and agriculture are closely intertwined. Water has always been an important resource in developing agriculture. At the same time, agricultural patterns have developed in different ways. Originally, farmers produced crops for their own consumption rather than for sale. Therefore, it was important to build irrigation systems to bring water into the fields. Laws dictated the type of weirs and dams (or people's irrigation systems or communal irrigation systems) that were to be built to assure power of community water management in early Thai society. Traditional water management practices still found today are both communal and private property (อัมพวา ประกาศิตและเนตรดาว แพทย์กุล, 2543: 9). People' s irrigation systems were the first water users' organizations that managed water. When Thailand began to use economic development and mass production as the primary means to achieve modernization, the agricultural patterns changed by encouraging farmers to grow a single cash crop, such as soybeans, tobacco, vegetables and various kind of fruit including litchi and longan. As a consequence, water is needed for mass production throughout the year and building irrigation systems for mass production is the main agricultural policy in Thailand.

The government's objectives in supporting irrigation programs are to bring water to the land when needed and in suitable amounts to grow crops for the most profit. Other objectives are to divert excess water from the land, to build a suitable environment for growing plants, and to make agricultural production more convenient (วิบูลย์ บุญยธโรกุล, 2535: 26). With the construction of reservoirs and irrigation systems,

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water can be stored for the next crop cycle. Although state officials in each irrigation project play an important management role, water users' organizations act as a significant laison between water users and officials in irrigation science, maintenance, and management. Because the state irrigation system is responsible for serving many water users, it sometimes has problems in providing enough water for crops and draining excess water from flooded areas (วันเพ็ญ สุรฤกษ์, 2528: 223). In addition, water users' organizations play a major role in cooperative efforts to maintain irrigation systems and to ensure that water is distributed fairly and adequately to all members (อุไรวรรณ ตันกิมยง, 2530: 13).

Royal Irrigation Department or RID policy encourages water users' organizations to participate in water management and emphasizes the on-farm scale. It also encourages members to be responsible for maintaining and conserving irrigation systems. The RID' s way of establishing water users' organizations in medium and large projects is by merging all water users in the same lateral; the current water users' groups were established in each service unit. These groups are informal organizations that will evolve into water users' associations or water administration groups that are served by the government. All water users' groups in the same lateral will be merged into water administration groups later. The water users' groups are responsible for operation and maintenance of on-farm facilities and collection of operation and maintenance fees. Each water users' group elects its own ditch president who acts as a common irrigator, covering an irrigated area of about 200-300 rai. In a large command area, these may be two or three assistants (ไพฑูรย์ พะลายะสุต, 2535: 50).

The water administrations' groups currently are large, informal gatherings of water users' groups of the same lateral. In the future, water administrations' groups will be important in managing water because they are the liason between the water users' groups and will become registered organizations of either water users associations or water users' cooperatives whenever they are ready. That will allow

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water users' organizations to have decision-making power in water management and participate in operating and maintaining fees in irrigation projects.

To allow water users' organizations to have decision-making power in water management, the government has to consider the feasibility of water allocation in irrigation projects, including aspects such as construction, design, water distribution, timely water control, place and quantity, water allocation, and maintenance. Water users' organizations have an important role in establishing and managing water at the on-farm scale and they will receive both advantages and disadvantages from the irrigation project.

Each water users' organization might have different ideas about water management, demonstrating the equality that exists between water user members. These diverse concepts reflect the capability of water users' organizations in water management in the future. In this study, Water Administration Group Zone 2, in Mae-Taeng Irrigation Project, is a registered organization. Originally, the group merged with another, called the People's Irrigation Form, and used water from the Ping River for agriculture. After the Mae-Taeng Irrigation Project was completed in 1973, it changed its name to the Mae Rim- Mae Taeng Samakkhee Water Users' Association, and at present is known as Water Administration Group Zone 2. This change provides us with an opportunity to study the evolution of different forms of water users' organizations together with social organization and methodology of water management for different objectives. Thus, the point of this study is to describe the methods that water administration groups use to manage water from irrigation projects throughout the year. A further point is to study the ideas of sustainable water management for different objectives, problems, and obstacles that illustrate differences in management styles between the original organizations and the most recent ones. Finally, we will examine whether operation and maintenance fees can or cannot create equality between water user members in water management and demonstrate the capability of water management in the future.

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1.2 Objectives of the study

1. To study the ideas of water users' organizations in water resource management in the context of several different objectives, such as water resource management for consumption and for sale, ideas of water resource management for rice and cash crops, and ideas of water resource management in cases where the water user members are landowners and in cases where they rent the land. The study will also explore similarities and differences between the experiences of land owners and renters.

2. To study the organizational management of water users' organizations from the earliest time to the most recent. How they do differ, how they are maintained, how they do solve problems and overcome obstacles and conflicts in water resource management.

3. From ideas of water users' organizations, what implements can be used in equitable water management, and what their are principles. Operation and maintenance fees are effective implements that can help to bring about equality in water use or not.

1.3 Conceptual Framework

The conceptual framework is set up to achieve the objectives of study as summarized in Diagram 1.1

The open systems perspective is used as a way of analyzing culture in the water users' organization. It includes water user groups at both the head and the tail of the lateral, each of which consists of groups of farmers who have multi - production and try to negotiate to get water in their fields. Additionally, water users' organizations have to change continually and adapt to environmental factors.

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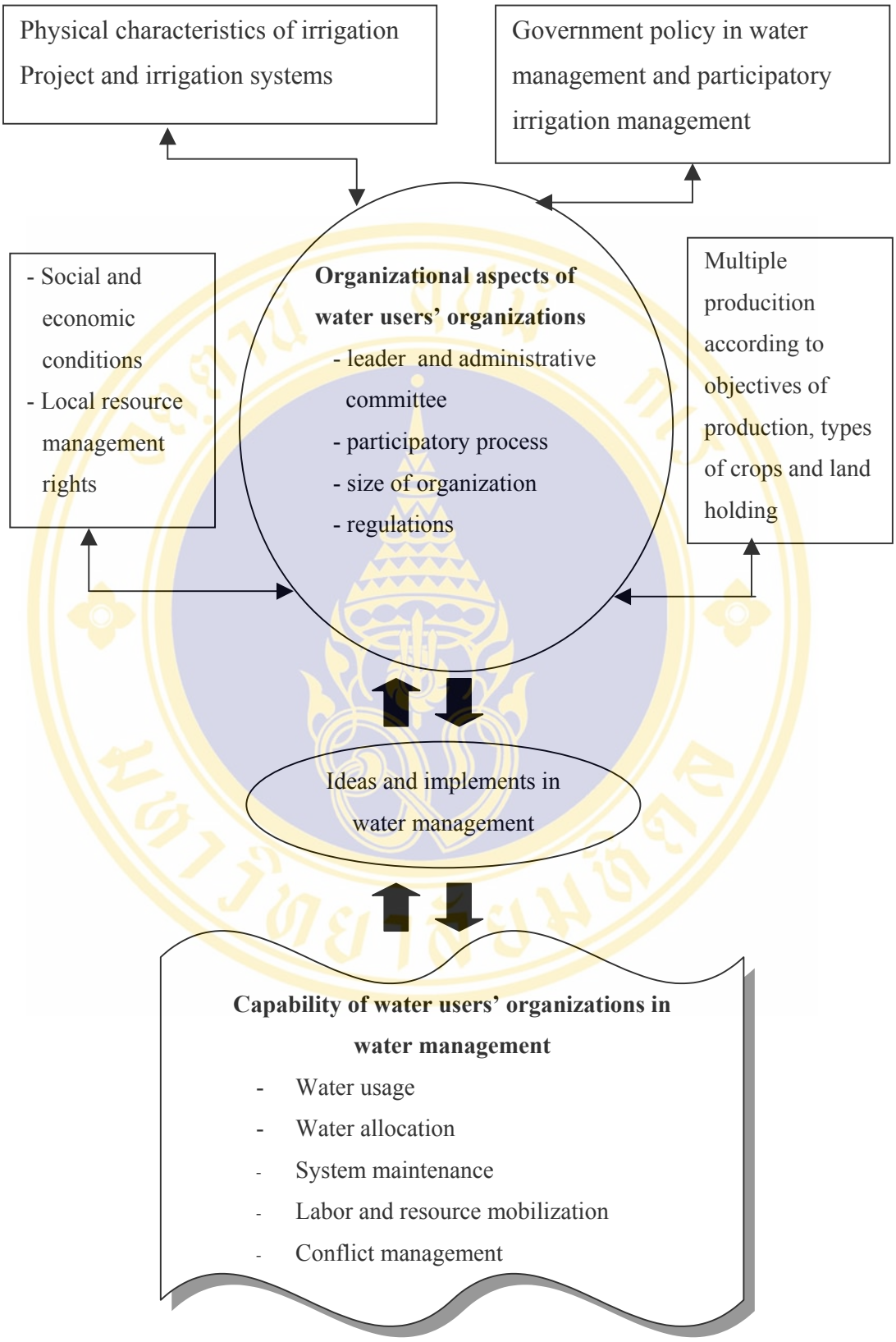

Diagram 1.1 Conceptual Framework

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Water Users' Organizations have to interact with economic systems, politics, and with the physical characteristics of irrigation systems and projects. Thus, they have to adapt their social structure to be consistent with the environment through social interaction and sanctions from outside. In addition, ideas and implements can reveal the capability of water users' organizations in water management, depending on the changes in multiple ways of productivity conditions, ecological systems and the base of resources. Apart from this, ideas and implements are related to property rights in terms of managing and controlling resources such as water. Water management by water users' organizations is a dynamic process that must continue to adapt. Therefore, the capability of water users' organizations in water management uses basic activities of irrigation systems as an analytical framework to understand social organization in each irrigation system. Coward (1980:17-20) suggests the following points as activities to study.

1. Water usage; the aim of this activity is to study water usage rules and rights between members in each irrigation system and groups that exist to find more sources of water.

2. Water allocation; the aim of this activity is to study rules for allocation of water between subunits of systems, farms, etc. and groups that influence the establishment of water allocation policies and the implementation of water distribution.

3. System maintenance; the aim of this activity is to study the rules for maintaining and repairing physical apparatus and the groups that exist to provide routine or emergency repairs to the system.

4. Labor and resource mobilization; the aim of this activity is to study the rules for mobilizing human and other resources to maintain systems and the groups that influence mobilization, operation, and verification.

5. Conflict management. The aim here is to study rules for resolving disputes that might arise between subunits of systems and between individuals, and to examine groups that participate in settling disputes and enforcing sanctions.

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1.4 Scope of the study

This study is one of field research exploring of capability of water users' organizations in water management in Mae - Taeng Irrigation Project, Chiang Mai, with Water Administration Group Zone 2 as a case study. This group has 1,824 members, divided into 14 groups in Mae-Rim and Mae-Taeng Districts, covering an irrigated area of about 7,294 rai. Most of the members are farmers who are engaged in several different kinds of agriculture.

Water Administration Group Zone 2 is one of 11 registed organizations in Mae-Taeng Irrigation Project which developed from basic water users' groups that can be found in every irrigation project. At present, RIDs encourage them to manage water by themselves. Water Administration Group Zone 2 used to be a people's irrigation organization that used water from the Ping River. Subsequently, it became the Mae Rim – Mae Taeng Water Users' Association, and finally, Water Administration Group Zone 2. The Mae-Taeng Irrigation Project was constructed as part of the first phase of the national economic and social development plan. This study examines the group's evolution in water management, whether it has changed, and if so, in what ways. Apart from this, it inquires into what basic ideas and implements in water management are reflected in the capability of Water Administration Group Zone 2 in water management.

1.5 Definitions

1. **Water users' organization** refers to a water administration group that merged water users in the same lateral. They share the same opinions and are ready to operate, repair, and maintain systems in the irrigated area by using the same rules and the same goals to become more powerful in negotiating with the government.
2. **Water fee** means the remuneration that water users give to the administrative committee because it provides water services for members in the irrigation project. This fee is collected in cash or in kind, depending on the members' agreement and ability to pay.

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1.6 Expected Benefits of the Study

1. To understand the water users' organizational ideas in water management regarding several kinds of production, such as ideas of water management for consumption and for sale, for rice and cash crops, as well as in cases where the members are the owners of lands and in cases where they rent the land.

2. The water users' organizational ideas enable us to understand basic thinking in political, social, cultural and economic aspects of water users' organizations and reflect the differences in social organization between the new and the old systems.

3. The water users' organizations' ideas help us understand how to use implements of equitable water management, including fees that reflect the equity principle of water management.

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CHAPTER II
LITERATURE REVIEW

In this chapter, we will study concepts, theories, documents, and research relating to a capability study of water users' organizations in water management, using Mae - Taeng Irrigation Project, Chiang Mai as a case study. The discussion will be divided into four important points as indicated below.

2.1 Concepts of organization.

2.2 Concepts of natural resource management rights.

2.3 Knowledge about irrigation management and water users' organizations.

2.4 Relevant documents and research.

2.1 Concepts of organization

2.1.1 Organization

Organizing is an important principle in social groups, such as water users' organizations. In every aspect of development, organizations have important responsibilities.

Generally, organizations are similar to other groups. Richard H. Hall (quoted in พิทยา บวรวัฒนา, 2538) defines an organization as a social cooperative and a type of social relationship. In general, it has entrance rules for all members, some of whom are leaders who ensure that other members go along with the rules. Apart from this, there are shared rights and responsibilities, and power stratification between members which enables the organization to continue its duties and to achieve its goals. In addition, according to Amital Etzioni (quoted in พิทยา บวรวัฒนา, 2538), an organization is a

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social unit created to achieve a specific goal. Finally, Penner (1978: 50) concludes that there are three factors or reasons to organize, as follows:

1. Needs: Members see that the organization or group can respond to their needs and that joining the group does not require investigation, which means when people decide to be a member of a group, they foresee something they want, which is advantageous.

2. Shared goals: If people cannot achieve their goals alone, they will organize to achieve them. Shared activities and interests are other reasons that people organize.

3. Shared threats: When people feel intimidated, threatened, or coerced by something, they will organize. Some theorists explain that when people feel threatened, they do not know what do. In addition, situations of uncertainty make people feel more threatened. Finding someone who is in the same situation is a way of decreasing the intensity of that feeling because other people will provide an opportunity to compare their feelings and find ways to manage the situation. Finally, according to Penner, when people face the same threatening situation, they will become a group or an organization. Needs, shared goals, and shared threats are all equally important factors that cannot be separated, but the process of becoming a group or an organization may begin with any of the three reasons.

Thus, important characteristics of organizations are:

1. The need to organize, such as having shared jobs or duties, shared power or rights and shared responsibilities;

2. Centralized power to control and coordinate the duties between members to achieve the organization' s goals;

3. The need to change the organization's officers continuously.

In the state irrigation project, water users' organizations generally have the same characteristics and underlying principles of communal irrigation organizations in the weir and dam systems, which are called Muang - Fai systems. A study done by Coward (1980:205-210), concluded that illustrative organizational themes from indigenous systems in Southeast Asia can be divided into three types and are similar to the current water users' organizations as follows:

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1. The theme of accountable leadership: In reality, the responsibilities of traditional irrigation leaders vary, in part, according to the size, physical aspects of the irrigation system, and the location of ultimate control of the system. The bases of the accountability model of irrigation leadership are small scale, local selection, and direct compensation.

2. The theme of mini-unit organization: In each organization, water users are almost always further divided into smaller subunits. These subunits usually have a set of local leaders to operate the system at this mini-unit level and these mini-units are also used as the basis for mobilizing labor for routine repair and maintenance tasks in the system.

3. The theme of canal-based organizations: The membership of traditional irrigation systems use the principle of holding irrigated areas. Consequently, the critical unit is the "irrigation community," composed of field neighbors, and not the "village community," composed of residential neighbors, that makes irrigation organization consist for the most part of gathering water users in different villages to manage water together.

Meanwhile, Tan-Kim-Yong (1995: 55-59) summarized the principles and fundamental elements of people's irrigation organizations (PIO) in the upper north of Thailand into nine points and adapted them as follows:

1. Balancing rights and obligations: The PIO has to manage a just distribution of benefits. The rights and benefits of each individual are equivalent to the duties and responsibilities demanded. At the group or community level, the distribution of duties and rights for individual benefit, as shared among the large number of water users involved, is determined so as to enhance a just balance and minimize conflicts between individuals which could threaten the unity of the group or organization.

2. Making labor obligations compatible with farmers' schedules: The system of activities managed by the PIO is ordered and arranged so as to fit within farmers' normal cycle of work and activities; the scheduled is harmonized with other agricultural activities throughout the year enabling farmers to manage household labor in such a way as to allow prompt response to group demands for cooperation. In addition, the PIO's activities are also important as a means of reinforcing the

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connection between farmers who using water together. In this way a sense of unity and mutual cooperation of the community is strengthened.

3. Flexible management of labor adapted to variable conditions: The organizing of farmers' labor is managed in a variety of ways consistent with the particular pattern of obligations and responsibilities. Generally, farmers are divided into groups of diverse and variable size and composition, depending on conditions related to the physical structure and social characteristics of people's irrigation systems. The structuring of small groups can contribute to the enhanced cohesiveness and unity of the larger group.

4. Balancing head and tail benefits: the PIO has to build mechanisms for reducing the natural advantages of those at the head of the canal with respect to these at the tail.

5. People's Irrigation (PI) leaders are elected from among PI members: Procedures for selecting leaders require that the mandate for leadership be derived through free elections by all farmers using water from the system, and that all candidates must be members of the group and work effectively through a system.

6. Passing on the People's Irrigation System (PIS) to new generations: The PI mechanism used to enhance continuity in leadership and knowledge of the technology associated with PI is to elect as the new leader a capable assistant to the previous leader.

7. Joint decision-making and local self-determination: The structure of PIO and leadership is based on democratic principles. The legitimacy of the elected leadership is linked to the process of decision-making within the PI, which in turn depends upon the willingness of the group to cooperate.

8. Creative planning and development: PIOs are primarily responsible for basic system maintenance, that is, keeping the facilities in good operating condition for irrigation through annual repairs and renovation. Aside from these basic activities, there also exists a system of activities aimed at development, investigation and improvements for resolving problems which arise under ever-changing social, economic and environmental conditions.

9. Enforcing mutually acceptable rules: Each PI has established rules to control potentially dangerous behavior or behavior which infringes on the rights of others. PI

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leaders and farmers are both liable to the same rules and penalties, and thus the system serves to control both parties.

The general characteristics and water management mechanisms of both Coward and Tan-Kim-Yong are the fundamental elements of the PIO or Muang - Fai organization. Later, when the government instead of the community began to manage water, some of the old PIOs became water users' organizations in state irrigation projects and still use fundamental elements of PIO. Consequently, it is important to analyze how those organizations adapted by using several concepts, such as those outlined below.

Wright (1994:18-19) cites Morgan, who showed that formal systems are based on three models of organization, each resting on a 'root metaphor.' They are the following.

1. Organization as machine: This model framed the way organizations are up and managed under classical or scientific management. Organizations in this sense are thought of as closed systems, with a segmental structure dividing up the overall goal of the organization into smaller and smaller tasks in a hierarchy of departments. The departments all have clearly defined relationships, with every part functioning in the smooth running of the whole. All are held together by managers' central control with workers expected to behave like parts or adjuncts of the machine. Morgan published a fast food company's checklist of the pre-planned actions involved in counter staff serving a customer. For example, there are three components to 'greeting the customer': smile, sincere greeting, and eye contact. This checklist is for managers to evaluate their staff's standardized performance of even personal interactions. They are to behave with mechanical repetition and precision.

2. Organization as organism: This model is derived from Human Relations and subsequent Systems and Contingency Theory. Images borrowed from biology and ecology inform the formal system of organizations and the language of management. In this model, workers have needs which have to be satisfied in order for the organization to perform effectively. Gradually the idea of needs was extended to

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envisage an organization as an open system depending on a satisfactory relationship with its wider environment to survive, satisfy its needs, and develop.

Organizations as organisms are broken down into subsystems (strategic, technological, managerial, and 'human resources') each of which might have a different relationship with its environment but all of which also need to be interrelated. Otherwise, a successful organization is still thought of as seeking a 'healthy' state of equilibrium (in anthropology) or homeostasis (in organizational studies).

3. Organization as culture is used to question assumptions in both the scientific management and organism schools that organizational analysis should be changed from what organizations accomplish and how they can accomplish it more effectively to how is organization accomplished and what does it mean to be organized. In addition, organization as culture argues that organizations are only made real by giving meaning, and instead of "the culture of an organization," it is more useful to consider "organizations as culture" and not agree with either the scientific management school or the organism schools that try to dispel the idea of an organization as static, in homeostasis or equilibrium. Consequently, analyzing an organization is a continuous process and the way that people negotiate the meaning of their everyday lives, routines, and the way they are involved with generating symbols through which organized activity is mobilized, including the construction of boundaries.

In addition, Reed (1992: 72-124) classified the study of themes, prospectives, and prospects of the sociology of organizations in five analytic frameworks, each of which has different approaches, as explained below.

1. Organizations as social systems: interested in studying forms of social organization that are able to adapt to the environment they face. This analytical framework is aimed at studying internal adaptation in organizations.

2. Organizations as negotiated orders: interested in studying the process of giving and receiving between members which they continue to practice.

3. Organizations as structures of power and domination: interested in studying coordinator structures constituted by the macro-structures of power and control in which they are located, as well as patterns and practices among organizations.

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According to this analytical framework, the macro-political economy structure will control and support organizations. Furthermore, social organizations always use social class as the basis of management.

4. Organizations as symbolic support of participatory constructions: interested in studying the cultural processes that create and support participatory feelings between members and organization identity. In addition, interested in studying the roles of members in reproducing in "organizational reality", which encourages members to have ideas and actions in the organization. This analytical framework sees organizations as objective entities that are reproduced through the logic of institutional change.

5. Organizations as social practices: synthesizes organizations as social systems, organizations as structures of power and domination, and organizations as negotiated orders by emphasizing political economic power structures from outside and specific functions from inside organizations. This theme is interested studying integration of functions and management mechanism of organization and multi – resources that establish and support the function of organizations.

Scott (1992: 29-94) studies organizations as social systems and suggested that the definition of organizations can be divided into three types, as follows:

1. Organizations as rational systems. From this perspective organizations as collectives are deliberately constructed to set specific goals, have high formalized social structures, and make the organization different from others. Organizations are instruments designed to attain specified goals.

2. Organizations as natural systems. From the natural system perspective, organizations make goal specificity and formalization less important than members. Members will use informal social structures to work and survive.

3. Organizations as open systems. In this perspective organizations are combined with different interest groups that try to negotiate and seek goals to work together. The combination of interest groups changes continuously and varies depending on the surroundings.

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Although we have several concepts for analyzing organizations, the natural reason for organizations to occur comes from groups of people who want to seek goals together. For example, an organization to manage water grows out of a gathering of people to solve the problem of inadequate water (especially fresh water and surface water) rather than doing it individually. Thus, an organization is an evolutional process that brings together groups of people to protect equality, make rules of living together and share benefits in the community. (กรมชลประทาน, 2544: 33) By gathering together, people who get any advantages will achieve the target together. Coward presents five basic activities of irrigation systems to understand social organization of water users' organizations.

1. Water usage; the aim of this activity is to study water usage rules, water usage rights between members in each irrigation system and groups that exist to find more sources of water.

2. Water allocation; the aim of this activity is to study rules for the allocation of water between subunits of systems, farms, etc and groups that influence the establishment of water allocation policies and implementation of water distribution.

3. System maintenance; the aim of this activity is to study rules for maintaining and repairing the physical apparatus as well as groups that exist to provide routine or emergency repairs to a system.

4. Labor and resource mobilization; the aim of this activity is to study rules for mobilizing human and other resources to maintain systems and groups that influence mobilization, operation and verification.

5. Conflict management. The aim here is to study rules for resolving disputes that might arise between sub-units of systems and between individuals, and to examine groups that participate in settling disputes and enforcing sanctions.

To determine the social organization pattern of water users' organizations in an irrigation system, Coward suggested, " In irrigation organizations, patterns of action and rules of behavior are often closely related to significant features of the physical habitat, the crops being grown, and the engineering apparatus."

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In this study, we use the concept of organizations as open systems that have their own culture. According to this concept, organizations have formal social organizational patterns that allow them to adapt the organization's structures, including the basic activities of the irrigation system. Coward suggested that this is consistent with the environment through social interaction and sanctions from outside.

2.2 Concepts of natural resources management rights

Rights of access to natural resources and the environment are significant points of debate in management. The concept of rights is an essential factor in relationships among people, communities, society, and government. In general, both Thailand and other countries accept two types of rights of access: state property and private property. Sociologists and anthropologists are beginning to be interested in studying the concepts of rights related to property because these ideas can solve general misunderstandings about property as a physical object that everyone can own. According to that thinking, property is seen only as a relationship between humans and things, but actually property is a relationship between one human and another, or others, by using rights to access things. Thus, having property means having rights and the person who has rights must enforce them to receive advantages along with the principle of social moral or laws. For this reason, sociologists and anthropologists use the concept of property rights in studying the basis of power relations between people with different abilities to access property. (อานันท์ กาญจนพันธุ์, 2544: 124) Moreover, Bromley (1991:2) explained that "property is not an object, but rather is a social relation that defines the property holder with respect to something of value (the benefit stream) against all others. Property is a triadic social relation involving benefit streams, rights holders and duty bearers. It is for this reason that, I shall urge the abandonment of the term 'common property resource' in favor of the more correct 'common property regime,' because regimes after all, are human artifacts reflecting instrumental origins and a property regime is fundamentally instrumental in nature."

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At present, rights are used a great deal in accessing natural resources because natural resources have both intrinsic and economic value. Intrinsic or deontological value depends on the principle of ecological and natural functions. Thus, natural resources are different from values or advantages in term of economics, which uses natural resources as a production factor. Initially, when natural resources are used to meet human needs, they are stipulated to be free goods or common property according to concepts of economics. Later, when natural resources become scarce because of human use, they have instrumental value or utilitarian value, which occurs from measuring human welfare. Thus, rights are a kind of instrument by which to manage natural resources and to provide opportunity to receive some advantages, including shared benefits, between members in the society. Property rights, therefore, are the most important kind of rights to manage natural resources (Young quoted in สันติ จียะพันธ์, 2539: 25-28)

Bromley (1991: 3-5) criticized traditional approaches, saying that "the fallacy in traditional approaches to the commons is that the writers have failed to understanding the concept of property, they have often been treated as if they had inherent characteristics that suggested it would everywhere be controlled under a particular type of property regime, and they have invariably failed to learn that the world is replete with reasonably successful common property regimes…In short, common property regimes exist and function very much like private property regimes and state property regimes. That is, some are not working very well, while other work very well indeed.

Once we have a better understanding of different property regimes, we can begin to comprehend the richer tapestry that is environmental policy. We can see, for instance, that environment policy is nothing if not a dispute over the putative rights structure that gives protection to mutually exclusive uses of certain environmental resources…These disputes may appear to be 'environmental problems' but they are, in fact, problems of conflicting rights claims."

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When rights are an important aspect of setting environmental policy, Bromley thinks that we need to analyze them, beginning with the origins of property rights, to understand clearly conditions of rights. He argues, "Generally, economists are inclined to find Locke' s views particularly compelling since, on this particularly tack, the private appropriation of scarce and valuable natural resources is necessary and sufficient for a market to emerge among atomistic resources owners. Locke argues that prior collective consent is not required for individual expropriation of valuable resources. That is, he maintains that the absolute right to appropriation derives from the need for all to secure their sustenance, and from the right of all to the fruits of their own labor. These two conditions justify the private appropriation of the earth's bounty, quite prior to any social contract."

But, in Bromley's view, Immanuel Kant differs from John Locke on two grounds – the universality of private property and its necessity. He claimed, " Kant' s position is that Locke confused empirical possession with ' de jure ' or intelligible possession. That is, while physical appropriation is necessary for something to become my property — that is, to able to control its benefit stream — it is not sufficient. Empirical possession cannot establish ownership until there is a social convention – a social contract is logically prior to real ownership. If the necessity of a social convention is understood to be the core of intelligible possession, then two conclusions follow immediately from this fact. First, and foremost, ' all property rights flow from the collective ' as opposed to flowing from some alleged ' natural rights ' that are claimed to be logically prior to the state. Second, and logically deducible from the first, property rights are instrumental variables.' That is, if the core of property is the external acknowledgement (that is, ' social recognition') of the legitimacy of the particular claim by the ' owner, ' then it follows ineluctably that property claims failing to win this external acknowledgment will not be recognized as legitimate by those forced to forswear interest in the benefit stream. Put more bluntly, if the collective fails to admit the social usefulness of a particular property claim, then it is delegitimized because it is regarded as non-instrumental." So, in Kant' s view, a state of nature has a moral—as opposed to an empirical—reality.

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In addition, private and communal properties rights are defined as rights to access resources that are important in the use and management of the environment by realizing the rights and responsibility of each group. The conservation of resources can lead to a decrease in conflict and a more orderly resource allocation. But the word, 'ownership', that is often used with 'rights' is management that depends on 'access to' as a condition in different characteristics. Thus, ownership is an important aspect that advantaged groups often use to enter into possession of resources. Although ownership did occur not many years ago by European countries, investigators, governments and residents began to ask for the rights to enter into possession of resources such as land, forests, water and border-land resources to use in producing consumer goods. (สิทธิพงษ์ ดิลกวณิช, 2543-2544: 16) Gibs, (1989: 24-26) shows three types of property rights through the characteristics of use that can be brought to bear on the management of property at present.

1. State property: for the most part, unified states have power to control and manage resources, which means all resources belong to the state. There are two types of state property, as follows:

1.1 Resources are controlled by the state; the state has direct agency over responsibilities such as water management or forest management.

1.2 Resources belong to the public; the state is the owner but allows private management; if the state cannot manage all resources, they then become an open system that everyone can use. This characteristic is useful but people who use the resources have no sense of ownership but have a sense of conserving.

2. Private property is property that can be used through individual objectives, depending on equity usufruct rights; this means that use does not affect other people and that it depends on the condition of state usufruct rights. Thus, private property emphasizes ownership by using the legal mechanism of the state.

3. Communal property is property that has principles enforced by cultural and traditional rules of the community to obtain some benefits by using usufruct rights of the community to control resource management, not legal mechanisms. The roles of communal property are:

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3.1 Agreeing that resources will only be used to respond to needs or to create sustainability in resources.

3.2 The ability to face technological changes for the purpose of stability and unselfishness.

3.3 The ability to use it without delay in order to be flexible in different uses.

3.4 Having a fair and equitable distribution among members to serve the entire community.

From the of characteristics of three types of ownership, สิทธิพงษ์ observed that property ownership problems arise out of different understandings of rights, such as:

1. Understanding of rights related to an object or an area; this understanding is characterized by only one type of ownership, such as private or state or both private and state ownership. The rights related to an object or an area result in single property management by using the principle of rights to access some types of resources. Thus, when common problems occur, they will probably not be solved cooperatively.

2. Understanding of rights that need to access property; This understanding occurs from divisions in the different uses of property. The property may be private or a combination of private, state and common property and may change continually according to the context and ecological, cultural, society, political and multi - economic conditions that make complex management. Therefore, solving problems might require cooperative management by making new rules.

At present, Thailand is emphasizing development through economic growth. In a capitalistic system, natural resources are related to the area and belong to a single owner. So, the state has laws to control forest management and land management and irrigation laws indicating ownership and power to control resources. The concepts of state in ownership covering all resources or establishing private ownership in that community conflict with the way of life, especially in northern communities which have local resource management based on ideas of common property ownership. Those ideas, which northern communities call ‘communality rights,’ can be found in

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community forest and water management. They are the principal ideas that still operate in northern culture because they can be adapted and renewed even now. In addition, communality rights are based on the essential principle of 'usufruct rights', which means rights that begin from an action such as when someone uses certain resources, he or she or groups have rights to use those resources. Thus, usufruct rights emphasize the basic activities people do, but cannot be exclusive because the rights end when people stop using those resources. In conclusion, usufruct rights are not exclusive to a group of people or a private owner, but will change owners continually and the underlying is principle is natural rights that emphasize human survival. (อานันท์ กาญจนพันธุ์, 2544: 238) From the ideas above, the important things is shared equity between people in society and usufruct rights to manage resources together. At the same time, all the ideas above are important in maintaining balance in the ecological system because the decision to use communality resources is usually related to a community's environmental stability. Communal use will create greater equity in an ecological system than private use, which often does not consider the effects on the environment. (เสน่ห์ จามริกและยศ สันตสมบัติ, 2536: 61)

Consequently, when the state rather than the community holds ownership in controlling resources, it can create conflicts in the relationship with the community in managing resources such as water. Conflict can result from several reasons: (พัชรี อาจหาญ, 2538: 11)

1. Different goals in resource management between the state and community; the state wants resources to be used in mass production, to export goods and to be the base of industry but community use is still based on the need to survive and to have all people share benefits equally.

2. Differences in management methods; community management uses the participatory process of all people in society and considers stability, while state management emphasizes centralized power management and allows officials to have full power to manage resources including deciding the best way to get maximum benefit for the country's economy as the principle of management.

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Therefore, the current water management policy of the state is under new irrigation systems that define 'water' as belonging to the state. Moreover, states have absolute power in water management, beginning with the People's Irrigation Act of 1839 (B.E.2482) and additional acts allowing private individuals and government agencies to have roles in constructing and managing irrigation systems in the form of private irrigation systems, people's irrigation and contractual irrigation. In people's irrigation systems, the state allows officials to have total power in both water allocation and conflict management. The objectives of this act cause conflict between targets and methods of community organization that use the principle of water management based on relationships between the ecological system, society and culture. Moreover, the water users' organizations in the new irrigation systems still use the old methods from community or Muang - Fai organizations to manage water, forcing them to have to adapt the ideas in water management and depend on the changing conditions along with centralized state power in determining water management. Besides, changes in the organizational structure of water management might result in inequitable water allocation among water users who use methods and ideas of managing water that are different from those of the community or Muang - Fai organizations.

2.3 Knowledge of irrigation management and water users' organizations in Thailand

Irrigation management and water users' organizations in Thailand are among the important bases of knowledge that can be used to study the capability of water users' organizations in suitable ways in water management.

2.3.1 Irrigation systems

The best way to manage irrigation is to for decisions to be made together with the irrigation systems. Each has functions covering with the reservation of the principal sources of water, spreading system, distribution system and water allocation. All functions of irrigation systems are important because they affect the distribution of

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water to the farmers, beginning with principal water quantity to the distribution of water into the cultivated area. The most important function is the distribution system into the cultivated area, which indicates the capability of distributing water in greater or lesser amounts. In addition, the distribution system must be related to other functions of the irrigation system to create effective water management.(ชูชีพ พิพัฒน์ศิถี และคณะ, 2543: 2-30) Generally, irrigation systems consists of two main functions, the headworks and the distribution systems.

The headworks in an irrigation system has varies characteristics depending on both objectives and needs. The headwork may be a reservoir, weir, head regulator or pumping station and it receives water from two sources - reservoir sources and river runoff. In reservoir sources, there will usually be some water distributed into an irrigation canal system such as a reservoir. Water that is not used will be reserved in the reservoir and used when the demand is inadequate. Because the quantity of water in rivers is sometimes uncertain, reservoir water is a more reliable source. In the runoff from river sources, the distribution system will get water directly from rivers. There is no reservoir to store water but there are diversion dams, barrages or weirs to divert the waterway to make sure that the water level from the north of the river is high enough to distribute it into the main canal. In addition, water in irrigated area is cause from rain but it is uncertain in quantity because seasons such as the rainy season will have more water than the dry season.

In most distribution systems, water will be distributed into cultivated areas by using canal systems. The canal system consists of surface-water ways that have been dug off or flit over land to let water flow from river sources into cultivated areas by using the force of momentum. The size of canals decreases from the head to the tail and spreads over irrigated areas. Canals may be identified through their characteristics and functions. The main canal is constructed to receive water from water sources into the main area and is generally built in upland areas between the banks of a river. A lateral is a canal that is dug separately from main canals, and the lateral ways are also constructed in the upland. The sub-lateral is a small canal, dug from the lateral to

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receive water from the lateral and distribute it throughout the cultivated area. A ditch has an important role in spreading water evenly and adequately in irrigated areas as well as controlling the flow.

In some areas, water is distributed by pumping and sent by the pipeline system because it cannot be distributed by the force of momentum. Moreover, in the areas where canals cannot be constructed, the pipeline system helps to decrease water loss when compared with the canal system. Consequently, the objectives of distribution systems and the characteristics of irrigated areas are important factors in determining the type of water distribution system in an irrigation project.

Apart from this, distribution systems are divided into three main types, as follows:

1. The all-time water distribution system distributes water into cultivated areas by stable quantity levels all the time and through all of the crop seasons. In this method, water is distributed from the time of cultivation until the harvest. Distribution is stopped to when it rains or after it rains. All farmers still receive irrigation water all the time.

2. The rotating water system distributes water into cultivated areas in suitable quantities and at suitable times. This method sets the distribution of water according to needs and growing time.

3. Distribution according to water users' needs refers to distributing water into cultivated areas on time and in the quantity needed. This method is the best way for water users to decide cropping plans and the suitable times and quantity of water that the plants need. Some irrigation projects that use this method have sufficient principal water sources to allocate water to farmers, but the disadvantages are that some water is lost while being distributed and sometimes the system cannot respond to the farmers' needs. Consequently, this method is suitable for projects that collect operation and maintenance fees (O&M fees) because farmers who use a lot of water will pay high fees, but those who use a little will pay much less. In this way the method will create an equitable situation and cause the farmers to appreciate having a supply of water.

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Irrigation water management allocates water by making distribution plans both during the rainy season and the dry seasons. During the rainy season, water allocation is not complicated because these is enough water to use in irrigable areas and these is water from irrigation projects when it does not rain or when these is on insufficient quantity of water fulfill to the needs of farmers. In the dry season, however, water allocation depends on principal water quantity because principal water will indicate the size of cultivated areas. Therefore, irrigation water management will have a distribution plan before the planting season to make sure that there is enough water to serve the irrigable areas. In addition, principal water quantity from reservoirs will indicate the distributed target area and the highest irrigable areas that can to be cultivated.(ชูชีพ พิพัฒน์ศิลีและคณะ, 2543: 2-32)

Irrigation water management consists of structures, management and organization related to the social and economic aspects. It is a highly sociotechnical process and if it lacks good management it will not be successful. Moreover, to be successful in water management requires construction, design, water distribution control and maintenance. Apart from this, irrigation water management must consider water supply, water allocation, timely water distribution, the place and quantity including drainage water from cultivated areas. Thus, the most important aspect is the participation process between water users and officials and coordination between the producing and marketing units.(ไพฑูรย์ พะลายะสุต, 2535: 38; วิบูลย์ บุญยธโรกุล, 2535: 35)

2.3.2 Irrigation water management

Generally, the main objectives of irrigation water management are to distribute enough water to farmers in irrigated areas. In discussing the organization of irrigation water management in Thailand, can identify two levels (ไพฑูรย์ พะลายะสุต, 2535: 39; วิบูลย์ บุญยธโรกุล, 2535: 26):

1. The project level. This means to manage water in the main canal, lateral and sub lateral level and every level of canal will help to disperse water. Therefore,

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irrigation water management at this level consists of distribution activities, water dispersion, water measurement control and maintenance. In general, both medium and large irrigation projects will be controlled by project officials.

2. The on-farm level means managing water in ditches and farm levels such as plant allocation by considering water distribution, water dispersion, and water measurement control to let adequate water quantity to the plants, on time and to places effectively and to drain water from cultivated areas. At this level, irrigation water management will merge with other functions such as farmers' institutions, water users, economic, social and agricultural technology.

Distribution and maintenance at the on-farm level are usually managed and controlled by farmers and water users' organizations. In some countries, however, farmers will hire irrigation projects to manage these activities.

2.3.3 Water users' organization

Water users' organizations are important to an on-farm water management as the means of coordinating between members and officials from project level. Before becoming the current water users' organization, they had an evolutionary process, as described below.

I. Background of Water User's Organizations

The first water user's organization in Thailand was established in small irrigation projects that had active participation and cooperation in planning, constructing, operating and maintenance. Palayasoot, P (1995:43-45) summarized the history of water users' organizations in Thailand as follows:

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“ Historically, small scale irrigation programs have been developed in the Ping River Basin, the Northern Region of Thailand by the members of water users’ organizations without any assistance from the Government since the 13th century. Such small scale irrigation works in the ancient Lan Na period consisted of bamboo made diversion weirs across the streams in combination with the small irrigation ditches leading to paddy fields. These irrigation systems are known as “Muang Fai Rat” or the People’s Irrigation systems. The Muang Fai systems had their own laws and regulations agreed upon among the water users known as Sanya Muang Fai. Administration of the Muang Fai system was put under the full authority of the head of Muang Fai or Kae Muang Kae Fai (weir chief) of each village. They controlled water allocation to achieve fair distribution of water, which depends on the amount of available water and the size and features of the irrigation areas.

For operation of the Muang Fai system, the water users had to pay the water fee either in cash or in kind as stipulated in the agreement. The water fee was calculated based on the cultivated land per each growing season. The collected fee was used for paying to the weir administrators, weir guard, Kae Muang, Liab Nam, etc.

For maintenance of the Muang Fai system, the water users had to pay the maintenance fee in contribution of tools and equipment for weir repair and dredging irrigation canal. The amount of labor and accompanying tools depended on the amount of individual cultivated land and the amount of water used from the system.

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The government become involved in the Muang Fai system or People's Irrigation about sixty years ago by enactment Muang Fai and Phanang Act of 1934 and the People's Irrigation Act of 1939. Before the enactment of these acts, Sanya Muang Fai or the agreement among the water users was practiced and it has become the traditional practice among the northerners to cooperate in their effort to build People's Irrigation Systems and repair the project facilities. However, after the enactment of the People's Irrigation Act of 1939, Sanya Muang Fai or agreements and regulations of Muang Fai system are no longer effective.

In 1963, the first water users' group (WUG) for Tang irrigation project was established in Udon Thani province. The main purposes are creating better understanding of water allocation, coordinating with Royal Irrigation Department staff in operation and maintenance of the system facilities and also performing credit and marketing activities. Later, this water users' group became Water Users' Association (WUA) and the establishment of Water Users' Associations was expanded into all Tank irrigation projects in the Northeast and Royal Irrigation Department irrigation projects in the other regions. In 1968, a Water Users Association Centre was established in the operation and maintenance division, Royal Irrigation Department. In general, there are very few successful Water Users Associations now. At present, the Royal Irrigation Department is organizing water users' groups at each service unit level and they will be upgraded as registered organizations of either water users' associations or Water Users' Cooperatives (WUC).

In the area where farm land consolidation has been implemented, the Cooperative Promotion Department will organize water users' groups in each service unit. The

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> organization of water users' groups in land consolidation areas was started in 1980. These water users' groups are pre-water users' cooperatives. All water users' groups in the same lateral will be merged in a water users' cooperative later, and then water user's cooperative was initiated in 1986. The water user's group or water users' cooperatives in land consolidation are responsible for operation and maintenance fee. At present, there is one section in the office of Hydrology and Water Management, Royal Irrigation Department involved in extension and development of water user's organization.."

In summary, water users' organizations began with Muang - Fai or community groups by using the participation process to operate irrigation systems. After that, state irrigation systems were used instead of the old systems because they are permanent in terms both of construction and operation. Thus, to operate and maintain irrigation projects, water users' associations developed in the same way; in land consolidation areas, they have water users' co-operatives.

At present, RIDs have a Participatory Irrigation Management (PIM) policy to let farmers participate in irrigation activities. Therefore, each irrigation project will establish a water users' organization, the objectives of which are:

1. To let water users join together and have allocated water distributed fairly throughout cultivated areas.
2. To let water users decide to improve irrigation systems by themselves especially in their farms to disperse water faster and in ways suitable with the new agricultural plans.
3. To let water users learn about and understand the importance of irrigation methods, drainage systems and correct ways of using irrigation water.
4. To let water users learn about and understand both the usefulness and the importance of maintenance methods and the correct ways of constructing irrigation systems.

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5. To let water users be the main coordinators between farmers and irrigation officials including other divisions of state officials concerned with receiving both theory and practical knowledge through advice and group training.

6. To decrease and eliminate conflicts over water use that occur between groups.

7. To change water users' reliance on state assistance to that of self-assistance in order to decrease the responsibility of state officials.

8. To share power of water management among the community.

From the roles of water users' organizations in water management described above, it is apparent that water users should have independence in water management, elect a president responsible for all duties, and use water according to the rules. To achieve these objectives, each water users' organization should be organized by members who share the same opinions and objectives. Similar to the Muang-Fai or community system, water users will agree with the rules under the contract called Sanya Muang-Fai. Apart from this, the implements used in water management, including water fees, are important in creating equity between members. Moreover, water fees may help to decrease problems, obstacles and conflicts that occur and each organization might set up a group of implements in different ways. For example, some groups or organizations may use only water fees, while others may use other implements or combinations of several implements to manage water in ways that are fair and sustainable.

II. Types of water users' organizations in Thailand

From the objectives of establishing water users' organizations, we can identify four types of water users' organizations, based on operation principles: (ไพฑูรย์ พะลายะสุต, 2535: 35-46)

1. Water users' organizations in people's irrigation systems or Muang-Fai irrigation systems in northern Thailand.

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2. Water users' organizations in small water source development projects established by coordinating and accelerating water source development committees.

3. Water users' organizations in medium and large irrigation projects of RIDs that operate in three steps: water users' groups, water administration groups and water users' associations or water users' co-operatives.

4. Water users' organizations in the consolidation area project that began with water users groups and after that, became water users' cooperatives in consolidation areas. This type uses the electrical water pumping project of the Nation Power Office.

Apart from this, water users' organizations can be divided into three types:

1. Private organizations, which are small organizations that agree to maintain small irrigation systems together.

2. Quasi-public organizations, which are larger than private organizations, and may be water users' associations or water users' cooperatives, established by both preference and action.

3. Public organizations are the largest and they have multi-objectives. As a result, the groups can get capital from members' fees, taxes, bonds or state loans to construct and improve irrigation systems apart from water allocation and maintenance. To establish a public organization, a group must have special laws or acts.

Palayasoot, P (No date: 10-11) described the status of water users' organizations in Thailand as generally divided into two main groups, ie., formal or legal and informal or customary.

1. A Formal or Legal Organization is organized by law for formal arrangements among the water users with specific purposes being decided by them. The organization then becomes a form of legal body. At present, there are two types of water users' organizations, ie. Water User's Associations (WUA) and Water Users' Cooperatives (WUC), that are classified as formal groups.

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1.1 Water User's Association (WUA). About 35 years ago, the first water users' association was established for tank irrigation and state irrigation projects of the Royal Irrigation Department (RID) in the Northeast. It is a formal institution which is organized by civil law. At present (as of 1998), there are a total of 69 water users' associations (covering an irrigable area of about 565,000 rai with 21,130 members), primarily in the Northeast. However, most of them were not able to function well because of lack of active farmer participation from the beginning and water users' officers and members apparently lacked a clear sense of purpose and responsibility.

1.2 Water Users' Cooperatives (WUC). In the areas where land consolidation and Department of Energy Development and Promotion (DEDP) pump irrigation projects have been implemented, the Cooperatives Promotion Department (CPD) will organize water users' groups in each service unit. These water users' groups are pre-water users' cooperatives. These organizations are formal groups organized by the Cooperatives Promotion Act. In 1985 and 1986, the first water users' cooperatives in the Department of Energy Development and Promotion pump irrigation project and in land consolidation areas were established respectively.

2. An Informal Organization is organized by informal arrangements among the water users that incorporates traditional, religious, and social values, or performs certain functions. There are currently four kinds of water users' organizations classified as informal groups, ie. Traditional Irrigation Associations, People's Irrigation Associations, Water Users' Groups and Water Administration Groups.

2.1 Traditional Irrigation Associations. This type of water users' organization has existed in Muang-Fai systems or People's Irrigation in northern Thailand for over 700 years. They have their own agreements or regulations agreed upon among the water users, known as Sanya Muang Fai. All water users are responsible for construction and operation and maintenance of the project facilities. In general, most of the water users obey and follow the regulations because they took part in the drafting of the regulations by themselves. The Muang Fai system's administrators were comprised of Huana Muang Fai, (weir director), Kae Muang (water master), Liab Nam (ditch rider) and Lam Nam (common irrigator) under weir

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committee. Most Huana Muang Fai remain in the position for many years if they are well respected and have an active in operation performance. However, the changing and election time for new Huana Muang Fai is generally at the beginning of the year or before the paddy growing season. The members of this organization had to pay the operation and maintenance fee either in cash or in kind as production of rice. The fee is used for paying compensation to the administrators and operator of Muang Fai system, for maintenance of the project facilities and for the requesting a rain ceremony and the others.

2.2 People's Irrigation Associations. These organizations are an outgrowth of Tradition Irrigation Associations after the promulgation of the People's Irrigation Act of 1939. The local government officials, namely provincial governors, district officers, sub-district chiefs and village headmen will act as competent officials in supervising the people's irrigation systems and also for water allocation. The administration and organization of People's Irrigation Associations are similar to traditional associations, following Sanya Muang Fai or agreements among the water users, but they are formal institutions.

2.3 Water Users' Groups (WUG). At present in the irrigation projects, the water users' groups are established in each service unit. These water users' groups are informal organizations and also act as pre-formal organizations, ie., water users' associations or water users' cooperatives. All water users' groups in the same lateral will be merged into a water users' association or water users' cooperative later. The water users' groups are responsible for operation and maintenance of on-farm facilities and collection of operation and maintenance fees. Each water users' group elects its owns ditch president who acts as a common irrigator, covering an irrigable area of about 200-300 rai. For the large command area, they may have 2 or 3 assistants. In 1998, there were about 12,000 water users' groups covering an irrigated area of about 3 million rai with 281,000 members.

2.4 Water Administration Groups (WAG). In the large- and medium-scale projects of the Royal Irrigation Department, Water Users' Groups of the same lateral may be merged into an informal organization as water administration groups. These types of organizations are informal and will become registered organizations of either water users' associations or water users' cooperatives whenever

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they are ready. At present (as of 1998) a total of 1,700 water users' administrations are in existence, covering an irrigated area about 2,861,000 rai with 234,500 members.

2.5 Farmers' Organizations. In general, all kinds of farmers' organizations within irrigation command areas have to be involved in water management and maintenance of the distribution network at the tertiary systems. Farmers'organizations in the CPRB are set up by different government agencies to carry out their programs with farmers. However, the official farmers' organization is divided into two types: cooperative systems and farmers' groups

A cooperative is the ultimate goal of farmers' institutions. At present, there are 6 major kinds of cooperatives which were established by the Cooperative Act. Cooperatives Promotion Department (CPD) is the agency that establishes and promotes these groups. Among 6 kinds of cooperatives, Agricultural Cooperatives and Land Settlement cooperatives are related to water resources development and management. Among these cooperatives, Agricultural Cooperatives are district level cooperatives and they are the largest kind.

Another formal farmers' organization is Farmers' Group organized under a Revolutionary Party's Decree to serve farmers in a tambon. A group of farmers who share common activities in a tambon, such as rice cultivation, upland crops growing, livestock breeding etc. are organized and promoted by the DOAE.

In addition, DOAE is also promoting other informal groups for different purposes ie. Farmers' Housewives Groups, Young Farmers' Groups and Production Groups. Generally, the Farmers' Groups are much less active than the coops. Although some of Farmers' Groups are performing well, many loans given to their members have defaulted.

Generally, there are very few successful water users' organizations. The precise status of the water users' organizations is ambiguous and lack of legislation for the formation of water user's organization prevents them from having proper legal status. In addition, the idea of establishing water users' organizations was not initiated by the water users themselves and there has been lack of active farmer participation in all phases of project development as well as inadequate support from the concerned agencies.

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In this study, I have chosen to study water administration groups that are informal organizations in the Mae- Taeng Irrigation Project. These types of water users' organizations are expected to have more power in water administration, including participation in O & M fees in the project, according to PIM policy in the future.

III. Factors affecting water users' organizations

Dick (1994: Executive summary) presented characteristics of successful water users' associations (WUAs) which can be classified into two types, as follows:

1. Internal structures for effective water users' organizations

1.1 WUA origins: WUAs must have a sense of 'ownership' and must have begun spontaneously from among themselves, rather than having been brought in by outsiders. Apart from this, some standardization of organizational form is often a legal requirement for registration of water users' organizations, particularly to operate bank accounts, obtain external assistance, or gain formal ownership rights to the systems.

1.2 Membership definition: Groups are likely to be strongest if membership is defined so as to maximize the common interests among members; the most successful WUAs are often found where the irrigation system layout is consistent with traditional social organization.

1.3 Size of WUAs: The optimal size for WUAs depends on the local balance between increases in transaction monitoring, and administrative costs on one hand, and potential economies of scale on the other.

1.4 Federation: This allows coordination between WUAs at each level, and makes it possible for them to undertake activities at the next higher level of the system. In addition, federation provides an organized forum for expressing farmers interests, and adds to the effectiveness of WUAs in providing decision-making input from their membership.

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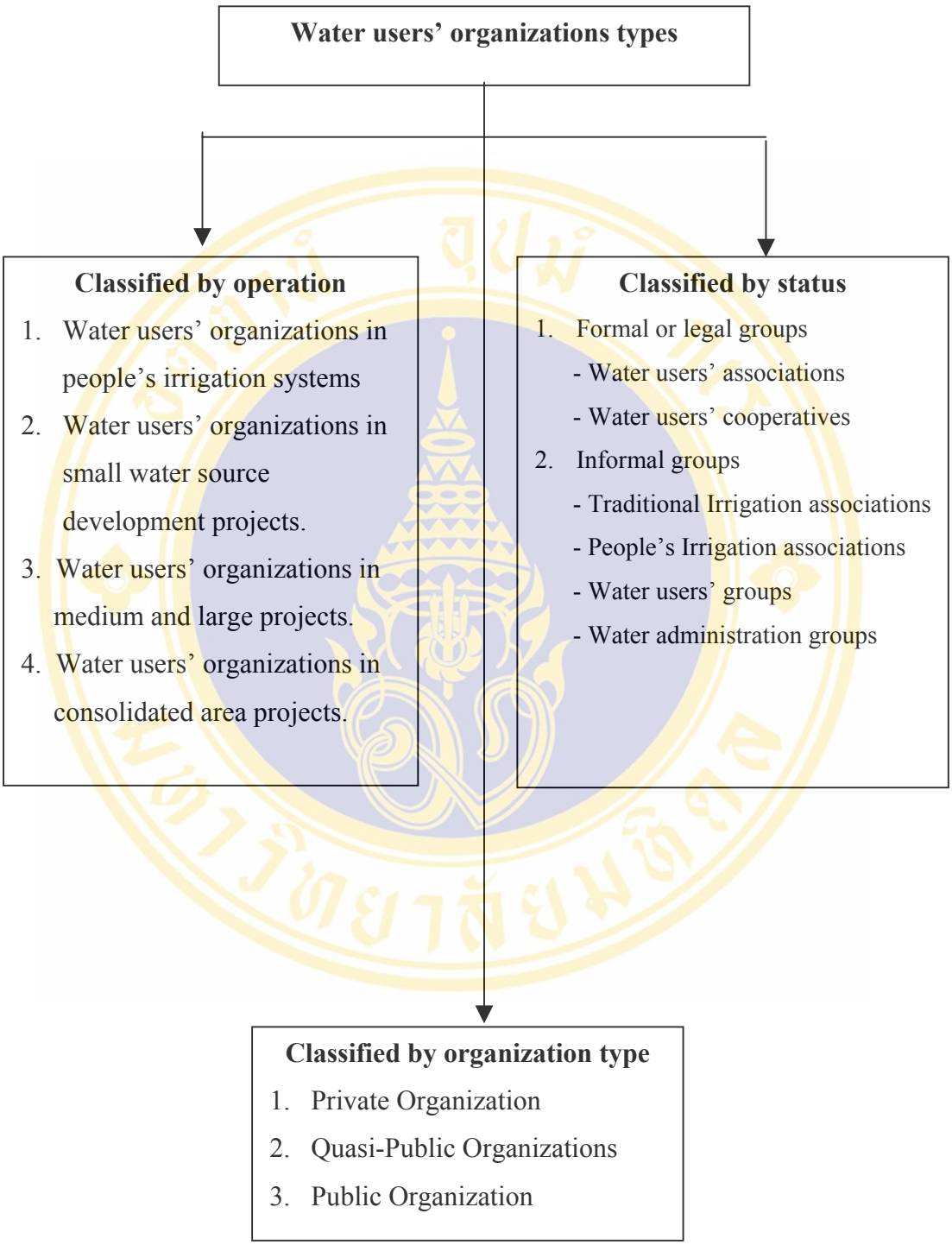

Diagram 2.1 Water users' organizations types

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2. External conditions for sustainable WUAs

2.1 Physical and technical factors: A moderate degree of water scarcity generally proved to be a better condition for collective action than abundant water or extreme scarcity, and advanced technology is not necessarily a barrier to WUA management of systems. In addition, the irrigation infrastructure for transportation and communications facilitates WUA activity by making it easier for members to meet, to travel along the system, and to monitor compliance.

2.2 Social and economic factors: Social cohesion and homogeneity among farmers facilitates collective action in WUAs and the net result of market penetration is seen not so much in the degree of WUA development, but in the structure of organization. Moreover, the high costs of agencies operating and adequately maintaining irrigation systems has been a driving force behind many programs to transfer irrigation management to WUAs. WUAs cannot operate at a deficit; financial viability of the WUA enterprise is thus critical to the sustainability of organizations and the irrigation infrastructure. But in the end, the success and long-run sustainability of WUAs are dependent upon sufficient incentives for farmers to participate.

2.3 Policy and governance factors: Legislation affecting WUAs must provide a facilitative framework, not a repressive one. This requires balancing requirements or responsibilities with rights of the organizations. Moreover, agencies which are able to deliver a reliable water supply in the main system, but not to every field, create the most conducive conditions for WUA activity and structural changes such as establishing financing autonomy for irrigation agencies and linking salaries and performance appraisals to work with farmers generally create the strongest and longest-lasting incentives for agency staff to work with WUAs.

In conclusion, to be successful in irrigation water management, on-farm and project level groups must continually undertake cooperative work because it always affects other aspects of management. This study will consider both the on-farm and project levels and will include examining the state's potential in irrigation water management and problem-solving.

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2.3.4 Concepts of Participatory Irrigation Management (PIM)

I. Definition of PIM

PIM is an important process that RIDs use to prepare farmers to participate in every step of irrigation development: before, during and after construction. Apart from this, PIM is a measure to improve irrigation usage, maintain irrigation systems, decrease problems of the tail-canal farmers and improve the entire economy in irrigated areas.

Moreover, PIM is the basis of several activities that accompany the changes in irrigation management. In general, PIM aims to increase the role and strength of farmers, including transferring irrigation management cost sharing to them. Apart from this, using successful indicators and service standards, including executive and decision-making power, are other important factors in creating effective irrigation administration by using cost or labor sharing. Thus, PIM has to create practical solutions and increase the ability of water users' organizations to be able to undertake responsibility effectively and solve day to day problems so that farmers become the real partners of RIDs.

PIM not only mobilizes labor from farmers and not only organizes water users groups, but it also improves the decision-making power of farmers so that they will be able to administer irrigation by themselves. This concept will become the service agreement that is developed between water users' organizations and irrigation officials at the project level. The service agreement is based on success indicators and service standards in the irrigation project. Thus, irrigation officials must work with water users' organizations and help them in every irrigation activity along with officials in other departments related to agriculture, credit and marketing.

In summary, PIM is irrigation development for farmers to be able to face future problems, such as having to increase the amount of food produced while decreasing water, multi-cropping, and the need to decrease losses and lower costs to

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improve the project. Thus, to strengthen the position of farmers and their ability to administer irrigation water, state officials have to change the emphasis from constructing systems to administrating water, and change from direct functions to supporting functions of water users' organizations in managing water themselves.

II. PIM targets

Developing water users' organizations to participate in irrigation management is the main goal of PIM. It works to increase capability and it trains water users' organizations to be successful in administration. Generally, the objectives of PIM are :

1. to build a sense of belonging in the irrigation project,
2. to improve water distribution and maintenance projects,
3. to use water resources in useful ways,
4. to share water dispersion equally,
5. to encourage water users to participate in irrigation management and to set times and frequency of receiving water according to the needs of water usage,
6. to let farmers have the power to choose the crops that they grow,
7. to improve the effectiveness of water usage,
8. to increase agricultural production while decreasing water usage,
9. to develop a sense of economy in water usage,
10. to develop sense of community in using water economically by cost sharing for irrigation administration,
11. to find the best way to solve water usage conflicts.

III. The basic factors of PIM

1. Transferring decision-making, responsibility, and power in water management from RIDs to water users' organizations.

2. Establishing and developing water users organization step by step, that is from water users' groups to water administration groups and eventually to water users' associations.

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3. To have co-executive committees manage water and have agents from all levels of water users' organizations serve as members.

4. Farmers are the new partners in irrigation management.

5. The new partners have cost sharing in irrigation management.

6. Farmers are the new partners for repairing and improving irrigation infrastructures.

IV. Cost sharing: Operation and maintenance fees (O & M fee)

Under PIM policy, distribution budgets for water delivery and maintenance systems should be based on the new principle of joint agreement of conditions by RIDs and WUAs. To prepare the joint agreements, suggestions are made according to changes in the assisted budget for operation and maintenance to add funding for participatory stimuli, called 'smart subsidies,' which will support rather than impede local investment.

Another example is the agreement regarding O & M fees at all level – lateral, sub-lateral and project levels. Moreover, the agreement of O & M fees will be shared by RIDs and WUAs according to the agreed proportion and will be prepared according to the type of agreement in which farmers will pay a little bit more.

In medium-size projects, WUAs need to develop self-capability because they will be transferred to response management completely in the second stages of the pilot project. Thus in medium size irrigation projects it is possible to establish WUAs and set irrigation management plans at the project level in two years or at the end of the second stage of the pilot project.

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Table 2.1 Participatory irrigation management plan in the years 2000 - 2008 for medium and large irrigation project

Preparation stage	First stage	Second stage	Third stage
6 month	2 years	2 years	3 years
November, 2000 – April, 2001	May, 2001 – April, 2003	May, 2003 – April, 2005	May, 2005 – April, 2008
Activities 1. Seminar to create understanding among RIDs officials. 2. Seminar to create understanding among officials in other departments. 3. Seminar to create understanding between irrigation officials and the pilot projects 4. Prepare to practice. 5. Practicing 6. National PIM units - Consultant committee from RIDs to set irrigation activity reform plan in PIM. - PIM units in irrigation office. - ICO Team to strengthen all organization levels.	**1st year** 1.ICO Team integrated WUG[2] and increasing capability. 2. ICO Team integrated WUG (IWUG),[3] increasing capability and establish an executive committee to manage water. **2nd year** 3.ICO Team integrated WUG to WUA[4] 4.Prepare to change practical plan, meeting with officials about responsibilities. 5.Coodinate with other units to support WUA. 6.Studying the way to establish IRIF[55]	**Co – project management** **Transferring to lateral** 1.Increasing capability of WUG, IWUG and WUA. 2.IWUG has decision – making power at the lateral level. 3.WUA becomes co – executive committee at project level 4.IWUG transfers agreements 5. Transferring building – conserved officials to WUA. 6.Set practical program about IRIF. 7.Accepted IRIF	**Transferring to main canal** 1.Increasing capability of WUG and WUA 2.WUAs have decision – making power in project level and co – management in headwork level.. 3.WUAs transfer IRIF agreements 4.Transferring conserve – building officials and zoneman to WUA and eliminate that position when they retired. 5.Begin to use IRIF and monitor water management, agricultural development and marketing promotion.

Notes:

1.ICO Team is Irrigation Community Organizer

2. WUG is Water User Group

3. IWUG is Integrated Water User Group

4. WUA is Water User Association

5. IRIF is Irrigation Improvement Fund

Source: กรมชลประทานและคณะที่ปรึกษา PIM Halcrow water, 2544: 8.

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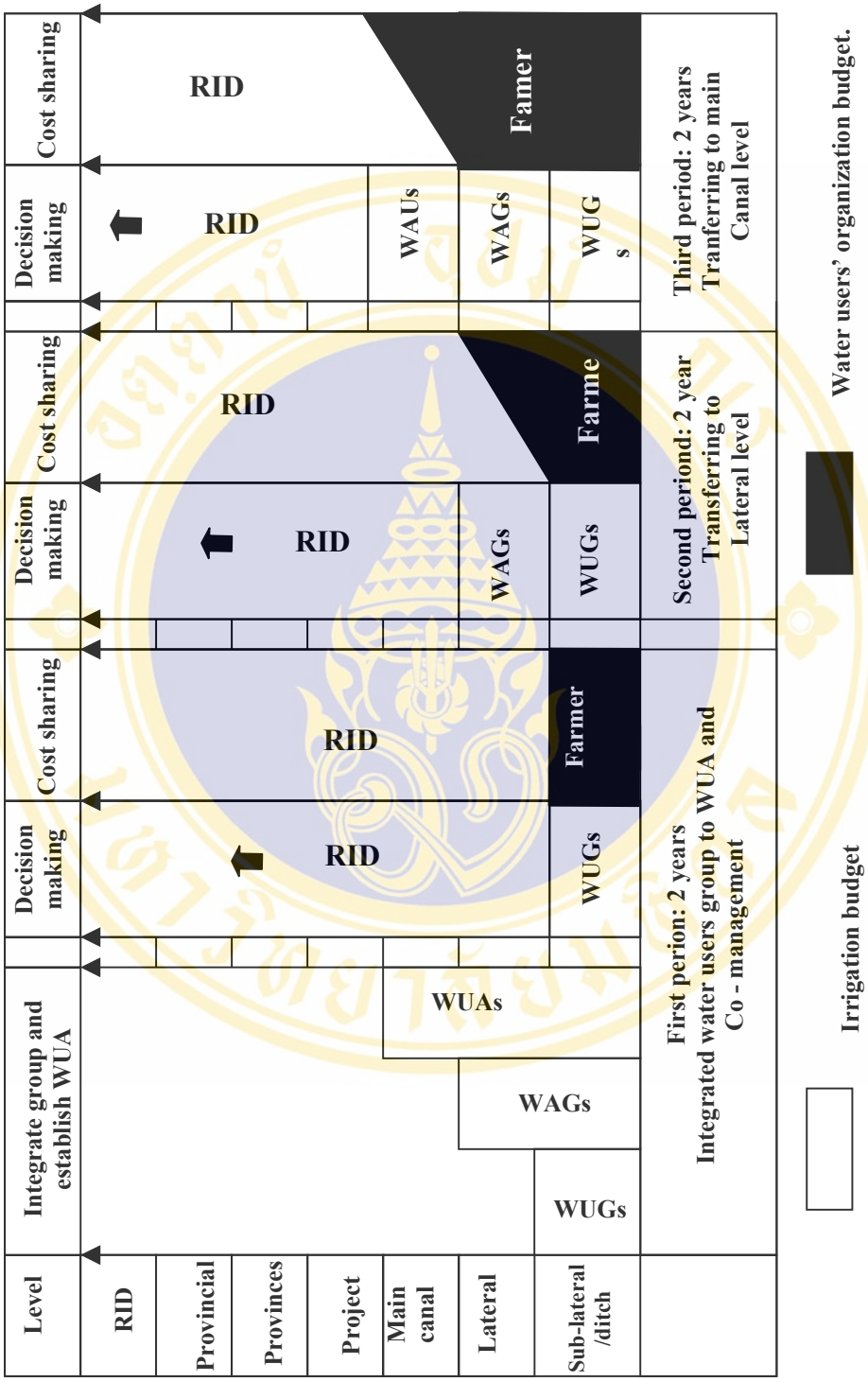

Diagram 2.2 PIM strategy in medium and large project

Source : กรมชลประทานและคณะที่ปรึกษา PIM Halcrow Water, 2544: 11.

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2.4 Relevant documents and research

Documents and research relating to capability studies of water users' organizations in water management include the following.

Tan–Kim–Yong (1995: 40-42) presented her research in "Muang – Fai Communities Are for People: Institutional Strength and Potentials," which emphasizes a study of the relationship between organizations and environmental conditions in an open–system approach. This research provides a view of 'Muang – Fai' organizations or people's irrigation organization (PIO) in the upper northern region by comparing and contrasting lowland and upland communities for a particular period in terms of their evolution, ecology, and history. In summary, lowland and upland PIOs have similarities, but they also have differences in social and organizational complexities. These differences involve rules, roles, and social groups or working group due to the fact that they have different irrigable areas sizes, physical structures of weirs and dams, and socio-political and economic effects.

Apart from this, PIOs in lowland communities are considerably more complex in their systems of labor and resource mobilization. The many types of social groups are managed differently for each kind of activity, enabling effective labor mobilization appropriate to each particular time and irrigation activity. Moreover, PIOs are structurally stratified; that is, members are classed into many different categories according to certain standard characteristics. Each membership category has obvious roles, rights, and responsibilities. Irrigation organization in the uplands is distinguished by a simpler structure. Leaders and members have similar roles and are of similar status. The differences between them and management by leaders is evident only in situations where it is necessary to mobilize labor for a particular activity. Thus, the leaders in lowlands have clear authority over others in controlling and managing people's irrigation affairs while in those in the uplands are coordinators rather than leaders.

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The same researcher, Tan-Kim-Yong summarized the principles and fundamental elements of people's irrigation organizations (PIO) in the upper north of Thailand into nine points and adapted them as follows.

1. Balancing rights and obligations: The PIO has to manage a just distribution of benefits. The rights and benefits of each individual are equivalent to the duties and responsibilities demanded. At the group or community level, the distribution of duties and rights for individual benefit, as shared among the large number of water users involved, is determined so as to enhance a just balance and minimize conflicts between individuals which could threaten the unity of the group or organization.

2. Making labor obligations compatible with farmers' schedules: The system of activities managed by PIO is ordered and arranged so as to fit within farmers' normal cycle of work and activities, and the scheduled is harmonized with other agricultural activities throughout the year so that farmers are able to manage household labor in such a way as to allow prompt response to group demands for cooperation. In addition, the PIO's activities are also important as a means of reinforcing the connection between farmers who use water together. In this way a sense of unity and mutual cooperation of the community is strengthened.

3. Flexible management of labor adapted to variable conditions: The organizing of farmers' labor is managed in a variety of ways consistent with the particular pattern of obligations and responsibilities. Generally, farmers are divided into groups of diverse and variable size and composition, depending on conditions related to the physical structure and social characteristics of people's irrigation systems. The structuring of small groups can contribute to the enhanced cohesiveness and unity of the larger group.

4. Balancing head and tail benefits: the PIO has to build mechanisms for reducing the natural advantages of those at the head of the canal with respect to these at the tail.

5. People's Irrigation leaders are elected from among PI members: Procedures for selecting leaders require that the mandate for leadership be derived through free elections by all farmers using water from the system, and that all candidates must be members of the group and work effectively through a system.

6. Passing on the People's Irrigation System (PIS) to new generations: The PI mechanism used to enhance continuity in leadership and knowledge of the technology

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associated with PI is to elect as the new leader a capable assistant to the previous leader.

7. Joint decision-making and local self-determination: The structure of PIO and leadership is based on democratic principles. The legitimacy of the elected leadership is linked to the process of decision-making within the PI, which in turn depends upon the willingness of the group to cooperate.

8. Creative planning and development: PIOs are primarily responsible for basic system maintenance, that is, keeping the facilities in good operating condition for irrigation through annual repairs and renovation. Aside from these basic activities, there also exists a system of activities aimed at development, investigation and improvements for resolving problems which arise under ever-changing social, economic and environmental conditions.

9. Enforcing mutually acceptable rules: Each PI has established rules to control potentially dangerous behavior or behavior which infringes on the rights of others. PI leaders and farmers are both liable to the same rules and penalties, and thus the system serves to control both parties.

Tanabe (1994: 131-156) studied 'Muang – Fai' organizations by using a social practices framework in an organizational analysis approach. He showed that each local irrigation system or 'Muang – Fai' system consists of 'Mu – Fai' or irrigation control groups or water users' groups principally organized by the households that use common irrigation water from the same 'Muang – Fai' system and the 'Mu – Fai' is, in principle, organized separately from the village community. 'Mu – Fai' will elect a 'Kae Muang' or an irrigation headman, who is responsible for coordinating all activities for maintenance and operation of the irrigation system related to the local social organization. The 'Mu – Fai' is held responsible for maintenance of the system under customary regulations in return for the privilege of receiving the water. Apart from this, Tanabe found that members are divided into two functional sub–groups according to seasonal land use, with varying responsibility for repair to the weir bodies and dredging canals, the rainy season group responsible for the primary repairs and dredging in the rainy season and the dry season group for the supplementary work in the dry season. Thus, the members in both groups have different responsibilities in

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system maintenance. Moreover, in the rainy season, groups use water rights and responsibilities according to the size of cultivated areas, but in dry season they do not.

พัชรี อาจหาญ (2538: บทคัดย่อ) studied the adaptation of local irrigation organizations to public intervention in Muang – Fai management of upper Mae Ping watersheds. The results of this study are first, public intervention into local water management is the same as the public irrigation development program. The term 'development' here is used more as an instrument to expand government power through public authority in order to control community resource management than an attempt to solve the real problem of local water management. Therefore, local water management is transferred to be under the public irrigation management.

Secondly, bureaucratic officials, members of parliament, local construction business companies, agriculture business groups and both formal and informal local leaders have influence in implementing public irrigation management into the public irrigation management as they can gain business profit and political power. All these groups can be called 'power blocs' and they can share benefits and become the main groups to create new state discourse in terms of modern technology and new irrigation management systems which oversee the indigenous local water management in the watershed area.

From the changes in water management systems, farmers have adapted various different patterns of water use. For example, farmers may reuse their local water management system as before in some suitable watershed areas; local water management organizations will adapt to be the monitor of public irrigation management systems; local water management organizations can seek ways to improve water management in these watershed areas; and farmers may change their cropping patterns in relation to the public management system, and some farmers avoid using water from public irrigation.

สาโรจน์ แววมณี (2541: บทคัดย่อ) applied sociological and anthropological concepts to understand the adaptive process of communal irrigation organization. He focused on the social organization of irrigation, locally known as 'Muang – Fai,' in

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Mae Klang watershed, Chom Thong District, Chiang Mai Province. This study applies two concepts to understand the adaptive process of communal irrigation organization: traditional, ecology and organization as culture. He found that ‘ Fai Muang Mai’ organizations require some structural adaptations to respond to the changing context under socio–political changes and modernization from recent economic and social development plans which can be observed in three phases.

1. Formation of social organization phase. In this first period, the members of ‘Fai Muang Mai’ organizations were divided into two groups; the leaders group and the water users. The water users’ group mobilized its resources and labor to operate and maintain the irrigation system once a year. ‘Fai Muang Mai’ reclassified membership into two groups; the head–canal group and the tail-canal group. The latter group mobilized its resources and labor for operating and maintaining the system twice and the former group only once.

2. Formalization phase. ‘Fai Muang Mai’ organizations reformed their structure and function based on leadership – the leader group could rotate to manage the system. Expanding systems of mono, intensified, and diversified crops demanded that ‘Fai Muang Mai’ organizations provide more elaborate water allocation and resource mobilization for operating and maintaining the system.

Meanwhile, ‘Fai Muang Mai’ organizations have two new membership categories; the first divides members into two groups, wet season user groups and dry season user groups. Both groups have to mobilize their resources and labor for operating and maintaining the system once a season. But the former group has to remunerate in kind, and the latter group has to remunerate in cash. The second category is to divide members into two groups, the original irrigated land user group and the extended irrigated land user group. The former group consists of ‘real members’ and has to operate and maintain the system. The latter group consists of ‘supplementary members’ and has to pay money once a year for maintaining the system. The former group has priority in using water.

3. Intersystem managements of watershed irrigation management phase. Though ‘Fai Muang Mai’ organizations have maintained effective management, which has become more formal, they need to cooperate with other communal irrigation organizations.

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พิศาล ดีพร้อม (2542: บทคัดย่อ) studied the administration of water users groups in Kam Paeng San Irrigation Project. The result shows that water users' groups have informal management and do not manage under the RIDs targets because water users lack knowledge and understanding about how to manage water users' groups. The administrative processes that he used to analyze water users' groups include the following: planning, organizing, directing, controlling, and managing conflict. In terms of planning, water users do not plan together because leaders do not organize meetings to let members participate in planning; in contrast, the reason that leaders give is members never cooperate in formal planning, and so planning is done informally through conversation among water users during their free time.

In terms of organizing, water users' groups have not clearly responded to organize because water users groups are organized and their structures and administrative procedures are established by irrigation officials.

In terms of directing, leaders have few opportunities in which to direct because most leaders are not able to enforce or persuade members to cooperate to achieve group goals. And in terms of controlling, water users' groups do not have an obvious control process because groups have not established formal plans to manage the process of control. However, certain control procedures can still be found in informal types where it is easy to control the main activities of water users groups, which are maintenance activities.

In case of irrigation water usage conflicts, he found that when conflict begins between members, water users' groups have no role in solving the problems because they lack integrating members and effective leaders who can enforce or influence other members. This is the reason water users' groups are not stronger.

In summary, all literature related to the capability of water users' organizations in water management agree that water users' organizations are important for local water management of both people's irrigation systems and community irrigation systems or Muang – Fai systems and water users' organization in state irrigation projects. Thus, water users' organizations as open–systems have traditions in their organization that indicate whether or not they have the ability to manage water fairly for all members.

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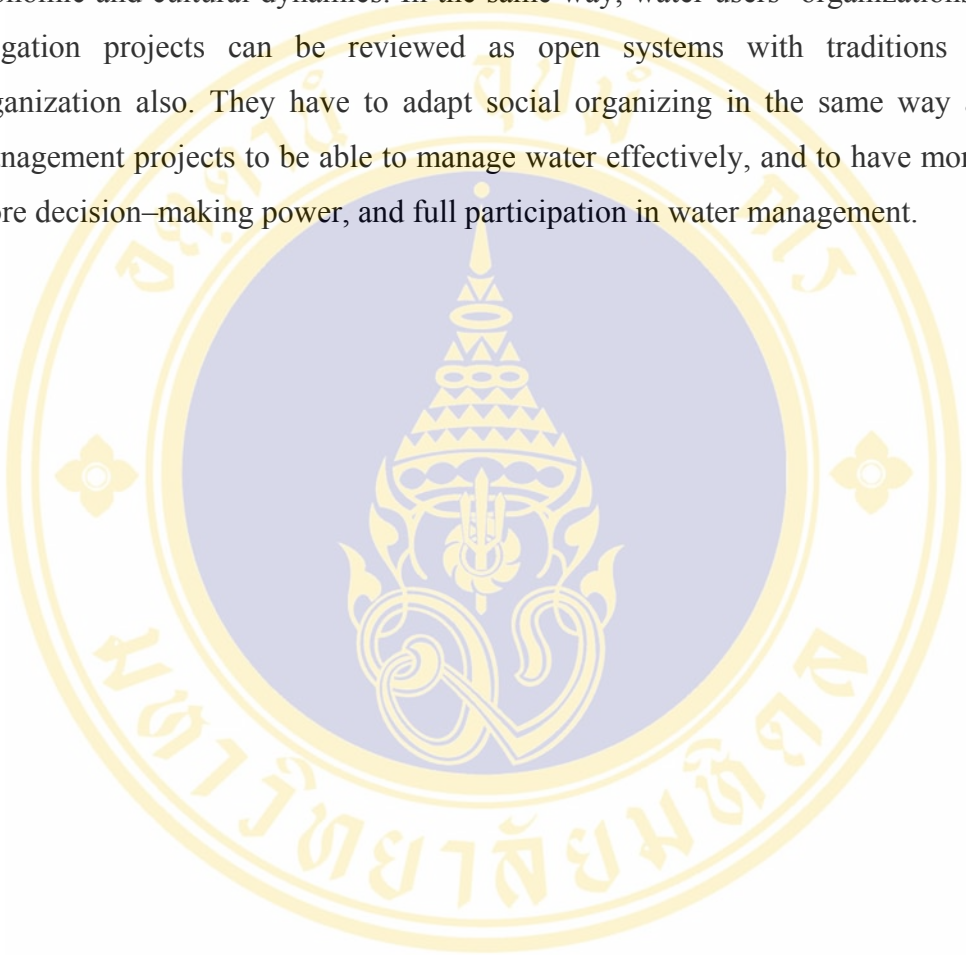
It depends on the structure of the organization whether members share responsibility equally as co–water users, thereby managing water in harmony with the physical characteristics of the irrigation project. Moreover, water users' organizations try to be flexible in their water management plans and be able to adapt according to social, economic and cultural dynamics. In the same way, water users' organizations in state irrigation projects can be reviewed as open systems with traditions in their organization also. They have to adapt social organizing in the same way as water management projects to be able to manage water effectively, and to have more rights, more decision–making power, and full participation in water management.



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CHAPTER III
METHODOLOGY

This capability study of water users' organizations in water management, using Mae – Taeng Irrigation Project, Chiang Mai as a case study, is field research which has as it objectives to understand ideas and implements in water management under socioeconomic and ecological changes that emphasize multi – production from the earliest to the most recent times. Apart from this, the study aims to show how ideas and implements used in water management look and how they can reflect the capability of water users' organizations in water management. This study uses concepts of grounded theory as the way to analyze organizations. Grounded theory is methodology that emphasizes the study of social phenomena, using all aspects of principles of understanding, such as values, ideas, beliefs and perceptions, including several definitions of behavior. From there, data is used to establish groups of concepts and find relationships between concepts to make theoretical conclusions concerning social phenomena. In this context, social phenomena are defined freely according to reality without having a rigid framework in advance about how things have meaning for people (นภาภรณ์ หะวานนท์, 2539: 103). The description and steps of the study are described below:

3.1 The study area

The criteria used to select the study area are:

1. The areas receiving water from irrigation projects for use in cropping.

2. Having water administration groups as water users' organizations, registered and coordinated with irrigation officials.

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The specific study area selected consists of laterals 5, 6 and 7 in irrigated areas of Mae – Taeng Irrigation Project, Chiang Mai, called 'Water Administration Group Zone 2', covering three subdivisions in two districts, i.e., Son Pong and Khi Lek subdivisions of Mae – Rim District and Kki Lek Subdivision of Mae – Taeng District. Apart from this, Mae – Taeng Irrigation Project was constructed as part of the first phase of the national economic and social development plan. The study demonstrates the group's evolution in water management and social organization. In addition, those areas have multi-cropping, which enables us to study ideas and implements in water management.

3.2 Target population and sample groups

Target population and analytical units used in this study are water adminsistration groups and the sample groups are listed and described below.

3.2.1 Members of WAG, who use irrigated areas for cultivation using water from the irrigation project. The researcher selected this group in order to present methods and implements in water allocation for cultivation through the frequency of receiving water for multi – production. Apart from this, members of WAG will demonstrate several roles, including participation, perceptions and opinions related to the study area and to water management.

3.2.2 Leaders and administrative committees; because these are important groups that completely control the function of WAG through rules or regulations, roles and responsibility of members. Apart from this, this group enables us to have data of water management from the earliest to the most recent times, include receiving several policies from the state that affect capability in water management.

3.2.3 Elderly people; this group provides us with social, economic, cultural and water management data about the community that allows us more obvious and complete information from the past.

3.2.4 Irrigation officials; those who manage water for cultivation and organized WAGs. Moreover, they put state policies into practice, enabling us to understand the ways in which they function in each period, and the problems and difficulties that result.

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3.3 Data collection methods

In this study data is divided into two collections.

3.3.1 Pre-data collection; this is data collected before beginning the fieldwork and includes documents, theoretical concepts, research, and state policies related to water users' organizations, knowledge of irrigation water management, water users' organizations in Thailand and related documents and research papers. This data is related to economic, social, cultural, political, environmental and resource conditions, including agricultural development policy in the study area and water management using the participatory process. All this provides the research study with the beginning of the conceptual framework.

3.3.2 Data collection in the study area.

I. Surveying; to study community lifestyle characteristics of water users' organizations and water management through multi – productions, relationships between members, water reception, water allocation, water usage behavior and traditions to establish relationships for research in several community contexts.

II. In-depth interviews; by using both formal and informal techniques. In-depth interviews according to the objective or points of the study and appropriate situations. In formal in-depth interviews consist of many questions, as follows:

1. Members who use cultivated areas at the head and tail of the canal
   - 1.1 Bibliography
   - 1.2 Types of crops and crops changing each year
   - 1.3 Land Holders
   - 1.4 Size of cultivated areas
   - 1.5 Frequency of cropping each year
   - 1.6 Income from cropping each year
   - 1.7 Problems and obstacles in water allocation
   - 1.8 Principles and methods in water allocation for cropping
   - 1.9 Water usage planning
   - 1.10 Adequately and frequency of irrigation water reception
   - 1.11 In case of inadequate water, how to request water from the project

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1.12 Who manages water

1.13 Equity in water allocation of leaders and administrative committee

1.14 How to solve conflict over water to use in cultivation

1.15 Preferences in project water allocation and points to improve; whether to have certain policies of water allocation or not

1.16 Membership

a. How long have farmers been members

b. Participation in issuing regulations of water allocation, maintaining and repairing irrigation systems, mobilizing labor or resources, preference for paying water fees

c. Roles and responsibilities of members

d. Relationships among members and between members and leaders and administrative committee

e. Preferences through functional of leaders and administrative committee

2. Leaders and administrative committee

2.1 History of WAG

2.2 History of leadership and administrative committee

2.3 Roles and responsibilities

2.4 Water users' organizational structures

2.5 Principles of sharing responsibility

2.6 Size of irrigated areas

2.7 Who has decision-making power in water allocation

2.8 Types of crops each year

2.9 Methods and principles in water allocation

2.10 Management, rules, and regulations of water users' organization

2.11 Implements to provide for fair allocation of water

2.12 Remuneration for serving as a leader or member of the administrative committee.

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2.13 Number of members and appropriate number of members in the organization

2.14 Relationship between members

2.15 Satisfaction regarding water allocation from irrigation project.

2.16 Cooperation of members in activities

2.17 Reasons for conflict and ways of dealing with conflict

2.18 Support from non-governmental organizations

2.19 Problems and obstacles encountered

3. Irrigation officials

3.1 History of Mae – Taeng Irrigation Project

3.2 RIDs policies in water management

3.3 RIDs policies regarding the establishment of water users' organizations

3.4 RIDs policies encouraging water users' organizations such as water administration groups (WAGs) to participate in water management

3.5 Water quantity stored each year

3.6 Areas of responsibility

3.7 Principles and methods of water allocation management for various activities and agriculture

3.8 Monitoring of water allocation

3.9 Management, rules, and regulations of water administration groups

3.10 Participation in WAGs' activities and conflict management

3.11 Participation of WAGs in various activities

3.12 Problems and obstacles in water allocation

3.13 Problems found in WAGs and way to solve them

Informal in-depth interviews with many questions depend on opportunities and appropriate situations to obtain more complete data and to be able to continue conversations without interruption.

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During in-depth interviews comparing the earliest times of water management with the most recent, the researcher interviewed leaders and members of the adminstrative committee of WAGs, irrigation officials, and elderly people - the groups that are concerned with water management. To verify and correct data, the researcher used the same questions with all the people in that group. The questions are as follows:

1. Early history as a water users' organization
2. Over-all objectives of setting up the water users' organization
3. The complete structure of the water users' organization
4. Roles and responsibilities
5. Principles of sharing responsibilities
6. Size of water receiving areas
7. People who have decision-making power in water allocation
8. Types of crops and annual yield
9. Principles and management methods of water allocation
10. Administration, rules, and regulations of water users' organizations
11. Implements used to allocate water fairly
12. Remuneration received from serving as leaders and adminstrative committee members
13. Number of members and appropriate number of members
14. Relationships among members, members with leaders and administrative committee and members with irrigation officials
15. Participation of members in various activities
16. Reasons for conflicts and ways to resolve them
17. Results of water allocation in the earliest organizations
18. Reasons for collaborating in water management in the earliest organization
19. Reasons for setting up the new and the most recent water users' organizations

III. Group discussion; enables us to understand opinions, perceptions, and attitudes through discussions and exchanges between members and irrigation officials. Apart from this, each group discussion will enable us to have more complete

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descriptional and observational data. Group discussion allows us to make conclusions and monitor the correction of data from members, leaders, and administrative committees. Consequently, group discussion is divided into two groups, i.e., irrigation officials and head- and tail-canal members in each lateral. The description of each group follows.

1. Irrigation officials; this group consists of five irrigation officials involved in WAG Zone i.e., the project engineer, the head of the water allocation and irrigation maintenance system, the head of the water delivery and maintenance, called the 'water master,' the zoneman, and the water dispersion man or irrigation building conservation man. This group enables us to understand water management, perceptions, and capabilities of WAG Zone 2. The questions are as follows.

- Current water management and its capability
- Problems and obstacles in water allocation
- Water management methods that the members want to use and conditions for successful in water management without conflict
- Opinions of WAG Zone 2 in water management

2. WAG Zone 2; this group consists of leaders of the basic water users' group and members, who cultivate areas in the same laterals. Each group consists of four members from the head-canal and four from the tail-canal. Thus, the members are farmers or water users who use cultivated areas in Laterals 5, 6 and 7. Moreover, each member group may have members who act as leaders and serve on the administrative committee. The questions are:

- Reasons for organizing as WAG Zone 2
- Principles of sharing responsibility
- Ideas and implements used in recent water allocation
- Rules and regulation in water allocation
- Adequacy and frequency of receiving water
- Participation of members in water allocation, maintenance and repair systems, mobilizing labor and resource and conflict management
- Satisfaction with WAG Zone 2' s way of managing water
- Problems and obstacles found in water management and ways to solve them

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- Satisfaction with water allocation of irrigation officials
- Water management methods they want to practice and conditions that enable them to succeed in water management

3.4 Analysis of Data

In this study descriptive data is analyzed from the study area, using in-depth interviews and group discussions on topics concerning water usage and water management behavior as well as observation of Water Administration Group (WAG) Zone 2, whose members use cultivated areas in Laterals 5, 6 and 7, and irrigation officials. The analysis can be divided into three sections.

1. Water management analysis of WAG Zone 2; according to multi-productions, that is, water management is analyzed through objectives of production, through types of crops, and through land holders. By analyzing these patterns, ideas and management methods, we can see similarities and differences.

2. Analyzing the entire set of characteristics of WAG Zone 2; their patterns of water management enable us to understand social organization, water allocation management, labor and resource mobilization to repair and maintenance systems, ideas of conflict, and the management of problems and obstacles. In addition we can see how they are able to adapt to physical characteristics of the irrigation project, RIDs perceptions of water management, and social and cultural conditions that change continuously, including concentrated and multi-agricultural production.

3. Capability analysis of WAG Zone 2 as a water users' organization in water management through five basic irrigation activities as outlined by Coward; these activities include water usage, water allocation, system maintenance, labor and resource mobilization, and conflict management. Other factors are whether not they are able to manage water, how they manage it, and under what conditions are they able to manage water successfully

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CHAPTER IV
SOCIAL CONDITIONS AND ECONOMIC SYSTEMS

In a capability study of water users' organizations, it is necessary to consider economic systems, social conditions, and traditions together because they all influence the ability of water users' organizations to establish ideas of water allocation that are appropriate and fair in complex and diverse contexts.

Therefore, I will try to present all of the factors involved in understanding the evolution of productive ways, including the social context and traditions of Water Administration Group Zone 2 before relating them to water management in the next chapter.

4.1 Water users' organizations: Water Administration Group Zone 2

Water Administration Group Zone 2 is one of 11 registed organizations, covering an irrigated area of 7,294 rai in Laterals 5, 6 and 7. This group has 1,824 members in three subdivisions and two districts, i.e Son Pong and Khi Lek subdivisions in Mae – Rim District and Kee Lek Subdivision in Mae – Taeng District.

Irrigated areas in Laterals 5, 6 and 7 are not far from Mae – Rim and Mae – Taeng Districts, and can be reached easily by Public Thoroughfare 107 (Chiang Mai – Fang Highway) which passes through all of them. These areas are located on a plain at the foot of a mountain slope, with the Ping River to the east and a main canal from Mae – Taeng Irrigation Project to the west. In addition, the irigated areas have the following boundaries.

the north: Son Maha Phon and Ban Chang Sudivision in Mae – Taeng District,

the south: Rim – Nuer Subdivision in Mae – Rim District,

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the east: the Ping River and Mae – Fag Subdivision in Son Sai District,

the west: a main canal of Mae – Taeng Irrigation Project.

4.2 The earliest social conditions and economic systems

Most members of Water Administration Group Zone 2 are originally from the northern region, including those who migrated from different subdivisions, districts or provinces. Thus, members are not different from one another in their innate characteristics and traditions.

Before the Mae – Taeng Irrigation Project was constructed, members grew only wet season rice and then it was the major occupation, since gardening and working as wage earners were not popular occupations as they are now. Paddy farming was done only once a year –during the rainy season between June and November – and the benefits in paddy farming included having a supply of fish to eat. During the dry season farmers would let their cows and buffalo graze in the paddies and produce fertilizer from their dung. Moreover, farmers who had several cows and buffalo would rent them to others for plowing when they had finished plowing their own fields. As a result, farmers had more rice to eat, since by renting a cow or a buffalo they would get approximately 7.5 bin* or 1 Tang** of rice per rai.

During the dry season, families that had paddies near a water source or water way would grow various vegetables, such as soybeans and chilies. Paddy farming in earlier times used only water from the rain that fell starting in April or May. Timely seasonal rainfall is primarily due to having fertile forests. In addition, timely seasonal rainfall produced a sufficient amount of water for paddy farming as the only major occupation and rice could be grown once a year for consumption. Therefore, the main objective of

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* bin for storing rice; a measure of capacity, especially for rice, equivalent to 20 liters

** Tang is a northern word means rice produtive unit, equivalent approximately 7.5 bins

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doing paddy farm was for consumption by the family and their relatives. The technology to produce it came from labor within the family and members' relatives who helped each other by exchanging labor among households more or less equally, depending on the number of laborers that were sent to help (*aw mua aw wan*).

For transplanting activities, remuneration was 1 tang per rai of rice and for harvesting it would be one bin. Each family member consumed an estimated 40 – 50 bins of rice per year. If they had more rice than they needed, they would exchange some for other necessities, but if they had less than they needed, they would borrow some from relatives or neighbors and repay it in double. For example if they borrowed 10 tang of rice, they would have to repay 20 tang.

If they had a surplus of rice, farmers would exchange it for other essential goods that they could not find or make by themselves, such as cloth, salt, tea, and paraffin to make light. They could exchange goods at a dry grocer's store in the village owned by a woman who was married to a Chinese man. Because Chinese people are good at business they would invest in this kind of store, while local people are not interested in investment.

To summarize, in the past, the pattern of social conditions and economic systems in Laterals 5, 6 and 7 was similar to that in other places in the northern region that do only paddy farming for subsistence as the single major occupation. Members exchanged rice for other goods and, as I mentioned, this was a type of business situation that did not emphasize financial profit. Looking at this generation enables us to understand the ways in which farmers used water and other resources found in their community by adapting their life way to be in harmony with the resources that were available. Their lives were characterized by balance, sharing of resources and labor, and mutual help. Moreover, the expenses in the family were almost nonexistent and so we can refer to this time as 'the perfect generation.'

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4.3 Social conditions and economic systems after promoting the new pattern of agriculture

After extensive irrigation systems were developed in Chiang Mai 30 years ago in response water usage needs, the agricultural patterns changed when members were encouraged to grow a single cash crop. Since completion of the Mae – Taeng Irrigation Project in 1973 (B.E.2516), members still continue engage in paddy farming but they have had to adapt their lives to be in line with the ways of multi – production in order to meet additional family expenses. Apart from doing wet season rice farming during the rainy season, members also plant several cash crops such as soybeans, corn and tomatoes during the dry season. Moreover, they raise fighting cocks, plant vegetables, and work on fruit orchards. Laborers who do the cultivation are primarily from the older generation and secondarily from the middle-aged generation while the younger generation are sent to study in urban centers in Chiang Mai, Mae – Rim, and Mae – Taeng and to be wage earners both inside and outside the villages. Thus, every year the agricultural pattern will begin with doing paddy farming during the rainy season and planting cash crops during the dry season combined with employment as wage earners throughout year or after harvesting rice, or working as wage earners as a major occupation throughout the year.

4.3.1 Agricultural patterns

Originally, members were only engaged in paddy farming, but the promotion of new agricultural patterns emphasizing several types of cash crops has made members use land more intensively throughout year. Agricultural patterns have changed and are now divided into two seasons.

I. The Rainy Season

The primary objective of planting wet season rice is still to produce rice for consumption within the family and the secondary objective is for sale. Consequently, members will select varieties of paddy that mature in three months,

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enabling them to use rain water rather than water from the irrigation project. Apart from this, using quick-maturing varieties of paddy gives them the advantage of being able to plant cash crops after the harvest. These cash crops grow quickly and bring a higher profit than rice.

Moreover, using less irrigation water decreases conflict among members and water requirements from irrigation officials. However, choosing the variety of rice to plant depends on prices and marketing requirements, such as sticky rice breed i.e ¡¢. 6, ¡¢. 10, ¡¢. 24 and Son Pha Thong 1. These varieties of rice are short, and do not fall over easily when planted and the seed is inexpensive.

The production of wet season rice can be divided into five periods of activity and each period uses local knowledge and ideas from the older generation, such as methods of paddy farming by considering the areas. These periods are described below.

1. Land preparation; clearing and smoothing areas by plowing the area twice. Generally family members will help each other, but if they have more paddies than people to do the work, they will employ laborers from the same village or from different subdivisions or districts. For the most part, they prefer employing people from the same village because they know each other. Consequently, the wage is lower than labors from different communities, such as from Fang, Son Pa Thong and Chiang Dao Districts. The wage for these activities is about 500-600 baht per rai. Land preparation is done in June.

2. Transplanting paddy seedlings; After the land has been prepared, water is brought to the land until the soil is soft, approximately three to four days. After that, the young rice sprouts are soaked in the paddy for two nights, before they are scattered. There are different prices of rice depending on the variety and the place where it was bought. For example, the variety from Ban Dong Subdivision is 5.5 baht per kilogram, the variety from the rice breed expanding center is 12-15 baht per kilogram, and the one from agriculture cooperatives is 5 baht per kilogram or from collection in previous years. Thus, to farm one rai, approximately 20 kilograms of rice

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seed or rice breed are used. Before planting the rice, the farmers will scatter fertilizer on the surface of the ground. Fertilizer for one kilogram costs about 7 baht.

During this period, members will work from the end of June until the beginning of July and then wait for pull out about a month before transplanting. Before scattering rice sprouts, they have to open a rice sprout channel (*sok rong ka*) in order to prevent seeds from sinking too deeply so that they will be easy to pull out. The method of opening a rice sprout channel is to see where grass is growing and tread on that grass until it sinks. Then, using a long level piece of wood, spread the soil and, with a digging tool, chop and pull out the soil to make channels. If members can not do it by themselves, they will employ labor at 260 – 300 baht per rai.

3. Planting period; done in August. There are several ways of planting, but the basic method is to grasp the rice sprouts with the fingers and use the thumb to hold onto the root and then plant it into the soil. The favored planting methods are grip planting (*kip puk*) and grasp planting (*yum puk*). Each method has different advantages and disadvantages, depending on the skill of the member. In grip planting, the advantage is that when the rice plant grows up, it will not bend. The advantage of grasp planting is that when the rice grows up, it will spread out. Apart from this, whether the rice flourishes or not depends on water and soil conditions, nourishing and planting methods, and on directive from which the wind blows. Thus, for the rice plants thrive, they have to be planted in the same direction in which the wind blows because they will be blown down if planted in the opposite direction. Each plant must be about 20-30 centimeters away from the others. Whether they are spaced far or close together depends on the condition of the land. If the paddy is smooth and the soil is fertile, the plants can be spaced far from each other; by contrast, if the conditions of the paddy are not good, they will be planted more closely because the rice yield will be less and the rice will be short. The wage for this activity is about 250-500 baht per rai.

4. Waiting for the harvest; after planting, members will wait for the rice to grow during the three months from September to November, depending on the variety of rice that members selected. During this time, some members find employment inside or outside the village.

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5. Harvest period; around December. Employment at this activity is similar to that in other periods, that is, workers are paid about 450 – 500 baht per rai, but for the most part, harvesting is done by the exchange of labor among relatives or neighbors rather than by employing other people. Each time labor is exchanged, members who own the cultivated areas will give the laborers rewards such as a party, money (usually 120 baht per person per day), or about two bins of rice.

In addition, after the harvest is finished, members still work on bundling, threshing, and milling rice and carrying it into the house. There is a different wage for each activity, i.e., bundling rice is 120 baht per day per person, threshing rice is 9 baht per sack, milling rice is 5 – 12 baht per bin, and carrying rice into a house is 5 baht per sack in addition to the cost of renting a car to carry the rice, which is 600 baht per rai. Apart from the wages, members might make a package deal, which includes harvesting, bundling and carrying rice into a house, at 800 baht per rai. Moreover, in this study area, there are hill tribe people who work as employees in all-season planting. They include both children and adults from Mae – Taeng District, who set up tents to sleep in beside the canal. Members who want this kind of labor will contact the head man of a village and negotiate the wages. In general, the wage for all-season planting is about 300 – 400 baht per rai. Labor is sought from outside the village or community it there are not enough workers because many residents are employed outside.

Other costs that members incur are for fertilizer and pesticides. The cost of fertilizer is 20 baht per kilogram and members have to use approximately 25 kilograms or one sack per paddy, while pesticide is 25 baht per bottle. Apart from this, when there is a crisis in the water supply or when the amount of water is inadequate because of insufficient rainfall, members will have to pay to have water pumped from underground into the paddies. If they have their own pump, they will have to only pay for gasoline – approximately 10 –13 baht per liter and about 10 liters per day. The members who do not own a pump will pay an additional 20 –25 baht per hour to rent a pump.

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Therefore, we see that the capital for doing only paddy farming is about 2,000 baht per rai while the rice yield is 70 bins per rai per year. When there is more than enough rice for a family, members will sell it for 6,900 baht per ton. If they sell it back to the agriculture cooperative where they bought the seed, they will get 9 – 10 baht per kilogram, and if they sell it to the agricultural center they will get 13 – 14 baht per kilogram. Either way, their income is very small. Consequently, after they finish harvesting, members plant cash crops, primarily soybeans and corn. The details are described below.

Table 4.1 Paddy Farming Activities Throughout the Year

Month / Activities	June	July	August	September	October	November	December
- Plot preparation	←	→					
-Transplanting paddy seedlings		←	→				
- Planting			←	→			
- Wait for harvest				←	→		
- Harvesting						←	→

II. The Dry Season

Soybeans; this is a favorite cash crop for members. Planting begins approximately at the beginning of January and harvesting takes place at the end of March or at the beginning of April. Generally, the soybean variety that members select is Chiang Mai 60. When it is harvested it can be sold at 10 – 11 baht per kilogram. Members buy soybean seeds from the Mae – Hea agriculture center and the agriculture cooperative of Mae – Jo District at about 250 – 300 baht per bin. To plant one rai of soybeans takes about 20 –25 bins. The price of soybeans varies depending on the variety. Grade A is about 370 baht per sack while grade B is 320 baht per sack. A sack of soybeans can be used to plant 1 –2 rai. Soybean seeds can be obtained from Mae – Jo District from an investor who supplies everything, such as soybean breed,

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fertilizer, and pesticide. When the harvest is finished members have to sell it back to that investor. In this case, members prepare their lands only by exchanging labor. The crop yield is about 20 bins per rai but the price of soybeans depends both on marketing requirements and the amount of moisture in the soybeans. The soybeans must not have too much nor too little moisture, to get in the best price. In 2001 the price was 10 –11 baht per kilogram.

The method of planting soybeans is different from that of rice and takes less time; it can be harvested after only three months. There are several ways to plant soybeans, but the soil conditions have to be taken into account. If the soil is fertile, when the seeds are dropped into the hole, they do not need to be covered up. If the soil is sandy, however, it gets dry easily, so when the seeds are dropped into a hole, they have to be covered with mulch or ash. There are three methods of planting soybeans.

1. A stick, approximately 1 –2 meters long and about an inch in diameter, is sharpened and pushed into the soil to make a hole wide enough to be able to drop seeds in; about 3 –4 seeds are then dropped in. The holes are 15 – 20 centimeters from each other. This method is the most favored now because the seeds can be planted without cutting and burning straw, which is the old method described below.

2. After the rice harvest, straw still covers the soil. In this method, before planting, members have to pry up the straw, put seeds into it and then close the straw. This method was favored in the past but not currently because it takes more time to plant.

3. In the last method, members will cut the straw down and burn it, plow the paddy with a tractor, making drainage, let water into the paddy for a night, and the next morning pour water on the soil again to make the soil wet, using a stick to prod and drop seeds into a hole.

Corn; the method of planting is similar to that of soybeans. Members will plant corn after soybeans are harvested or around April. In the study areas, the planting of corn is similar in that there are investors who supply all the materials and

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after the harvest, members have to sell it back to that investor at 8 –12 baht per kilogram. The goal of planting corn is to export corn seeds to another countries.

Exchanging labor for the growing of soybean and corn still continues between members, relatives, and neighbors. The labor can be divided into two groups. The first, consisting mostly of men, makes a hole in the soil using a long sharp stick, while those in the second group, mostly women, drop seeds into the hole. The reasons that men need to do that job is that the stick is heavy and when it is pushed into the soil it has to be turned a little to make the hole wide enough to put seeds into. This also allows other members to see whether a hole already has seed in it. In addition, when the soil is muddy and sticky, it is difficult to pull the stick out, so this job is more appropriate for men. Soybean and corn growing patterns employ approximately 10 – 20 persons and they can seed about 5 rai per day.

Table 4.2 Planting Schedules

January February March April May June July August September October November December
----------Soybeans---------
---Tomatoes---
----Corn----
----------Wet Season Rice----------

Because of the many details in all planting patterns – paddy farming, soybean and corn planting - members have to help each other through labor exchange. This situation enables them to maintain their relationships and demonstrates that they still pool their efforts in various local ceremonies such as those related to religion, i.e., Visakha Bucha Day*, the End of Lent Day and the beginning of Buddhist Lent Day. Moreover, they have a day to present food to the priests *(tan kuay sa lak)* . Members

* Visakha Bhucha Day means the annual celebration of the birth, enlightenment and departure of the Buddha.

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perform rituals for their relatives who passed away and for good deeds in the future. The ceremonies relating to cultivation include presentation of rice to the monks (*tan kaow kong kang*) or presentation of rice over a bowl ceremony at the temples that begins in January after rice has been harvested. In this ceremony there are many bowls lying in the middle of the temple hall and members will present rice as they wish but at least in one bowl. Moreover, the aim of presenting rice is to enable the monks to consume whenever they want because members believe that this act will increase food productivity in the next year.

Another ceremony related to cultivation is the ritual of water god, *wai Pii – Fai*. This ceremony demonstrates the members' respect for water and is a way of thanking the water god Pii – Fai for giving them an abundant supply of water to use in cultivation. Members will perform this ceremony in each lateral and they will pool their money to buy offerings. It will be arranged in two places – the head of each lateral and in each village.

In the head of each lateral or big weir (*Fai – Yai*) the ceremony is performed by the administrative committee and the offerings consist of a boar's head, a bottle of white alcohol, and joss sticks while in each village that has a small weir (*Fai – Lek*), it is performed by the common irrigator and members. The offerings consist of a pair of chicken's heads, a bottle of white alcohol, and joss sticks. Members will pay reverence to the water god or Pii – Fai, first at the big weir and then at the small weir.

Although some segments of the agricultural pattern employ labor steadily, the labor exchange among members is decreasing because so many people look for work outside their villages. At present, people of the young generation cannot do the work involved in paddy farming, such as harvesting, anymore. However, some members of the old generation still emphasize agriculture and continue to practice it because they believe that it can guarantee the family's survival. They believe that even if they do not have money, they still have something to eat. However, agriculture provides an uncertain income because it is dependant on marketing prices, strict merchandize rules, and uncertain crop yields each year. Nevertheless, that uncertain income is used

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to pay family expenses, including costs for the next year of planting. Meanwhile, working as a wage earner has certainty and more money than agriculture.

4.3.2 Working as a wage earner

In this study these are three types of ways people work as wage earners:

1. Working as a wage earner throughout the year outside the field of agriculture.
2. Working as a wage earner throughout the year inside the field of agriculture.
3. Working as wage earner only during the agricultural off-season.

Working as a wage earner all year outside the field of agriculture refers to work outside villages or communities and can be divided into three types.

1. Working in a business, such as a company or department store, and working in government offices downtown; this is more stable, regular work and has a certain salary.

Apart from this, when Lanna Golf and Green Valley were established 10 years ago, many women, including some in Son – Pong Subdivision, began to work as caddies, earning 140 baht per round. During the hot season they will work three rounds a week, and during the cool season six rounds a week; the total remuneration including tips is 5,000 – 6,000 baht per month. For these reason, women in the study area and in the vicinity are interested in working as caddies. (ยศ สันตสมบัติ, 2546: 135-141)

2. Jobs in the housing construction industry, such as cementing, carpentry, or painting; this work is consistent most of the year, but the wage depends on experience and skill. Generally, the wage is approximately 200 – 300 baht per day.

In all cases, people with these jobs go out in the morning and return home in the evening.

3. Wage earners who make sa-paper boxes for packing joss sticks and aromatic candles to export. These are women who work in a housewives' group in their village.

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Those who work year-round in agriculture work either inside or outside the village. Those who are wage earners during the agricultural off-season work outside the village in downtown Chiang Mai, Mae – Rim, or Mae – Taeng District.

Although the family income of members comes mostly from agriculture, working as a wage earner is a new income source that has begun to be more important. At present, the young generation work as wage earners primarily because of money and good transportation. Good transportation enables them to work outside conveniently by having a vehicle pick them up in the morning and send them back in the evening, along with their children who study outside. All these factors enable them to ignore the agricultural way of life, and thus have an impact on changes in land holding.

4.4 Changes in Rights of Land Ownership and Rent

Changes in the way of life from doing only paddy farming to intensive land use for planting throughout the year caused changes in the rights of land ownership. In the beginning, paddies belonging to members were called 'private - paddies (*na suan tua*)' and the members claimed the right by title deed. The private paddies were used generation after generation and parents would divide them for their children. Each member owned at least approximately 15-20 rai; as little as 10 rai was enough to grow rice for a family to eat all though the year. If they had less than this, however, it would be difficult and the head of the family would have to borrow rice from other members and pay it back in double. Originally, paddy farming was not concentrated like now; rice was precious and difficult to find, so that a family with many children but little had to eat rice in small amounts because they were afraid that it would be used up quickly. At that time, rice was so valuable that when people boiled rice they finished all of it, which is different from the present situation where there is so much rice to eat that people do not value it.

About fifty years ago, investors from the urban center of Chiang Mai loaned money to some of the members, who were nearly starving. Their incomes were not sufficient to meet their expenses and they had to pay high costs to grow cash crops in

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the dry season, which they would repay in rice yield, called 'rice – loaning.' For example, if they borrowed 100 baht, they would have to repay it in 20 bins or about 40 liters of rice, and they usually borrowed it before they did paddy farming. Thus, when members faced an uncertain crop yield situation, or a low crop yield, investors would acquire all of their yield. In that situation, members had no rice to eat, forcing them to borrow it from other members or relatives and then borrow money again, so they would be debtors for the rest of their lives. Moreover, although members had already repaid the rice they borrowed, they had to repay money as well; if they were unable to repay money in the year they borrowed it, the charges would double. If, in three to five years they could not repay the money, and did not want to be a debtor and did not want the investors to acquire their paddies, they would sell their paddies to the investors for about 2,500 baht per rai including the green rice* added as a premium, and investors would return some money to them to pay family expenses. In this way private paddies became known as downtown paddies (*na weing*), or paddies sold to investors from downtown Chiang Mai.

After members sold their paddies, they no longer had land for farming and so they had to rent the lands that they had sold in order to continue doing paddy farming. At that time, lands in the study area became 'rented land' (*na chao*) until now and rent was paid by giving the owner half of the rice yield, called *na pha kerng,* rather than money. Moreover, some years when the rice yield was low and in sufficient to pay the rent, investors would acquire all of the rice and members became debtors again. But in this case, members would sell their lands again or stop doing paddy farming or work as wage earners and investors might find someone else to rent their land. Members did paddy farming in both rented paddies and private paddies because the goal of farming was changing from subsistence alone to both subsistence and production for sale, including cash crop farming in the dry season. Consequently, if any members did not have enough land of their own, they would rent someone else's land.

* The green rice means rice that growing up for a while and have green color paddies.

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At present, most land in Laterals 5, 6 and 7 has been rented for several generations. As a result, the type of rent changed from paying half of the rice yield in the past to paying by rice quantity and rice yield price each year now. In the first type, the rent depends on the rice yield; for example, the rental rate is the rice yield of approximately 20 – 25 bins per rai per year. The second type is based on the rice yield price; for example, this year rice is 50 baht per bin but rice yield is 20 bins per rai, so members have to pay rental costs of 1,000 baht per rai per year. Members will select the way to pay according to an agreement with the investor. In addition, a lot of land owned by investors is cultivated free because there is so much land that investors sometimes can't remember where their lands are. The recent price of land in this study areas is approximately 200,000 baht per rai, depending on the location.

To summarize, in the first period, rights of land ownership changed when parents divided their land and gave it to their children to continue using it. But correct changes in the right of land owners are related to the promotion of the new agricultural pattern. According to which the land must be used throughout year, production costs are high and members' family expenses are increasing more than their incomes. Thus, they borrow money to solve the problems. When the money they borrow is still insufficient to pay for renting the land, they become debtors and have to sell their land to investors. The positive outcome is they will get some money meet family expenses.

4.5 Conclusion

The changes in the social relationships and economic systems of Water Administration Group Zone 2 have had an impact on the way of life of the members. In the earliest times, members did only paddy farming to survive. Relatives and neighbors helped each other by exchanging labor and in this way developed strong social relationships.

After the promotion and development of new agricultural patterns emphasizing concentrated and multiple production, development in several sections such as roads, electricity, water and telephones created more family expenses. In addition, promotion

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of the new cropping pattern increases the costs of agricultural materials, such as seed, fertilizer, insecticide and technological items used in cultivation. Apart from this, paddy farming alone cannot increase the income of members' enough to meet their expenses and so they have to raise cash crops in the dry season and work as wage earners. These are the reasons for the decrease in labor, changes in the right of land ownership, and increased costs of land rental. All these factors demonstrate that social relationships among members are becoming more distant and members carry on their lives without being concerned about others.

However, agriculture is still the main occupation and source of income for members, who continually adapt to changing social, economic, and ecological conditions, for example, seeking work as wage earners. In the next chapter we will see the effects these changes have had on water users' organizations in water management.

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CHAPTER V
WATER MANAGEMENT BY WATER USERS' ORGANIZATIONS:WATER ADMINISTRATION GROUP ZONE 2 MAE – TAENG IRRIGATION PROJECT

This chapter presents the overall picture of water management my the Water Administration Group Zone 2 from the past, which was managed by the communities before the construction of the project, a state irrigation project for agricultural use, to the time of the completion of the project. This is aimed at illustrating the dynamics of water management which has been changed and developed continually according to changing environment and circumstances. Water management in the past fifty years was of a historical context, viewed as necessary to integrated previous study results into the present ones so that a complete picture of development and changes could be clearly perceived, which would be beneficial to future studies.

5.1 Past perspectives: community water system management

Prior to understanding the present water management, knowing the background before the advent of the state irrigation project is of some significance since it would enable us to realize causes and effects of change of the organization as well as a thinking process in managing irrigational water from the project.

Chiang Mai is regarded as one of the oldest agricultural areas in the northern region, with a long history of continuous irrigation system development, dating back over 700 years. The irrigation system enabled agriculture to become diverse and year round. The development of irrigation was in the form of a weir system because the city was located in the mountainous basin with Ping River running through it and acting as a life line of the residents. Water exploitation from the river was collectively done by

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community members by diverting the water to rice fields in the rainy season in the form of weir construction on a higher area and digging canals for water to flow to lower areas. Such a collective undertaking enabled members of the weir system to retain water for agricultural purposes, as evidenced in the reign of King Mengrai (1262 – 1317). In addition, Chiang Mai was the first place in the North, where modern irrigation system was constructed in the reign of King Rama VII. The first irrigation project was Mae – Faek or Sinthukij Preecha Project, before the construction of Mae – Taeng Irrigation Project (วันเพ็ญ สุรฤกษ์, 2528: 44). The projects were based on or exploited from the weir or popular system, for instance, natural irrigation canal system and water management system with weir heads and committee members in charge.

5.1.1 The goal of water management

From the social contexts and community economic system before the construction of the project, wet season rice planting was the only way of life for farmers in the area. In the dry seasons, rice fields were grazing lands instead of growing other crops. Furthermore, the economic system was subsistent without intensive agriculture and trade system. Consequently, rice planting was carried out once a year and the yields were for domestic consumption, making it unnecessary to use large amount of water. Besides using water for rice planting on an annual basis, the water was utilized only for consumption in households. Thus water management to meet the social and economic needs at the time was the weir system. It was mainly management of water for paddy cultivation in the rainy season and the folk irrigation system provided water to agricultural land ranging from 5 rai to approximately 10,000 rai.

5.1.2 Geographical aspects and the weir system

Before the completion of the project in 1973, members mainly exploited water from the Ping River. In addition, certain villages used water from the Mae – Khajan and Mae Rim Rivers and other streams for paddy cultivation. Water management was

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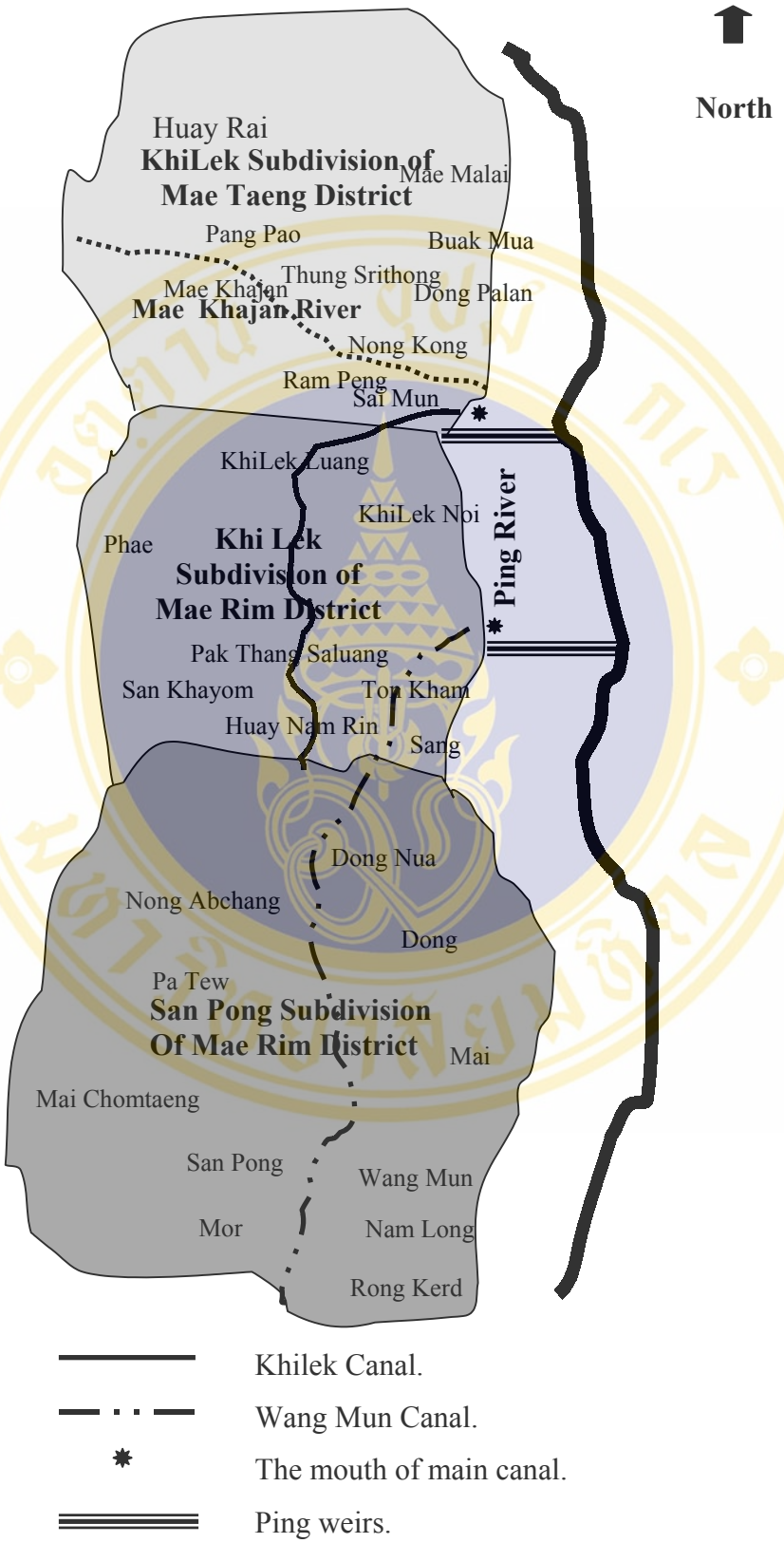

Figure 5.1 Irrigated Areas of Both Two Weirs

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similar to that managed by communities, that is, the weir system. The two Mae Ping weirs, a distance of 10 kilometers from each other, were on the bend of the river. Originally, there was no village there, but later about ten families moved in and settled. Or it was at Saimun Village, Khilek Subdivision of Mae – Taeng District, which is not found on the present subdivision map. Water was diverted to Khilek Canal, the major canal (*lam muang lak*) covering Mae – Rim district. The canal was originally called Lao Canal because it was dug with the help of Lao people. The areas benefiting from the canal included Saimun Village, Khilek Subdivision of Mae – Taeng District, Khilek Luang, Khilek Noi, Pak Thang Saluang, Ton Kham, Hauy Nam Rin and Sang villages, Khilek Subdivision of Mae – Rim District. At present, it is the area benefiting from irrigation Laterals 5 and 6. The second one was located at Pa Ngae Village or slightly above Ton Kham Village opposite San Sai District at the present time. It diverted water to Wang Mun Canal. The name was derived from the water being diverted to Wang Mun Village, San Pong Subdivison of Mae – Rim District. The areas benefiting from the canal included certain part of Sang Village, Dong Nua, Dong, Mai and Wang Mun villages, San Pong Subdivision of Mae – Rim District. Each place would have its own smaller canals to divert water to its rice fields. At present, it is the area benefiting from parts of the irrigation Laterals 6 and 7.

As for Pang Pao and Mae Khajan villages, it is more convenient to divert water from Mae – Khajan river, whereas, Dong Palan, Huay Rai, Mae Malai and Thung Srithong villages of Khilek Tambon, Mae – Taeng District use water from streams. For Mor and San Pong village of Tambon San Pong, Mae – Rim District, they draw water form Mae – Rim River.

Regardless of what rivers and streams are involved, the physical aspects of weirs and water management processes are similar to those of the two weirs on the Ping River, which are unique in water management in the northern region. As a consequence, this investigation would focus on the weir system in Ping River due to large areas of water being used and a large number of water users. The two weirs were made from wood with the same physical aspects and water diversion methods. Furthermore, they were old weirs with unknown dates of construction but had existed

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generations previously, older than the present chairman of the group, who was 72 years old. The weirs were made from wild bamboo rods taken from the forest. The rods were then firmly put into the ground in a straight line across the river. Once they were firmly in place, bamboo sheets or sticks were woven and held in place with weir pillars. There were many layers of these bamboo rods in order to act as shock absorbers. The first and the following lines were about 20 centimeters in height from one another. After the weir was completed, a channel (*hom*) was made in the middle of it to allow water and rafts to go through. Above the weir were stone baskets (*kuaj hin san*) made from bamboo. The baskets contained stones from the river bed, but before they had to put into the baskets, they must be de–sanded. When the baskets were full, their ends had to be tied and then put in front of the pillars from one end of the bank to the other. The function of these stone basket was to raise the water level to the mouths of the main canals, Khilek and Wang Mun, which were behind the weirs so that the volume of water could be sufficient to flow into smaller canals and rice field eventually.

Before the bamboo rods were placed in the weirs, sand on the canals had to be removed otherwise the water would be unable to get to the canals, flooding aimlessly. Prior to diverting water to rice fields, water users would help construct the 'Poom' for each village. Due to vast water using areas, the number of Poom depended on how much water was needed for each village. If distant rice fields could not share the same Poom, members would help build another nearby Poom. A Poom consisted of wooden rods firmly put into the ground across a canal with certain space from one rod to another. Wood planks would be put over the rods to hold them in place and serve as a temporary bridge. Water would overflow the planks and be diverted to smaller canals. Poom was always open but when the water ran dry, members would get water from Ping River to the main canals before flowing to Poom. Members could open and / or close water at will. Such water use was called 'undated water use', which was often compared with the 'dated water use' in the present state irrigation project.

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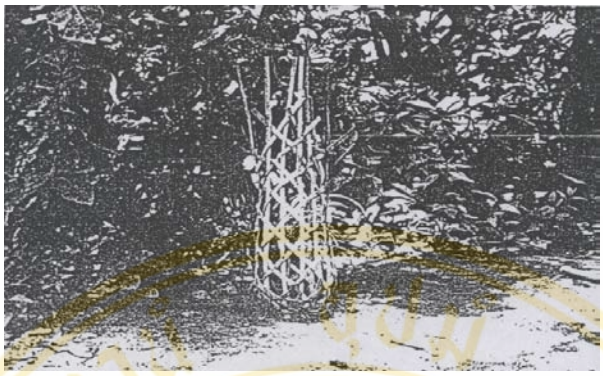

Figure 5.2 A Stone Basket

Source: พัชรี อาจหาญ, 2538: 39.

In summary, the structure of the two wooden weirs and the structure of water diversion system of weirs were similar to the general weir system in the North, consisting of the main weir made from wood with fluctuating duration of use. When the current was strong, the weir was damaged and repair or reconstruction was required. The site of the weir might be moved upward or downward without standardization, but it had to be always in good condition. Certain weirs were made from stone obstructing river flow to raise water levels to a desirable point. When water was required, members would divert water onto the main canals with Poom functioning in diverting water in the canals. The main canals would be on a higher level than cultivated land, sending water down smaller canals that branched off. When the water would be diverted onto rice fields, 'Tae' or small water diverter make from bamboo, would be put in the branching canal (*lam muang soj*) to divert water to ditches (*lam muang sai kaj*) leading to rice fields. Excessive water would flow into a dredging canal (*lam muang sia*), which might be the main canal of lower – lying areas. It could also flow into natural water sources, which could be use further.

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Poom **Tae**

Figure 5.3 Poom, Tae and Ditches in the Past

5.1.3 Organizational aspects of water users' organizations

Water management before the construction of Mae – Taeng Irrigation Project was similar to managing weir organizations in other areas in the region. Each Ping weir was composed of the administration group or Muang – Fai Committees and farmers group or water users. The Muang – Fai Committees included the wier chair (*hau na maung fai*), one village representative acting as an assistant to the chair or weir chief (*kae maung kae fai*), another village representative acting as the former' s assistant, one ditch rider or water messenger (*lam nam*) from each village, and one canal guardian or field checker (*liap nam*). The Muang – Fai Committees was responsible for management, weir repairing and allocating water fairly to members according to their needs and just conditions. The two groups would draft and ratify regulations for water use and repairing weirs, and write them into a document called the weir contract (*san ya muang fai*). The regulations were numbered and signed by members after they were read out and everybody agreed. They were concerned with responsibilities of the administration group and rights, duties and responsibilities of members.

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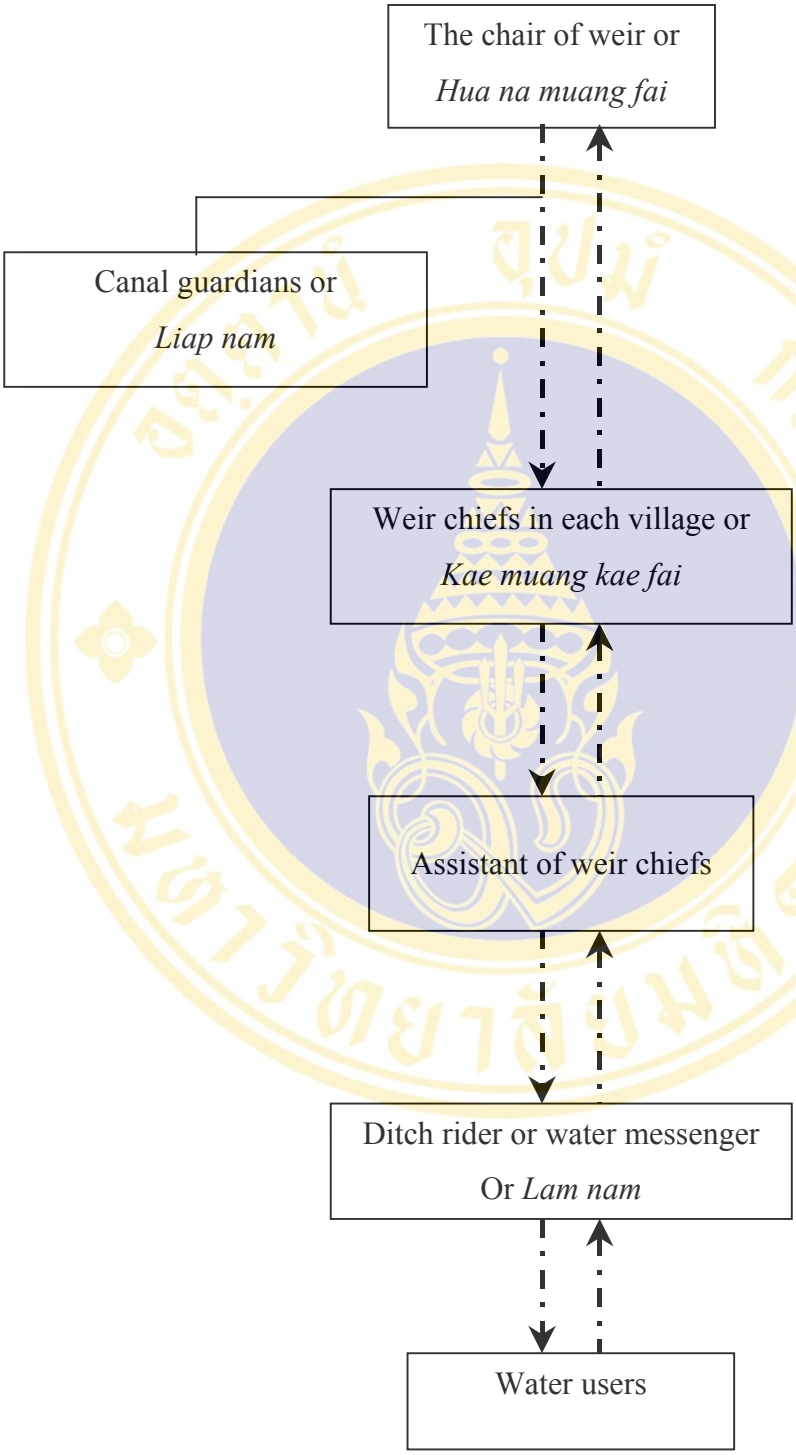

Diagram 5.1 Organizational Aspects of Water Users' Organizations

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The chair and weir chiefs were elected by water users of the two weirs, while the rest were selected and appointed by their respective villages. The head would specify meeting dates, dates for repairing or dredging weirs, equipment, water allocation, managing conflicts and supervising the work, with the help of his assistants. Important duties of the assistants included attending meetings with the chair and helping manage the irrigation system as authorized before passing information via ditch riders. In the past, the riders would inform all members by shouting out announcements in their respective villages so that everyone could hear. At the same time, when problems arose among water users, the ditch riders would be informed and carry the messages to the head.

Therefore, when dredging or repairing weirs was required, the chair would inform the members of the date and equipment necessary for particular tasks and every field owner was expected to contribute labor to help in their respective weirs. Labor would be considered according to the amount of land ownership, which was decided by the chair and his assistants. For instance, a member owning less than 10 rai had to send in 1 laborer, and between 10 to 20 rai 2 laborers. They could send in either family members or someone they hired. Each one had to bring his own equipment and tools. If the work dealt with repairing, what was required were bamboo rods, a big wooden hammer (*khon na waen*), a hoe and a field knife. The number of bamboo rods depended on the amount of land possession and how damaged the weir was, for example, 1 rai for 20 rods or 30 – 50 rods in case of severe damage. The wooden hammer used for hitting the rods was about 5 – 6 inches in diameter and 10 inches in length. The hoe was used to dig up sand in the river and canal beds, while the field knife was used for cutting and doing final touches. It was kept in a sheath and carried around the waist. For dredging, the tools required included a wooden shovel kept in a sheath, a hoe and a field knife (วันเพ็ญ สุรฤกษ์, 2528: 132).

To summarize, the chair would determine the types and number of tools for each type of weir work according to land possession and conditions of the weirs. Ditch

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riders would announce the work in advance, usually 3-5 days for weir repair and 1 day for canal dredging.

Inspecting the tools and equipment was the responsibility of the assistant from each village to see whether they were sufficient in number and up to the standard. For instance, if the wooden hammer was of low quality, a fine would be raised by requiring the owner to buy a new one sold at the weir, costing 5 baht. If a laborer was not sent, a fine in the form of rice or money, depending on the agreed regulation, would be imposed, costing 5-10 baht a day. The money would be used to hire other landless people to help in the work. If rice was used as a fine, agreement must be reached before the work began, usually 5-10 tang.

Repairing the weir was an annual event before the rice cropping season started. The major work included hammering bamboo rods, they world cut the bamboo rods and sharpen them at one end and then tie them together in a bundle to bring them to the work place. Weir work usually took the whole day, so they had to bring lunch from home. Which village would start the work first depended on how well its members could swim because in the old days the Ping River was deep, wide and turbulent. Normally, the first ones would be villages located along the river banks. Water users from Dong, Mai, Wang Mun and Nam Long villages, for example, would be the first ones to start work. If a village had 100 members, all of them had to work at the same time. If a village had fewer members, they would join with another one so that work could be finished faster. Villages from Huay Namrin and Nong Abchang villages would work later since they were not good at swimming. Workers constructing the weirs had to carry earth to fill up the river so that the first row of bamboo rods could be put into the ground. After the wood work was done, stone baskets would be placed behind the weirs, which was usually in late afternoon. Dredging sand for the mouths of the canals had to be carried out before the repair of the weirs. The work was collective with weir heads from the villages supervising it. Dredging branching canals and ditches was carried out before the start of the planting season, with members helping one another in a collective labor force. Labor for such work was derived from men of working age, not children, women or the elderly.

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To sum up, water management at the main weirs was chiefly the responsibility of the chair, while at the field level, it was the role of respective smaller weir chiefs, their assistants, ditch riders and water users of each Poom. The activities were similar to those of the main weirs, consisting of canal work, water allocation and setting up of regulations. As for branching ditches diverting water into the fields, owners in the same area would be completely in charge, without involvement of the Muang – Fai committees.

Water fees were imposed on users to pay the Muang – Fai committees for managing water, supervising weir work and solving water conflicts. The fee would be according to mutual agreement between the Muang – Fai committees and water users. In the area of the reserch, rice was used as water fee, collected from villages after the harvest season. Half of what was collected was the weir chair' s share and the rest would be divided among smaller weir chiefs, their assistants and ditch riders. The proportion would be according to what was previously agreed. Moreover, a water guardian also got rice as fee for his service, about 2 liters per rai. Sometimes the fees for chiefs and ditch riders were the same since they worked equally hard. Water fees were raised once a year after the harvest.

Regarding water allocation, the principle was that water was shared equally among rightful farmers who possessed their land with or without ownership and benefited from water from their respective Poom at that particular period. They had to inform weir chiefs of their places and amount of land. In addition, their rights to exploit water would be fully endorsed when they had participated in weir – related activities specified in the weir contracts, such as repairing and dredging weirs and canals, mobilizing labor or equipment for weir activities or attending weir spirit appeasing ceremony. The volume of water which each farmer would receive depended on the size and quantity of fields he owned. The same applied to participation in the activities and mobilization of labor and equipment. Every member was entitled to use water at all times, which was managed by the Muang – Fai committee.

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With respect to water allocation, water was released according to needs of farmers. Closing and opening the main weirs and Poom was laissez – faire since it was 'undated water' in the rainy season with large volumes of water supplying to different rice fields at the same time. Closing the main canal would only be done when weir repair was required.

In summary, water management in the weir system before the construction of the irrigation project was carried out by communities, and was truly in accordance with the way of rice cultivation during the rainy season. It did not put any particular importance on water management during the dry season as rice fields were used as grazing land and cattle droppings were regarded as natural fertilizer. This enabled the communities to become almost free of water shortage problems. Moreover, diverting water from the Ping River to the main canals functioned like a reservoir providing security for water use to members at all time. Furthermore, the canals were also an important food source, providing a variety of fish to villagers. Nonetheless, the problem was the impermanence of the wooden weirs as they were easily damaged during the rainy season and sand was swept into the canals. As a consequence, a water users' organization was established to oversee the weir operations by issuing regulations, duties and rights of users, as well as consequences for breaking the rules. The organization mainly focused on organizing labor for the weir work rather than defining specific water allocation criteria.

5.2 The emergence of state water management system: Mae – Taeng Irrigation Project

When national development focused on international trade with agricultural produce as an important export, agricultural production and land use became diversified. The goal of water management was changed to intensive water use all year round. To meet the change, the development of irrigation systems to accommodate the growing agricultural sector was inevitable. Mae – Taeng Irrigation Project was established during the early national economic and social development plans, representing a crucial turning point in water management by communities as well as

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by water users' organizations. Development of changes in successive phases would be presented from the goals of water management, physical structure of water diversion systems, and organization of management.

5.2.1 The goals of water management

The national development guidelines emphasized on a newly industrialized country, focusing on economic growth, production expansion and profit orientation. Such development especially since 1975 was based on the concept of national modernization so that the country could be on par with western countries. One evident change in the agricultural sector was that production of agricultural produce had been changed from subsistence orientation to trade and export orientation (เสน่ห์ จามริกและยศ สันตสมบัติ, 2536: 41-42). The impact on the agricultural sector in the upper northern region was that more land was used for the cultivation of cash crops and thus these was demand for water all year round. As a consequence, irrigation development for increasing agrucutural production was an important policy and the main goal of water management in the state sector. In Chiang Mai, several large irrigation projects were constructed in many major rivers and one such project was the Mae – Taeng Irrigation Project. Furthermore, both private and state financial institutions were established in the area, such as the Cooperative and Agriculture Bank, the Mae – Taeng and Mae – Rim Agricultural Cooperatives, and the Agricultural Cooperative. Money for investment became easily available, and it was the driving force for farmers to grow more cash crops for export and trade in the dry seasons.

Land use and water management for crop cultivation in the areas of the former Laterals 5, 6 and 7 were intensive the entire year. Instead of paddy cultivation on an annual basis in the rainy season, the cultivation was both subsistence and trade – oriented. Moreover, tobacco cultivation in the dry seasons was promoted because a state tobacco factory was set up in Chiang Mai. The state provided farmers tobacco seedlings, fertilizers and pesticides and bought back tobacco leaves at a guaranteed price of 1.20 baht per kilogram. One truckful of leaves would earn farmers about 200-

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300 baht. After the tobacco harvest, the second paddy cultivation was launched while soybean plantation was not yet popular. When water from irrigation was reduced in the dry seasons, it was insufficient for the second rice cultivation. Farmers thus turned to soybeans instead, which did not require much water. At present, more corn and tomatoes are cultivated than tobacco.

When the production pattern changed, water use patterns did likewise. The goal of the weir system was providing water not only for the annual paddy cultivation, but also for cash crops. When the project was established to provide water for intensive and diverse crop cultivation all year round, water users in the conventional weir system became members of the project, which was state – sponsored, and abandoned the two Ping weirs completely. However, some villages still made use of water from Mae Khajan and Mae – Rim weirs in addition to that from the project because they viewed the irrigation system from the project as durable and built according to engineering principles, resulting in water from the project being more abundant than that from the weirs. Furthermore, there was no need to build irrigation canals or ditches since they were provided by the project. Moreover, weir work was no longer required as state budget was allocated for repair and maintenance, indicating that members were confident that the project was able to provide them water all year round. It was found later that because the two weirs were left unused and without repair, they were completely gone as time went by. In addition to the construction of the project, sand digging for commercial purpose by concessionaires had deepened and narrowed the river, making weir construction difficult. When the river was deepened, the water level was well below the mouths of the two diverting canals, which were no longer in use at the present time. Nevertheless, Wang Mun canal is still in use, but only for accommodating excessive water from rice fields and the project. Without water from the project, it would be dry with and useless.

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Figure 5.4 The Remain of Ping Weir

Figure 5.5 The Former Main Canals: Khilek and Wang Mun

5.2.2 Background

When the goals of agricultural development at the regional and national levels were changed, water management by the communities was replaced by that of the state sector, which was more reliable and permanent and, which guaranteed a year round

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supply of water. In 1953, Mae – Taeng and Mae – Faek Irrigation projects were considered simultaneously, which was regarded as the beginning of modern irrigation in the northern region with permanent sluice. Since the geographical area covered by Mae – Taeng Irrigation Project was a narrow strip of low – lying area parallel with the Ping River, the main irrigation canal was 75 kilometer long. When compared with that of Mae – Faeng Project, it was over twice as long. Consequently, the investment budget was higher with more areas benefiting from the project. Due to state budget restrictions at that time, the two projects could not be undertaken simultaneously, so the Mae – Taeng Project was suspended. Mae – Faek Project was thus started in 1929. In 1955, crops in the areas of Muang and Hang Dong districts were severely damaged due to prolonged drought, particularly in Hang Dong District, which almost on an annual basis. This was because the quantity of water in natural streams was insufficient to meet demands; thus, the RID reconsidered the Mae – Taeng Project and approved its construction.

During 1955 – 1957, land surveys at the construction site were conducted. Land was bought at the headworks to build shelters, and rocks were blasted to make a dyke. However, the work was temporarily suspended due to lack of funds. In 1963, the department received a loan of 26 million baht from international financial institutions, and the work resumed and was completed in 1973. The total construction cost was 308,053,800 baht.

The Mae – Taeng Irrigation Project is located between latitude 18 degrees north and longitude 92 degrees east, with about 78 kilometers in length from north to south and 24 kilometers in width from east to west. The main office is at village # 2, Mae – Taeng Subdivision of Mae – Taeng District. It is 45 kilometers from downtown Chiang Mai to the north and 790 kilometers from Bangkok.

The entire area covers the left side of the main canal to Ping River with the following frontiers.

The north	borders on	Chiang Dao District,
The south	borders on	Chom Thong District,

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The east	borders on	Ping River, Sansai, Muang, Saraphi districts and Lam Phun Province,
The west	borders on	Suthep Mountain Range and Samoeng District.

5.2.3 Water capacity

The project derives water from the Taeng River, which is a tributary of the Ping River. Its rain – accommodating area is rectangular in shape, with 80 kilometers in length from north to south and 40 kilometers in width from east to west. The northern most borders the Burmese frontier. The tributary meets the Ping River at Sob Taeng, about 2 kilometers from the district hall and about 5 kilometers from Mae – Taeng dyke. Its origin is from Inthanon Mountain range, meandering along the valleys for 120 kilometers. The upper part of the dyke could accommodate rain water for approximately 1,880 square kilometers. The watershed is covered with thick jungle. It is estimated that the water volume is about 30% of rain water in low – lying areas. The maximum water volume is estimated at 800 cubic meters per second and the minimum volume at 2 cubic meters per second. Average annual volume is approximately 700 million cubic meters or an average annual flow of 23 cubic meters per second.

The project feeds water to the areas on the right of the Ping River with only one main canal, 74.558 kilometers in length. The water is delivered only on the left side of the canal to the Ping plains. The areas are sloping from the Suthep Mountain range in the west to the Ping River in the east. The shape of the areas is narrow in the beginning and pans out at the end. The height from the dam site to the end of the project ranges from + 350 to +290 meters from the mean sea level.

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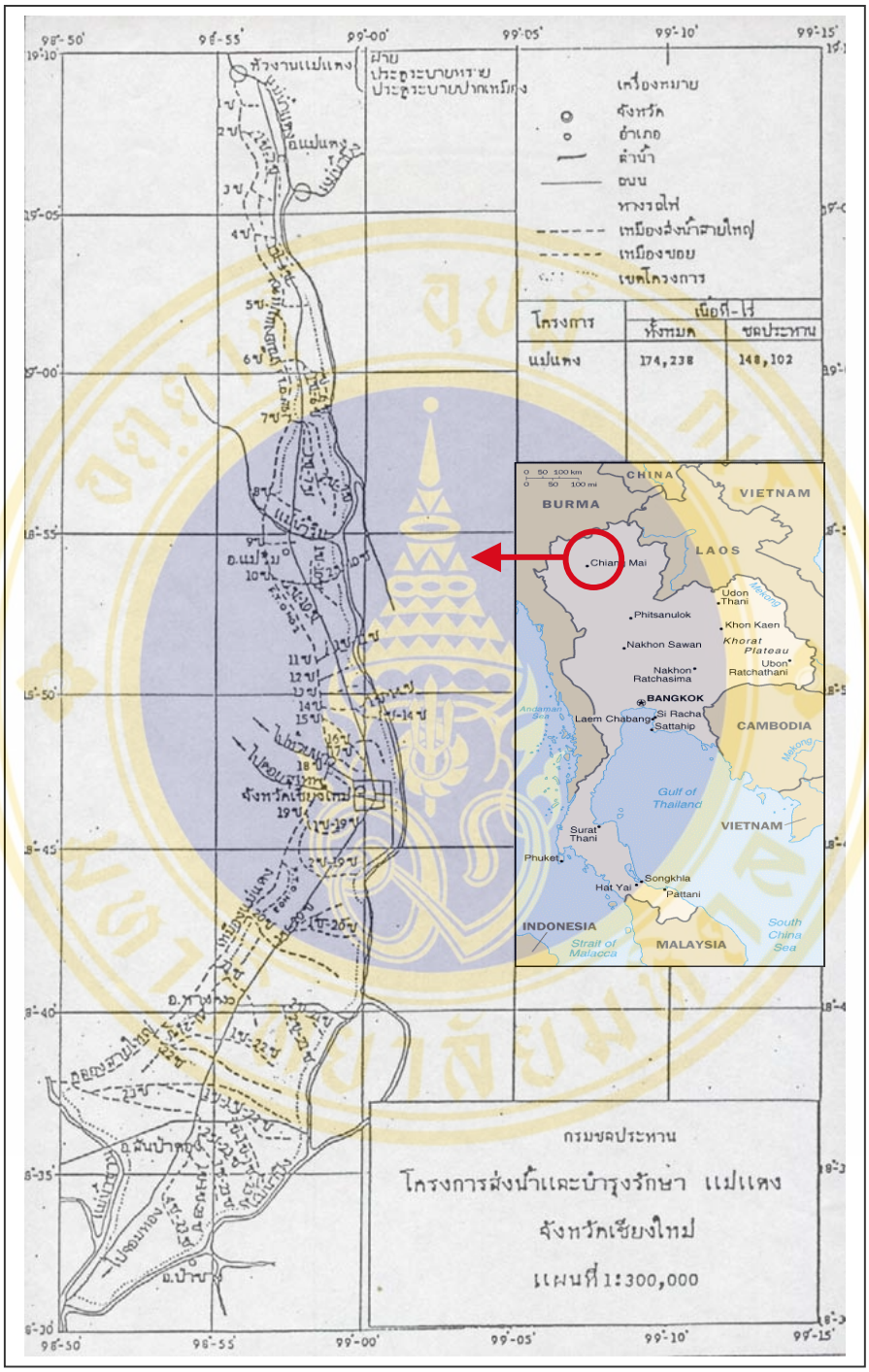

Figure 5.6 Mae – Taeng Irrigation Project Map

Source: โครงการส่งน้ำและบำรุงรักษาแม่แตง, อัดสำเนา: 13.

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5.2.4 Benefits from the project

Irrigated water from the project provides benefits to the areas on the right of the Ping River, with a total area of 174,238 rai. The irrigated land is 148,102 rai, covering 5 districts, namely, 3 subdivisions in Mae – Taeng District, 6 subdivisions in Mae – Rim District, 6 subdivisions in Muang District, 10 subdivisions in Hang Dong District, and 9 subdivisions in Sanpatong District. There are 17,694 households benefiting from the project and the present irrigated area is 116,531 rai. Besides benefiting paddy and other crop cultivation, the water is used for consumption, washing away polluted water in moats and canals in downtown Chiang Mai, and promoting tourism. Benefits of the project could be summarized as follows: (โครงการส่งน้ำและบำรุงรักษาแม่แตง, 2545: Unpublished Manuscript.)

1. Agricultural activities, e.g.,
   - Annual paddy cultivation 148,102 rai
   - Dry season crop cultivation 60,000 rai
   - Fruit cultivation 14,431 rai
   - Fishery 371 rai
2. Consumption. Water from the project is used as raw water for water works by Chiang Mai Water Works. Additionally, it is used in activities of Chiang Mai University, Rajabhat Institute Chiang Mai, Wing 41, Chiang Mai Suksasongkhroh School, and Boromraj Chananee Nursing College.
3. Tourism industry. Water is used in King Rama 9 Lanna Garden and for filling up moats around the city center.

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Table 5.1 Number of villages and subdivisions in the area of Mae – Taeng Irrigation Project

No.	Districts	Subdivisions	Villages	Area / rai
1	Mae – Taeng	3	18	4,792
2	Mae – Rim	6	37	26,527
3	Muang	6	22	6,600
4	Hang Dong	10	75	49,330
5	Sanpatong	9	68	29,282
Total	**5**	**34**	**220**	**116,531**

Source: โครงการส่งน้ำและบำรุงรักษาแม่แตง สำนักชลประทานที่ 1 จังหวัดเชียงใหม่, 2544.

5.2.5 Physical aspects and water diversion system of Mae – Taeng Irrigation Project

The project is a large state – subsidized irrigation project with a sluice diverting water from the Taeng River at the headworks, where the concrete dyke was constructed across the river to raise the water level. Water then is diverted into the single main irrigation canal to supply water to the areas covered by the project. Excess water is released into Munag Luang, which flows into the Khan River and finally the Ping River. Details of each section of the project are as follows:

1. **The headworks**, comprising the following important structures: a dyke, the main sluice, a sand sluice, an earth dyke and an emergency sluice.

2. **Mae – Taeng dyke** is a stone dyke built at the shortcut of the river. The dyke is 80 meters wide, +347 meters from mean sea level and 5.50 meters from the water level below. The maximum volume of waterflow is 700 cubic meters per second. When the water level is over 2.5 meters from the dyke, it would overflow through the emergency sluice.

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Figure 5.7 Mae – Taeng Dyke

3. The main sluice is composed of two 3 meter water gates 6 meters in height and requiring human labor to open and close. The maximum volume of water it can release is 24 cubic meters per second. It is +340.o meters from mean sea level.

Releasing rain water from arable land in the project area does not pose many problems, except about 4,000 rai in the low – lying areas of Hang Dong and Sanpathon districts, which is an annual event. For other ricefields, natural streams and creeks are used to accommodate excess water. The present condition is that these streams and creeks become shallow, requiring dredging every year. Moreover, there are 8 canals with the total length 6.453 kilometers to serve the purpose. There are additional 140 places with problems of water run – off in addition to 26 conduits along the main canal. The volume of water run – off is irregular and uncontrollable. With too large a quantity, it could damage the canal despite 13 canals constructed for accommodating water run – off from the mountains. Nevertheless, releasing excess water from the main canal is often problematic when natural streams and creeks overflow.

4. Sand sluice is a – 3 channel curve gate 4 meters in width and 8 meters in height, requiring human labor to open and close. It is +343 meters from mean sea level.

5. Emergency sluice is an earth dyke obstructing the former Taeng River. It is 444 meters in length running to a hill on the left bank of Taeng River. It is +349.620 meters from mean sea level.

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6. The main canal is 74.558 kilometers long 35.618 kilometers of which are concrete and 38.940 earth. The full capacity from the entrance is 24 cubic meters per second and there are 384 structures along the entire canal.

7. The Lateral. There are 23 laterals and 3 special conduits, totalling 26 laterals and 38 sub – laterals, with a total length of 238.577 kilometers. They are all made from concrete and there are 1,439 structures along the entire laterals.

Figure 5.8 Lateral 5, Accommodating Water from Mae – Khajan River

Lateral 6 **Lateral 7**

Figure 5.9 Lateral 6 and 7

8. Ditches leading to rice fields. There are 910 ditches totalling 759.492 kilometers in length and 38 ditches for excess water with a total length of 119.308 kilometers. There are 1,066 structures along the entire ditches. All of the ditches are paved with cement and no additional ditches will be constructed.

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The irrigation system is relatively permanent and strongly built, with adjustment of the canal area into a straight line. All the canals and ditches are paved with concrete. The construction was standardized according to engineering principles as it was a new project independent from the weir system. Furthermore, it could supply water to 8 areas of the weir system; 3 in the Taeng River and 5 in the Ping River, which has long ceased operations. (วันเพ็ญ สุรฤกษ์, 2528: 208-209)

5.2.6 Water allocation of the project

The allocation of water for agriculture of the project covers 5 districts. The allocation is based on water volume in the dyke, types of crops cultivated, conditions of arable land and efficiency of water diversion, such as water loss due to seeping underground. However, most of the time the consideration is based mainly on water volume. The more water volume remains, the more users can utilize. Water allocation of the project could be categorized into 3 methods as follows:

1. Allocating water for areas around the main canal with specific closing and opening times. This method is used when water becomes scare due to prolonged drought or unusually high demand in the dry seasons. Representatives of water users from each zone would meet with project officials to discuss and seek consensus on when water should be released for each zone. For instance, schedules for dry season crops during April 2001 / 2002 were March 31 to April 3 for Laterals 1 – 7 covering areas in Mae – Taeng and Mae – Rim districts, and April 4-7 for Laterals 8-18 covering areas in Mae – Rim and Muang districts. At the same time, each release could be changed according to the water volume (See Appendix).

2. Allocating water to all laterals and ditches at all time. This method is employed when water volume is abundant, particularly during the rainy season at the start of paddy cultivation.

3. Allocation according to users' needs. The method is utilized by users' requests to specific areas, time and quantity. This is mainly based on the existing water volume.

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5.3 Facts: Water management by water users' organizations

When the goal of water management was changed, state – sponsored irrigation systems replaced community systems. Mae – Taeng Irrigation Project was established, in change of and providing water to users in several districts. As a consequence, water users' organizations were set up to coordinate water users and project officials and to manage water use efficiently in the form of an organization. Initially, the organization was formed as an association just before the completion of the project and later it was changed to a water administration group.

As for Mae – Taeng Irrigation Project, there are 2 levels of water management: the project level and the on – farm level. The former is composed of state officials working in the project while the later is comprised of water users. The two must work together in both levels, which could not be considered separately since the project is state - owned. Therefore the water is considered state property with state officials overseeing the operation and the users' organization managing water use efficiently, fairly and with optimal benefits. It is found that water management at the two levels is similar with slight differences according to time and changing circumstances as follows:

5.3.1 Water management by Mae – Rim – Mae – Taeng Samakkhee Water Users Association

After the first organization that managed water from the Ping weirs was gone, when the construction of the project was completed in 1973, members began to use water from the project instead. They had to first apply for membership from the irrigated water users' associations, which were divided into two associations according to the number of laterals. Mae – Rim – Mae – Taeng Samakkhee Water Users Association was in charge of the areas of Laterals 1-14, while Mengrai Maharat Association was responsible for the areas of Laterals 15-23. Users could become members of any associations, where water use was convenient to their land. However, Mae – Rim – Mae – Taeng Samakkhee Water Users Association is also in charge of

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the areas of Lateral 5, 6 and 7, presently covering the area under the supervision of Water Administration Group Zone 2, which is the later group after the weir organization and Mae – Rim – Mae – Taeng Samakkhee Association.

I. Background of the association

The association was founded on June 19, 1969 while the project was near its completion. The association was in charge of the areas on the upper part of the project, covering 37,339 rai in Laterals 1-14 with 1,628 members. The association was under the supervision of the Irrigated Water Users' Association Center, which was set up by the Order of the RID at 230 / 2511, dated August 2, 1968 and was under the authority of the Water Allocation and Maintenance Division. The association was responsible for providing consultation on administration and methods of water use, coordinating with other agencies to assist farmers, and monitoring the administration of the association according to the regulations and policies of the department. The main objectives were to oversee water management at the on - farm level so that water could be thoroughly and evenly distributed, and to maintain and repair irrigation structures at the on – farm level The main objectives of the establishment of the association could be tentatively summarized as follows: (วันเพ็ญ สุรฤกษ์, 2528: 223-227)

1. To make members aware of the value of water and use it carefully as well as to keep the canals and buildings in good condition in an attempt to increase productivity.

2. To help one another improve the water diversion system, water discharge, water allocation, and main cash cultivation so that yields per rai could be raised.

3. To maintain optional benefit on agricultural produce sales and provide agricultural equipment for members.

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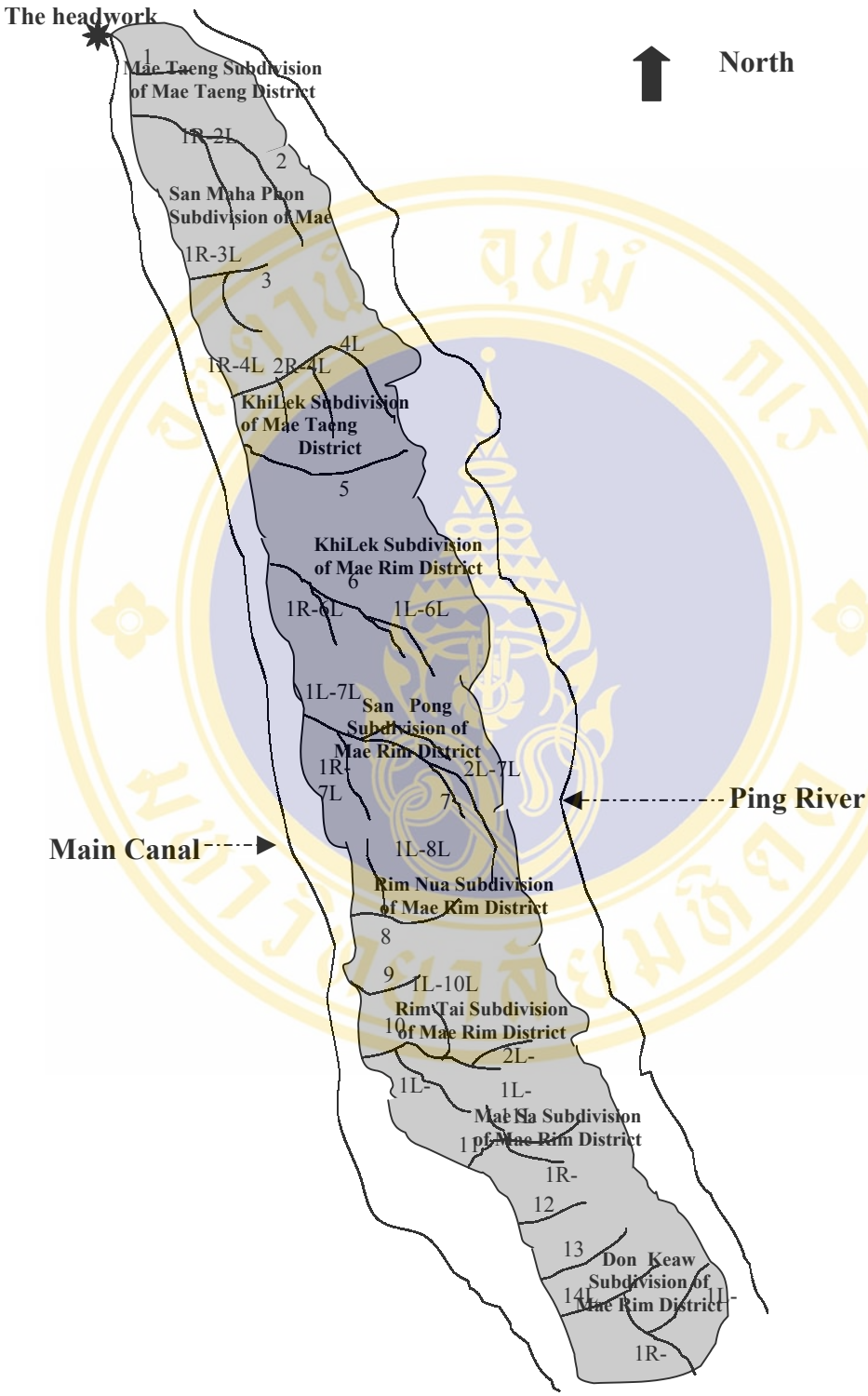

Figure 5.10 Water Using Area of Mae – Rim – Mae – Taeng Samakkhee Association

Source: Interview and adaptation from the project map.

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4. To promote and disseminate agricultural academic knowledge to members.

5. To resolve and manage water allocation conflicts and problems.

II. Organizational structure at the project level

Despite having an association manage water at the on – farm level, due to certain aspects of water use and vast water using areas, the association could not manage water at the on – farm alone. When members could use water for agricultural purposes they still depend on the decision of the project officials. They include the chief of irrigation project or project engineer, water masters and the zoneman working jointly with the engineer' s assistants and agricultural officers. The chief of the irrigation project played a significant role in planning, implementing and overseeing policies and providing academic consultation about water distribution. For instance, he set up practical regulations about water distribution standards, specifying operational steps which could be promptly applied in case of emergency. Furthermore, he was responsible for coordinating with members and the association to promote water use for crop cultivation. He worked with his assistants and four water masters in charge of determining water needed from cultivation plans, recording daily and monthly water levels, compiling annual water levels and discharge, and overseeing the work of canal mechanics, sluice guards, the project hydrologists, irrigation agriculturists, agricultural officers and common irrigators. Water masters played an important part in water management and maintenance, and solving water conflicts among users. They worked with 14 zonemen who reported to them about cultivation conditions, cultivated areas and buildings requiring maintenance and repairs. In addition, they carried out other duties specified by the water masters, including distributing water to common irrigators or users according to required time and suitable quantity. Therefore, zonemen were closest to common irrigators and water users. Furthermore, they were coordinators between water users and project officials.

The above organization structure was for water management at the project level, which covered the main canal, laterals and sub – laterals.

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Mae Rim – Mae Taeng Samakkee Water Users Association must coordinate with the second water master and four zonemen to inform them of water needs, amount of cultivated land, types of crops, and report what needs to be repaired prior to the time of water distribution so that the data could be analyzed and integrated with water use of Mengrai Maharat Association before water distribution plans for the next season could be set up.

III. Organizational structure at the on – farm level

It is well known that users eligible to use water from the project must apply for their membership with the association and grow crops in their ricefields regardless of whether they are the owners. To be eligible for members to use water from Laterals 1-14, members had to pay a fee of 2 baht (during 1970 to 1971) and 5 baht since 1972. In addition, they had to pay 2 baht per rai per cultivation season (rainy and dry) as a water fee or 4 baht per rai per year. This terminated their membership of the weir system. Once their membership was approved, they had the following duties and rights:

1. Vote to elect or be elected as representatives to the association' s board of administration;
2. Cast a no – confidence vote to terminate board members;
3. Ask the association about its activities, balance sheets, incomes and expenses, elect an auditor, provide suggestions, and accept or reject meeting minutes;
4. Compiling with the association' s rules and regulations as well as the authority of heads and board members;
5. Help prevent water theft and destruction of water passages and structures.
6. Get assistance or other privileges according to the law and regulations of the association.

Members were obliged to carry out the following.

1. Pay membership and water fees according to the regulations of the association.

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2. Provide free labor to improve, maintain and repair the irrigation system.

3. Register as members, use water carefully by informing their heads or board members of cultivated areas and required water quantity before the cultivating seasons so that the data could be integrated into water use plans and submit them to the project head

4. Comply with the association' s rules and regulations and authority of heads and board members.

5. Help prevent water theft and destruction of water passages and structures (วันเพ็ญ สุรฤกษ์, 2528: 228).

Non – members and members violating the association' s regulations would be prevented from using the water in any circumstance, whether it was for agriculture or consumption. Theft of water would be punished accordingly. Regulations were drawn up in the assembly, consisting of the project officials, subdivision chiefs and village headmen, and were approved by common irrigators and members before they were implemented and enforced.

The regulations ensured members the rights to use water, carrying out obligations and participating in activities of the association. There was a group of water administrators taking care of and facilitation water use for members at the on – farm level, with the same functions as those in the weir system. Thus, the administrative structure was the same with additional responsibility for general administration, and supervision and the duties were more clearly divided. The administrators were categorized into two groups. The first group, consisting of the chairman, his assistants and the central committee acting as consultants, was in charge of general administrative work and supervising the operations of the 14 laterals. The positions were from elected tambon chiefs and village headmen, working in coordination with the registrars,

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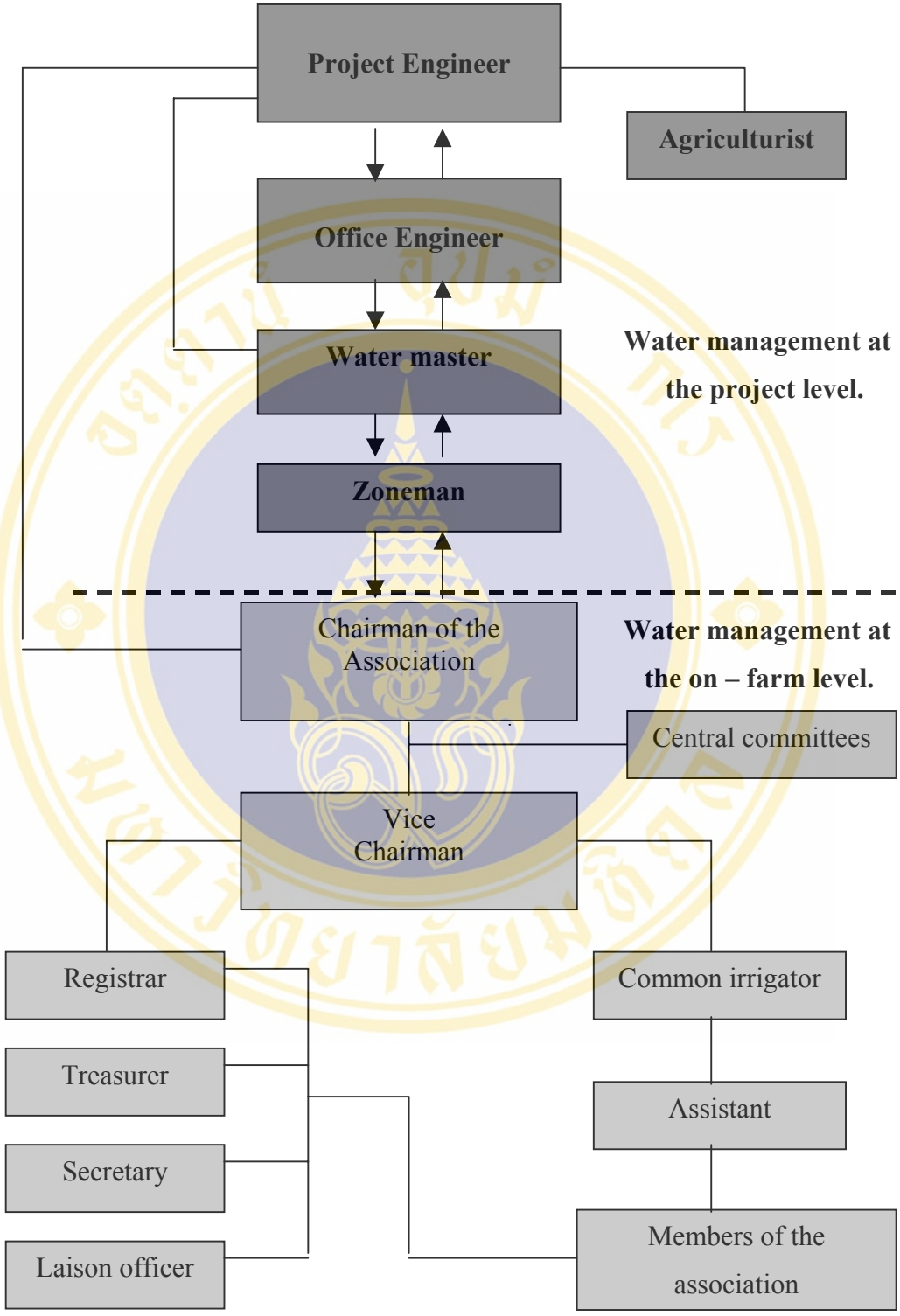

Diagram 5.2 Organizational Structures at the Project and the On – Farm Levels

Source: Interviewed and adapted from วันเพ็ญ สุรฤกษ์, 2528: 215.

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who kept records of membership and documents related to the issue. A treasurer was responsible for financial issues, book keeping, and receiving and paying money. A receptionist was in charge of reception, keeping buildings and properties of the association, while the secretary prepared documents, meeting agenda, recorded minutes, took care of correspondence and informed members about water use according to the regulations.

The second group was in charge of water distribution and maintenance, consisting of common irrigators, who were and did the same duties as weir chiefs (*kae muang kae fai*) in the original Muang – Fai systems, elected from members of each village. Each common irrigator was responsible for 1,000 rai of land and held the position for two years. In reality, he was in charge of water distribution and could be in the position indefinitely if he was fair and worked hard. In addition, he would have assistants whom he personally appointed. In certain villages, common irrigators might assume the duty of ditch riders.

When the members of the administrative committee were selected, they were formally appointed by the Association Center and supervised so that the operations would be according to the regulations.

The common irrigators played the most important role in water management of the association. Besides managing the distribution of water at the on – farm level, they also coordinated and worked with zonemen at the project level, who operated and supervised water distribution to laterals and sub – laterals. Each year, the project engineer held a meeting to inform members of water allocation policies before the dry season cultivation and the rounds of water distribution. At the same time, the engineer would be informed of water needs and distribution problems of members in order for him to seek solutions. After that zonemen would inform common irrigators to tell their members to dredge their respective laterals and sub – laterals. The common irrigators supervised the work, and allocated water with justice and according to plans. Moreover, they were in charge of repairing irrigation structures, opening and closing the structures in canals and discharge canals, maintaining them in good

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condition, solving water conflicts and problems among members, and informing zonemen of water distribution and maintenance. Furthermore, they were to inform members of irrigation information, organize meetings for members and have their assistants check the numbers of ricefields and report to the common irrigators.

A common irrigator was paid for his services by his village. Initially, members paid him 2 liters of rice per rai. Later, he was paid in monetary form, 2 baht per rai per cultivating season; in later years it was raised to 5 baht because water fees could not be all collected and it was done after the harvest was over. As for his assistants, the common irrigator would share his earnings with them.

Regarding weir work, since all the structures including canals, were made from concrete, members were not required to repair them every year. When damage occurred, the project would allocate state funds for repairs. Consequently, members participation in weir work was reduced to dredging laterals and sub – laterals in their respective areas. Dredging would be carried out 2 – 3 times a year, depending on convenience of members and the amount of sediment deposited. It was done at least twice a year before the cultivation in the rainy and dry seasons. Most work was concerned with getting rid of sediment and weeds and the required equipment included a hoe and a shovel for digging and a field knife for weeding. The responsibility of dredging was calculated from the length of the canals divided by the amount of land they fed. For instance, the 7th right lateral was 200 wah [*] in length feeding 20 rai of ricefields. Members benefiting from the lateral were thus responsible for dredging the lateral for 10 wah. The number of laborers required from land owners was not definite as they would come to help one another until the work was finished. Common irrigators would examine the completeness of the work. As for ditches leading to each ricefield, the owner would be in charge of dredging alone. Absentees would be fined and if warnings did not lead to actions, water would be cut off. However, up to the present time, no one has been punished at this level. With regard to regulations on

[*] wah is a linear measure equivalent to two meters.

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water use and lateral dredging, members and common irrigators would set them up exclusively for their respective villages.

Water management of the project treated water users as service users, reporters of water demand and demanders to have the laterals repaired. This resulted in insufficiency of water because the water was 'dated', being released at specified times. Unlike the weir system, water was collected from the Ping River whenever the canals ran dry with members coming to help one another in a collective force. Being provided with water as needed made members become lazy. Common irrigators had always complained about volunteer laborers when repairs of laterals and structures were required. They all waited for the state budget, which took time to get approved. Moreover, the areas under the responsibility of the association were so widely spread out, covering 14 canals, that it was beyond the capability of the association to monitor thoroughly. This led to the collapse of Mae Rim – Mae Taeng Samakkee Water Users Association. A water administration group was established in its place.

Water allocation methods, problems and conflict management of the association will be summarized and concluded with those of Water Administration Group, Zone 2 because they are similar.

5.3.2 Water management by the Water Administration Group, Zone 2

I. Background of the group

When the Mae Rim – Mae Taeng Sammakkhee Association, registered in 1969, was unable to manage water efficiently since the areas under its charge was too large, primary water users groups based on residency in villages and districts were set up, with common irrigators managing water at the on - farm level. Whenever water volumes became insufficient, conflicts erupted, making it difficult for the project officials to supervise and monitor. To eliminate water conflicts among users and increase water distribution efficiency at the on – farm level, the project revived and established a new form of water users organization called 'water administration

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group', in compliance with policies of the Irrigation Department. As a consequence, the Mae Rim – Mae Taeng Samakkhee Association, as formerly known, is divided into 3 zones. The first zone is in charge of water using areas of Laterals 1-4, the second zone 5-7, and the third zone 8-12 left respectively. The administration structure of the 3 zones is very similar, therefore Water Administration Group, Zone 2 was selected as the case study of this investigation. The group is directly under the supervision of the First Distribution and Maintenance Division, Mae–Taeng Irrigation Project. The objectives of establishing the groups are as follows: (โครงการส่งน้ำและบำรุงรักษาแม่แตง, 2540: 2)

1. To reduce state burdens in maintaining and managing water at the field level efficiently;
2. To become coordinators between state officials and water users in terms of information, problems, and activities, which would lead to effective problem – solving;
3. To strengthen unity and cooperation in using water systematically and to reduce water management conflicts among members;
4. To establish a sense of ownership among water users, which could lead to maintaining water distribution systems and benefits in their respective areas;
5. To mobilize funds from users in order to repair structures and distribution systems where the state budget could not cover;
6. To become a foundation for other developments; and
7. To enable members to participate in the decision – making process, which promotes democracy at the grass roots level.

The group was officially registered with the department on February 1, 1997. Initially, there were 1,218 members, divided into 14 primary water users' groups and covering a water using area of 7,137 rai. At present, there are 1,824 members, in another 7,294 rai. It covers 3 subdivisions in 2 districts, namely, Khilek Subdivision of Mae – Taeng District, and Khilek Subdivision of Mae – Rim District.

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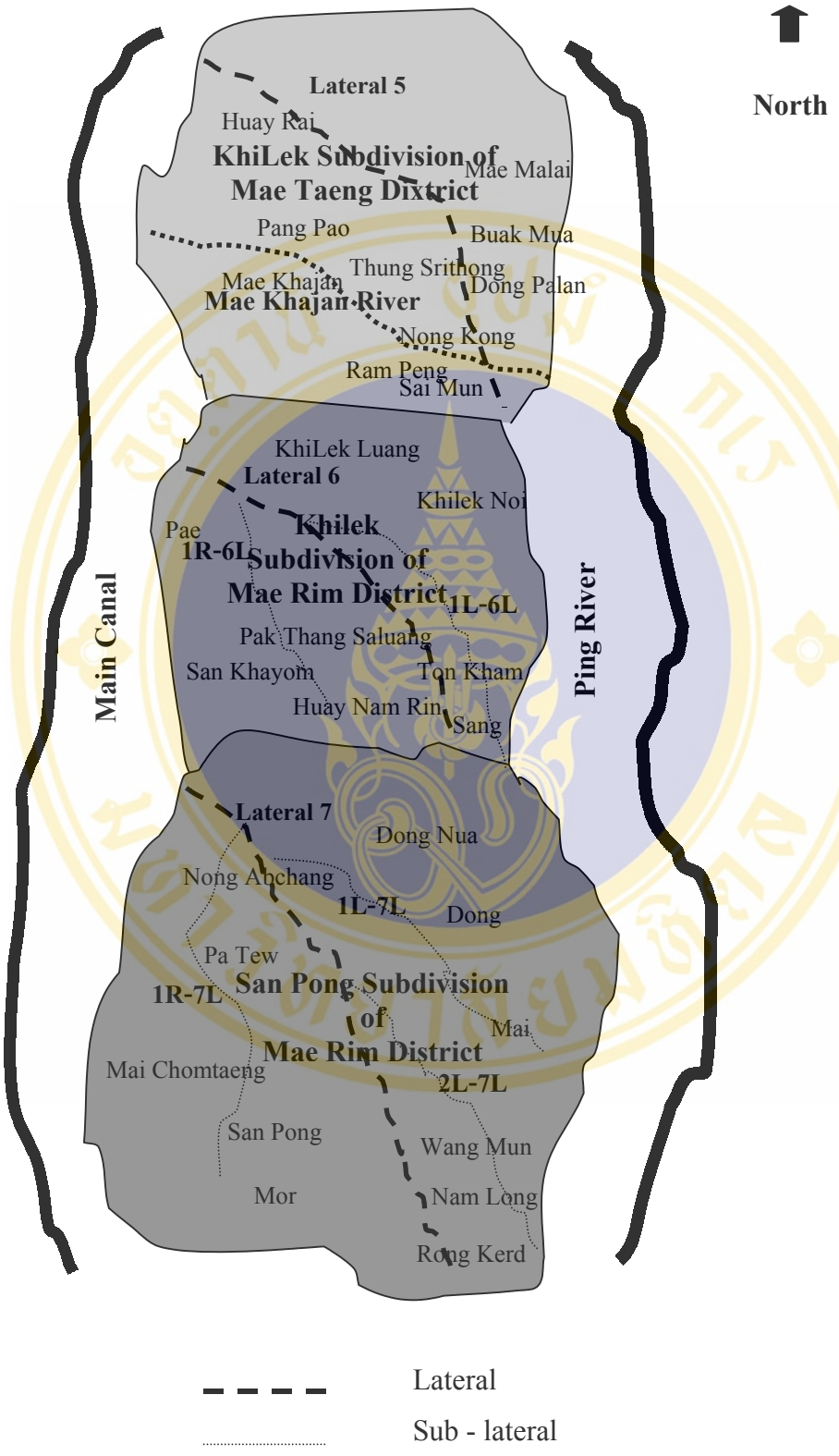

Figure 5.11 Water Using Areas of Laterals 5, 6 and 7

Source: Interviewed and adapted from Mae – Taeng Irrigation Project map.

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Despite covering three subdivisions in two districts, in some villages it is more convenient to use water from laterals of other zones or natural streams. Therefore, not every village in the zone has become a member. For instance, Mae Malai and Huay Rai villages of Khilek subdivision, Mae – Taeng district, where Lateral 5 left is located, use water from Laterals 3 and 4. Huay Rai village in particular, is situated close to the main canal, where it never encounters water shortage problems. Thung Srithong village gets water from Lateral 4, Mae Khajan village from the Mae Khajan River, and Pang Pao village from natural creeks. Thus, water using areas of Lateral 5 include Buak Mue, Dong Palan, Nong Khong, Ram Perng and Sai Moon villages. Every village in Khilek subdivision of Mae – Rim District gets water from Lateral 6 and San Pong Subdivision of Mae – Rim District from Lateral 7. Mai Jom Taeng, Mor and Pa Tiew villages get water from Lateral 8, while Son Pong village uses water from both Lateral 8 and the Mae – Rim River weir. In general, however, almost every village is a member of Water Administration Group Zone 2.

II. Organizational structure at the project level

The organizational aspect at the project level is the same as that of the Mae – Rim – Mae – Taeng Samakkhee Association. Decisions on administrating and monitoring water distribution still depend on the project officials. Besides the project engineer, water masters and zonemen, water allocation and irrigation maintenance officers has been added, omitting the engineer' s assistants. The engineer is in full charge of the overall operations, ranging from general administration, engineering, water allocation and irrigation system improvement, mechanics, water distribution and maintenance to coordination with water users and water administration groups. Moreover, he also works with other officers in allocating water and maintaining the irrigation system. Water allocation and irrigation maintenance officers are in charge of water allocation policies and plans at the main canal level. Furthermore, he participates in considering how much water should be sufficient for each branching canal. Water masters implement water allocation policies and supervise the distribution and maintenance of the system in their areas of responsibility. Water allocation planning and decision – making are based on date provided by zonemen

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about cultivation plans, cultivation advancement, rain quantity, dampness conditions in cultivated areas, and water volume flowing through main water – monitoring buildings. Additionally, water masters play a part in establishing primary water users groups, training members to have knowledge about how to use water correctly, and coordinating with district officials and water users in solving water conflicts. Their main duty is the responsibility for water allocation at the lateral level. In addition, they oversee the work of zonemen in surveying cultivated areas, reporting cultivation conditions, coordinating with administration groups and the project, and repairing and maintaining relevant equipment, structures and distributing and discharge canals. Water guards close and open water gates to distribute water to canals and cultivated fields as agreed and to see whether members receive water sufficient to their needs. Decisions on water distribution usually rest on the chiefs of water masters and allocation and irrigation maintenance officers. When problems become too complicated, the project engineer would be involved.

Water Administration Group, Zone 2, has to coordinate with water masters, a zoneman and water guards in each lateral. Laterals 5, 6 and 7 have 1, 2 and 3 water guards, respectively, who have to report information on water needs, quantity of cultivated land, types of crops, and repairing needs in laterals and sub – laterals to zoneman. The data would be analyzed with those from other zones before being integrated into a distribution plan for the following season.

III. Organizational structure at the on – farm level

The collapse of the Mae – Rim – Mae – Taeng Samakkhee Association was due to the areas in charge being too large to administer and monitor efficiently. When the group was established, the areas in charge were reduced to three laterals from fourteen originally. These are a total of 14 primary water users groups and members are required to comply with the regulations, which are adjusted from those of the former association. The regulations became officially effective on August 9, 1996, and were announced at Khilek Subdivision Council in Mae – Rim District. The details are as follows:

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1. The main objective is to solve water problems and help water users and members thoroughly.

2. Members of the group are water users whose membership is approved.

3. For landowners living at a distance and unable to apply for membership, beneficiaries of the land would automatically be endowed with membership.

4. Every member must disclose the actual quantity of cultivated land or water quantity needs for consumption by their household.

5. Every member must pay a water fee of 15 baht per rai per year to the group. Of this, 10 baht per rai would be allocated to a common irrigators. The consumption fee is paid on an annual basis and the amount would be determined by the administration group.

6. Members or representative must collectively help develop laterals and sub – laterals at least three times a year or according to how the common irrigators and administration board see fit.

7. Members must not secretly open or obstruct laterals or dispose of waste into water passages without authorization.

8. Members must reasonably and suitably comply with agreements from the assembly or orders of the administration board or common irrigators.

9. Members must keep in good condition earth dykes and structures on laterals or ditches in their land.

10. Members must comply with Field Dyke and Ditches Act, irrigation laws and regulations of the group.

11. Violators would be reported to the group by common irrigators. They would be first admonished, and if insistent, water would be cut off by the order of the meeting.

12. A violator of Item 7 would be fined not exceeding 1,000 baht a time.

13. A violator of Item 8 would be fined not exceeding 1,000 baht a time.

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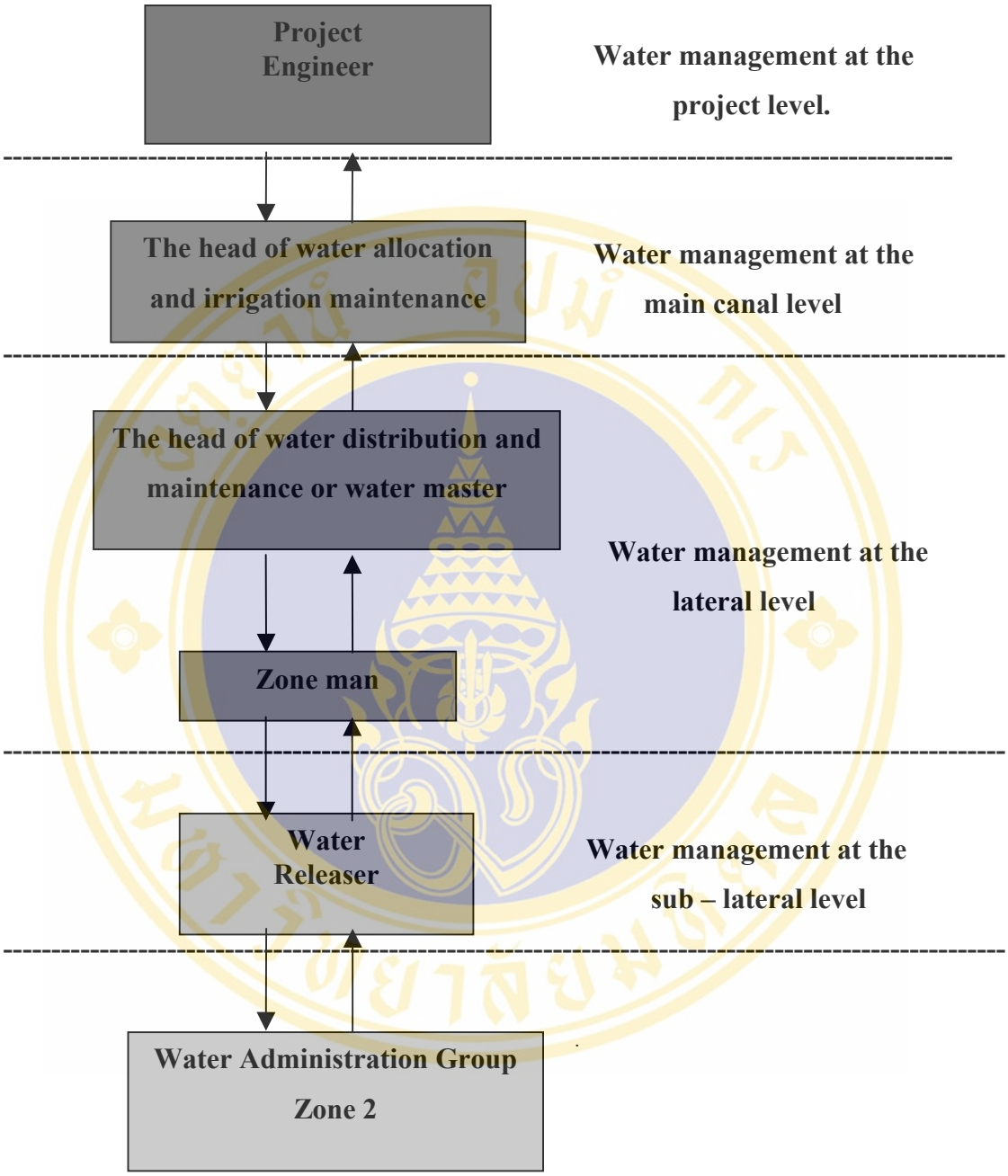

Diagram 5.3 Organizational Structure at the Project Level

Source: Interviewed.

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14. Members would be informed at least three days in advance of development work.

15. Members receiving water though seepage must cooperate and comply with the regulations as others.

16. Members of each lateral must keep the canal in good condition. Whatever means of development depend on the agreement with field inspectors or the administration board.

17. Members having their land on the higher ground have to pump water from the canals, causing problems for others. Before such an undertaking is carried out, they should consult with common irrigators.

18. Members or representatives aged 15 years and over (both male and female) must contribute their labor to development work or activities. In case of sickness or death, whether they would be exempted depends on consideration by common irrigators.

19. The tenure of the administration board members is two years.

Although the regulations are laborious, detailed and strict, in principle, members are eligible to use water when their membership is approved and water fees are paid. Furthermore, they must take part in maintaining and repairing the irrigation system, regardless of whether they are landowners or not. In addition to these, practices, which are relatively flexible must be approved by the assembly.

As for the main positions in supervising and monitoring efficient water management at the on – farm level, they are similar to those of the former association. They are mainly divided into two groups. The first group, which is responsible for general administration, consists of the groups chairman, his deputies and consultants, who work with the registrar, treasurer, secretary and receptionist. The second group, which is in charge of water distribution and maintenance, consists of common irrigators and their assistants. The difference is that the deputies permanently monitor each lateral because the length of the laterals and water using areas are different, which could be summarized as follows.

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Table 5.2 Details of Laterals 5, 6 and 7 and their sub – laterals

Canal Names		Length (kilometers)	Irrigated Areas (rai)
Laterals	Sub - laterals		
5 left		0.576	374
6 left		3.540	2,930
	1 right - 6 left	2.300	927
	2 left – 6 left	2.900	842
7 left		9.955	9,334
	1 right - 7 left	6.360	1,378
	1 left - 7 left	5.979	1,262
	2 left - 7 left	6.131	1,849

Source: โครงการส่งน้ำและบำรุงรักษาแม่แตง, 2544: 7.

The administration of the group is divided according to irrigated areas of each lateral. Members of Lateral 5 and 6 are classified as one group under the supervision of a deputy and the administration board of the laterals due to shorter length and smaller irrigated areas. The other group consists of members of Lateral 7, under the supervision of a deputy and the administration board of the lateral due to longer length and larger irrigated areas. The division is aimed at thorough supervision of water distribution. The two groups are under the same chairman, which become the Water Administration Group, Zone 2.

After the selection of the administrative positions is over, they must be registered as a water administration group from the registra of the department before official appointment could be announced.

The common irrigators still play the most important role in water management of the group. They must work with representatives of the project: zoneman and water releasers. They supervise and operate water distribution within the laterals and sub –

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laterals, with an emphasis on water allocation to all members and according to plans. Furthermore, they submit water requests to the project for members who do not receive water rations. As for other functions, they remain the same as those at the project level. However, repair and maintenance works are under the responsibility of the zoneman.

Another individual playing an important role is the chairman of the group, who functions as a common irrigator simultaneously and is elected by water users. In addition to general administration, he supervises water distribution and maintenance of the canals, and sees that every member receives water according to their needs and thoroughly. Moreover, he monitors problems of the water distribution system and tries to develop unused water resources so that water could be reused in the area. For instance, the present chairman proposed a project to develop Wang Mun canal, which is specifically used to store water without being exploited, so that the water could be brought into good use. Furthermore, he also proposed a project to divert water from Mae Kung dredging canal, a discharge canal, so that the water could be kept for use in the dry seasons since capital water in the project would be scarce. However, the two projects came to a permanent halt due to continuous transfers of project engineers and other officers. The present chairman is well respected and many members believe that nobody could replace him as he is also a spiritual center for them. Besides working hard, he is also honest, reasonable, just and highly responsible. He is a factor that makes members obey and follow the regulations. He does not have to work in the fields anymore since his children do it. Therefore, he could devote all his time to water management. He is a local man and knows the areas well. When he was young, he followed his uncle who was a weir chief. Later he had an opportunity to work at a water users' organization in the weir system, as a common irrigator in the Mae Rim – Mae Taeng Samakkhee Association and presently the chairman and common irrigator of the group. He adapts conventional water management and water allocation methods to use with the group. Often he is a consultant to project officials because he is experienced and knows the area very well.

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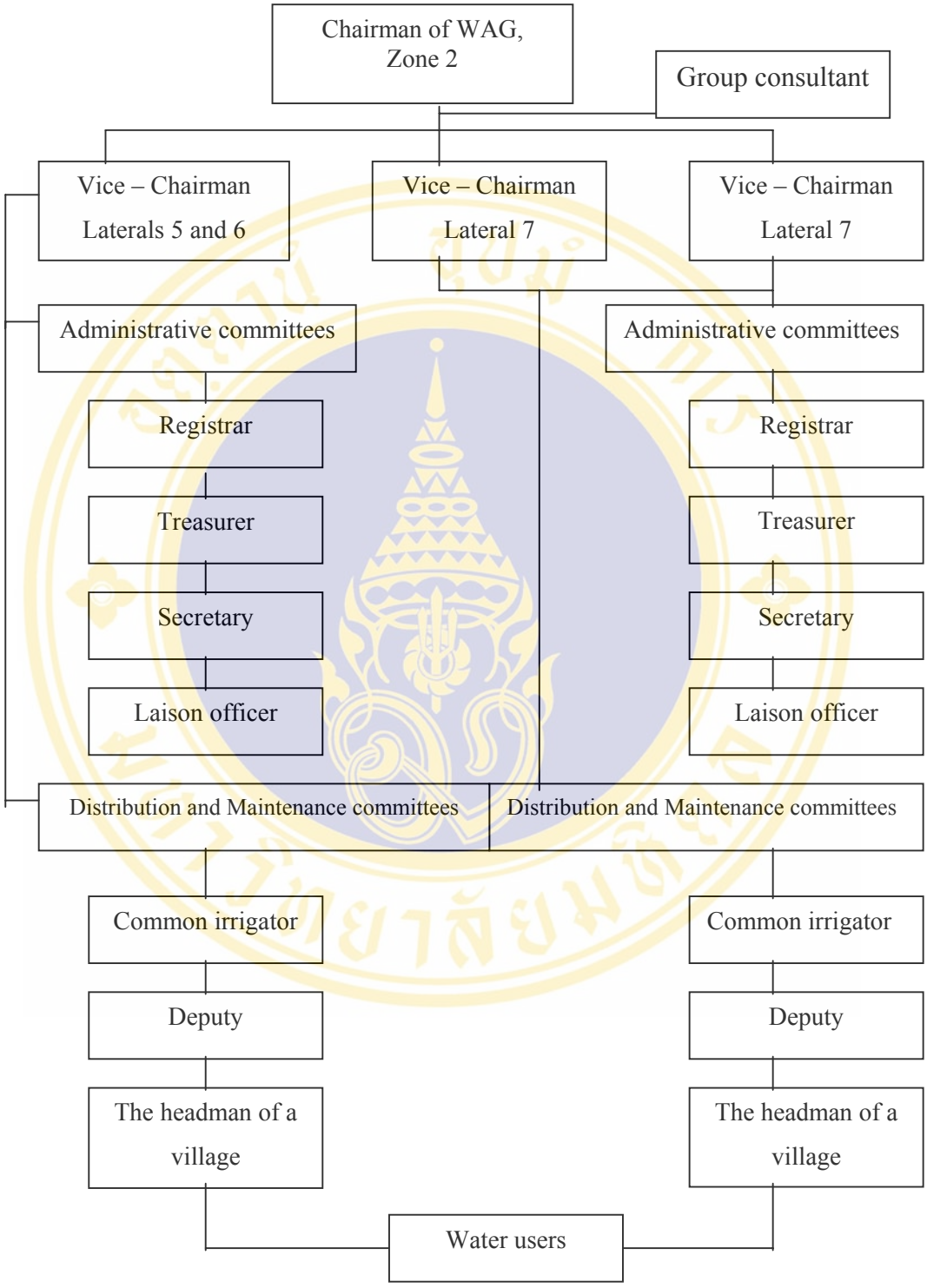

Diagram 5.4 Organizational Structure at the On – Farm Level

Source: โครงการส่งน้ำและบำรุงรักษาแม่แตง, 2540: 7.

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The chairman uses his own motorcycle to inspect laterals and get in touch with the project, which is relatively distant. Nonetheless, he is willing to do so because he believe that water, past or present, is a valuable natural resource and every member should be able to use it according to his or her needs. Nevertheless, allocation methods and quantity of water are determined by the project, which are not certain, depending on the capital water. Since water demand is intensive all year round, more members exploit it for their own use to satisfy personal demand. One impact of such water use is that some members do not have sufficient water for their crops. Consequently, he has to manage water use so that everyone gets an equal share. If the issue were left to project officers to handle, they would not do as well as he does because they do not know the place well, they speak a different language and hold on to theory, which is sometimes against actual practice. Although his annual stipend rarely covers petrol costs for his motorcycle, he still carries on his duties regularly, devoting his time and energy for the sake of the group and members.

Regarding the water fee collected from water users for common irrigators, it has been raised to 15 baht per rai per year. Of this amount, 10 baht is for the common irrigator in each village, who facilitates water distribution for them and 5 baht is kept as the group' s dues or is used for repair expenses, which the state budget could not cover. These is very little money left at the moment because they could not collect from every member; only from those willing to pay for the hard work of the common irrigators and their attempts to solve water conflicts among members. Theoretically, when a member refuses to pay the fee, he would be informed and admonished. It insistent, water would be cut off from his field. However, in practice such an extreme measure has never been used. In some villages, common irrigators could not collect the fees as members are relatives and they avoid paying. The result is that no money is left for the group. For instance, fees could not be collected at Ton Kham and Sang villages. It is also found that only 5 baht per rai per year is paid because members are not satisfied with the performance of the common irrigators in the villages. The chairman is not involved because he regards it as an internal affair and the sub – district chief is supportive. It should be left for the villagers to solve. Due to insufficiency or lack of money, water canals are in bad condition as there is no money

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to par for repairs. Additionally, members who do not pay the fee feel that water belongs to everyone and nobody possesses or owns it and nobody has the rights to forbid them to use it.

As for canal dredging, initially for every one kilometer of the canal, there would be two people hired by villagers to clean and look after it. Later there was no money to hire canal cleaners, resulting in more collection of sand and sediment. Thus water could not be fully exploited. As a consequence, members have to dredge the canals by themselves, which is carried out three times a year: before the annual paddy cultivation, after rice seedlings become green and before soybean cultivation. More dredging would be conducted if sand makes the canals shallow or they are covered with weeds. The chairman would call his deputies and common irrigators for a meeting to set a date. After reaching an agreement, a circular would be sent to members. The equipment includes a hoe, a shovel and a field knife. The method of responsibility is that the length of the laterals is divided by the amount of land benefiting from the laterals. Everyone is in charge of his responsibility and no collective labor is required. Normally, members would be notified a week in advance. Labor is mainly from men, and not from children, women or the elderly; and the number is not restricted. It is noticeable that the number of members has been reduced. Those present are those suffering from difficult water flow due to sediment. Some of those who do not see the importance of the work and do not contribute their labor. They usually go to work in other villages as daily wage earners. Those absent would have to pay 120-150 baht per day as a fine, or the equivalent of minimum labor wage. Each village would set up its own committee to collect the fine. However, the number of laborers for dredging work has been greatly reduced because ricefields in some village have been sold for real estate projects, such as, Nong Ab Chang and Sang villages. In addition, later years have seen the amount of sediment so huge that it has been beyond the capabilities of members to eliminate it by themselves. Thus common irrigators in coordination with the chairman have requested macro – trucks from the project to excavate it. This has made members less interested in helping to dredge the laterals and instead they rely on help from the state budget. As for water fees that the

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group keeps, they are spent on minor repairs of the canals. With respect to sub – laterals and ditches, land owners would take them under their own responsibility.

Before the responsibility for lateral dredging would be divided, the common irrigators would inspect the amount of land and the names of members before the planting seasons. This is because a large amount of land has been sold for real estate projects. In addition, the name list would enable the common irrigators to know how much dredging work a land owner should have and to collect the right amount of water fees. It is often found that the quantity of cultivated land has been understated.

Members are also required to attend meetings organized by the project officials, the group chairman and common irrigators to inform them of water use directives. The meetings are held twice a year: before the annual paddy cultivation and before cultivating soybeans in the dry seasons. Topics of the meetings include water use, water distribution, canal dredging, volume of capital water and follow – up of projects the group has proposed. When problems of water use arise, members could use the meetings to voice them. If assistance from the project is required, the chairman and common irrigators would negotiate for it later.

5.3.3 Water allocation methods at the on – farm level

As mentioned earlier, water distribution and water allocation of the project are based on the volume of capital water in the main canal, types of crops, conditions of cultivated areas and efficiency of water distribution, such as loss from seepage. With this information in hand, water allocation and maintenance heads and water masters of the project would determine water distribution plans and inform zonemen and water guards in the field so that they could plan with water users organizations to specify cultivation periods in accordance with the distribution. Such a practice must be implemented in all areas so that it would be convenient to predict and plan for the distribution in line with existing capital water.

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Unlike the weir system, the two organizations have no rights or authority to make a decision on water allocation to members according to their demands and needs. Although they participate in the planning process with officials of the project, authority on supervising, making decisions, determining the quantity and allocation methods, and distributing water depends on officials of the project. As a consequence, water management at the on – farm level does not have criteria regarding who would get water first and how much. The criteria for water distribution of the project are as follows:

1. They must be members with cultivated land in the areas covered by the project and there are canals and ditches where water could be easily accessible and exploited.

2. They must inform common irrigators and their administration groups of cultivated land and types of crops. Zonemen collect the information and submit it to the project.

3. They must prepare their land and clean their canals and ditches to accommodate water.

4. Water distribution must be done in the periods determined by the project because there must be a time to stop distributing water to repair canals and buildings.

When the project determined water distribution methods canal, the group chairman would send circulars to the common irrigator in each village to inform members about the schedules and practices. Besides the rainy season when the free flow of water can be done, members could only get water during the time schedules. When the project determines the time and volume of water to be delivered, members could not specify the volumes they need for their crops. It is thus customary that when the water is delivered, those at the beginning of the canals would be able to use the water to their satisfaction before the gates are closed in order to let those at the end of the canals use their rations. Water use of each member depends on the types of crops, which are as follows:

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1. During paddy cultivation between June and December, water is needed in large quantity.

1.1 During the preparation of land, seedings and planting between June and August, water would be let into the field every ten days. The field must always be flooded about 10 centimeters from the ground. Water is crucial during this period as it would affect the growth of seedlings.

1.2 During the yielding period in October, water is essential for the quality of husks. However, by the end of November, water is no longer needed since the harvest season is near, around December.

2. Cash crops in the dry season: soybeans and corn.

The crops would be planted in late December and early January. They require water periodically from the start to the harvest. For soybeans, after the seeds are planted, water would be let in every seven days and then every 10-15 days. For corn, water is needed every 6-7 days. Again, it all depends on how well the soil could absorb and retain water, and how difficult water could be delivered.

Figure 5.12 Letting Water into the Rice Field

It was found that members require water all year round and paddy cultivation requires water in the largest quantity, which is suitable in the rainy season when water

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shortages are rare, except during prolonged drought. As for soybeans and corn, they need water periodically, which is suitable in the dry seasons when the supply of capital water decreases. When water use is compared, rice requires 100% whereas soybeans and corn require only 30%. Regardless of whether their land is located at the beginning or the end of the canals, members want and need water for their crops to prevent damage and to have production yields to generate sufficient incomes and profits from investment.

The product of those having their land at the beginning of the canal getting water first makes those at the end of the canals receive less water, or sometimes water, particularly in the dry seasons. The latter group hence has to depend on delivery schedules in the main canals, which includes several canals together. For instance, the project usually delivers water to Laterals 5, 6 and 7 with Laterals 1-4. Furthermore, the number of days for water delivery in the 7 laterals is very few when compared with the cultivated areas they cover. From February to April in 2001 and 2002, for instance, water was scheduled to be delivered 4 times and each time it took 4 days. When the schedules came, water was delivered to all 7 laterals simultaneously. For long laterals like Lateral 7, members at the end rarely got any water and it took days for the water to arrive. When the water arrived, it was the final day of the rotation as water had to be shared by the other 6 laterals. As a consequence, they had to pump underground water or water from the Ping River to feed their crops even though it would cost more money.

As for common irrigators, they would find out whether members in their respective villages get water rations evenly and thoroughly. When disadvantages are found out between those at the beginning and the end of the canals, they would use their own experience in water management, examining this in person and checking the condition of crops to consider and make a decision so that every member gets a fair portion. If they find that the water provided by the project is actually insufficient, requests would be submitted to zonemen with the following steps.

1. Members must inform common irrigators of their water needs, including amount of cultivated land, types of crops, days and times when water is needed.

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2. Common irrigators submit the information to the group committee and the chairman.

3. The chairman must contact or authorize common irrigators to contact zonemen.

4. Zonemen take the issue into consideration. If the requested volume is huge, supplying more water may affect members in other zones. Zonemen then have to inform the divisions of water distribution and maintenance, and water allocation and maintenance of additional volumes so that they would consider the requests in a way that will not affect other zones.

In conclusion, although Mae – Rim – Mae – Taeng Samakkhee Association and the Water Administration Group Zone 2 have been established to represent water management at the on – farm level, project officials who are state employees have to supervise and monitor it. Thus water allocation at the on – farm level mainly relies on the decision of the officials. As can be seen, the project determines water delivery methods and volumes and the organization implements the plans as set, which causes problems in actual practices.

5.3.4 Problems and conflict management

Water management problems could be categorized into two levels according to water management level.

1. Problems at the project level.

1.1 Water quantity from the project is insufficient because the water volume in the Taeng River is irregular. When it rains in the watershed, the quantity of water in the river is abundant while the capacity to use water is 24 cubic meters per second at the maximum. Excess water would overflow the dam to the Ping River. When it does not rain in the watershed, water volume in the river is reduced and insufficient for use. Therefore, the volume of water in the river depends on annual rain falls.

1.2 There is no reservoir to store water for use during prolonged drought when the water volume in the river is drastically reduced.

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1.3 The consequence of the above problems is that water supply is below demands of users, causing conflicts among users. Some violate the rotation of water delivery schedules to avoid crop damage, income loss and low production yields.

1.4 Water delivery system found in water diversion structures, canals and ditches is inefficient as they are old and in bad condition. Furthermore, most laterals are below water using land, which is due to the deposition of compost and sediment. As a result, the areas are unable to fully get water, particularly those at the end of the canals, where water is not easily accessible.

The project could solve those problems. For the water delivery system, officials should regularly inspect and repair it by requesting the state budget for the operation, which might take some time to receive. The problem that the project could not permanently solve is insufficient volume of water for users since the project solely relies completely on water from the Taeng River, where water quantity is irregular. Moreover, the project is responsible for providing water to irrigated land in 5 districts. Additionally, water from the project is not solely used for agricultural purposes. It is a life line for people in the city center. Several agencies use water from the project, e.g., educational institutions and the Chiang Mai Water Works. The water is also used for the tourism industry. The present solution is delivering water on a rotation basis to each area according to existing capital water. The concept to solve the above problem could not be carried out in a concrete term due to several factors. For instance, in the past there was a Mae – Taeng development project to support capital water for the project so there would be water available year round by constructing Kuet Dam. The dam would function as a reservoir over Mae – Taeng dyke, located at Mae Taman village, Kuet Chang Subdivision of Mae – Taeng District. Up to the present time, however, the dam has not been constructed despite a complete survey and land purchase. The government has suspended the construction indefinitely, pending budget and environment impact assessment.

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2. Problems at the on – farm level.

The problems at the project level have had an impact on water management at the on – farm level. The problems of the two water users organizations can be elaborated as follows:

2.1 Water distribution based on existing capital water and lack of a reservoir result in insufficient water in the dry seasons, causing water competition and conflicts among members, especially those having cultivated land at the beginning and the end of the canals. The former try to keep all the water for themselves. In addition, water theft through unauthorized conduits to divert water to individuals' fields is rampant.

2.2 Small volumes of water, together with an old and inefficient delivery system, make it difficult for common irrigators to facilitate water to members, resulting in inability to collect water fees. Without monetary incentives, some common irrigators are discouraged from facilitating their members at their fullest extent. Furthermore, there is no money left for repair expenses because members see that water is always available despite not paying the fee.

2.3 Although members see the importance and benefits of being member of the organization, most of them neglect participating in group activities, especially canal dredging, annual meetings and the appeasing ceremony for weir spirits. Only common irrigators, their assistants and some members carry out the activities, indicating that most members are not enthusiastic about participating in group activities. This is because many of them have become daily wage earners, which provides more regular income than being a farmer. Furthermore, promotion of intensive agriculture all year round makes members put personal interests ahead of public ones. Additionally, the project is state – subsidized, therefore, members view it as state duty to provide such a service to them.

An individual playing a significant part in solving water conflicts is the common irrigator. Water competition and conflict usually take place between members having cultivated land at the beginning the canals and these at the end. If they are unable to negotiate by themselves, the common irrigator would be a mediator for both sides to make a compromise. If he sees that the group really needs water and the supply is

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insufficient, he would coordinate with the group chairman to request more water from the project. Most of the time, those at the end of the canals would solve their own problem by pumping underground water rather than waiting for assistance from the common irrigators and the project.

Concerning lack of participation in group activities, particularly canal dredging, the common irrigators and the group chairman would try to convince members of the importance of canal dredging. If admonishment is still fruitless, it is the responsibility of members in the village to impose a fine. Lack of such an interest stems from the perception that it is the duty of the project to seek state funds for canal dredging.

Regarding water fees, it is the decision of members in each village to make the agreement with their common irrigators since it is a direct responsibility of the common irrigators to facilitate water for members. If the common irrigator is irresponsible or performs his duty unsatisfactorily, members have the rights not to pay water fee. In certain villages, the position is appointed to disseminate water news from the project. The group chairman or president of the association would not be involved since the matter is regarded as an internal affair of the village.

5.4 Conclusion

Irrigated land in Laterals 5, 6 and 7 under the management of zone 2 used to be community – based water management in the form of the Muang – Fai system, diverting water from the Ping and Mae – Khajan rivers and other natural streams. At present, the management is state – subsidized in accordance with the change of agriculture in the northern region from subsistence to intensive and diverse economic agriculture. Thus the goal of water management is to meet water demand all year round.

To meet such a change, a state irrigation project in Mae – Taeng District was established to support more land use and water utilization all year round. The conventional weir system with a focus on providing water for the annual paddy

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cultivation in the rainy season, equal share of water and participation in weir work activities was deserted. The state – subsidized project is permanent because it was built according to engineering principles. It provides water services and relatively strong canals and ditches free of repair and maintenance. As a consequence, members in the weir system turn to rely on provisions from the project since it could provide water for crop cultivation the whole year.

Regarding water management at the project level, it took place among the developments with emphasis on more efficiency and potential of agricultural yields. Water allocation is based on increasing technological competency to deliver and discharge water at its optimum. It is believed that more water volume, the more equal benefits the public would get. Nonetheless, water management at the on – farm level by water users organizations tries to adapt the weir methods so that they would be in line with those at the project level, to allow members an opportunity to get equal shares of allocated water.

Therefore, the principles of water management between state and community by water users' organizations are very different from those of community – based and human – centered management. The management by state agencies puts importance on the physical aspects of water, the water requirement of plants and the competency of water distribution systems. It will be further analyzed, from water management by those organizations in each period and considering basic activities of irrigation, whether their real potentiality would be shown if they were given freedom to participate, authorize and administer irrigated water system by themselves.

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CHAPTER VI
CAPABILITY OF WATER USERS' ORGANIZATIONS IN WATER MANAGEMENT

Water Administration Group Zone 2 in Mae – Taeng Irrigation Project is one of the water users' organizations that is trying to sustain, change, and adapt cooperative water management to be consistent with the state's water management policies that were established recently. Water users' organizations were first developed as communal irrigation systems or Muang – Fai systems that repaired and maintained their systems according to specific characteristics of social organization for irrigation in early Thai society. They also share some general water management characteristics with those of water users' organizations in other northern Muang – Fai systems. Since the Mae – Taeng Irrigation Project was completed in 1973, or 30 years ago, social groups to maintain irrigation systems can still be found today, but the social organization of irrigation systems has changed from water users' organizations in Muang – Fai systems to Mae – Rim –Mae – Taeng Samakee Water Users Association, and finally, to the present Water Administration Group Zone 2. The organization of irrigation systems has had to continue changing because of confronting environmental dynamics both inside and outside the organization.

Water Administration Group Zone 2 can be considered a kind of social group; it is local group that has to interact with other groups in society, including external economic and political systems. Even though it is just a part of the way of life of farmers in the north, it can help us analyze the structure of Water Administration Group Zone 2 as a water users' organization based on social relationships in production or economic cooperation among members. It also allows us to see whether or how members have changed principles of cooperation in water management according to changing social and economic conditions.

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Each evolutionary period of water users' organizations in water management presented in Chapter V displayed ideas in water management and different characteristics of social organization. From this we can summarize the two main reasons that water users' organizations have been able to change ideas concerning water management and social organization characteristics in each time period, as described below.

1. The goal of water management has changed and no longer serves only paddy farming as a major occupation in the rainy season; instead, it serves multiple production, which encourages members to engage in new cropping patterns by growing a single cash crop such as tobacco, corn, and vegetables for sale. As a consequence, water is needed for mass production throughout the year.

2. State irrigation projects, instead of community or Muang - Fai irrigation systems, play an important water management role in increasing cropping products, which is the main cultivation policy. The government's objectives in supporting irrigation systems are to facilitate the changing of water management goals, including central decision-making by the state, to deliver and allocate water, and to repair and maintain the system.

From these two reasons, which enable us to understand the capability of Water Administration Group Zone 2 in water management, I will begin to analyze the physical characteristics of irrigation changes that have affected the characteristics of water user's organizations and basic water management activities from the earliest times to the most recent, i.e., water usage, water allocation, system maintenance, labor and resource mobilization, and conflict management. All of these factors lead us to conclude that water users' organizations include implements that can be used to promote equitable and capable water management.

6.1 Changes in the physical characteristics of irrigation systems

The main objectives of state irrigation systems are to increase efficiency of storage and to improve the capability of water delivery. Other goals are higher capability in storage and water deliver ability to serve multiple production both in the

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rainy and dry seasons or throughout the cropping season. Technological developments in irrigation systems have changed the original physical aspects and irrigation system of Muang - Fai. In the past, the major objectives of weirs and dams were to pump water up high enough to flow into cultivated areas, unless a major canal was a food source for members, especially fish. These factors enable us to understand that ideas regarding building weirs and dams or Muang – Fai systems were the most consistent with the ecological system.

When water management by the government began, the original systems changed. Strong and permanent weirs and dams were constructed from the Taeng River without a reservoir to act as a water source for the areas on the right of the Ping River, to serve rainy and dry season cropping, consumption, and to support the tourist industry. Moreover, from the background of Mae – Taeng Irrigation Project in Chapter V, we know that although the government did not demolish the two weirs that had been used to pump water from the Ping River up for cultivating, RIDs improved and constructed canals by using concrete that changed irrigation systems to the new pattern in which it was easy to receive water from the project. The original canals have been abandoned until now. Most sub-laterals and ditches are still using details and elaborate structures of the Muang – Fai systems because that technology was flexible and consistent with equitable water allocation for all members, while the state irrigation system was more rigid and difficult to change when there are problems. Members do not want to change the system if they have not participated in establishing and managing it. Therefore, a sense of belonging at the on-farm scale still exists among members, although canals have been changed to concrete through the government's construction budget, making members believe that concrete canals will be more effective in delivering water than the original system.

In contrast, most of the state irrigation system is not responsible for serving many water users all the time as the Muang – Fai system did, because the Muang – Fai system had major canals functioning as reservoirs that enabled members to have water when they needed it. In the irrigation system project there is a weir without a reservoir that affected to the seasons. Having a strong and permanent irrigation system frees

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members from having to repair it since it is the responsibity of the project. Therefore, the Muang – Fai system function was abandoned and two original Maung – Fai systems were lost, and Ping River was dammed up, changing the way of life, production, and several patterns of members in water management.

6.2 The organizational aspects of water users' organization: Water Administration Group Zone 2

Water Administration Group Zone 2 is an original water users' organization in the Muang – Fai system, having organizational aspects like communal management and having management traditions, including a continuous social organization that changed according to context. As mentioned above, the organization's major goal is water management for the community, so members share responsibilities, duties, and power among themselves equally. These include system repair, and resource mobilization to maintain the system according to the amount of land they own or the cropping area that they use and the amount of weir or dam damage each year. Thus, the water users' organization is a small organization, consistent with the Muang - Fai system and with easy procedures for reaching an agreement, including the ability to adapt to changing environmental conditions.

Water management in the Muang – Fai system both in earliest times and now in some areas such as the study of พัชรี อาจหาญ and สาโรจน์ แววมณี is still co-water management among members in the community with a sense that 'water' is communal property and all rivers belong to everybody who can use them. Moreover, if a community constructs weirs to pump water up to store in major canals and divert into cropping areas, water in the canals is owned by the community that built the weir according to conditions agreed upon by the members. That underlying principle of water management conditions or agreements depends on sharing gain fairly and the need to use is managed by the Muang – Fai organization. Usufruct rights are related to use, not to occupation, and if members do not use it any more, they will not be the owners of that property or water.

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After the government developed the physical aspects of irrigation systems like the Mae Taeng Project, irrigation projects had to establish organizational aspects to support water management at the project level so that water would be allocated effectively and in line with plans for the large irrigated areas. These organizational aspects consist of policies, regulations, and procedures, including complicated decision-making, all of which are in writing. This had an impact on the community's water management structure and control of water usage as well, because Mae – Taeng Irrigation Project is large and water users' organizations act as laisons between members and officials.

Moreover, water users' organizations play an important role in facilitating cooperation among members to use and maintain irrigation systems properly, including fair distribution of water in a suitable amount and timely fashion. Water users'organizations were created first by merging several basic water users' groups and then developing them to be water administration groups made up of water users in the same lateral. Like Water Administration Group Zone 2, the organizational structures were changed drastically from Muang – Fai organizations, which managed water by community decision-making, with independent water distribution and allocation, system maintenance and reparation, to water users' organizations in the Mae – Taeng Irrigation Project, which are controlled by the government.

In this way, the original organizations changed from having their own patterns, traditions, and rules of water management to having those dictated by the government in which decision-making power is up to irrigation officials. When the water users' organization changed, both its rights and position in water management decreased from having decision-making power in water management to be merely a water users' organization in an irrigation project.

The organizational aspects of Water Administration Group Zone 2 established clearly shared responsibilities, which were formulated in writing as government requirements for people who need service. In irrigated areas, farmers are able to use water when they apply for membership and establish groups as water users'

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organizations. They request water usage service from the government so that the state irrigation will know the number of members, irrigable areas, and types of crops to plan water allocation. Water Administration Group Zone 2 changed from being only a water users' organization of an irrigation project and under the command of irrigation project – RID. The organization also plays a role by waiting to receive the water service that they require; giving descriptions of the areas as well as details of water needed; repairing and maintaining the system according to lines of command; repairing and maintaining ditches and canals, and acting as a laison between members and officials at the on-farm level.

The organizational features of Water Administration Group Zone 2 in the Mae – Taeng Irrigation Project were not set up to serve members' needs, as the water users' organization in Muang – Fai system had been, but to provide water for multiple production and to conform to the project water management plan. As was mentioned above, those organizational features have affected the patterns, traditions, and rules of the basic activities of Water Administration Group Zone 2 at the on-farm level, including adaptations necessary to conform to the Mae – Taeng Irrigation Project. I will present the details of water management capability in the next section.

6.3 Basic activities of irrigation systems as indicators of capability in water management

Water management patterns, traditions, and rules changed after state irrigation project developed the physical components of the irrigation system. The earliest water users' organization were based on community rights to manage water under the command of the government. The capability of Water Administration Group Zone 2 can be explained throught basic activities of the irrigation system that have adapted water managmenet ideas from the original Muang – Fai system to conform to state water management by Mae – Taeng Irrigation Project and to the needs of multiple production conditions, such as those below.

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6.3.1 Water usage

Originally, water usage policy in the Muang – Fai system, in which water was pumped up from the Ping River, included water usage rights. In order to be a member, a person had to participate in constructing, repairing, and maintaining the system similar to the way people invest money and effort. They established rules for using water to achieve the highest goals, which were equitable and sustainable in water management by the Muang – Fai. Moreover, all members had a chance to get water to use for cultivating until the cropping season was over according to each member's needs. Apart from this, the cropping pattern in the earliest time consisted of only paddy farming. Thus, the members of the Muang – Fai system were groups of farmers and they did not delineate water usage rights strictly according to who could use water first or last. Instead, members who used cropping areas in the head-canals always had rights to use water before those in the tail-canals. However, the rights were fair to all members because they usually had to rely on each other in every way.

When the state irrigation project was completed and water users' organizations managed water at the on – farm level, water usage rights also changed because of the conditions of the irrigation project that served to promote multiple production goals. The group with power to establish duties for members was the government as an investor in constructing, repairing, and maintaining the system. Consequently, members would use water by following the rules that served for government' s plan, such as the rules and rights to use water of Water Administration Group Zone 2. Moreover, the conditions for farmers to receive water from the Mae – Taeng Irrigation Project included membership in Water Administration Group Zone 2, having cropping areas in water delivery areas of the project, having canals and ditches. They also had to have the ability to use water from those canals or ditches, and maintain dikes and structures of the system in good condition.

However, water allocation in the irrigation project was generally uncertain in both quantity and time. Consequently, the project was unable to supply water for cropping that began at different times. Members had been encouraged to grow several

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different types of cash crops, such as corn, soybeans, and tomatoes at the same time in the dry season, and that created different water needs. Water Administration Group Zone 2 did not indicate who should use water first or last or in what quantity, but they knew that according to traditional practices, water usage rights depended on the source of the cropping areas. Thus, members who use cropping areas in the head-laterals or sub-laterals would use water before those who use cropping areas in the tail, but in different quantities. Because of having an advantage in the location of cropping areas, members in the head-lateral used water more conveniently and could use up all the water whether it was an all-time water distribution system or a rotating water system. Moreover, in concentrated production throughout the year, water is needed to guarantee that members' products are not damaged. Consequently, members at the head-lateral ignored those in the tail-lateral who might not able to receive an adequate supply of water. In this way, the new cropping pattern made the process of producing and using water more selfish.

Water usage rights, then, are tied to the areas that members use for farming but not to those who do the farming and use water from project according to the rules and duties to maintain the system. Therefore, every member has the same rights to use water, or to put it another way, all members who crop in irrigated areas of Mae – Taeng Irrigation Project have to practice according to the responsibilities of the cropping areas they use first. It is obvious that there is no stipulation about the different responsibilities of the members or who should use first or last, or how much.

Meanwhile, to find more sources of water, Water Administration Group Zone 2 tried to resurrect Wang Mun Canal and Mae Kung Dredging Canal when they faced water scarcity and lack of response for members who needed water, especially those cropping in the tail-lateral or sub-lateral when the Mae – Taeng Irrigation Project delivered water by rotating existing water. Moreover, each member had a cropping plan that began at a different time so they used water without thinking of the other members because they all had the same water usage goal. That the result was some of them were able to get enough water to use but others did not. Problems like these led to a call for resurrecting those canals, but this depended on the project to consider the

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budget before allocating money because the top officials, especially the chief of the irrigation project, had very little experience in local irrigation because they are usually transferred to several irrigation projects. Consequently, the effort to find more sources of water was not very successful.

The case of members who needed more water was similar, that is, it usually depended on the decision of the project and the need to go through many complicated steps to determinate water distribution. As a result, members who cropped in the tail-lateral had to rely on themselves to get sufficient water. They obtained it by pumping underground water, either using their own pump or renting one from other members; in either case, they were guaranteed an adequate supply instead of waiting for an uncertain amount of water from the Mae – Taeng Irrigation Project.

6.3.2 Water allocation

Originally, water users' organizations in the Muang – Fai system allocated water at the on-farm level without rules to indicate how much water each land owner could use. The reason for this was that the Muang – Fai or weir and dam system let members use water to meet their needs by opening and closing the main canal including 'Poom' in each village with an all-time water flowing system that I call 'undated water use'. However, water allocation in the Muang – Fai system served only paddy farming and members would close the head of the main canal when it was time to repair the system. Thus, members would allocate water among themselves so that each one would have enough. They would consider the time, size, and amount of cropping areas that belonged to members while considering whether the next member would have an opportunity to use water.

All these water allocation rules were based on their ideas of morality among members. As a consequence, all heads of weirs (*hua na maung fai*) and weir chiefs (*kae maung kae fai*) in each village followed these rules to allow members to use water conveniently and equitably in order to use resources and share water fairly. Although the rules sometimes were not written down, everyone was willing to practice

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the same way. Furthermore, the heads of weirs and weir chiefs would help all the members to use water according to the rules by coordinating among themselves and they would get a remuneration, called a 'water fee,' from the members.

At first the water fee was paid in rice to each village, which kept it as a central stockpile because at that time rice was regarded as valuable. Since paddy farming was done only once a year, rice was more important for survival than money; consequently, members would divide the rice into two portions, half for the head of the weir and and the other half for the weir chief in each village, according to their agreement.

After the construction of the Mae – Taeng Irrigation Project, the water allocation pattern of Water Administration Group Zone 2 changed through government interaction which tried to change the pattern of members' production to be consistent with their goal of increasing production for market purposes. Consequently, the government established many patterns and rules to allocate water to meet that goal, including establishing responsibilities of members through the state's water management law putting state officials into power to manage the irrigation project. Two water management laws were enacted by the center – the State Irrigation Act of B.E. 2485 and the Field Dykes and Ditches Act of B.E. 2505. Their purpose was to change ideas from the past, which gave power to the community, to more state formal power over water ownership, physical characteristics of irrigation systems, and rights to control and allocate water.

Operations allocating water were obviously divided between members and water distributors so that members became merely a group of people who used service from the government, which gave them rights and duties as a people who used water. Meanwhile, the government controlled the allocation of power, usage control, and the changed physical characteristics of delivering systems. The government used engineering principles to calculate and establish water allocation methods through capital water quantity in the project to be consistent with cropping needs and the size of all cropping areas.

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However, the water allocation ideas of Water Administration Group Zone 2, as a group that received water services from the project at the on-farm level included still having a Common Irrigator (*nuy trout na*) in each village to take care of water usage. The Common Irrigators had an important role in allocating water to members in the villages for which they were responsible, but they tried to adapt to be in line with water allocation from project. Thus, they used the principles of sharing by surveying first hand as well as experience from having worked in Maung – Fai systems and having done cropping for several years combined with a sense of ethics to make decisions that were as fair as possible for each member. The irrigation project always set water allocation by actually understanding members' cropping systems that involved different types of plants, enabling them to use more water than before. Consequently, they could not set close or open rotating water under the same system and so sharing or allocating water became very complicated.

In the earliest times, the Muang – Fai system was able to provide equitable distribution of water according to the amount and size of cropping areas. However, when the cropping pattern changed, it became difficult for the Common Irrigator to flow water according to amount of cropping areas or to allocate water according to each members' needs because major decisions were made by project. Therefore, surveying first-hand with their eyes, using their water management experiences in the Muang – Fai system, and using their experience of having done cropping were the implements that Common Irrigators tried to use to allocate water equitably. This was because most irrigation officials who operated in the areas had technical or theoretical knowledge rather than practical understanding of cropping patterns, which caused the opening or closing of the water system to be out of synch with the needs of the members.

6.3.3 System maintenance

Originally, maintainance and repair in the Muang – Fai system consisted of two main jobs: system repair and canal dredging. Construction was a very difficult job because the physical structure of the system consisted mostly of bamboo rods,

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hardwood, and soil so it was very fragile, especially when there was a lot of rain. Moreover, when the Ping River had had a lot of water, it flowed very fast and the weirs or dams were easily damaged. The original water users' organization had to mobilize both labor and equipment for repairing and maintaining the system at least once a year before planting during the rainy season, but in some years it had to be repaired many times. The head of the weir would determine the damage and the areas that had to be repaired and maintained. He would also estimate the number of bamboo rods and the labor that had to be mobilized from members by calculating according to the amount of cropping area each member used. As a consequence, anyone who used a large cropping area had to contribute a great quantity of bamboo rods to repair the system. This was regarded as a principle of cooperation that demonstrated equity for the survival of water users' organizations in the Muang – Fai system.

After that, when the government supported the development of large river sources to provide water for concentrated cropping for export sale, water was needed to crop throughout the year and Mae – Taeng Irrigation Project was constructed with government funds. The construction of strong weirs in the Taeng River and concrete water delivery systems resulted in the government having responsibilities to maintain the system for members who used cropping areas within the project's boundaries. Thus, repairing and maintaining the physical structure of the water delivery system in Mae – Taeng Irrigation Project covered every aspect of the project: the headwork – big weirs of the project, main canals, laterals, sub-laterals including open and close water equipment. Thus, the project required that to maintain and repair the systems, RID needed to get that budget to operate.

In the maintenance section of Water Administration Group Zone 2, the main job is dredging the canals, laterals, and sub-laterals. Apart from this, they maintain the dikes and structures in each lateral and ditch, together with the local project officials whose main job is reporting damage in that system.

Dredging of the laterals and sub-laterals is done by the members in each village through which the laterals pass because it is easy for people to get together. Common

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irrigators in each village will meet with the chairman of Water Administration Group Zone 2 before the dredging season. They will share responsibilities with members in ways similar to the Muang – Fai system, that is, using the length of the lateral or sub-lateral divided by the number of cropping areas that receive water from that lateral or sub-lateral. A bamboo rod about one wah in length is used to measure the length of laterals or sub-laterals. When common irrigators have done the division, they will look to see if the dredging has been finished and if they find that members have already done it according to their responsibility, they will finish in the laterals or sub-laterals. If there is too much sediment for the members to remove by themselves, then common irrigators in coordination with the chairman will request a macro truck from the project to excavate it.

It is apparent that in terms of sharing system maintenance responsibilities, even though common irrigators adapted the original method from the Muang – Fai system to comply with the project's water management policy, it has changed considerably. Originally in the Muang – Fai system, water users' organizations used the amount of cropping areas of each member to determine each one's share of system maintenance responsibilities, so there was a relationship between labor and resource mobilization. Members of Water Administration Group Zone 2, by contrast, share maintenance system responsibilities by using the length of laterals or sub-laterals divided by all cropping areas, which means that responsibilities are shared but are not related to labor and resource mobilization. It demonstrates that members who own many cropping areas have to dredge laterals or sub-laterals for a long distance, which I will discuss later. As a consequence, lateral and sub-lateral responsibilities are individual responsibilities rather than communal responsibilities; all members have to finish on time according to the agreement.

6.3.4 Labor and resource mobilization

Originally, labor and resource mobilization meant that members would meet and make an agreement with the weir chief. When they had agreed, they would announce it in a meeting and the proportion of labor and resources would change according to

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environmental changes each year. These, in the Muang – Fai system, all members had to participate in labor mobilization according to the amount of land they owned. For example, a member owning less than 10 rai had to send in one laborer and each laborer had to bring *Khon Na Waen*, a hoe and field knife, to work. The number of bamboo rods to repair the weir depended on how damaged the weir was. Usually the work was finished in a day because members helped one another in a collective labor force. Inspecting labor and resources were the responsibilities of weir chiefs from each village. Moreover, system maintenance was done by men of working age, not children, women or the elderly because it was hard work that required a lot of strength. To sum up, sharing system maintenance responsibilities was considered an important part of labor and resource mobilization from members.

The completion of the Mae – Taeng Irrigation Project freed members from the job of repairing the main weir and water delivery system at both the project and on-farm levels because the project provided system maintenance. The remaining job is only the dredging of the laterals and sub-laterals as the responsibility of Water Administration Group Zone 2 at the on-farm level. It is an important requirement that allows members to use water service from the project. Labor must be done by members themselves or they can send someone to do it, but that person must be at least 15 years old, whether male or female. Exceptions, in case of sickness or death, are up to the common irrigator in each village. In all of these ways, labor and resource mobilization of Water Administration Group Zone 2 has had a great impact on the way of life and on social and economic situations.

Because of the decreased need for cropping labor, many people work in town as wage earners. Apart from this, some members think that system maintenance is the responsibility of the project because of its budget, so the number of lateral and sub-lateral dredging laborers is decreasing also, especially among the young generation. At present, lateral dredging is not hard work anymore; women and children can take care of getting rid of the grass next to laterals or sub-laterals. Moreover, because the way of life has accelerated by cropping throughout the year, members work on their own responsibilities and ignore the communal aspects. As a consequence, labor

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mobilization has adapted and changed through decreasing labor force and not requiring a fixed amount of labor that must be sent to dredge, as was done in the past. Lateral dredging responsibilities involve all lengths of lateral and sub-laterals divided by the total number of cropping areas, a principle that members consider to be fair. But in case of sending labor, as mentioned above, in Water Administration Group Zone 2 it is not necessary to send a member who uses cropping areas; anyone can be sent to do it. There is no fixed amount of labor and no inspection, the only requirement is to work according to one's responsibilities and finish on time. Labor mobilization like this is done under members' own responsibilities like ditch and branch-ditch dredging; each member will do it by himself without the involvement of other members.

Money was sometimes collected from members to use in various activities under the Muang – Fai system, but in Water Administration Group Zone 2, money mobilization is included in the water fee that they pay for the remuneration as common irrigators in each village. Five baht per rai is collected as part of the membership fee but at present they usually do not collect it. Moreover, money mobilization for repairing the slight damage to the water delivery system in the field usually comes from members who are affected by the damage.

6.3.5 Conflict management

In the Muang – Fai system, conflicts in water management occurred only rarely because members usually obeyed the rules regarding the various irrigation activities, as mentioned above. Apart from this, the Muang – Fai system emphasized member participation and everyone had a chance to use water for cropping. Moreover, members would share water among themselves and give others a chance to use water. As a consequence, if problems arose, they were not caused by water usage but by situations where some members' cropping areas blocked water from other members' ditches, preventing the flow of water into their cropping areas. In those cases, conflict management generally amounted to a warning or negotiation between the two parties.

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If the two could not agree, the weir chiefs in each village would play a role, acting as a laison between them and they were always able to resolve problems.

Problems in Water Administration Group, Zone 2 at present result from conflicts in the water management process between the government and members. Water management of Water Administration Group, Zone 2 tries to let members participate and have rights to use water fairly, but water management of Mae – Taeng Irrigation Project emphasizes centralized decision – making power by irrigation officials and is more concerned with economic benefits than the water usage of members, such as water allocation. It gives first consideration to the cost of water supply and types of crops.

Moreover, the project can not attain its goals in delivering water to members; thus, the major conflicts are from disputes over water especially between members who use cropping areas in the head-lateral and those in the tail-lateral or sub-laterals. They have the same goal of managing water to decrease product damage and expand production for sale and export. Consequently, some members try to get more water by opening a water gate to let water into their fields without permission of other the members or weir chiefs or by using pipes to bring water into the fields illegally. Another problem is that some members do not participate in group activities, such as lateral and sub-lateral dredging, because they work outside as wage earners.

In cases where members open a water gate, the problem is solved by common irrigators. At first, they give a warning, and if this doesn't bring results, the common irrigator will use his rights, as a person who in charge of water usage, to close the water gate and plug the illegal pipes by himself. In cases like this, common irrigators will usually solve the problem.

In cases where members have not participated in lateral or sub-lateral dredging, common irrigators will record the incident and issue a warning, but if the member still doesn't do his share of the work, common irrigators will charge a fine and each village will set up its own committee to collect the fine without involvement of weir chiefs.

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Generally, members do not collect the fine or ban water use because they help each other and that is why Water Administration Group, Zone 2 remains until now, but it has become less effective in water management.

Another important conflict is between members and irrigation officials of Mae-Taeng Project. This is especially in cases where members do not use the rotating water system that the project delivers; as a result they have to request water from the project by gathering together to complain to the chief of Mae – Taeng Irrigation Project. As a result, irrigation officials deliver only some water because of a limited supply. Thus, members have to yield to those who are more powerful, which demonstrates that the government's power has caused communities and groups to have less power and participation in solving problems or examining the government's practices because concrete weirs and water belong to the government. Thus, in practice, groups have no power to solve problems but must wait for irrigation officials to take action.

6.4 Conclusions regarding the capability of water users' organizations in water management

Changes in the physical characteristics and organizational aspects of Mae – Taeng Irrigation Project affected the management of water at the on-farm level of Water Administration Group, Zone 2. As a consequence, the group has had to adapt several basic irrigation activities according to changing environmental conditions. Most ideas are adaptations of irrigation activities of water users' organizations from the Muang – Fai system for use in the Mae – Taeng Irrigation Project and reflect organizational features of both the old water users'organization and the more recent Water Administration Group, Zone 2.

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Table 6.1 Comparison of water management in the old and the more recent water users' organization

Water users' organization / **Water management**	**The old:** Water users'organization in Muang – Fai system	**The most recent:** Water Administration Group, Zone 2
Water management targets	Serve communities for growing wet season rice to survive in rainy season	Serve multiple production
Physical characteristics of weir and water delivery system	- Bamboo weir and soil - dykes - Mobilized labor and resources from members	- All concrete - Built by government
Organization - **Selection** - **Principle**	- Selected from members - Freedom to make decision	- Chosen from members but appointed by irrigation officials - Decisions are made by members but irrigation officials consider management and practice
Water delivery system	All – time water flowing	Usually all – time water delivery but rotating water when capital water is inadequate

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Table 6.1 Comparison of water management in the old and the more recent water users' organization (continued)

Water users' organization / **Water management**	**The old:** Water users'organization in Muang – Fai system	**The most recent:** Water Administration Group, Zone 2
Ideas in water management	Emphasize controlling and allocating water fairly according to needs of each member to survive as a community	The chairman of WAG, Zone 2 and common irrigators try to allocate water fairly but have to be in line with project water allocation which considers water supply quantity and types of crops but members use water selfishly
Water management		
1. Water usage	- Participating in construction, repair and maintenance	- Practicing through water delivery regulations&group's rules
2. Water allocation	- Size and amount of cropping areas	- Water supply that the project allocated.
3. System maintenance	- Members	- Members and the project' s budget

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Table 6.1 Comparison of water management in the old and the more recent water users' organization (continued)

Water users' organization / **Water management**	**The old:** Water users'organization in Muang – Fai system	**The most recent:** Water Administration Group, Zone 2
Water management **4. Labor and resource mobilization** **5. Conflict management**	- Members - Weir chiefs and the head of weir	- Members and the project' s budget - Common Irrigators and the chairman of WAG, Zone 2
Implements used to manage water fairly	Conscience and ethical principles	Conscience of common irrigators; need for consistent water allocation
Water fee	Remuneration for the head of weir and weir chiefs who find, take care of, and provide convenient use of water to all members	Remuneration for the common irrigators who help, take care of, and provide convenient use of water to all members

From the table above, it is obvious that there are many differences between water users' organizations in the Muang – Fai system and Water Administration Group (WAG), Zone 2 in terms of physical characteristics of weirs and water delivery systems. Regarding ideas of water management, water management targets, organization, water management, implements used to manage water fairly, and water fees, there are methods similar to those of water users' organizations in the Muang – Fai system. However, WAG Zone 2 has to consider how to manage water to be in line

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with water allocation, plans, and decision making of the project officials including trying to adapt to social conditions and economic systems that changed because of the multiple production process. Thus, WAG, Zone 2 has a role in managing water at the on-farm level and in providing all members with the opportunity to use water equally. However, Mae – Taeng Irrigation Project has to depend on water management at the on-farm level to achieve its goals.

From the various irrigation activities as indicators of the capability of WAG, Zone 2, to manage water at the on-farm level it appears that the group has capability to manage water from Mae – Taeng Irrigation Project's allocation. The group can manage water by using the Muang – Fai water management system adapted to be in line with both the project's water allocation and changing social and economic conditions, including multiple production. In each basic irrigation activity, the group has methods with which to respond. This is especially true in adapting labor and resource mobilization and system maintenance to be in line with decreased labor by adjusting the amount of labor sent according to the size and number of cropping areas. Members can also help one another in a collective labor force by using the length of laterals and sub-laterals divided by the number of cropping areas instead of fixing labor. Some members, however, have become distant from each other because some of them work outside as wage earners, and thus the group cannot expect them to be a part of them anymore.

In water usage and water allocation activities, however, there are common irrigators who can make water use among members fair and who can solve conflicts by using ethics, surveying the situation firsthand, and using their experience in water management and farming as well as the advantages they have as local people. They know each other's family members well and are able to serve as common irrigators to manage water equitably. Although ethics and conscience are intangible factors, they help to determine if there is adequate water for each member. Moreover, supporting ethics and a sense of conscience in members' minds is important because these factors have decreased due to the current accelerated production, which has made members use water selfishly, without thinking of other members. Thus, promoting a sense of

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ethics and conscience creates a better balance of principles in the group and can enable it to go on managing water effectively.

Moreover, the group has a good leader who is able to act as a central decision maker, taking charge of his rights and duties and providing leadership for members. Other important roles at the village level are those of common irrigators, and the chairman of WAG, Zone 2 who is regarded as a good decision maker and leader at the administrative group level. Members respect him and are able to ask for his help. Moreover, he enables WAG, Zone 2 to gather members even now. I can compare him with the head of weir in Maung – Fai system. The study showed that the old head of weir is the uncle of the recent chairman and he has made note of successful water management in Maung – Fai system to use in the project. Furthermore, he is an honest, fair, responsible person who respects members' decision making and he is also an elderly person so that every member knows him well. Moreover, he is also a public health volunteer for both his village and the subdistrict level; consequently, most members and project officials believe that if the group still has him, the group will develop to participate in irrigation management with the project.

Meanwhile, water management at the on-farm level must consider ways to be consistent with the water allocation process and system maintenance of the project. This has caused the capability of the group in water management in some irrigation activities to decline. The group had important responsibilities that enabled it to practice more freely when it was in the Muang – Fai system. This was particularly true in water allocation and water usage activities even though it has the same ideas of water management as in the old system, emphasizing allocating water equally. At present, however, they have to emphasize allocating water equally with sharing conditions that have to be consistent with water quantity and water allocation methods. As a consequence, common irrigators do not allocate water to members even though they want to, because they have to wait for the project officials to make decisions before they can provide for members' needs fairly.

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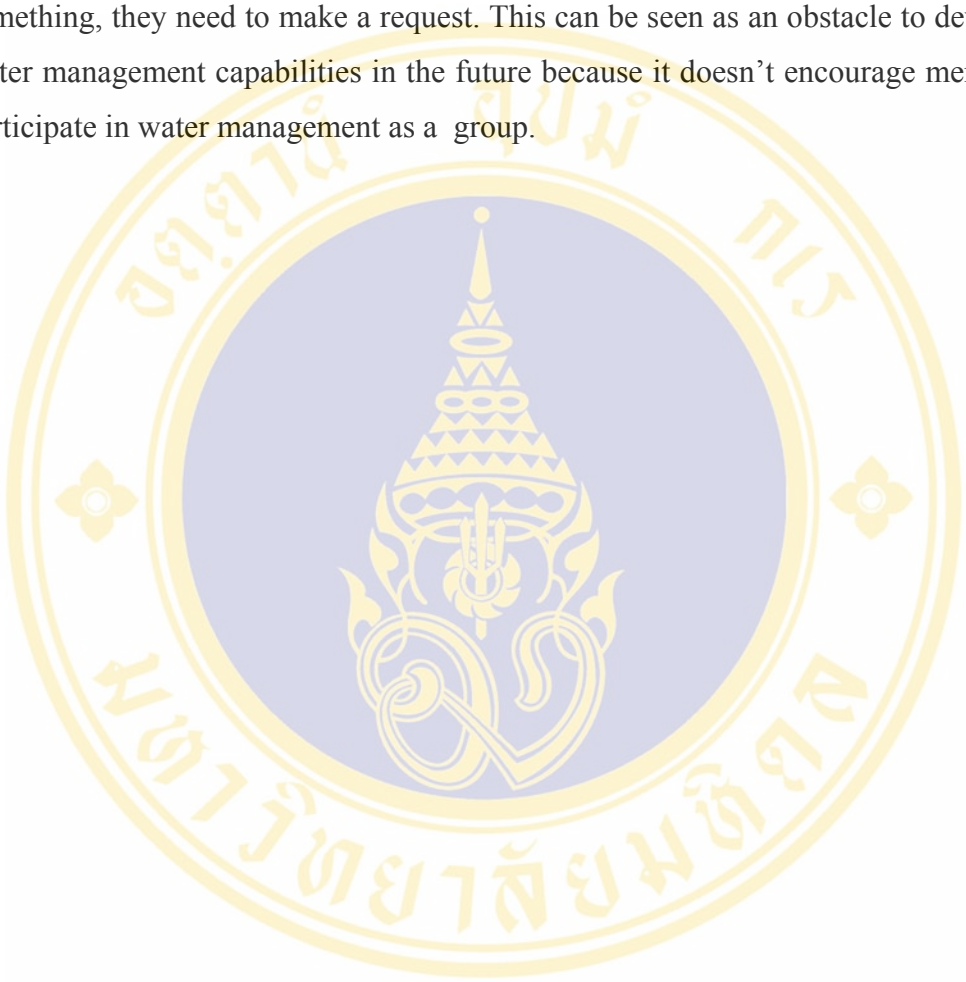
The budget for irrigation system maintenance is under the jurisdiction of the government, leading members to believe that it is the project's responsibility and many of them will rely on project officials to make decision about repairing and maintaining ditches and canals. As a consequence, whenever they want to do something, they need to make a request. This can be seen as an obstacle to developing water management capabilities in the future because it doesn't encourage members to participate in water management as a group.



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CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

Water Administration Group, Zone 2 is a water users' organization in Mae – Taeng Irrigation Project where I chose to study water management capability because the government has a policy of supporting water users' organizations to participate in water management in all state irrigation projects. Therefore, this study emphasized understanding water management at the on – fam level; it also examines whether or not water users' organizations have the same ideas in water management according to the multiple production context, and the ways in which they do.

In addition, the study looks at whether or not those ideas reflect differences between the earliest and the most recent organizations, and how and what implements are used to manage water fairly. All this information will explain the capability of water users' organizations in water management by using field research which I have conducted through a case study consisting of interviews and observations to understand water management ideas and processes of water users' organizations.

The result of this study can be summarized into three major points to answer the questions through objectives of the study in Chapter I, including some of my opinions about water users' organizations, as follows:

1. Ideas of water users' organizations in water management according to multiple production conditions,
2. Organizational aspects of water users' organizations,
3. Capability of water users' organizations in water management.

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7.1 Ideas of water users' organizations in water management according to multiple production conditions

Multiple production are classified into three groups as follows:

1. Multiple objectives of production, i.e., ideas for managing water for consumption and sale,
2. Multiple types of crops, i.e., ideas for managing water for rice and cash crops,
3. Multiple types of land ownership, i.e., ideas for managing water in cases where the members are landowners, and in those where they rent the land.

The principles of water users' organizations both in the Muang – Fai system and WAG Zone 2 emphasize allocating water fairly among members. WAG Zone 2, as a recent water users' organization in the Mae – Taeng Irrigation Project, has principles of allocating water to be consistent with water allocation patterns of the project, whose goals are to provide for multiple production. Thus, water quantity and type of crops are the two main factors used by the group and the project in considering the basics of allocating water to members.

Because of the different ideas in water management for rice and cash crops and the different water requirements for rice as opposed to those for cash crops, water is needed during every production period especially in preparing land and waiting for the harvest periods. It should be noted that there is no pressure to use water among members because they have the same ideas of managing water consistent with the water allocation process of the project. This process allocates water to cropping areas and members by an all-time delivery system when there is a great quantity of water in the rainy season. However, when the rain does not come on time, the water supply is inadequate and the project has to deliver water through a rotating system.

Cash crops such as soybeans and corn need water only some of the time and water does not need to be held in the fields as it does for growing rice. However, in growing cash crops, members have pressure to use water because it is the same period as delivery water by rotating from the project when water supply quantity is

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inadequate in the dry season. As a consequence, these is competition between members who use cropping areas at the head- and those at the tail–canal who want to make sure that their products will not be damaged because it will affect product price.

At present, members in irrigated areas – Laterals 5, 6 and 7 – have concentrated cropping throughout the year by growing rice during the rainy season and cash crops in the dry season. Their social conditions and economic systems still depend on growing rice for consumption; thus, growing rice for food is their first objective, but if they have a surplus, they will sell it. The main objective of growing cash crops in the dry season is for sale. As a consequence, rice can be compared with production for consumption and cash crops are production for sale. Thus, I can summarize that ideas in multiple objectives of production, i.e., ideas for managing water for consumption and for sale, are different.

Regarding ideas of multiple land ownership, i.e., in cases where the members are landowners and where they rent the land, it appears that WAG Zone 2 does not manage water differently. As we know, the group will manage water through water quantity from project delivery and type of crops. Moreover, WAG Zone 2 regulations mention the principle that those who receive water are farmers who are members of the group and have cropping areas that able to use water from canals of the project. Thus, water management of the group does not emphasize differences between land ownership any more.

Thus, in summary, we can say that WAG Zone 2's principal ideas of water management follow multiple objectives of production and multiple type of crops.

7.2 Organizational aspects of water users' organizations

Supporting multiple production has changed water management targets by having the state irrigation project, that is, the Mae – Taeng Irrigation Project, manage water in response to that change. The government constructed strong, durable weirs and water delivery systems, including trying to control water management by sharing clear

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responsibilities. The project allocates and manages water at the project level including managing the budget for construction and system maintainance throughout the project. Meanwhile, WAG Zone 2 was established by the project and it is the same group as the original water users' organization in the Muang – Fai system. It manages water at the on-farm level and acts as a group of people who require water service from the project. Therefore, the group has to follow the conditions that the project sets. Apart from this, the group has a role in adapting the project's water allocation plan using water management at the on-farm level.

WAG Zone 2 is a more formal organization under the control of the Mae – Taeng Irrigation Project and shares clearly written responsibilities. The group is divided into two groups – general administrative committees and water delivery and maintenance committees. Although members choose committees, project officials will appoint them. According to the group's principles and rules, members are decision makers who draft principles and rules, but the project officials will decide them again before announcing them. Therefore, the social structure of WAG Zone 2 is organized to be in line with the project's condition that ability to use water from project, only under the command of the Water Delivery and Maintenance Project, the first RID.

Apart from this, the group has other roles, including reporting details about areas, information and water needs; repairing and maintaining the system through the commander; and acting as a laison between members and project officials. However, the group does not have independence in decision making to manage water as was the case in the Muang – Fai systems because they did not participate in construction and system maintenance.

There are many organizational differences with the Muang – Fai system. First, water users' organizations in the Muang – Fai system were established for the same goals and the need to use water to grow rice together. Therefore, all members participated in construction and maintenance in order to use water from the weirs and dams they had built together. Second, having the same goals in using water together until weirs and dams were finished and used for cropping gave all members full

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decision making power and independence to manage water and they would think of the other members' opportunities to use water equally. Third, the social organization shared responsibilities of repairing and maintaining the system according to the size and amount of land ownership of each member; thus, it directly affected labor and resource mobilization from them including water quantity obtained equally and fairly. Apart from this, all-time water flow enabled members to use water all the time and there was no need to have many people to take care of it; only the heads of weirs look after all systems of water usage from members. Weir chiefs in each village make it convenient to use water at the village level or 'Poom' level and ditch riders look after weirs and canals to make sure that they are not damaged.

7.3 Capability in water management

When considering the capablility of Water Administration Group Zone 2 in water management under the organization level mentioned above, we can see that the members are the same group as in the Muang – Fai system. Although the group was established by the project officials, in fact, the members had been organized and had been cooperating in water management for a long time. In order to use water at the present time, they had to reorganize to be Water Administration Group Zone 2 and adapt the water management process from the Muang – Fai system to be consistent with the project's plan and water allocation methods, as well as with changing social and economic conditions. As a consequence, Water Administration Group Zone 2 has unique features and is able to manage water effectively. For that reason, we can explain through each basic irrigation activity as follows.

7.3.1 Water usage

In the earliest times, before there was concentrated and multiple cropping both in the rainy and dry season, members in irrigated areas – Laterals 5, 6 and 7 – received water from the Ping River by using weirs to dam up the water in the main canals. In this way they could use as much water as they needed to grow rice until the cropping season was over. In 1973, when the Mae – Taeng Irrigation Project was established to

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provide for water usage in multiple cropping, it led members to abandon the original Muang – Fai system. They became members of the project so that they could use water according to its rules and regulations. Subsequently, there was not enough water in the project to serve to all over members equally. Therefore, they tried to find other sources of water; for example, they made some changes in the Wang Mun canal and reused water from the Mae – Kung dredging canal, but they were not successful because they had to wait for project to make decisions and provide funding for construction. Consequently, members have to rely on themselves by using pumps to pump water up into their field. This is especially true of members at the tail-canal.

7.3.2 Water allocation

In the earliest times, before there was concentrated and multiple cropping during both the rainy and dry season, members in the Muang – Fai system who cropped only in during the wet season rice would let water flow into their fields throughout the cropping season without water allocation rules because they had an all-time water delivery system or 'undated water use'. They had enough water to take care of their needs and they also were considerate of other members. Subsequently, when the Mae – Taeng Irrigation Project was established, the project played an important water allocation role. As a consequence, Water Administration Group Zone 2 became a group of water users as people who only require water service from the project, report their needs for water and system damage that needs to be repaired. Water allocation at the on-farm level still has common irrigators to oversee the project so that all members have a chance to use water equally. They do this by surveying the situation firsthand and using a sense of ethics and their conscience as tools of fair water management.

7.3.3 System maintenance

In the earliest times, before having concentrated and multiple cropping both in the rainy and dry season, members of the Muang – Fai system repaired weirs and dams at least once a year before growing rice in the wet season. In addition, they performed emergency repairs during the cropping season according to the volume of water each

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year, and they shared responsibilities by using the size and quantity of fields owned by the members to determine how much labor to send. When the Mae – Taeng Irrigation Project was established, it constructed weirs and water delivery systems throughout the project and at the on-farm level. All of the structures were regarded as strong and durable and it was the project's responsibility to maintain and repair them. As a consequence, Water Administration Group Zone 2 does not repair weirs and delivery canals anymore; instead, the major role of the group is to dredge the laterals and sub-laterals. Apart from this, members do separate maintenance tasks in each lateral and divide the work by using the length of laterals or sub-laterals divided by the number of fields in which they use water from those laterals or sub-laterals.

7.3.4 Labor and resource mobilization

In the earliest times, before there was concentrated and multiple cropping both in the rainy season and the dry season, members of the Muang – Fai system mobilized labor and resources such as bamboo rods, field knives, hoes, and wooden spades for repairing weirs. In addition to labor and resource mobilization, the number of workers and the number of bamboo rods would be calculated according to the proportion of cropping areas used and the number of weirs damaged. Members who used an extensive area for cropping would gather a great quantity of bamboo rods, and if the weirs were badly damaged, they would mobilize in great numbers also. Thus, people worked together and contributed their labor to achieve their common goals.

When the structure of weirs and water delivery systems changed to concrete, the group no longer needed to collect bamboo rods. As a consequence, there was no need for labor mobilization but only for resource mobilization in the form of equipment such as field knives, hoes, and wooden spades to dredge the laterals and sub-laterals. In labor mobilization, the group does not fix the amount of labor that is sent to help, but insteadd uses the length of lateral or sub-laterals divided by the quantity of fields each member owns, and mobilizes labor under their own responsibility without involving the members. The reason they changed the way of sharing responsibility was that some members worked outside as wage earners.

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In terms of repairing weirs and water delivery systems both in the project and at the on-farm level, if the amount of sediment in the laterals or sub-laterals was in great that it is beyond the capability of members to remove it by themselves, the project will pay for the cost of repair and dredging from its budget. But if the laterals or sub-laterals are only slightly damaged, only the members who use water from those specific laterals will collect money for the repair by themselves.

7.3.5 Conflict management

Water users' organizations in the original Muang – Fai system generally did not have conflicts because most members did not break the group's rules and regulations regarding the basic irrigation activities, as mentioned above. Conflict was usually found in cases where cropping areas or ditches blocked the passage of water to other fields. Common irrigators would resolve those conflicts. When the Mae – Taeng Irrigation Project was established, it could not allocate enough water to meet members' needs because of the limited amount of water available, and conflicts occurred as members competed for water, especially at the head- and tail-canals. Those conflicts would generally be resolved by common irrigators, who would also issue warnings and consider whether there was adequate water to use.

Moreover, conflicts arose between members and project officials when members did not receive enough water. This type of conflict cannot be resolved quickly because the water allocation method from the project is practiced by calculating the existing water quantity and members must yield to that reason.

Fortunately, there are good and effective leaders, including both the common irrigators, who manage water at the village level, and the chairman of Water Administration Group Zone 2, who manages water at the project level and the on-farm level. Consequently, members have decision making power and they respect the rules. Moreover, common irrigators and the chairman affect the capability of water management, as well. Apart from this, they rely on a sense of ethics and their conscience as intangible tools that have an impact on equitable water management in

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basic activities such as water usage, water allocation, system maintenance, labor and resource mobilization, and conflict management.

It should be noted that if those rules are not written down, most members still follow them, such as in labor and resource mobilization to dredge the canals. While the rules indicate that both men and women have to dredge together, actually, women no longer do this labor, but do work that requires less strength, such as uprooting the grass next to the laterals or sub-laterals. In case of conflict management, water usage, water allocation and system maintenance people who can perform these roles conveniently will survey and inspect conditions first hand and use their experience to make proper decisions affecting members' water usage.

As for water fees, they do not appear to be a useful implement in creating equity among members anymore because the fee is just a remuneration, paid to common irrigators who only look after and provide convenience in use water. Moreover, if members do not pay the fee, they can still use water because it is common property that everyone can use. Consequently, the best implement for fair and equitable water management is an internal sense of ethics.

7.4 Discussion

In investigating the capability of water users'organizations to manage water, we have seen that these organizations have consistently adapted their methods to be in line with changing social, economic and environmental conditions. Any effects on the capability of water users' organizations from the time they were in the Muang-Fai system until the present when they are part of the government irrigation project are the direct result of the project itself. This is due to the fact that the government's water management goals were a response to the country-wide economic development plan. As a consequence, large irrigation projects were built that provided extensive areas of irrigated land for farmers to grow certain crops. However, in accelerating the development of irrigation systems, the government no longer paid attention to the participation of water users or the old water users' organizations. They did not

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establish water users' organizations in the new irrigation projects and, as a consequence, several old water management patterns were changes.

The most obvious changes brought by irrigation were the physical characteristics of water distributing systems, in which bamboo or stone weirs were replaced by concrete. As a consequence, members no longer had a role in examination and construction except for building and maintaining ditches and dikes at the on-farm level. The government irrigation projects, such as Mae – Taeng Irrigation Project, were responses to develop the right areas of the Ping River to increase agricultural products. That change affected local communities' water management rights and control over water usage. Whereas in the past, local organizations had status and free decision-making power to manage water, after the irrigation project was constructed they had to depend on irrigation officials for the water they needed. Apart from this, water from the irrigation project now became government property and they usually thought that "water" had utilization value that could use to be an important product factor. Thus, the government began to use a single water management method by giving management rights to itself. Moreover, government was the sole only property holder with duties to control and manage water, including systems maintenance. Water management rights became an implement that the government used to establish opportunities for water use benefits among members according to various regulations.

Apart from this, members' water usage rights changes from the original ones. They had to participate in labor and resource mobilization to maintain and repair systems in order to be able to use water. In irrigated areas in project, if farmers were members and had cropping areas, they could use water. But participation in labor mobilizing was not in the conditions that project would not distribute water. Furthermore, changes in water distribution systems in response to communities and their ability survive in multiple production of cash crops created difference needs, such as quantity and frequency, required by the various plants. Because of the difference water distribution goals, the irrigation project had to establish new patterns of water flow patterns. Water flow was open all the time for rotating water systems according to plan requirements each year as calculated by the members' planting

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schedules. While there were extensive irrigated areas, the water supply was insufficient because it came from only one source, the Mae – Taeng Irrigation Project, and thus the project could not allocate enough water to response to all the members' needs.

Moreover, the establishment of multiple production systems and the uncertainty in product prices gave some members the idea of using water like the government did by using rights as an implement to use and get water. For example, those members whose land was located in the head-canals could use more as much water as they needed without thinking of others, especially those in the tail-canals. Water usage rights, then, were tied to the areas that members uses for farming rather than changing all the time as in the past or in the present in parts of the Muang – Fai systems. In this way the capability of water users' organization in water management decreased.

At the same time, from the result of this study, we found that water users' organization was not only waited to accept water management methods from government all the times but they tried to adapt water management to be in line with environmental changed. Such as WAG Zone 2, although rights to manage water was decreased and members used water more selfish but they tried to change and adapt ideas and patterns to manage water that used to use in Muang – Fai systems to be consisted of water management by government to response to water usage of members as much as they could. So, there was adaptation to survive together and encouraged water users' organization to increase decision making power to manage water in project that rely on the relationship basics of water usage from the same source. In the part of labor mobilization, system maintenance and conflict management, presented that members were still understood and accepted together that water was communal property that everyone could use and need to their lives. Water allocation and water usage, although it up to decision making of irrigation officials but common irrigators and the chairman of WAG Zone 2 would take care and manage to be in line with water quantity that project allocated by using moral in mind. So, it was flexible adaptation characteristics to join effected from development by government to make more benefit to groups as much as they could and less conflict. All this, if compared this study with

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the study of พัชรี อาจหาญ (2538: 122) in seven years ago, we found that capability from organization adaptation of WAG Zone 2 was similar to the water users' organization that พัชรี studied in Mae – Ngad Irrigation Project. Because of water users' organization could play two roles in water management in the same time, that were;

1. In formal side; water users' organization played as an organization under government controlled.

2. In adaptation side; water users' organization tried to change role from playing as who waited for accepting services from government to organization that ready to inspect government' s functions to respond to communities' benefits in water management as they could.

Therefore, with the water users' organizational aspects that used to merge in Muang – Fai and had adapted roles including the new rules and water usage patterns to manage water in project, brought members to have secured guarantee in more controlling and managing water. As a consequence made the researcher though that WAG Zone 2 had enough capability to manage water and that was the reason, making them could manage water until now. By the way, if compared with the conclusion of Tan – Kim – Yong, who summarized the principles fundamental elements of people' s irrigation organizations in the upper north of Thailand that adapted them until now, found that this group could conserve that principles in six points under water management by irrigation project as follows:

1. Making labor obligations compatible with members' schedules was orders and arranged so as to fit within members' normal cycle of work and activities such as in dredging canals, that group set to do at least twice a year, before doing paddy farming in July and before soybean planting in January. In that period, members were free from harvesting and members' families could divide labor to response group' s activities and supported relationship among members.

2. Flexible management of labor adapted to variable conditions by changing labor mobilization method consistent with labor decreasing situation.

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3. Leaders were elected from members; although irrigation officials was appointed but they came from members' decision making.

4. Joint decision making and local self – determination of members was depended on principle of democracy by decision making together once a year.

5. Creative planing and development irrigation systems that could receive water from project according to environmental, economics and social conditions changed.

6. Enforcing mutually acceptable rules that members had established rules together to be regulations of using water and maintaining system.

While, water management in the project levels had conditions that made balancing rights and obligation and balancing head and tail benefits decreased because water allocation did not response to all of members' need. So, balancing rights and obligations that had to manage a just distribution of benefits was unequally. All this, although all members had duties to maintain system and had rights to use water but rights was use as an implement to use water in the different way. As a consequence, conflict was came from water usage competition among members and brought conflict between members and irrigation officials when they could not response members' need. In passing on the irrigation system to new generation, at present, the generation that continued were still father and mother generations but in the future, this water management knowledge was decreased or might be disappeared because members like to send their children to study in downtown and some of them working as wage earners. From that reason, water management in the on – farm level might be rely on decision making by irrigation officials, although had policy to encourage water users' organization participated in water management with the project and water users' organization had capability to manage water.

In conclusion, conditions that made WAG Zone 2 had enough capability to manage water by themselves and able to participate with irrigation project was came from the advantage that used to merge to be water users' organization in Muang – Fai system. As a consequence, made them conserve social relationship between members in a while and because of having strength leaders, who were a mind centralization,

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including took care of using water and made balancing among members not to use water selfish.

Any way, to give opportunity to water users' organization had participated in water management according to RID' s policy was a good way to return decision making power and rights in water management to communities but with the government' s way in the past that had water management by using centralization decision making power, made members had no sense of belonging in irrigation project. In addition, water allocation in the project level made conditions to members and they always rely on water from project, including system maintenance and finally would make members use water in the different ways and more selfish. Therefore, to let water users' organization had participated in water management with the project again, might have problems. All this, in the next subject, the researcher will suggest the way to develop water users' organization, from the result of this study, to have more capability in water management.

7.5 Recommendations from this study

From the discussion of capability in water management in irrigation, we see that Water Administration Group Zone 2 has sufficient capability to participate in water management because this group is an important mechanism and the Mae – Taeng Irrigation Project has had to depend on them and has allowed them to have increased participation in water management. Therefore, I suggest several significant recommendations.

7.5.1 Allowing water users' organizations to participate in water management with the Mae – Taeng Irrigation Project at every step. Begin with setting up a water delivery plan, repairing and maintaining, actual water delivery plan, solving problems during water delivery season and conflict management. At every step, emphasize the importance of using facts about the areas, ecological systems, social conditions and economic systems to each group.

7.5.2 The government should support the capability of existing water users' organizations to be more empowered by promoting management techniques, including

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economics, such as training and practicing, giving information about water before and during the cropping season, providing engineering service to repair systems and supporting them through funding or constructing inventories to repair irrigation buildings.

7.5.3 RID should establish strategies for preparing to transform water management at the lateral and the on-farm levels to decrease the responsibilities of government agencies that are involved in water management, such as the Mae – Taeng Irrigation Project, and increase the role of water users' organizations in managing water by themselves.

7.6 Recommendations for further study

7.6.1 A study of suitable organizational aspects and types of water users' organizations in each province of Thailand.

7.6.2 Adapting conditions, types, and water management patterns of original water users' organizations in each province by making them consistent with the new and most recent systems of water management.

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APPENDIX

EXAMPLE OF DELIVERY SCHDULE

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ประกาศโครงการส่งน้ำและบำรุงรักษาแม่แตง

เรื่อง กำหนดการส่งน้ำสำหรับการเพาะปลูกพืชฤดูแล้งปี 2544/45

โครงการส่งน้ำและบำรุงรักษาแม่แตง ได้กำหนดการส่งน้ำสำหรับการปลูกพืชฤดูแล้ง ปี 2544/45 ซึ่งวางแผนการส่งน้ำเพื่อให้สอดคล้องกับแผนการปลูกพืช และปริมาณน้ำต้นทุนที่มีอยู่ เนื่องจากปริมาณน้ำต้นทุนมีปริมาณค่อนข้างน้อย และมีแนวโน้มจะเกิดวิกฤติการขาดแคลนน้ำในช่วงเดือน กุมภาพันธ์ ถึง เมษายน จึงขอกำหนดการส่งน้ำ ดังนี้

รอบเวรที่	วัน/เดือน/ปี	กำหนดการส่งน้ำ	หมายเหตุ
1	1-4 ก.พ. 45 (4 วัน)	คลองซอย 23 ซ้าย	- สำหรับน้ำเพื่อการประปาจะได้รับใน
2	5-8 ก.พ. 45 (4 วัน)	คลองซอย 1-7 ซ้าย	ช่วงที่โครงการฯ ทำการส่งน้ำให้
3	9-12 ก.พ. 45 (4 วัน)	คลองซอย 8-18 ซ้าย	คลองซอย 19-22 ซ้าย
4	13-18 ก.พ. 45 (6 วัน)	คลองซอย 19-22 ซ้าย	- การปิด-เปิด บานอาคารฯเวลา 08.30น.
5	19-22 ก.พ. 45 (4 วัน)	คลองซอย 23 ซ้าย	
6	23-26 ก.พ. 45 (4 วัน)	คลองซอย 1-7 ซ้าย	
7	27 ก.พ.-2 มี.ค.45 (4 วัน)	คลองซอย 8-18 ซ้าย	
8	3-8 มี.ค. 45 (6 วัน)	คลองซอย 19-22 ซ้าย	
9	9-12 มี.ค. 45 (4 วัน)	คลองซอย 23 ซ้าย	
10	13-16 มี.ค. 45 (4 วัน)	คลองซอย 1-7 ซ้าย	
11	17-20 มี.ค. 45 (4 วัน)	คลองซอย 8-18 ซ้าย	
12	21-26 มี.ค. 45 (6 วัน)	คลองซอย 19-22 ซ้าย	
13	27-30 มี.ค.45 (4 วัน)	คลองซอย 23 ซ้าย	
14	31 มี.ค.-3 เม.ย. 45 (4 วัน)	คลองซอย 1-7 ซ้าย	
15	4-7 เม.ย. 45 (4 วัน)	คลองซอย 8-18 ซ้าย	
16	8-13 เม.ย. 45 (6 วัน)	คลองซอย 19-22 ซ้าย	
17	14-17 เม.ย. 45 (4 วัน)	คลองซอย 23 ซ้าย	
18	18-30 เม.ย. 45	ส่งเฉลี่ยพร้อมกันทุกคลองซอย	

ในการส่งน้ำดังรายละเอียดข้างต้น หากพื้นที่ใดมีปัญหาการใช้น้ำ โปรดติดต่อเจ้าหน้าที่ส่งน้ำในเขตรับผิดชอบ เพื่อประสานงานแก้ไขปัญหาดังกล่าว หากปริมาณน้ำต้นทุนไม่เพียงพอตามรอบเวรที่กำหนด โครงการฯ จะพิจารณาปรับรอบเวรการส่งน้ำเพิ่มเติมต่อไป

ประกาศ ณ วันที่ 29 มกราคม 2545

(นายวิทยา สวนแก้วมณี)

หัวหน้าโครงการส่งน้ำและบำรุงรักษาแม่แต

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