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COMMUNITY AND SUSTAINABLE WATER RESOURCE MANAGEMENT: A CASE STUDY OF BAN LIMTHONG, AMPHOE NANG RONG, CHANGWAT BURI RAM

Mrs. Royboon Rassameethes

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy Program in Thai Studies
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Thesis Title	COMMUNITY AND SUSTAINABLE WATER RESOURCE MANAGEMENT: A CASE STUDY OF BAN LIMTHONG, AMPHOE NANG RONG, CHANGWAT BURI RAM
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วิทยานิพนธ์นี้มีวัตถุประสงค์เพื่อวิเคราะห์กระบวนการเรียนรู้ของชุมชนในการจัดการน้ำชุมชนที่ยั่งยืน โดยใช้ บ้านลิ่มทอง อำเภอนางรอง จังหวัดบุรีรัมย์ เป็นกรณีศึกษาความสำเร็จ วิทยานิพนธ์นี้ยังวิเคราะห์ปัจจัยทางสังคมและวัฒนธรรมที่มีผลต่อความสำเร็จของระบบการจัดการน้ำชุมชนที่ยั่งยืน

ในการวิเคราะห์การจัดการน้ำชุมชนที่ยั่งยืน งานวิจัยได้สำรวจศักยภาพของชุมชนในการค้นพบปัญหาการจัดหาแหล่งน้ำ และใช้ทรัพยากรน้ำชุมชนอย่างมีประสิทธิภาพโดยการพึ่งพาตนเองจากประสบการณ์การเรียนรู้ของชุมชน มีการรวบรวมข้อมูลของหมู่บ้านอย่างเป็นองค์รวมเพื่อนำมาใช้ในการวิเคราะห์ปัจจัยทางสังคมและวัฒนธรรม ส่งผลต่อความสำเร็จในระบบการจัดการน้ำชุมชนที่ยั่งยืน การสำรวจวิจัยเชิงพื้นที่มีวิธีการ ได้แก่ การสำรวจ การมีส่วนร่วมในการสำรวจและ การสัมภาษณ์เชิงลึกกับบุคคลหลักในชุมชน รวมทั้งข้อเท็จจริงที่เกิดขึ้นจากหมู่บ้านใกล้เคียง

ผลของการวิจัยพบว่า ปัจจัยที่ส่งผลต่อความสำเร็จในการจัดการน้ำชุมชน ได้แก่ ความเข้มแข็งของผู้นำชุมชน การมีส่วนร่วมของชุมชน การปรับใช้ภูมิปัญญาท้องถิ่น รวมทั้งความร่วมมือและเครือข่ายของผู้ที่เกี่ยวข้อง ข้อค้นพบในงานวิจัยชิ้นนี้แสดงให้เห็นว่าความสำเร็จของบ้านลิ่มทองเป็นผลมาจากการใช้ภูมิปัญญาท้องถิ่นและกระบวนการเรียนรู้ของสังคมในการดูแลรักษา การปรับเปลี่ยน การผลิตซ้ำและการใช้นวัตกรรม

สาขาวิชา ไทยศึกษา ลายมือชื่อนิสิต.....

ปีการศึกษา 2552 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

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KEY WORDS: WATER RESOURCE MANAGEMENT, SOCIAL LEARNING SUSTAINABLE COMMUNITY, BURI RAM

ROYBOON RUSSAMEETES: COMMUNITY AND SUSTAINABLE WATER RESOURCE MANAGEMENT: A CASE STUDY OF BAN LIMTHONG, AMPHOE NANG RONG, CHANGWAT BURI RAM. THESIS ADVISOR: PROF. SIRAPORN NATHALANG, Ph.D. 142 pp.

This thesis aims at analyzing the community social learning process in achieving sustainability in water resource management by using Ban Limthong, Amphoe Nang Rong, Changwat Buri Ram as a successful case study. The thesis also identifies the social and cultural factors affecting the success of building a sustainable community water resource management system.

To analyze sustainable community water resource management, the research explores the capability of the community to identify problems, locate water resources, and use them efficiently and the potentiality to be reliant based on experiential learning of the community. Ethnographic data and holistic approach are used to analyze the social and cultural factors that affect the success of building a sustainable community water resource management system. Fieldwork research methodology includes observation, participatory observation, and in-depth interviews of key informants in the community. Ethnographic data on neighboring communities was also collected.

Research findings reveal that factors contributing to the success of community water resource management are strong leadership, community participation, the use of transmitted local wisdom, and collaboration and networking with stakeholders. The findings for this research have identified that the success of Ban Limthong is influenced by its local wisdom and its process of social learning which include preservation, adaptation, renewal, and innovation.

Field of Study : Thai Studies Student's Signature .....

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INTRODUCTION

1.1 Rationale of the Research

Water resource management has become one of the major concerns in the world today. There are currently 102 countries with 3.9 billion people where climate change and water-related crises create a high risk of violent conflict. Problems continue to be worsen and water resource management has become a significant part of many communities.[1]

Many cases of community water resource management have used an integrated approach. For example, in Africa, five cases suggest that the concept of Integrated Water Resource Management (IWRM) must include the user's participation, planners, and policy makers in every process. Governments in the Middle East such as Saudi Arabia and several countries in South America have also adopted the concept of IWRM as the main tool to achieve sustainability of water resource management.

In China, community learning process has been a key policy that supports water resource management at this local level. In Europe, the use of social learning by way of knowledge sharing and social involvement is the key to success in water resource management. Social learning is taken into account in an approach to solve the water shortage problems in Europe. Many European research projects have investigated social learning and agreed that the human dimension plays a key role in water resource management. Interestingly, Africa is also using the same social learning approach to manage water shortage.

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[1] Speech by Ban Ki-moon, United Nation Secretary-General, **the World Economic Forum** (2008).

In North America, government is responsible for setting up the overall strategy and activities to manage water and address the intricate network of interactions within ecosystems.

Most cases in various regions of Thailand, have large scale water resources engineering and forestry resource management as the focal point of concern. Northern Thailand is interested in forestry resource management. While Southern and Central regions are interested in water resource management. In addition, most Isan water resource management case studies focus on local participation and local contributions that enable communities to play major role in improving water supplies but do not involve social learning in the process.

In Thailand, water is critical for the nation's economic and social well-being. Thailand currently faces increasing problems from flooding and droughts, with damages from flooding averaging over a quarter billion US dollars a year. Agricultural areas are worst hit. These issues directly affect farmers who are already poor. Most Isan people are in the agricultural sector. For them, land without water is useless.

From the past until now, most Thai government projects have been concerned with large scale water resources engineering. Recently, many developed countries around the world have focused their attention on social learning to conduct sustainable water management at the community level.

Most lower Isan areas suffer from drought and a lack of water for agriculture. However, certain villages can solve their drought-related problems since they have learned how to manage agricultural water resource and water consumption. This research will then focus on studying such villages, particularly on their practical solutions and their

learning process for water resource management that will affect the overall water resource management in terms of sustainable development.

This research selected Ban (บ้าน) Limthong (ลิ่มทอง), Amphoe (อำเภอ) Nang Rong (นางรอง), Changwat (จังหวัด) Buri Ram (บุรีรัมย์) as a case study. The village has successfully managed its water resource, as a learning center, and has passed on its experience of social learning and developing processes in order to establish a social network.

The significance of social learning and cultural adaptation has become a major issue of concern. This research will report the complexity of local knowledge and how villagers can use and adapt them through their learning experiences in order to improve standards of living, capability to identify problems, and how they manage water resources effectively. The real power of social learning in Ban Limthong is created by local wisdom and the links among community members; moreover, the community collaborates in water resource management with other communities, and the government sector, the private sector, and NGOs. It also passes along new ideas through local specialists and lures more participants and stakeholders to take part in water resource management. Further study will be analyzed in detail.

1.2 Objectives

The objectives of the thesis are:

1) To analyze the community's social learning process in achieving sustainability in water resource management and

2) To identify the social and cultural factors affecting the success of building a sustainable community water resource management system.

1.3 Hypothesis

The community's social learning process is vital to the sustainability of community and water resource management. This social learning process includes community self-reliance through the use of local wisdom, collaboration and networking among community members, and a strong sense of belonging to the community.

1.4 Research Methodology

This thesis uses qualitative research methodology. In order to collect the ethnographic data, a field survey was conducted in Ban Limthong, Amphoe Nang Rong, Changwat Buri Ram between November 2006 and January 2010.

The research gathers data by using qualitative fieldwork, i.e., observation, participant observation and in-depth interviews and other sources of information such as community records and reports. Personal and group interviews were conducted in order to obtain data on the roles of community water resource management.

In-depth interviews as conducted with: community leaders, local government officials, community networks, and stakeholders. The in-depth interviews include the following issues:

1) Community settlement pattern, history, and background to collect the information from records/reports, local government, permanent migration, seasonal migration, relocation, and related current policy;
2) Community, structure, and condition to collect the information from local government, private institutions, and field observation;
3) Local wisdom and initiatives to collect the information records, field observation, and interviews;

4) Sharing mechanism that ensures equitable distribution of benefits among the community members to collect the information from field observation and interviews;
5) Access to support services to collect the information from a list of groups working in the community, field observation and interviews;
6) Self control in a decision-making aspect to collect the information from field observation and interviews;
7) Ability of administration, leadership, network, and social relations to collect the information from local government, field observation, and interviews; and
8) Participation in community activities related to water resource management to collect the information from community development reports; and local rules and regulations on the use of water resources management to collect the information from historical/existing sources on the rules and regulations being implemented in the community over water resource management.

This research selected one case study in the lower Isan area which focuses on practical solutions and learning processes for water resources management with effects in terms of sustainable development. This research selected Ban Limthong, Amphoe Nang Rong, Changwat Buri Ram as a case study for sustainable water resource management since it has the potentiality of self-reliance.

Definition of the Term

There are some key words in this research which are clarified as follows:

1) **Water Resource Management**

The ability to search for a water supply, manage reservoirs, and use water efficiently.

2) **Social Learning**

The complexity of local knowledge and how the villagers can use it and adapt it through their learning experiences to improve their standard of living.

3) **Sustainable Community**

The definition of sustainable community for this research is in terms of social management. A community has the capability to identify problems, locate water resources, and use them efficiently. Community members maintain a network in order to provide members with access to water resources. In this case, overall growth in agricultural produce has increased substantially with much impact on social development, such as income growth, better standards of living, and sustainability of water reserves, social management impacts on management philosophy, degree of sharing, and the process of developing sustainable community water resource management.

1.5 Literature Review

1.5.1 Literature Review on Water Resource Management's Major Concerns

The World Bank's Comparative Study of Regulatory Frameworks for Water Resources Management indicates that water is a scarce and finite resource with no

substitute, and upon which the very existence of life on earth depends. The challenges facing water resources are daunting. During the last century, the population of the world has more than tripled, from 1.6 billion to over 6 billion, while water resources have remained the same. The United Nations World Water Development Report, 2003, presented a gloomy picture: About 2 billion people in over 40 countries are affected by water shortages, more than 1 billion people lack sufficient and safe drinking water and 2.4 billion have no provisions for sanitation.[2]

The World Bank Report on Reengaging in Agricultural Water Management indicates that agricultural water has helped meet rapidly rising demands for food, and has contributed to the growth of farm profitability and poverty reduction as well as to regional development and environmental protection. The role of government is changing, responsibility is being decentralized, farmers are playing an increasingly important role in decisions and investment, and more and more, markets are driving growth. Water for agriculture has to be used sustainable within an integrated approach. The World Bank Report also states that climate is changing worldwide with some evidence of a growing trend of extreme climatic events. The impact of these changes is likely to be particularly injurious to developing countries because they are located more often in risk areas, are more dependent on vulnerable economic sectors such as agriculture, and have less capacity to adapt due to lack of resources.[3]

The Stockholm Environment Institute (SEI)'s Annual Report 2006 states that the management of water resources is a key challenge in the global battle to reduce poverty.

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[2] The World Bank, **The World Bank's Comparative Study of Regulatory Frameworks for Water Resources Management** (2006).

[3] The World Bank, **Reengaging in Agricultural Water Management: Challenges and Options** (Washington, D.C., 2006), p.36-40.

The potential role of water in poverty reduction is well recognized in some areas, such as improved water supply, but less known in others and we have only recently seen the emergence of an integrated approach to understanding the links between poverty reduction and water management. SEI has taken the lead in developing international approaches to the analysis of these links through the production of some key papers for leading international institutions. The basic contention is that water management is a good investment: not only can it contribute to poverty reduction, but it can do so in ways that are affordable and, in many cases, generate wealth.

SEI's Water Resource Program aims to support decision-making and induce change towards sustainable water use by providing knowledge that bridges science and policy making. The growing global water crisis threatens the security, stability, and environmental sustainability of both developed and developing countries. It is increasingly difficult to meet requirements for food production, ecosystem services, industrial and energy production, and even personal consumption and hygiene. The work is conducted at global (water scenarios), regional/national (river basin management), and local (urban and rural water systems) scales. The program integrates multiple disciplines in a systems-based and process-oriented approach that encourages stakeholder participation.[4]

For water resource management, success means different things to different people. The problem is that it deals not only with technical aspect but also other essential factors such as social, government, culture, and participation in all levels. The Dublin Statement and Conference Report indicate that water development and management should be based on a participatory approach involving users, planners, and policy at all

[4] **Stockholm Environment Institute Annual Report 2006.** (Bangkok: Asia Centre, 2006).

levels.[5] Poolman and Van De Giesen support this thought and show that terms such as participation, participatory approach and participatory planning are often used. However, most of the time actual participation is limited because most of people who get involved cannot agree on what they are trying to achieve.[6]

1.5.2 Literature Review on International Cases Concerning Water Resource Management

In essence, the review of relevant research and case studies concerning water resource management, by villagers in various regions of Thailand and elsewhere in the world, is the first step in order to understand the similarities or differences among multiple cultural areas concerning water resource management. The following analytical review gathers information from multiple cases around the world to figure out the key ingredients for sustainability.

To build up the understanding of how the research cases in the lower Isan area of Thailand are similar to or different from other cultural areas concerning water resource management, the research has analyzed the views of the following cases from multiple regions around the world.

These cases are selected because they range from under developed countries to the most developed nations in the world. Other criteria such as people's behavior, population size, budget, location, local government policy, local participation, laws and

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[5] Dublin Statement and Conference Report, "The Dublin Statement on Water and Sustainable Development," in **Adopted by the participants at the Conference on Water and the Environment (ICWE)** (Ireland: 1992).

[6] Poolman, M. and Van De Giesen, N., Participation: Rhetoric and Reality. "The Importance of Understanding Stakeholders Based on a Case Study in Upper East Ghana," in **Water Resource Development** 22, 4 (December 2006): 561-573.

regulations are also considered with the intention of analyzing water resource management.

1) Africa

There are five research cases in Africa to analyze community water resource management: the Upper East Region of Ghana in West Africa, the Mhlatuze Catchment in South Africa, the Lower Zambezi in Mozambique, the Kuiseb Basin in Namibia, and Lusaka in Zambia.

Several million people directly or indirectly rely on rivers in Africa. There are quite a few rivers extending throughout the continent. For example, the Lower Zambezi River extends from Cahora Bassa dam, in Mozambique, to the Indian Ocean, over a distance of seven hundred kilometers. It is the one of the largest national basin in Africa, draining 50 percent of the country's water resources. The local communities are rural and depend on the ecosystem to maintain their fragile livelihoods by means of agriculture. Very little irrigation is practiced with most reliance on flood-recession agriculture on riverbanks.

The IWRM – a process that promotes the coordinated development and management of land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems – is used as the comprehensive approach for the management activities in many areas throughout Africa. The IWRM focuses more on the management issue by

setting up structures and institutions that can help to ensure wise decisions are made about how best to use the water.[7]

Even though there is the involvement among in all levels including users, planners, and policy makers, insufficient alignment and cooperation between the policies of different government departments still exist due to lack of understanding about effective IWRM. In term of government policy, the concept of IWRM is a part of national policy in most countries in Africa.

To build a foundation for successful of water resource management, a capacity building in water demand management is a key component for attaining development goals. The technique such as water demand management (WDM) is being used throughout Africa as a component of IWRM by promoting and balancing efficiency, equity and sustainability objectives for the management and allocation of water resources.

Water demand management (WDM) covers a wide range of technical, economic, educational, capacity building and policy measures that need to be applied by water resource planners, water supply agencies and end-users. The economic, social and environmental reasons for WDM vary from country to country in terms of meeting basic human needs and providing affordable access to minimum supplies of water for that purpose. WDM is normally viewed as a useful tool in achieving IWRM.

Throughout the years, many countries in Africa have encouraged public participation in integrated water resources management. They use low-tech solutions and focus on management to ensure that they have enough water for their crops. Different

[7] Rockstrom, J.. "Water Resource Management in Smallholder Farms in Eastern and Southern Africa: An Overview," in **Physics and Chemistry of the Earth** 25 (2000): 275-283.

strategies draw on different scale of household, community, and catchment. Effective and sustainable management of water resources is vital for ensuring sustainable development. However, efforts at water resource management seem to demonstrate inappropriate practices, especially when compared to water consumption trends in most developing countries. Poor water resources management have stimulated and sustained a number of problems related to health, socio-economic variable and the environment, which need to be solved. As many cases suggested, an integrated approach to water resources management is the most remarkable of the approaches to managing this vital resource.[8]

2) Asia

While China is working towards becoming one of the leading economic giants in the world, back home more than 400 cities are now suffering from water shortages and the actual irrigated area accounts for only 40 percent of the total arable land. The Yellow River, the second longest river in China, is regularly confronted by frequent water shortages and serious water pollution. So as rapid economic development has increased the demand for water usages, the situation has become worse. Liu and Zheng indicate that frequent drying-up of the lower reaches of the Yellow River is mainly caused by human activities, especially the over-extraction of freshwater. Agricultural water use represents the biggest portion of total use – more than ninety percent.

Because of low extraction charges for water resources set by the Chinese government, pricing has not only blocked water conservation but has also weakened the

[8] Manning, N., and Seely, M., "Forum for Integrated Resource Management (FIRM) in Ephemeral Basins: Putting communities at the centre of the basin management process," in **Physics and Chemistry of the Earth** 30 (2005): 886-893.

effectiveness of management efforts. In addition, there is no centralized freshwater management administration in China. For instance, the Ministry of Water Resources is responsible for surface water and agricultural water use, while the Ministry of Land and Resources is responsible for groundwater and the National Environment Protection Bureau is in charge of wastewater drainages and water quality protection. The fractured management of freshwater resources has caused conflicts among regions and governmental agencies, and resulted in management failure.

Learning process is one of the most important factors used to manage freshwater resources in China. The Chinese government has pushed the water resource management to become public issues. Information is promoted through video, kiosks, displays, and other media to present material covering a variety of freshwater management topics.[9]

The Middle East's economic situation seems optimistic. While billions in oil sales have poured in for decades, there also has been a sharp rise in the region's water demands. Abderrahman suggests that Saudi Arabia has experienced growth in water demands along with the country's comprehensive and rapid developments in social, construction, education, health, transportation, industrial and agricultural sectors.

Demand for water is so strong that the use of available groundwater in local aquifers is essential to satisfy the substantial socio-economic developments coupled with rapid increase in water demands for different purposes, including agriculture. The reuse of treated wastewater for irrigation has been less than one percent. Therefore, the water resource management is essential in order to prepare a comprehensive water plan defining the policies related to development of its water resources, and their protection and

[9] Liu, C., and Zheng, H. Freshwater, "Resources Management in China: Case Study of the Yellow River Basin," in **International Review for Environment Strategies** 3, 2 (2002): 284-293.

conservation for different purposes. The government has adopted IWRM as the main tool to achieve sustainability of water and development.

3) Europe

In Europe, the social dimension of sustainability is key indicators that capture the extent to which villagers receive benefits of having water supply. They get to be involved with decision making processes that affected water resource management in Scotland and Benelux middle area.

Pahl-Wostl *et al* point outs the new paradigm in water management as follows: participatory management and collaborative decision making, increased integration of issues and sectors, management of problem sources not effects, decentralized and more flexible management approaches, more attention to human behavior, explicit inclusion of the environment in management goals, open and shared information sources, and iterative learning cycles.[10]

The difficulties in water resource management in Europe can be overcome by learning from doing that is by attempting to translate the goals of sustainable development into practical management approaches. There are also many common errors that European communities often make, such as leaving out the socio-economic factors when trying to manage water resources. Many projects only focus on economic benefit without capturing the social dimension of sustainability.

In the Benelux middle area, the processes of social learning are conflict and confrontation among stakeholders, the discovery of their mutual interdependence, the

[10] Pahl-Wostl, C., Tabara, D., Bouwen, R. et. al. "The Important of Social Learning and Culture for Sustainable Water Management," in **Ecological Economics** 64 (2008): 484-495.

development of social spaces where they could encounter each other in shared actions, and the role of facilitators and process leaders in helping stakeholders to go forward. Other countries in Europe also develop environmental policy based on procedural approaches where local organizational structures are set up to initiate social interactions, establish common working methods, and formulate collective agreements in order to acquire heuristic value.

What seems to be interesting is that in some part of Europe, such as the French Atlantic coastal wetlands, scientists are the one who become champion in water resource management through their research in the area. In the United Kingdom, system approaches are used for managing water shortage by way of knowledge sharing and social involvement, such as the generation of social capital and the development of new social practices.

4) North America

There is a research case in the Green Bay region of the Laurentian Great Lakes, North America to analyze community water resource management. The Green Bay region of the Laurentian Great Lakes has been known for decades as one of the most polluted bodies of water in North America. Water quality problems have come to public attention for quite some time from fishermen's complaints. The water resource management activities are usually funded and supported by the state government. In this case, the state of Wisconsin is responsible for the management of Green Bay water quality problems. Since 1972, the government has poured in lots of money trying to solve this problem. The difference with America's effort in managing water resources and anywhere else is that most initiatives are conducted and funded by Federal and State

governments. Harris et al. suggests that the water resource management in the Great Lakes is ineffective because it needs to develop better management strategies which address the intricate network of interactions within ecosystems and the impact of human activities.

5) South America

There are three research cases in South America to analyze community water resource management: the river in Brazil, a rural area in Chile, and Cerro Chapelco mountain area in Patagonia, Argentina. In the past, local governments in South America (such as Chile) have tried to stimulate economic development in rural areas without success. Today, the development of a rural area must be planned within the framework of the general national strategy. The Analytical Hierarchy Process (AHP) is used to arrange the structure to promote water resource management and regional development.

The steps include identifying local decision makers, experts, and government representatives in the area. Second, detecting activities affect the success of water resource management. Next, allowing experts express their preferences on their own areas of expertise and knowledge. Finally, prioritizing activities could bring about local improvement in water resource management. Applying the AHP to the water resource management allows us to integrate the diverse judgments and preferences of the stakeholders in the community to obtain ranking of the activities in order to manage water resources.

In other area such as Argentina, water policies are moving toward IWRM at the level of the river basin or watersheds. Multi-Stakeholder Platforms (MSPs) are used for negotiations in order to solve water conflicts among different stakeholders. Moreyra and

Wegerich point out those MSPs are not only about stakeholders but also about the different constructions of boundaries, scales and political interests, which include and exclude stakeholders. Moreover, information sharing is the key success of water resource management in South America.[11]

1.5.3 Literature Review on Thai Cases Concerning Water Resource Management

For a collection of cases to build up the understanding of how the research case in the lower Isan area in Thailand are similar to or different from other cultural areas concerning water resource management, I based my analysis on the views of the following cases that covered various regions in Thailand:

- Hat Yai (หาดใหญ่), Changwat Songkhla (สงขลา)
- Huai Mong (ห้วยมอง), Changwat Nong Khai (หนองคาย)
- The Khlong La Ok (ละโอก) and the Khlong Pra Sae (ประแสร์) Reservoirs
- Changwat Rayong (ระยอง), Changwat Chon Buri (ชลบุรี), Changwat Chanthaburi (จันทบุรี), and Changwat Chachoengsao (ฉะเชิงเทรา)
- Tambon (ตำบล) Takfah (ตากฟ้า) and Tambon Lam Payont (ลำพยนต์), Changwat Nakhon Sawan (นครสวรรค์)
- Ban Pala U (ป่าละอู), Changwat Prachuap Khiri Khan (ประจวบคีรีขันธ์)

[11] Moreyra, A., and Wegerich, K. Highlighting, "the Multiple in MSPs: The Case of Cerro Chapelco, Patagonia, Argentina," in **Water Resources Development** 22, 4 (2006): 629-642.

- Amphoe Mueang (เมือง), Changwat Maha Sarakham (มหาสารคาม) and Amphoe Ban Phai (บ้านไผ่), Changwat Khon Kaen (ขอนแก่น)
- Ban Saeng Pha (แสงภา), Changwat Loei (เลย)
- Ban Pue (ปัว), Changwat Khon Kaen
- Ban Tamaprang (ท่าหมะปราง), Changwat Nakhon Ratchasima (นครราชสีมา)
- Ban Par-Suk (ผาสุก), Changwat Phrae (แพร่)
- Wang (วัง) River, Changwat Chiang Mai (เชียงใหม่)
- Soi (ซอย) River, Changwat Lampang (ลำปาง)
- Mok (มอก) River, Changwat Lampang
- 32 villages, 19 northern villages and 13 Isan villages.

Most of the research and case studies in various regions in Thailand are concerned with large scale water resources engineering and forestry resource management. At present, there are many research and case studies on how to deal with crises such as flood and drought. The research of water resources engineering normally uses mathematical mode to stimulate scenarios of water use and to estimate an effective rainfall. The studies of water uses are conducted by using modified tank model, effective rainfall model, irrigation demand and system simulation model.

Several researches are focusing on water resource management issue because of water shortage in the past few years. The small scale water resource management case studies focus on local participations and local contributions that can play a major role in

improving water supplies. The community water resource management case studies concentrate on how local activity to manage and improve water supplies has occurred and has been stimulated in Thailand. There is a need to learn more about the capacity of households and communities to manage and improve water supplies. The research to learn more about knowledge of management and organizational techniques is needed not just for improving agency programs but also for encouraging local investment and building local management capacity.

Most of small scale case studies focus on water for domestic use: drinking, cooking, bathing, washing, etc. The case studies are not really concerned with water for irrigation of field crops and agricultural water resource management. Three bodies of literature aid the understanding of village water supply in Isan Thailand. Anthropological case studies provide information on village social organization and some information about water supply methods to try to help solve village water supply problems.

Some Isan case studies are similar to African case studies that focus on women role and participation in community water resource management, the relationship between women and their way of life, including how they deal with natural resource management.

The basic concepts of Royal Irrigation Department (RID) case studies on a small system have the ultimate goal of developing small scale irrigation by proceeding in accordance with the three steps and methods management: planning, operation, and continuing activities.

For attributes of social and cultural structure, the case studies have a major objective to study the people's level of perception, expectation, and benefits as well as,

the level of confidence of the community leaders. Another major objective is to study the relationship between the levels of perception, expectation, the level of their confidence in the community's leaders and the participation level of people in developing small size water sources.

There is one study concerning sustainable development, but that does not deal with water resource management. The Study of Sustainability Assessment of Development Scenarios: Methodology and Application to Thailand, Nijkamp and Vreeker. This study aims to offer an applicable evaluation framework for assessing sustainable development strategies at the regional level, with a particular view on the treatment of uncertain information at Hat Yai, Changwat Songkhla.[12]

The regions of Thailand each have distinctive geographical features and natural surroundings. Its geographical location makes the country more diverse, both in terms of weather conditions and geographical landscape, when compared with others in Southeast Asia.

Most of the area in the north of the country is occupied by mountain ranges with valley plains in between. So people tend to settle in the valleys near natural water sources. The central part of Thailand, on the other hand, is considered a flood plain area with several major rivers coming from the north that eventually meet and make the region's main artery, running through the area to the sea. This vast flood plain, well fed with water, makes the region fertile enough to accommodate a huge number of people and that leads to the establishment of a flourishing civilization.

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[12] Nijkamp, Peter and Vreeker, Ron, "Sustainability assessment of development scenarios: methodology and application to Thailand," in **Ecological Economics** 33 (2000): 7-27.

The Isan part of Thailand, however, seems to be a rather rough place, with harsh living conditions. The region is marked with a vast plateau and hilly areas, separated from the North and the Central parts of Thailand by mountain ranges on its western and southern edges. It is encircled by the Mekong (แม่โขง) river, with its tributaries such as the Chi (ชี), Mun (มูล), Songkram (สงคราม) and Lumtakhlong (ลำตะคลอง) rivers penetrating throughout the region.

All these parts of Thailand are influenced by the same monsoons which means all the regions will have a four-month long rainy season while for the rest of the year the temperature varies between mild and scorching hot. There will, however, still be some moisture lingering in the ecosystem.

Such a geographical landscape means that the southern part of Thailand gets more rain than areas of the country. It gets six months of pouring rain a year, and never gets cold because of being so close to the equator.

Different climates in all the four regions mean a different environment and therefore different ecosystems. The varied environmental conditions lead to varying lifestyles, as people need to adapt to their natural surrounding and form their livelihood on the local resources available. The most distinctive evolution induced by their surroundings and their need to adapt to it, lies in their effective measures to direct water to feed their farms. Realizing that the mountain ranges and the forest covering the area yield water and water yields life, the northerners value their forests highly. Having been able to adjust to the environment, the villagers have gradually developed their own culture and practices and pass these on from generation to generation. That is how the Lana civilization was formed.

People in the central part of Thailand, too, developed their own distinctive ways of living. Living on a floodplain area, close to water resources, the villagers learned to understand and read the water's nature. As they literally lived with water, people learned to adapt to their surroundings and their community expanded and became a kingdom, along both sides of the river. People have also learned to extract the water resources from the river to use on their farms and orchards, located further away from the river.

For those living in the Isan plateau, some are blessed with just enough water to survive while others are deprived of it. Whichever the case, despite the generally rough geographical features of this area, which is a mix of highlands, flood plains and vast arid fields with little water, the Isan people have mastered the skills for choosing places to settle and grow their crops. They are keen on selecting places with easy access to natural resources and where the soil is rich in nutrients. They have also learned to live with occasional droughts. With some help from the Mekong River and her tributaries, the villagers here have developed their own ways of life and their own civilization.

Those in the South are familiar with the sea and heavy rain. Hence their livelihoods revolve around fishing and agriculture, which is done in the tidal flat areas. They have the thick, heavy tropical rainforest as their resources, yielding all kinds of spices, herbs and fruits.

The richness in the southern part of Thailand has been a firm base on which the Chiya civilization and others were formed. The geographical features and the climate have also contributed to the southerners' distinct life style.

The adaptation by the Thais living in different parts of the country as mentioned above, highlights the fact that people from their cultures and lifestyles as they adapt to

their surroundings. Thailand's great geographical diversity, boosted by cultural exchanges and a variety of transportation channels, has also made the nation very culturally diverse.[13]

1.5.4 Literature Review on Isan Water Resource Management

A brief summary of anthropological thinking indicates that community participation should be considered mandatory in any development area; and local communities should be viewed as equal partners and participate fully in the design, implementation and benefit sharing of any water related development area. This means empowering them with the necessary tools to take care of their own welfare by ensuring that their involvement and interests are adhered to. There are several ways to get local participation. These include public hearings, notice and comment procedures. However, when assigning different tasks to the local communities, it is important to take into account their ability in terms of administration, leadership, network and social relations.

After all, compared to other regions, Isan is still deprived of water and its people's experiences in dealing with drought has led them to find ways to store water for use during the dry season and to share among others in the same community. Take those in the Nakhon Ratchasima (Khorat (โคราช) basin), for example, who have learned to dig ditches around their community and, in some places, to create a system of waterways around their village.[14]

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[13] Sakaviriya, Vichit, ed. **Facts about Community Development Programs in Thailand**. (Bangkok: Ministry of Interior, 1965).

[14] Phongphit S. and Hewison K., **Thai Village Life Culture and Translation in the Northeast** (Bangkok: Village Foundation, 1990), p.6-16.

Most Isan people are in the agricultural sector. This region has the lowest income in the country. Regarding community development in Isan Thailand, most of the villages are situated on highland with no irrigation ditches. A majority of the villagers are rice farmers whose living relies mainly on uncontrollable natural factors. They are often in debt due to delay in rainfall and drought during the rice growing season. Unproductive cultivation forces some to borrow more and more, which leads to chronic debts. For them, land without water is useless. If there is rainfall, they will have work, thus have income to repay their debts, whereas if there is a drought or a delay in rainfall, they will have to go and find something else to do in order to have some income.

For water resource management, the typical feature of Isan is its vast area of plateau stretching towards the country's eastern edge. In spite of being right in middle of the Southeast Asian region and far away from the sea, Isan is affected by the same monsoon as the Central Plain, namely the South Western monsoon. This means the amount of rainfall that it gets is similar to that of the Central Plain. However, because of the poor soil quality, the earth can neither absorb nor retain water from the rain, so all the water flows into the Mekong, the Chi and the Mun, as well as their tributaries. As a result, the moisture evaporates with the rain by the end of the rainy season, leaving the area with a longer dry season than other parts of the country and even with droughts. The villagers in this area also suffer from flooding in the rainy season, when the water level in the Mekong rises and eventually overflows onto the land on both sides.

Many natural water resources in Isan Thailand, the three major rivers are the Mekong, the Chi, and the Mun; and there are innumerable smaller rivers and *huai* (ห้วย); and natural water reservoirs called *nong* (หนอง) and *bueng* (บึง) (lakes and swamps).

Nevertheless, in many places, the problem of drought, either within a year, or over consecutive years has occurred and still does, with monotonous regularity. [15]

During one third of the dry season, the weather can be very dry and cold whereas another third is scorching. There are rock salts underneath the earth in many places far away from natural water resources. When the rain evaporates from the surface, especially in places severely affected by deforestation, the salt underneath will surface and result in saline soil which can be devastating to the local crops.

Although a vast area of the Isan Plateau bears rather harsh living conditions, there are places in this region where the environment is rich and green enough to facilitate humans' settlement and cultural development. These well-nourished areas lie to the west side of the Phetchabun (เพชรบูรณ์) Range, the south side of the Dong Phaya Yen (ดงพญาเย็น) and San Kamphaeng (สันกำแพง) Ranges, and the east side of the Phanom Dong Rak (พนมดงรัก) Range, which stretches towards the Thai-Cambodian border, separating upper and lower Isan from each other.

The mountain ranges above Changwat Chaiyaphum (ชัยภูมิ) and Changwat Loei, along with the ranges on the east side of Sakon Nakhon (สกลนคร), are the source of major rivers such as the Songkram. Besides this source of water, these mountain ranges also work in attracting rain and are natural resources of food and medicine on which the villagers rely very heavily.

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[15] เสรี พงศ์พิศ. "วัฒนธรรมพื้นบ้าน: รากฐานการพัฒนา," ใน **ภูมิปัญญาชาวบ้านกับการพัฒนาชนบท เล่ม 1,** (กรุงเทพมหานคร: มูลนิธิภูมิปัญญาและมูลนิธิหมู่บ้าน, 2536), หน้า 35-61.

The plain areas outside the mountain ranges are good for cultivation because they all have easy access to natural water resources, making the area suitable for settlements. The Khorat and Sakon Nakhon basins here are examples of such places where most of the population have chosen to settle.

The rest of the region is rather dry. Water supplies are often insufficient compared to the above mentioned areas. Even so, a variety of plants, various kinds of animals and a great diversity of aquatic life are found in this area. Certain kinds of crops, such as rice, have also adjusted successfully to the harsh conditions that prevail, making it possible for humans to survive and live off the available resources. The villagers, like other beings, have adjusted to their surroundings and established an interesting relationship with nature.

The huge difference between each season – the rainy season and the dry season - plays an important role in shaping the villagers' choice for settlement and their livelihood. Harsh living conditions in this part of the country have forced the villagers to develop suitable skills to use in places with sufficient water to settle and cultivate. Certainly such places are where there is rich soil and with easy access to natural water resources. Most of these places are in the low-lying land close to big marshes such as the area around Nong Han (หนองหาน) in Udon Thani (อุดรธานี), Bueng Phlan Chai (บึงพลาญชัย) of Roi-Et (ร้อยเอ็ด) and Lumtakhlong in Nakonrachasima as well as other areas along the Mekong, the Chi, the Mun and their tributaries.

The reservoirs built in virtually every changwat over the years have led to the expansion of areas for cultivation. Even so, more water is still needed to cope with rising demand, following the population growth in the area and the fact that these people are scattered in places that have suffered from severe and repeated droughts.

In the past the villagers were fond of deepening existing ditches or pond bed and building moats and canals within the community compound to reserve water and manage the resources for the year's use. This is a common practice, especially in the Khorat basin, and has been so for many centuries. Excavations in the area have revealed traces of such construction done by those in ancient communities.

Besides their favorite location for settlement - around or close to natural water resources - the Isan people tend to build their homes close to each other in a quite united village. Examples of that are seen in villages in Sakon Nakhon and the Khorat basin.[16]

Due to limited water resources, the villagers have learned to make the most of every drop of water both for household use and cultivation. The idea is to use as little water as possible to do as many things as possible. Hence, the villagers' household utensils and their standard of cleanliness are different from those of the people in the areas with abundant water resources.

Their livelihood, lifestyle and food are also different. Having adjusted to their surroundings, the Isan people have developed unique ways of preserving food. They have also developed their own techniques to maximize their catch as well as building up on their knowledge about various plants in the area for food and medicinal purposes.

The rituals, cultures and arts developed by the people in this area are all very unique and have all been shaped by their surroundings, which are very distinct from those in other regions. Unfortunately, the region is running out of fertile land with easy access to natural water resources because of the rapid growth of the population. As a result, the

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[16] พัฒนา กิติอาษา. **ท้องถิ่นนิยม** (กรุงเทพมหานคร: สำนักงานคณะกรรมการวิจัยแห่งชาติ, 2546).

villagers have to find other ways to obtain water, firstly by looking high and low and traveling far to get water and bring the supplies home. When hit by severe droughts, they patiently extract water from sandy soil that may have some moisture in it.

Along with the increasing population, deforestation began. In some places the villagers have even invaded forest reserves. Eventually many have had to move out to look for jobs in other parts of the country or even abroad. However, the bond between these people, their families and their homeland remains strong.

Before deforestation started, the villagers showed their appreciation through preserving the forest near their community by linking it with their belief in supernatural powers. The villagers also share and look after their communal water resources well. Many also grow vegetables for their household consumption near the water supply, sharing some with their neighbors.

Isan's rather unfriendly environment has made the villagers tough. They have learned to face hardship with amazing courage. Furthermore they have built on their knowledge and understanding of their surroundings, which in turn has shaped their lifestyle, cultures, practices and belief.

After all, compared to other regions, Isan is still a region deprived of water and its people's experiences in dealing with drought has led them to find ways to store water for use during the dry season and to share water among others in the same community. Take those in the Khorat basin, for example, who have learned to dig ditches around their community and, in some places, to create a system of waterways around their village.

This idea was well received and widely respected by people in the area. Many, especially those in the lower Isan region, adopted and adapted the idea to serve their own

needs for water, especially during the dry season. Reservoirs proved to be the most effective way to help the villagers survive the droughts.

Those living in the upper Isan region, or in the Sakon Nakhon basin, often choose to settle on high land where it is easy to find underground water or other natural water resources. As a result, they, unlike those in the lower Isan region, have no need to build wells or water reservoirs for use during the dry season.

Michael M. Calavan states that traditional Thai villages in Isan were built around nearby water supplies. Many are located on the banks of permanent streams or natural lakes and ponds. In other cases, villages are located near natural depressions associated with small streams (huai) which flow for at least part of the year. Water is impounded for at least part of the year by construction of earth embankments.[17]

Surachet Vechapituk indicates that villagers need only to clear the land and establish *khanna* (คันนา) (paddy bunds) to divide the land into smaller portions. The *khanna* are necessary for conserving and delivering water to all fields. Not all trees on the plain would be cut down neither nor would all small bushes and ant hills be destroyed. The reason for this was that these are the places where birds and other animals make their homes, and nature is therefore kept in balance.[18]

The main reason why villages chose to settle close to a natural water resource was not because of a need for agricultural water. Rather, it was for consumption by the

[17] Calavan, Michael M., "Local Resource Management: Some Development Principles for Rural Thailand," in **Development Issues in Thailand** (1984).

[18] สุรเชษฐ เวชชพิทักษ์. **รากฐานแห่งชีวิต วัฒนธรรมชนบทกับการพัฒนา** (กรุงเทพมหานคร: สำนักพิมพ์หมู่บ้าน, 2533).

villagers, their cattle, and animals, and for the provision of food; such as fish, crabs, shrimp, plants and vegetables.

The reason water resources were not essential for agriculture was that rice growing and other crops relied almost entirely on rain. Very few permanent dams for irrigation were constructed by villagers, and state activities in this area only began in the 1960s with some small dams on small streams, and larger water reservoirs in the 1970s. However, during the rice growing season, villagers would build numerous temporary structures to control the flow of water through their fields.

Villagers only dug wells for drinking water and for community consumption. Villagers might also dig a community pond in order to have more water for the animals and to grow vegetables throughout the year.

Rainwater began to be used as drinking water only with the introduction of metal roofing about fifty years ago, and has become common amongst villagers only over the past thirty years, but even then, few could afford it. Ordinarily, a villager's house had a roof made of leaves, grass or wood tiles. In the latter case, the owners also stored rainwater for drinking only in small clay jars, not in tanks, ceramic jars, or large ceramic jars, or large cement jars, all of which were introduced relatively recently.

As water is the key to good living, when natural water resources are out of reach, Isan people will work together to build a reservoir for the whole community. They will build houses close together on high land so that flood waters cannot harm them during the rainy season. Such cooperation continues to this day.

Table 1: Thailand Topography and Water Resources

Annual Average Years 2002, 2005, 2006			
Region	**Rainfall Million Cubic Meters**	**Collected Million Cubic Meters**	**Collected as % of Rainfall**
Central and West	109,748	25,248	23.0%
North	148,032	21,371	14.4%
South	157,506	6,239	4.0%
Northeast	228,833	6,134	2.7%
East	61,657	644	1.0%
Total	706,826	59,636	8.4%

Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology.

Contrary to conventional thinking, there is plenty of rainfall in Isan. More rain falls here than any other region in Thailand. However, the topography of Isan is different from the North of Thailand. The North has mountains and Isan is relatively flat.

In the North, there are many possibilities for making big damns and water can be distributed over long distances using the gravity flow. In Isan, only 2.7% of the rainfall is collected and used. The model of collecting large bodies of water and distributing over long distances is not enough, there should be an additional system for the flat terrain of this region.

The significance of community water resource management at Ban Limthong, Amphoe Nang Rong, Changwat Buri Ram, shows that rain water can be easily and economically harvested at the local community level to increase significantly the availability of water for agriculture and domestic use throughout the year. Further research will explain this in detail.[19]

[19] Bangkok Chaowkwanyeun, **Community Water Resource Report in March** (2007).

The challenge for sustainable water resource management today is about understanding the culture of villager and how to collect their knowledge in order to build up the capacity to engage in social learning for resource management, improve processes, and build common awareness when different targets and perspectives exist. Most cases investigated here come up with similar findings about the ingredients for social learning that are significant for social learning in water resource management. These features are to identify problems, understand the interdependence and complexity of the management system make an effort to work together, build trust, and establish informal as well as formal relationships among stakeholders.

Villagers have to start solving their own problems by themselves. Learning-by-doing is to earn experience. Villagers also share their accomplishments to people in other communities because there are communities without hope and support. Ban Limthong community is lucky to have their partners. However, the support would be worthless unless villagers started helping themselves.

Tambon Administration Organization (TAO), which is a government agency closest to the community, receives a budget for managing community's water resources over the period of five years. This budget for the five-year period averages out at 2.15% of the total expenditure allowed for the Local Administration Promotion Department, under the Interior Ministry.

In 2006, Thailand was hit hard by drought and severe floods. The damage and the cost of remedy for such problems, including TAO's water resource management accounted for 9.08% of the local community's budget. Of this, 2.92% was spent on

community water resources development and 6.17% of the grand total was used to cover the damage and remedy to problems subsequently incurred.

Pursuant to the provisions in Chapter 2 and 3 of the Constitution of The Constitution of the Kingdom of Thailand, B.E. 2550, the local administration organizations have the liberty to manage every aspect of their affairs, including the management of the community's resources. The Constitution has also provided that some responsibilities are transferred to the local administration organizations. The local administration organization has therefore become the main agency in the community authorized to provide public services both in the areas of social development and public health services, including infrastructure such as water resources and roads.

CHAPTER II

BACKGROUND OF BAN LIMTHONG

Most Isan villagers are rice farmers whose living relies mainly on uncontrollable natural factors. Villagers are often in debt due to delay in rainfall and drought during the rice growing season. Unproductive cultivation forces villagers to borrow money more and more, which leads to chronic debts. Compared to other regions, Isan is deprived of water and its people's experience in dealing with drought has led them to find ways to store water for use during the dry season and to share with others in the same community. In Nakhon Ratchasima (Khorat basin), for example, people have learned to dig ditches around their community and, in some places, to create a system of waterways around their village[20]. Ban Limthong, Amphoe Nang Rong, Changwat Buri Ram, a selected case study, has successfully managed its water resource as a learning center and has passed on its experience of social learning to manage water resources and develop processes in order to establish a social network. This chapter will provide historical and social background of the village of Ban Limthong.

2.1 Historical Background

Based on the oral history of Ban Limthong, the first group of migrants chose to settle and cultivate where the soil was rich in nutrients and water. The place chosen as a new village site in 1925 was characterized by two elements: water resources and forest. Ban Limthong was once a rich source of large trees and a wide variety of plant species.

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[20] Seri Phongphit and Kevin Hewison, **Thai Village Life Culture and Translation in the Northeast**, (Bangkok: Village Foundation, 1990), 6-16.

There was a huge clean swamp abundant in aquatic creatures and fish that also provided the villagers with adequate supplies of fresh water all year round.

The three headmen who moved to settle in Ban Limthong were Mr. Ho Sinsuphan (โฮ สินสุพรรณ), Mr. Toe Thongsaard (โท ทองสะอาด) and Mr. Mee Ruengsri (มี เรืองศรี). The first two were *Suay* (ส่วย) ethnic minority, having migrated from Changwat Surin (สุรินทร์) and Changwat Sri Sa Ket (ศรีสะเกษ). These two started off by occupying the land in the area where the Lum Mat (ลำมาศ) (a natural canal) runs past and near a lush forest teeming with life, before moving in to settle down. As for Mr. Mee Ruengsri, he is of *Thai-Khorat* origin. Mr. Mee, together with 40 other families, a total of 200 people, moved to Ban Limthong from a tambon, which is now known as Tambon Chum Saeng (ชุมแสง) in Changwat Buri Ram, when it was taken over by the Khorat governor (at the time). All these families had long known one another and had taken possession of a lot of land a long time ago. After the settlement of the village for a while, Mr. Krum Boonkongchart (กรึ่ม บุญกองชาติ) became the first *Phu yai ban* (ผู้ใหญ่บ้าน) (or the headman of the village) and remained in the position for 3 years. Then he was elected to serve as *Kamnan* (กำนัน) (or the head of a group of villages) and remained in that post for 30 years, After that, Mr. Plan Boonkongchart (แปลน บุญกองชาติ) (Krum's son) assumed the post of the village headman for many years. The Boonkongchart family has taken the role of a community leader and continues to do so to the present day. As part of the settlements, the locals have established the village's *Pu-Ta shrine* (shrine for village guardian spirits).

Regarding the name of the village, it was told that one day merchants traveling on a wagon stopped for lunch under a huge shady tamarind tree standing next to the swamp. While they were resting, a golden wedge-shape object protruded from the water's surface. They greedily rushed into the water and tried to grasp the golden object. Surprisingly, just before reaching it, the golden wedge-shape object sank in the blink of an eye. They, therefore, named the place "Ban Nong Thong Lim" (บ้านหนองทองลิ่ม) (Ban=village; Nong=swamp; Thonglim=golden wedge-shape object). Ban Limthong Community parted from Ban Nong Thong Lim on 1 June 2004, and was given the new name "Ban Limthong", similar to their original hometown[21].

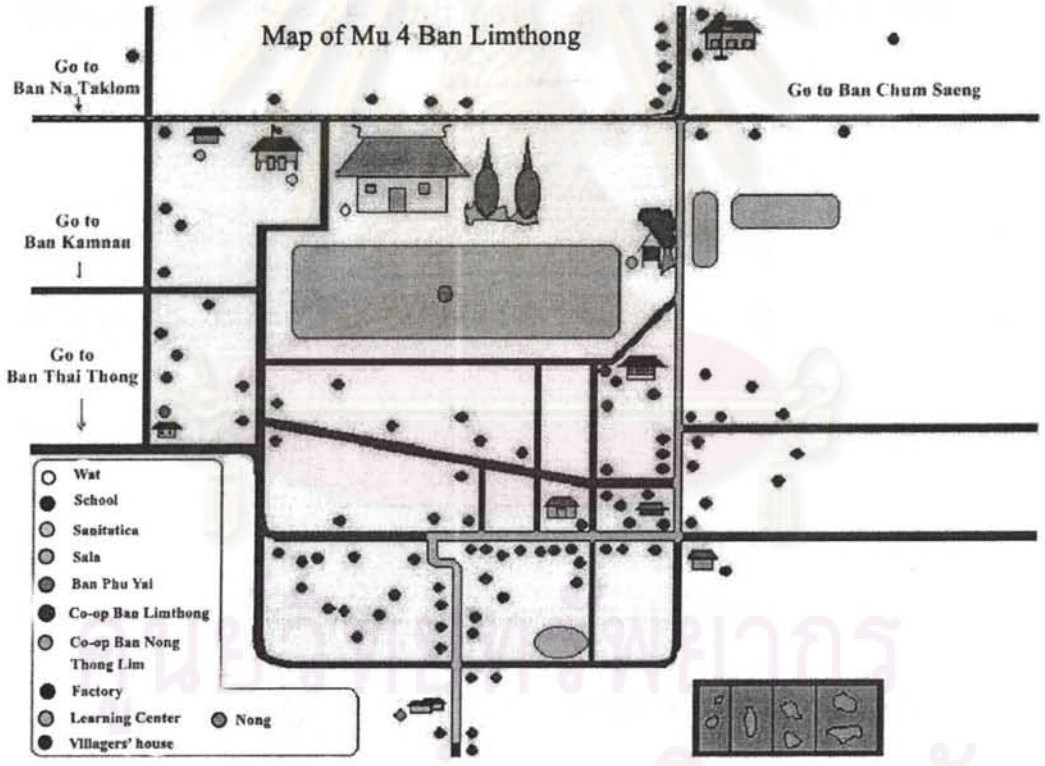
2.2 Physical Background

At present, Ban Limthong Community is under the administration of Tambon Nong Bot (หนองโบสถ์), Amphoe Nang Rong, Changwat Buri Ram, 69 kilometers northwest of Buri Ram city limit. Nong Bot is located in a flat, plain area, a little above sea level. The soil structure here is of a sandy loam, which is suitable for growing field crops, rice and trees and the area enjoys the benefit of a natural water resource, known as the Lum Mat, that runs through it. In the care of this tambon, there are 14 villages in total, including Mu 1 Ban Sa Kham (สระขาม), Mu 2 Ban Sa Pradu (สระประดู่), Mu 3 Ban Nong Thong Lim, Mu 4 Ban Limthong, Mu 5 Ban Khok Maka (โคกมะค่า), Mu 6 Ban Nong Bot, Mu 7 Ban Nong Yang (หนองยาง), Mu 8 Ban Tha Pun (ท่าปูน), Mu 9 Ban Khok Phluang (โคกพลวง), Mu 10 Ban Nong Kan Nga (หนองกันงา), Mu 11 Ban

[21]Interview with Plan Boonkongchart, A former head of the village, 6 April 2008.

Nong Takain (หนองตะเคียน), Mu 12 Ban Non Si Suk (โนนศรีสุข), Mu 13 Ban Nong Bot Phatthana (หนองโบสถ์พัฒนา), and Mu 14 Ban Thai Thong (ไทยทอง). The village is bounded on the north by Mu1 Ban Sa Kham village, the south by Mu 9 Ban Khok Phluang village, the east by Tambon Chum Saeng, and the west by Mu3 Ban Nong Thong Lim and Mu14 Ban Thai Thong village, respectively. A vast plain of sandy soil dominates the landscape of the village.

Figure 1: An outline map of Ban Limthong, located at Mu 4, Tambon Nong Bot, Amphoe Nang Rong, Changwat Buri Ram.



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology.

There are three schools in this tambon, one of which is in Ban Limthong village. This school was established in 1947 in a pavilion, even before the construction of the local temple. The school was offered primary education from grade 1 to grade 4, and the

school later expanded in 1997 to offer education up to the 9th grade (the 3rd year in secondary school) and it now has a nursery center as well in the village.[22]

2.3 Community Geography

2.3.1 The village's way of life

The villages' way of life shows that their traditional production system is based entirely on a high level of self-sufficiency living. They have developed efficient schemes to protect and take care of their precious resources.

Annual produce is for household consumption, for merit-making, as well as for other ceremonies. The village's structure is composed of extended families. Almost everybody is related by blood and by marriage. There are not many different family names among those living in this village.[23]

Their livelihood, lifestyle and food are also different. Having adjusted to their surroundings, the villagers have developed unique ways of preserving food. They have also developed their own technique to maximize their catch as well as build on their knowledge about various plants in the area for food and medicinal purposes.

Villagers also share similar traditions and cultures as other in Thailand such as *Songkran* (สงกรานต์) Festival, Buddhist Lent, or *Loy Krathong* (ลอยกระทง) Festival. Apart from these, the local community holds two spiritual ceremonies to ask for rain.

Water problem were in crisis in this village for over decade. The villagers had their own ways of religious ceremonies to ask for rainfall from nature, or at least cheer

[22] Interview with Paveena Tipnangrong, A head of youth leader, 10 February 2008.
[23] Interview with Koon Thongsaard; Boonsong Boonrod; and Somchai Angkabpetch , A group of elders, 11 May 2008.

them up from the trouble they were in. Their life was hanging with superstition and supernatural power.

One of the ceremonies is called the *Hae Nang Maew* (แห่นางแมว). This rite is performed around the sixth or the seventh month of the lunar calendar when there has been a lack of rainfall. Villagers place a female cat in a cage, which is part of their fishing equipment and carry the cat around, chanting and praying for rain and rice. In addition, villagers also perform a local traditional dance in front of the *Pu-Ta shrine.* The ceremony is performed in order to ask for rain, as without the rain the crops will fail. This ceremony was originated from the villagers' plea to their rain gods for the seasonal rain, and not the heavy depressions. People are also expected to observe Lord Buddha's precepts, as villagers believe with high moral standards are "*Deva*" (เทวา) in human form. In order to bring rain, which is also regarded as *"Deva"* or a god, villagers calling for rain are supposed to behave well too.

The other ceremony is called *Nang Dong* (นางด้ง). This rain making ritual is performed during Songkran Festival and it has been observed and passed on from generation to generation. When the villagers agree to perform this type of rain asking rite, some villagers will be assigned to prepare the props. These are a threshing basket, betel and betel nuts, flowers, incense sticks, candles, water and scented powder. Other villagers will prepare the location for performing the ceremony and inform villagers so that they all attend.

On the day set for this rain making rite, the village medium, who has to have prior experience performing this type of ceremony (and there is only one or two medium in

each village) will begin the rite by inviting the guardian spirits and devadas to the ritual area. The person will chant: "Oh holy spirits please descend; I hereby invite the medium and invite the holy spirits to possess the medium". After having successfully invited the holy spirits to participate in the ceremony, villagers attending the rite will chant the *Nang Dong* song in order to call the *Nang Dong* spirit in to possess the threshing basket held by the medium. When the spirit moves on to possess the medium, the threshing basket will vibrate and move. While this is happening, there may be a form of fortune telling by lots. For example, participants may hide a container containing water near the area where the rite is performed and ask the medium to find it. If the *Nang Dong* spirit finds the container, that would mean the villagers will get to enjoy dued seasonal rain in that particular year or that they would have sufficient rain. Then participants may ask the spirits to winnow the rice and if the medium performs a traditional dance gracefully while winnowing, that would also mean they would get sufficient rain. Apart from these two ceremonies, Ban Limthong has another rain making rite called *Nang Sum* (นางสุ่ม), which is similar to *Nang Dong Ceremony*, except that the equipment used is different.[24]

2.3.2 Population

At present, Ban Limthong village comprises 117 households, 230 males and 222 females. The population totals 452. Today, 90% of the villagers in this community are *Thai-Khorat*, 9% are *Thai-Lao* and the remaining 1% are *Thai-Kamae*. The Populations of Ban Limthong can be divided into different age groups as follows:

[24] ครูมนตรี โคตรคันทา, **ประตูสู่อีสานบ้านเฮา** (ออนไลน์), 25 มกราคม 2553, แหล่งที่มา www.isangate.com/local/boran_isan_08.html

Table2: Distribution of population by age group

Age group	Number of people
0-7 years	65
8-14 years	70
15-25 years	40
26-35 years	100
36-59 years	132
60 years and above	45

Source: Community Water Committee

The major occupations are rice and fruit farming, animal raising and manual labor. Among the people in Ban Limthong village, 75% of them are farmers. Another 25% of the population are general employees while the remaining 5% are government officers. Agricultural crops grown include rice and cassava and the villagers also keep cattle and pigs. Their native dialect is called *Thai Dang* (ไทยเดิ้ง), which sounds a lot like *Thai-Khorat* a typical language spoken in Changwat Nakhon Ratchasima. Apart from this dialect, a small number of people speak other variations of the northeastern dialect and Khmere.

All villagers are Buddhists. There are 2 temples and one monastery in Tambon Nong Bot. One of these temples is located in Ban Limthong village. The *Up-Ta shrine* was built since the first settlement and had served as monks' monastery before the temple in a village was built in 1952 named *Wat Suwannaram* (วัดสุวรรณาราม).[25]

[25] Interview with Paveena Tipnangrong, A head of youth leader, 10 February 2008.

Following the expansion of educational service, only 10% of the populations over the age of 25 in the village have received a fourth grade education or less. Approximately 60% of the populations are high school graduates while 30% of the populations are on informal education programs and 5% have a bachelor's degree.

At the moment 5% of the young people in this area have not yet completed the 9th grade (the third year of their secondary education), 45% of those in this age range, have completed the 9th grade while another 45% have completed the 12th grade or have completed the final year in high school and the other 5% have achieved a bachelor degree.

2.4 History of Community Forest

The community is located close to the Lam Mat and water resources. The forest in the area at the time was rich and teeming with life. Wild animals such as gaurs, common barking deer, deer and types of trees usually found in mixed forest such as *Siamese Sals, Ingyins* and *Engs* were found here. Several kinds of fish such as shark catfish, catfish, snakehead, grey feather back fish and flat head fish were found in their water. People could choose the location and the size of their plots as they pleased or as they could afford. Houses were built around and close to the pond. In the past the pond was wider and deeper than what it is at present. It took the shape of a deep pan, with the depth of 3 meters.

About forty years ago, the forest in this area took up a space of 2,500 rai (or 1,000,000 square meters). Around this time the Agricultural Land Reform Office divided the land up for farmers to grow their crops. Villagers then believed that if they had left the land allocated to them as a forestry area, the plot would be confiscated and made a

reserve. As a result, the forest was destroyed and trees turned into charcoal or used for building houses. In 1955, clearer land title deeds were then established.

Over the past 20 years the forest has been completely destroyed, leaving the land dry. Villagers could not find as much wild products as they used to in the past, when the forest was still teeming with life and rich in natural resources. With the villagers' habit of counting on just one crop a year, during the rainy season, 200 rai worth of land (or 80,000 square meters) could only yield 2,000 litres of rice during the past 20 years of severe drought. Villagers' produce was neither sufficient for a household consumption, nor for sale.

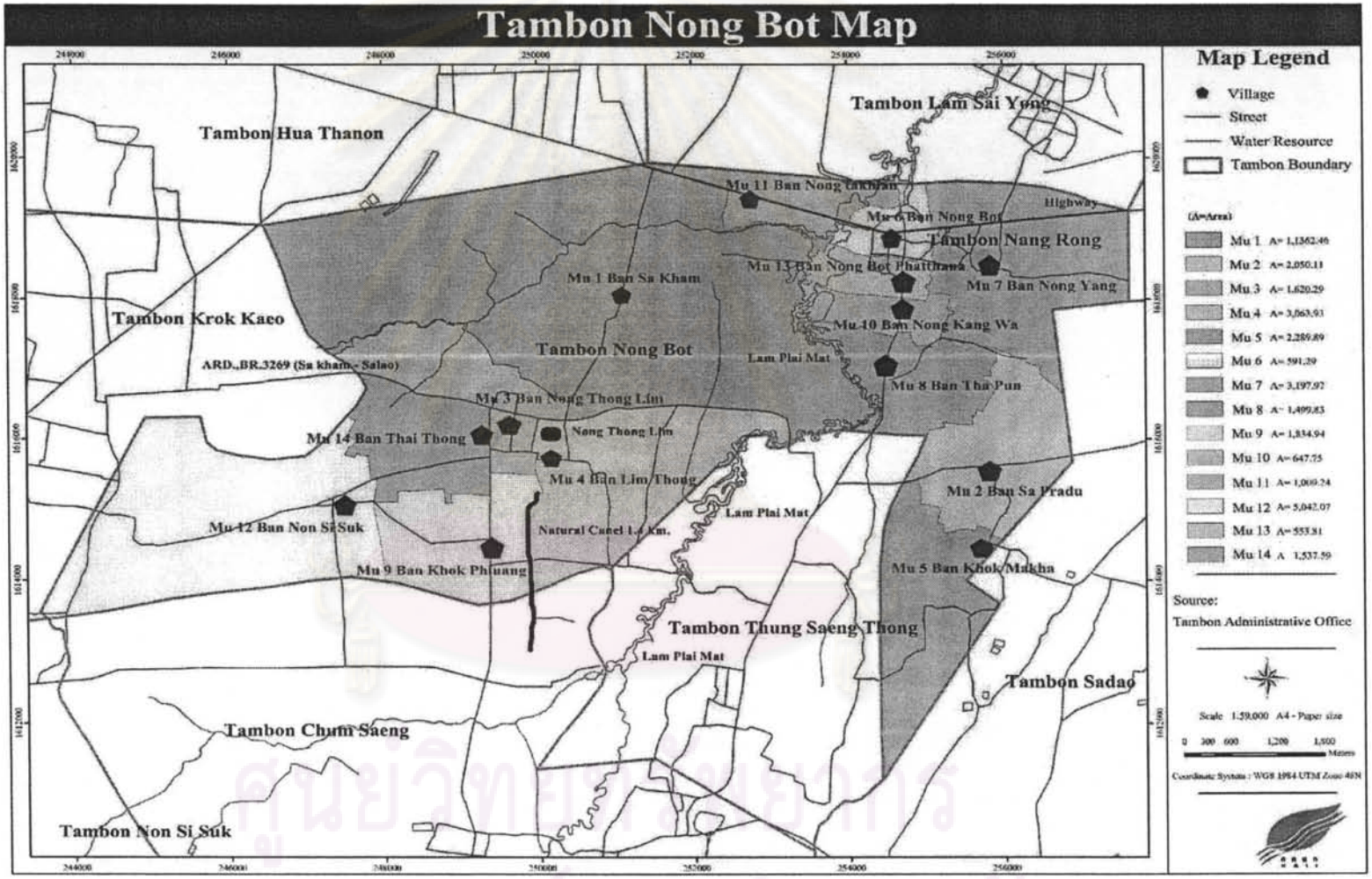
Forests near village have rapidly disappeared over the past 30 years and villagers are encouraged to grow commercial crops. Without forests, the land cannot absorb or retain water from the rain because of poor soil quality.

Along with the increasing population deforestation began. The village has even invaded forest reserves. Eventually villagers have had to move out to look for jobs in other parts of the country or even abroad. However, the between these people, their families and their homeland remains strong.

2.5 History of Community Water Resource

In the past, there are three locations of water resources namely Lam Plai Mat (ลำปลายมาศ) (i.e., a big natural canal on the south and east of Ban Limthong which villagers called Lam Mat), Nong Thong Lim (i.e., the biggest pond in Ban Limthong), and 1.4 kilometers of natural canal on the south of Ban Limthong.

Figure 2: Ban Limthong before implementing water resource management



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology.

The villagers had to travel for 1-2 kilometers carrying hoes to the area called Ban Non Koon (โนนคูน). The area was in the middle of nowhere and the villager would scoop a shallow hollow for water supply. Some came by a bullock cart, some came on foot. It took people almost the whole day to get a 1-day water supply back to their families. If there was time left after working in the field, they would go to Ban Non Koon to store more water supplies that could be used further in a few days. The sweat from the task was as much as the water supply.

Water is the most important factors to the village's traditional production system. In the rainy season, jars are filled. They dry out later in the dry season. This cycle is repeated every year, but nobody has the courage to create more water storage on their farms. Even though rice fields are flooded every year, the excess water is useless. The villagers thought that they are in enough trouble, so creating more work to make farm ponds is another trouble. For water storage they have is only one pond in the community which does not meet the increasing demand.

The villagers also share and look after their communal water resources well. Many also grow vegetables for their household consumption near the water supply, sharing some with their neighbors.

Ban Limthong has a series of problems caused by water scarcity in the area. The changwat Buri Ram nickname of *Buri Ram Tam Nam Gin* (บุรีรัมย์ตำน้ำกิน) (Buri Ram people providing said to get water) is from this common problem in the area. Water supply is never enough to use both in the household and for agricultural activities. People's primary income is from seasonal rice growing which depends on rainfall only.

The cessation of the rain in the cultivating season damages the yield every year. Since earnings from the yield are not enough to cover all the costs, villagers start to accumulate debts. No rice in the field, no earning from the farm, all they grow are debts that take life time to repay.

People in Buri Ram have a rite for extracting drinking water by means of pounding. This is the local wisdom for tackling the lack of water. For this rite, people first dig up dirt to make a small hole. Then they take mud from a dried up well, a pond or a marsh and fill it in the hole. After that, they stamp on the mud until it becomes watery mud or put the mud in a woven bamboo bucket and beat it with a stick until it becomes watery mud, with high density. They would then leave the water in the mud to seep out and settle. The water extracted from the watery mud is clear on the surface, which makes it usable as well as drinkable, once it has been boiled. This wisdom shows their ancestors' hardship and their patience. They had to try to observe the nature and carefully consider the phenomenon before they could come up with a solution to their lack of water. Apart from this rite, villagers in this area also perform a rain pleading ceremony for the same purpose.

Due to limited water resources, the villagers have learned to make the most of every drop of water both for household use and cultivation. The idea is to use as little water as possible to do as many things as possible.

Forty years ago, the villagers used many instruments for water resource management such as a hand-irrigation pump with the aid of large spoon-shaped instruments, with which the water was thrown up into irrigation channels. The villagers were irrigating the fields along the Lam Mat, some using a wooden scoop, others treading

an endless chain of boards in order to lift the water to the trenches as a waterwheel. The villagers knew how water was scooped up with baskets tarred on both the inside and the outside and capable of holding 36 liters of water. The basket was tied to four ropes and two men drew water with it from the canal or trench. The basket was emptied on the other side of the embankment.

Basically, villagers in the community wasted their time hanging on fate. The best that could be done was complaining and requesting a water supply from the government. If the government support was not enough, water had to be bought from peddlers. When the yields were damaged, they asked for compensation from the government. When there was a flood, they asked for help to pump the excess water out of the field.

The voice of the villagers in Ban Limthong was heard and the government provided different facilities and projects into the area such as Ban Salao (บ้านเสลา) Reservoir, farm ponds, canals, roads, Green Isan Project, and a tower for a community water system. What they received from the government did not change their life because people didn't change. Without good management, the facilities became nonfunctional and or impractical.

An instant solution from the government is not an answer without the community's collaboration and community comprehension. Since the community did not feel the ownership of the facilities, the villagers did not feel the responsibility to look after those facilities. The facilities were not maintained. The canal became shallow, the water system tower became rusty, and ponds became cluttered by weeds. The gap between people in need and the government grew wider and this reflected the failure of development, too far from sustainability.

Nong Thong Lim was once a massive fresh water resource, covering an area of 26,000 square meters and was 5 meters deep. The water in this marsh was crystal clear with some algae and various kinds of fish, including shark catfish, catfish, snakeheads and sawfish. Now the marsh has shrunk to 18,000 square meters in size and 2.5-3 meters in depth due to land reclamation for the construction of a temple. Dikes were built around the marsh. Unfortunately, they blocked water from flowing into the marsh during the rainy season.

In the past, the water in Nong Thong Lim was used for household consumption and people then tended to settle close to the marsh. Villagers built shallower water reservoirs of 3-4 meters in depth for the purposes of consumption. In the early days of the settlement, villagers made use of these for household purposes. There are seven of these reservoirs, which villagers jointly built, four of which are located around the marsh while the other three were built around the village. The villagers have also built a huge reservoir in the middle of Nong Thong Lim to keep water for use during the dry season. Apart from these reservoirs, the villagers keep water in clay containers. In the early days, these containers were made from clay brought from *Dan Kwean* (ด่านเกวียน) and were kept at home.

This village is 4 kilometers away from the Lum Mat, its nearest natural water resource. In the past, people prefered to cultivate land near the Lum Mat and made use of hydro turbines made from bamboo to divert water into a pipe line, to feed water to their rice paddies. Plot owners at the time did all the cultivation themselves. In this area there were 14 hydro turbines in total, each with a lifespan of 70 years. These turbines were placed in parts along the stretch of the rice paddies. However, the villagers stopped relying on this idea well over 40 years ago. In 1951, the community jointly built dykes

close to the Lum Mat in three different spots: the first spot was in *Thung Pho* (ทุ่งโพธิ์) area, covering an area of 8,000 square meters, the second in *Thung Ta Duang* (ทุ่งตาด้วง), taking up a space of 10,000 square meters and the third in *Thung Manaw* (ทุ่งมะนาว), covering the same amount of area as the second site.

In the past, people in the community cultivated for household consumption only. However, the rapid population growth has resulted in severe damage being done to the natural environment. Apart from the population expansion, there were other factors contributing to the destruction of the forestry area. These include the people's habit of cutting down trees to make charcoal and because of their misconception of the government's policy on the National Forest Reserves, villagers started cutting down more trees in order to avoid having their plot taken away. Likewise, the rapid growth in population pushed up the demand for wood to construct shelters, leading to further deforestation. As a result, water for consumption became scarce during 1975 – 1976. During the dry season, villagers had to gather around 8 pm in order to search for artesian well water. Just under five years later, the forest has been destroyed and the amount of natural water had dropped and become murky. Worse still, the small amount found was not sufficient and the quality was far too poor to be used for household consumption.

In 1981, the villagers began to grow economic crops such as cassava and sell their produce to industrial plants. Soon after that, they were faced with the absence of seasonal rain. Without reserved water, the people lacked water for agriculture. Apart from drought, villagers were also hit by flash floods in September and October.

In the past, beside the Lum Mat, this community used to be able to rely on a natural waterway of just under 1 meter in depth, situated close to the village, allowing them to control the amount of water going into their rice paddies. People who had moved to settle here in the early days tended to opt for plots close to water resources. Later when this stream dried up and failed to function in 1982, the Department of Mineral Resources installed eight pump-handle artesian wells, each of 7 to 8 meters deep. These wells were placed in at the centre of the community. They worked well for about four to five years but then failed to function because there was no underground water left. On top of that, some of the wells' pipes were broken due to the lack of maintenance. Soon enough after that the amphoe government distributed clay water containers to the villagers, so that each and every household has a container to store water for consumption. Since then, the villagers have stopped relying on the shallower reservoirs and at the same time, the water in these reservoirs has decreased dramatically.

In 1985, there was another attempt to put an end to water shortages in this area by the Department of Mineral Resources by establishing a community irrigation system at a local temple. However, this was not a good enough solution to the problem, as the system was not available for extended hours of use. Villagers in Ban Limthong and Ban Khok Phluang had to take turns using the system. Then in 1987, the Royal Irrigation Department established the Khlong Pak Pa Kab (ปากปะคาบ) water resource, at the point where two rivers meet but these communities still could not make use of the water from the resource for agricultural purposes. Worse still, the small reservoirs built on the agricultural plots to retain and store water from flash floods are not efficient enough to hold water for a long time due to the quality of the soil used to build them.

The villagers mainly made a living by doing only rice farming, and the yields relied on the rain level. Unless the rain is enough to increase the yields, the community will hardly earn enough to feed their families. After annual rice planting, people had no other sources to make a supplementary income. Once they started borrowing money, their income from rice farming was to pay off the debts. A major problem in Ban Limthong Community was accumulating debts.

Ban Limthong Community was also facing the problem of drought and had limited access to clean fresh water for household consumption. Agricultural activities, the only source of income, were also hopeless to solve their debt problems with the inadequate water supply. Most people in Ban Limthong were once living aimlessly and deeply in debts. Due to lack of knowledge, people in Ban Limthong did not know how to begin to improve the standard of their living.

2.6 The First Lesson of Social learning

Rapid and extensive socio-economic changes, regional prosperity, modernity and the first introduction of amenities such as roads, electricity, water and a wide range of technologies introduced to the village had adverse effects on the casual way of life and rich culture of the villagers. They stopped helping one another in the fields, started hiring supplementary laborers instead. Without knowing the impacts of such changes, the people of Ban Limthong began to face a soaring debt problem.

The debts are increasing and the yields can not pay them off. Their sweat does not make enough for living. 15 kilograms per rai is not what people can live with. Even though the villagers own their land, the water supply is not enough to make adequate yields. The area is at a higher altitude without any irrigation system. People are left with

is only a wither piece of land. The community is bounded by their fates. Since the yields could not feed their families, the villagers left their homeland to find laboring jobs in the city. There are only babies and elders left at home. The community is entering the era of breaking down.

Ban Limthong is a case study of villagers' cooperation with inside and outside networks in water resources. In this community, Mrs. Sanit Tipnangrong, (สนิท ทิพย์นางรอง) (Aunt Noi (น้าน้อย) Krum's granddaughter and Plan's niece), is the community leader who manages to live without debt by using household budgeting to change her life. (Figure 2) Aunt Noi and her family were heavily in debt and had no way to settle it. After having the opportunity to learn about household accounting, preparation of life plan and supplementary career from the Lighthouse Project's representatives, she was able to settle all her family debts by early 2003.[26]

She learned to make plans for the future of her family and hoped for a better quality of life through effective career and life planning development. All of which would not be possible without the full support of her husband and her children, especially her daughter, Miss. Paveena Tipnangrong (ปวีณา ทิพย์นางรอง), who worked alongside her mother in making the family plans for 2-3 years ahead. With great pride, both mother and daughter transferred to their fellow-villagers how doing their household accounting helped them to pay off their debts. They extended the success of this project to their community and raised their standard of living progressively.

[26] The Suksapattana Foundation attempted to apply the Constructionism theory found and developed by Professor Seymour Papert of the Media Laboratory of Massachusetts Institute of Technology, USA, to the development of education suitable for local environment and Thai Culture. In 1988 the Foundation adopted the theory and applied it to its Lighthouse Project carried out in many areas of Thailand.

Figure 3: Mrs. Sanit Tipnangrong, or Aunt Noi

Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology.

Advantages which the community received from household accounting are the following:

1) A chance to practice calculation, raising community awareness of credit and debit transactions; eliminating unnecessary purchases; efficient use of resources and money.
2) Planning for debt relief program, able to appraise the annual credit and debit accounts, leading to budget planning for sufficient money to spend and the rest of the money to repay debts.
3) Applying the learned experiences in household accounting to family career planning.
4) Utilization of a computer in data entry, calculation and accounting leading to the learning of modern technology for the benefits of future livelihood and preparation of a life plan.[27]

At the beginning of community water resource management, the community set up regular meetings to figure out how to solve the water supply problems for household

[27] Hydro and Ago Informatics Institute, **The Learning of Aunt Noi and Her Family**, (Bangkok: United Nations Educational Scientific and Cultural Organization, 2005), p.30.

consumption and agriculture. In 2005, they started to survey their area and try to find ways to solve the problems without requesting help from others.

One issue was raised: why they were not able to solve their problems permanently even though there were a lot of opportunities offered to the community. Questions were why they still had debts, low incomes, and a low quality of life.

The villagers realized water had been an important issue for many generations. This community has never had sufficient supplies. Community meetings were mostly about road construction and other development. Aunt Noi brought up the issue in a meeting about how to improve the way of life and how to build a canal for a water supply; this was an important step to lead to a right solution. People in Ban Limthong and nearby communities started working together, bringing knowledge from villagers to find a solution for water shortages in the area.

With a clear comprehension of community problems, a process of planning was started. A first agreement of the people in the community was that nothing would ever change unless they started changing it. The villagers of Ban Limthong started making a plan to find a better water supply for their community by their own efforts.

The community cooperation to create the plan for water solution marked the beginning of everything. "Together for One Another" was a first lesson of social learning.

CHAPTER III

COMMUNITY WATER RESOURCE MANAGEMENT

Ban Limthong once faced this persistent water scarcity problem. The villagers had accumulated debts because of unsuccessful agriculture. Their main income came from rice farming which relied only on rainfall. However, the fact is that the rainfall data in the Northeast shows sufficient water supplies to do agriculture all year long. But, little amount of water was reserved. The solutions would be by adding water resources in the area.

This chapter will provide information on Ban Limthong's water resource management. The community has solved their problems by improving their community water system and water storage. The villagers have planned to improve watercourses in the area to forward water from reliable water resources to their farms. The impacts are not only for the villagers to have a better supply for agriculture, but also a sustainable network of water resource management. The new watercourse project has received full collaboration from people in the community and its neighborhood. Moreover, the villagers have learned how to plan their agricultural activities to balance the activities with available water supplies in order to obtain successful results.

3.1 Community Water Consumption

Rainwater in Ban Limthong began to be used as drinking water only with the introduction of metal roofing about fifty years ago, and has become common amongst villagers only over the past thirty years, but even now, few can afford it. Ordinarily, a villager's house has a roof made of leaves, grass or wood tiles. In the latter case, the

owners also stored rainwater for drinking only in small clay jars, not in tanks, large ceramic jars, or large cement jars, all of which were introduced relatively recently.

Mostly water from rain was stored in large containers at each household. One of the water- related problems in Ban Limthong was water for household consumption, an ancient issue. A previous system was constructed by Department of Mineral Resources to pump groundwater up to a 25-meter-high tower and forward it to households. However, supplies were not sufficient because the amount of groundwater was very little and the use of an electric pump was very costly. The water was not of good quality; it was unclear and contained a lot of sediment.

With the previous community water system, two communities took turns. Ban Nong Thong Lim, 80 households, took the shift in the morning from 6 am to 6 pm. 60 households in Ban Limthong took their shift in the evening from 6 pm to 6 am. The pump did not last very long because of low maintenance and heavy use. A tower of the community water system did not meet the needs of the community.

From meetings throughout the year of 2005, the community started to solve their water issues. Villagers surveyed the households of the two communities, and found a total of 230 households or 1,030 people. The conclusion was to seek a better community water system. The villagers were suggested to visit Community Based Involvement in Rural Development (CBIRD) in Phutthaisong (พุทไธสง), where the best of the community water system was. CBIRD has helped many communities to form their own water system. It was a great opportunity for the villagers from Ban Limthong to visit the site and learn from the best at Ban Sra Bao (สระบัว), Amphoe Phutthaisong Changwat Buri Ram and Ban

Prathai (ประทาย), Amphoe Prathai, Changwat Nakhon Ratchasima. When the villagers learnt from the center, they would know what they could do for their own community.

The prototype of the community water system in Phutthaisong was not right for Ban Limthong because there was insufficient groundwater in the area. This issue was brought up in a meeting with Hydro and Agro Informatics Institute (HAII) (สถาบันสารสนเทศทรัพยากรน้ำและการเกษตร (องค์การมหาชน)), who were involved in the initial survey. A solution was that Nong Thong Lim Pond was an ancient water resource of the community. The pond has never been empty and it could be used as the main resource for the new community water system. The plan was to build 9 farm tanks, 3 meters high each, including 3 tanks of filtration and 6 storage tanks of clear water supplies. The new system was connected to the existing pipe to forward water to households.

The community water system plan was moving forward. CBRID provided suggestion for the construction and the Coca-Cola Foundation Thailand (มูลนิธิโคคา-โคลาประเทศไทย) contributed a financial support of 250,000 baht for the construction. Everything was coming together with the collaboration in the community and self-solving skills.

In July 2006, staff from CBRID visited Ban Limthong to help plan the construction and the process was started on 28 July and completed on 14 August 2006 by over 100 villagers from the two communities. This water system represented the success of community collaboration as well as the sense of community ownership.

The water system has been serving both communities (180 households) 24 hours a day over since. The two communities changed from taking turns to use water to having

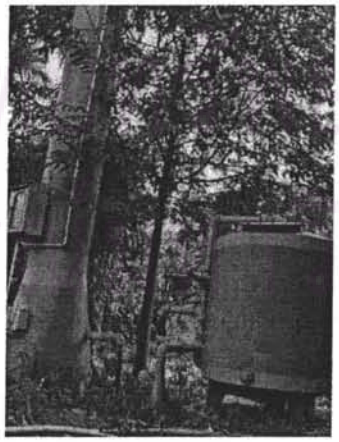
access to clean water 24 hours a day. Every household was responsible to pay for the utility: 6 baht per unit. The fee collected from the villagers was used for the system maintenance.

The community's cooperation to create the plan for water solution marked the beginning of further solutions. "Together for One Another" was a first lesson for the community. A small further step was always better than wasting time hoping for the best and doing nothing. There were more coming stories of success.

The first valuable lesson of the community water system strengthened the sense of ownership within the community, so they started to survey the area to find water for agriculture.

After people in the community had learned to plan for their agricultural activities, they realized that their standard of living was limited because of insufficient water supply, so they came up with plan to solve their water-related problems. "The Community Water Resource Management Project" was then started to respond to the needs of the community.

Figure 4: Previous Water System for Household Consumption



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

The first project was to better a community water system for household consumption. This water system was planned to give people in the communities (Ban Limthong and Ban Nong Thong Lim) access to clean fresh water 24 hours a day.

Since people in Ban Limthong Community had a plan to solve their problems improve their standard of living to better their being, they realized that what they needed was an adequate water supply. "The Community Water Resource Management Project" was developed responding to the plan of the community. A first priority was to build a new community water system with a capacity to deliver water supply to every household in the two communities (Ban Limthong and Ban Nong Thong Lim) 24 hours a day. As a result, water tanks and water treatment systems were constructed with a budget of 250,000 baht with no labor charge because over 100 people from two communities volunteered to complete the construction. The number of households receiving the benefits from the new water system is 160 households.

This construction represented not only the success of the concrete structure, but the success of community collaboration as well. Before the construction of the new water system, the community formed water committees to draft the rules of water management. The committees were made up of 23 members from the involved communities to maintain the system.[28]

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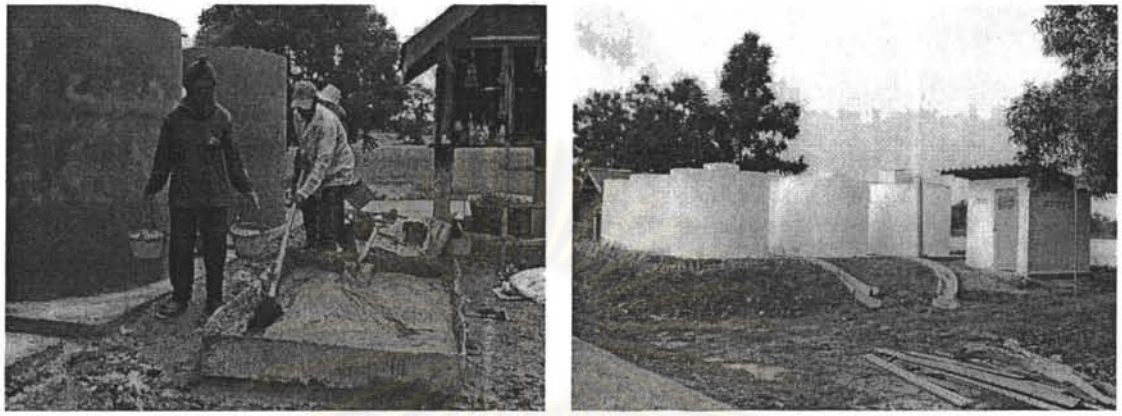
[28] สถาบันสารสนเทศทรัพยากรน้ำและการเกษตร. **จากการเรียนรู้สู่การจัดการทรัพยากรน้ำและการเกษตร.** (กรุงเทพมหานคร: 2550)

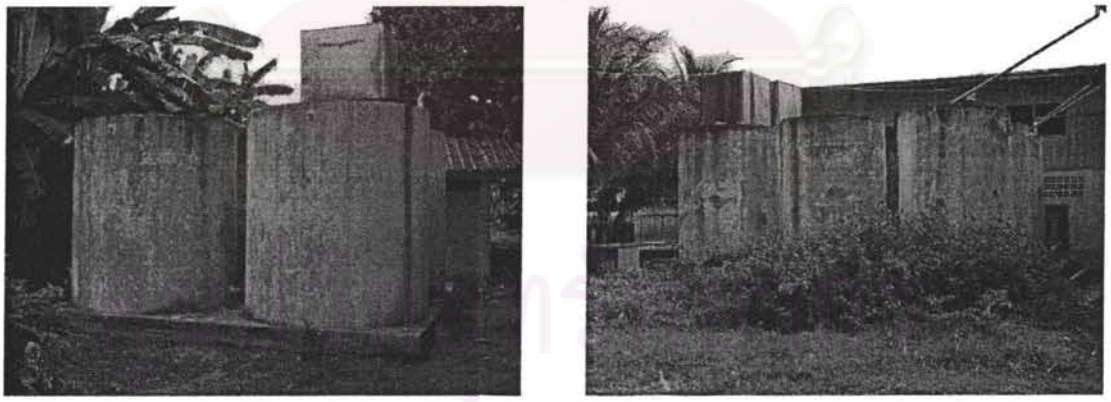
Figure 5: Construction of New Water System



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

For drinking water, Ban Nong Thong Lim School has approximately 500 teachers and students. Drinking water at the school is contaminated by bird droppings and has a poor water filter system. Despite owning over 14 rainwater tanks, there is not enough drinking water for daily demand which forced them to pay water charge.

Figure 6: Previous Water System for Drinking Water at School



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

With the cooperation of teachers and students, the Water Project was launched to supply sufficient, clean and hygienic water for drinking and to reduce cost of water charges at the school. A water filter system, situated at the back of school canteen, was installed with the cooperation of every group in community. The system comprises:

- 3 strainers with the capacity of 6,000 liters per day
- 1 reverse osmosis strainer with the capacity of 250 liters per hour
- 1 ultraviolet pasteurizer
- 1 stainless drinking water tank with the capacity of 2,000 liters, and 1 polyethylene tank with the capacity of 1,500 liters with controlling equipment and system

Figure 7: The installation of water filter and controller system

Square-shape tank to store water(underground water)

Tank to store filtered drinking water

Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

Table 3: The Potential of Water Filter System in Ban Nong Thong Lim School

Water Sources	**Underground Water**
Reserved water (underground water)	2,000 liters (2 square-shape tanks, with approximate capacity of 1,000 liters)
Production rate of drinking water	6,000 liters per day
Drinking water consumption	1,000 liters per day (500 people x 2 liters/person/day)
Reserved filtered water	3,500 liters (a 2,000 liter stainless tank, and a 1,500 liters polyethylene tank)

Water Sources	Underground Water
In case of unworkable underground water pump	Can reserve drinking water for 4 – 5 days
Cost reduction	Cost reduction in drinking water charge, approximate 10,000 baht per day (500 people x 20 baht/person/day)
Health and sanitation	Reduce risk of infection from drinking unhygienic water

Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

3.2 Community Agricultural Water

The main income of villagers in Ban Limthong was from agricultural activities. They could barely feed the whole family with a little income since water supply was not enough to increase the yields. Consequently, people in the community started to look for other water resources besides rainfall. They surveyed the watercourses themselves and manually collected the data.

As a result, the first project was also to help the community have better water resources in the area to do agricultural activities and find solutions to reduce the impacts of drought.

The community set up a meeting to discuss the issue of water scarcity for agriculture. From ground zero, the meeting brought light to the area. The elders from other nearby communities knew the ancient waterways of the area. These were the paths to connect Ban Limthong and other communities to a better water source. In October 2005, the plan was started. A first team started a survey of the ancient waterways as told to them by the elders of the community. They found possibilities to bring water into the area. There was hope. There were more following-up surveys. The adults led the young through the way and collected more data of water resources and water retention.

The young and their adult leaders used Global Positioning System (GPS) receivers to specify locations and compared the data with satellite images of Tambon Nong Bot and applied the knowledge provided by HAII to their plans. They learned that technology could help facilitate their plans. At first, they were not familiar with the technology, but they learned by experience in the field. The young were faster-learning and they helped their leaders with fun. A serious commitment of working together was very valuable and also strengthened community learners.

The bright sunshine made the team tired and they sat down together. Even during breaks, they kept on working, still discussing their obstacles. The Khlong Pak Pa Kab (คลองปากปะคาบ) was one possibility, but it was very far from Ban Limthong. It would require a large pump to forward water supplies to Ban Limthong, which would be too costly. Another possibility was to forward water from the canal in Ban Salao, but this may lead to a dispute between Ban Limthong and Ban Salao. If they had never surveyed the area themselves, they would have never known these problems.

Since the villagers knew the obstacles and possibilities, they could find better ways to solve them. The last thing they wanted was to start a dispute with their neighbors. The team reviewed the plans and consulted with others in the community. The news reached the Tambon Administrative Organization (TAO), and the chief of TAO suggested the villagers to forward water supplies from the Khlong Palai (คลองปลาไหล) to another location and connect to the ancient waterway. The Chum Saeng TAO was going to renovate the river banks and put in a pipe to forward water to the Khlong Pak Pa Kab and water would be out into the Khlong Ban Salao. The plans were modified to make it fit the situation.

With several surveys and meetings, a first plan was concluded. If the plan was not drawn into an actual picture, it would be hard to work in a team. Each idea was included to make sure that people shared the same understanding of the plan. A drawing of a new canal was developed on a computer using Paint Program. One picture was more concrete than words and helped the team work in the same direction.

When there was a map, the villagers had the same understanding. The community shared their ideas in meetings and worked together toward the plan from ideas, to letters, to images, to actions. Sharing was a key to successful management. However, the villagers struggled to integrate data they received from the survey into the plans.

The fourth survey involved HAII to resolve the questions they had with the data. The villagers of Ban Limthong showed HAII their plans, maps, drawing, and IKONOS satellite images and explained how they combined their field data with the knowledge in Information Communication Technology (ICT) provided by HAII.

HAII helped the villagers to realize strategies they could apply to start water resource management. The villagers surveyed the area again along with learning how to use maps, GPS, and satellite images in different dimensions. They learned how the area of Ban Limthong was different from other communities with sufficient water supplies. The more they know about the problems, the more the community realized the importance of community water resource management.

The community learned that they needed effective questions to find right answers. Questions were an effective learning tool if the learners were eager to start their thinking process to find answers themselves.

The villagers started asking themselves these questions: where was the water, how to reach the resource, how to manage the supplies, how to connect the water ways, how much water could they gain, how long would the supplies last, and how were others impacted by these methods, They were in the process of learning how to find water, how to reserve it for the future use, and how to use the supplies appropriately. Since they realized what they were looking for, they should find a right answer in an effective way.[29]

Regarding community agricultural water, Mr. Luean Wisetpan (เลื่อน วิเศษพันธ์), a member in the community water committee, mentioned, "By applying new local wisdom and existing knowledge, community is able to improve the old canal that created from the ancestor's knowledge. The same canal has been helping people in the community to have a better life."[30]

3.3 Community Water Resource Management Plan

For a community water resource management plan, a committee was established to follow up on the recommendations. Through several meetings on Analysis of Solutions to Community Water Scarcity Problems the data of water demand and solutions was reviewed. Aunt Noi, Chairperson of Ban Limthong water committee mentioned that "We have to start solving our own problems ourselves. Learning-by-doing is to earn experience. We should also share our accomplishments to others Good ideas should be forwarded to other communities because there are communities without hope and support. Ban Limthong community is lucky to have our partners. The support would

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[29] Hydro and Agro Informatics Institute, **The Learning of Ban Limthong Water Resource Management**, (Bangkok: Hydro and Agro Informatics Institute, 2007), p.22-34.

[30] Interview with Luean Wisetpan, A member in the community water committee, 20 November 2007.

be worthless unless we started helping ourselves. There would not have been the accomplishment we had today."

The final report made the following conclusions:

1) Add more water retentions, called Monkey Cheeks, following the King's initiatives;
2) Construct a canal to forward water from Lam Mat to the community, a distance of 3.64 kilometers;
3) Renovate water passages in the area; and
4) Found a cooperative for community water resource management.

From learning to doing, the process of pondering and planning brought the knowledge of management into the community. The report by the water committees was Ban Limthong's way of coming together. The report was submitted to Royal Irrigation Department (RID) (กรมชลประทาน), Changwat Nakhon Ratchasima, on 13 July 2006. The director of the irrigation office accepted the report for consideration, as well as gave good advice regarding the plan. RID forwarded the plan to Nong Bot Administrative Office to survey the water path to Ban Limthong.

On 23-24 August 2006, construction staff from RID surveyed the area along with the water committees of Ban Limthong. Villagers who owned land in the way of the canal construction granted permission to use their lands for the new water passage. Everybody believed that water would bring life for them. Lands without water are useless. With complete collaboration among the villagers, a path to the dream was finally open.

Although the construction plan had to remain on hold until the next budget year, the hope was still up. The villagers kept following up the process, and also sought new knowledge about community water resource management by visiting sites with successful water resource management.

On 16 March 2007, the water committee from Ban Limthong made a visit to the office of RID and received very good news that the canal construction was included into the budget plan for that year.

After a year of waiting, the day was coming. Everybody was excited and waiting. On 10 June 2007, the construction began and strengthened collaboration in the community. The villagers were proud of the group because they worked together to make it happen. The canal was 3.637 kilometers long and 3 meters deep, with a budget of 1.96 million baht. Ban Limthong and other surrounding communities had advantages from the canal which covered 3,800 rai of cultivated areas, and 1,038 households in 3 Tambons, or 11 villages.

The canal was finished in the cultivation season, gaining a water supply of 121,000 cubic meters. The supply from the canal was very helpful for the community because they could grow vegetables in the dry season to earn more income. In the rainy season, the canal was used as water retention to collect excess water, preventing the cultivated areas from flooding. The excess water was kept as a supply for use in the future. The villagers had to manage the use of the supply for their cultivation all year long. Water brought the community better living, lessened their debts, and added more savings. The community realized that having an effective plan would create a better

future. The canal served not only one group of people, but was expanded to those who lived far from the canal. Hearts of people who care for others are always precious.

The water committee planned to establish the community water system by increasing water storage linked to one another as a network called *monkey cheek ponds* (water retention initiated by His Majesty King Bhumibol Adulyadej) and *small monkey cheek ponds* (farm ponds).

3.3.1 Community Water Resource Management and "The New Theory"

In March 2007, the Development Cooperation Foundation introduced two local experts on farm ponds and *"the New Theory"* (on agricultural process initiated by His Majesty King Bhumibol Adulyadej) to the Ban Limthong leaders. The first was Mr.Thongkum Yimrum (ทองคำ ยิ้มรัมย์), a village chief of Ban Non Kwang (โนนขวาง) in Changwat Buri Ram, and the second was Mr. Chantee Prathumpa (จันทร์ที ประทุมภา) from Ban Non Rang (โนนรัง) in Changwat Nakhon Ratchasima. They were invited to Ban Limthong to share their experience and local wisdom on how to manage water supplies and plan cultivation to fit the available water supplies throughout the year.

The community consolidated new knowledge from villagers to skills they already had on ICT. They understood more about community water resource management. In the meeting they discussed finding a conclusion adapted to fit conditions in Ban Limthong. The plan was to add more water storage called big monkey cheek ponds and mall monkey cheek ponds connected to the canal. The villagers contributed their lands to be dredged up for the water storage and areas around the storage for agriculture.

Monkey cheek ponds stored water from the canal and forwarded the water through small passages to farm ponds in the cultivated areas. The system served the community as a whole. People were sharing advantages from the system. The sharing was the unity of the community by passing their thoughtfulness through the stream.

The areas around the canal, the monkey cheek ponds, and farm ponds were used pilot plots for "the New Theory" and vetiver grass. The grass would be planted on the river banks to prevent erosion and moisture evaporation. Approximately 500,000 bunches of vetiver grass were planned to be planted.

Before the monkey cheek ponds were dredged, the villagers went out to survey the areas again on 28 March 2007. They used IKONOS satellite images and GPS receivers to find the right positions for the Monkey Cheek Ponds. A conclusion was to dredge up seven monkey cheek ponds covering an area of fourteen rai with the capacity of 65,700 cubic meters. The plan was brought up in the community meeting and the objectives of the monkey cheek ponds were summed up as follows:

1) To store water for cultivation during the periods of water scarcity;
2) To promote land and water resource management in a sustainable way with "the New Theory" in order to be able to farm all year long, make more income, and have a better standard of living; and
3) To promote planning and water resource management at the community level.[31]

Seven land owners signed an agreement to contribute their lands for public use. The land owners would be the group leaders of the ponds on their land and they included

[31] Hydro and Agro Informatics Institute, **The Report of Community Resource Management** (2008).

five members in each group. The group worked as a team to do agricultural planning, collect data about productivity, share experiences, and make a deal for their products. After the team got the work done together, they then shared their experience with other teams. This strengthened community learning and development following *Self-Sufficiency Economy* (His Majesty King Bhumibol Adulyadej's initiative).

The water committee and the seven leaders of the monkey cheek pond groups created the structure together and submitted the ideas to their network agencies. The Coca-Cola Foundation Thailand was always a helping hand showing their vision in continually supporting the Community Water Resource Management by sponsoring community water system for household consumption in the first phase and the Monkey Cheek Network for agriculture in the second phase. The monkey cheek ponds Network helped the community help themselves. Ban Limthong applied local wisdom and IT skills to solve their problems and this could be a prototype of effective water resource management at the community level, a foundation of the national community water resource.[32]

The monkey cheek ponds system management was set up as follows:

1) Release water from the upper area along the canal leading to Ban Limthong for 3.64 kilometers, covering 25 rai, 3 meters deep, with a capacity of 121,000 cubic meters. The canal is connected to 7 Mother monkey cheek ponds, covering 14 rai, 3 meters deep, with a capacity of 67,000 cubic meters; the total capacity of 188,000 cubic meters;
2) If the water level in the Lam Mat is lower than the new canal to Ban Limthong, the water will release from the new canal by gravity flow;

[32] Interview with Sanit Tipnangrong, A chairperson of community water committee, 10 May 2008.

3) Pump water from the monkey cheek ponds to release water to relieve flood problems;
4) If the water level in Lam Mat is higher than the new canal, the water gate will be shut to keep the one-way flow; and
5) The Monkey Cheek System works as an irrigation system to store water and prevent flooding. The capacity of 188,000 cubic meters serves the community in agriculture.

The monkey cheek ponds consist of 4,800 cubic meters capacity in each pond, 40 meters wide, 40 meters long, and 3 meters deep. The earth embankment is 10 meters wide and 1.5 meters high.

The community has the capability to identify problems, locate water resources, and use them efficiently. Community members maintain a network in order to provide access to water resources. In this case, agricultural production has increased substantially with significant impact on social development, such as income growth, better standards of living, and sustainability of water reserves. Social management impacts on management philosophy, degree of sharing, and process of developing sustainable community water resource management. Regarding to community water resource management, Miss Paveena, A head of youth leader, mentioned, "The villagers' participation and intention had led them to the success of community water resource management."[33]

Their initial plan and first success was the community water system with the cooperation of the Hydro and Agro Informatics Institute, the Coca-Cola Foundation and the Population and Development Association. Ban Limthong Community had faced the

[33] Interview with Paveena Tipnangrong, A head of youth leader, 11 May 2008.

problem of a scarcity of clean fresh water for a long time. The problem was solved with the Tank Farm system made up of tanks, water treatment, and piping. People in those communities have access to clean water 24 hours a day. This community water system has been able to serve people not only in the area of Ban Limthong Community, but also its neighborhood. The earnings from this water system are enough to maintain the system, plus extra to support other community activities. The community water system serves 160 households, and the success of the watercourse improvement covers three sub-districts, five communities, and 1,038 households.

For the second plan, the community water committee used GPS and Satellite Image Maps to collect data on sub and main canals, agricultural areas, and farm ponds in order to set a better plan for water allocation and increase the number of water storage areas by linking different canals into a systematic pattern. The community has also gathered other data, such as living areas, community forests, and groundwater ponds, to put on the community website.

The outcome from the application of technology is a map of watercourses in the area on the community website, which is good for water management and agricultural activities. People also used the map to come up with a clear plan of how to manage water resources in the area. The plan was submitted to RID asking for their collaboration and granted to improve the watercourses in the area.[34]

Later, the community water committee came up with a plan to improve canals and watercourses in the area and submitted it to the local irrigation office. This office then explored the area and included the plan into the annual budget of 2007. Moreover, there

[34] Interview with Paveena Tipnangrong, A head of youth leader, 11 May 2008.

was further development of water storages called Monkey Cheeks in Tambon Nong Bot Amphoe Nang Rong Changwat Buri Ram. The Monkey Cheeks construction has received full collaboration from community leaders and people in the area.

In May 2007, the construction of the Monkey Cheeks started and it finished in June. The lands for Monkey Cheek were donated by the villagers. The community now has 7 Monkey Cheeks Ponds covering a total of 14 rai. The capacity of the monkey cheek ponds has added 43% more water supply in the area. The extra supply can serve 500 rai of cultivated area and has increased the cultivated area by 150 rai. The details of the ponds are as follows:

Table 4: The Sizes of the Monkey Cheek Ponds in 2007

NO	Area (rai)	Depth (meter)	Capacity (cubic meter)
1	2.25	3	8,748
2	2	3	7,128
3	1.5	3	5,328
4	4	3	16,428
5	1.5	3	5,508
6	1.25	3	3,948
7	1.5	3	4,608

Source: the report of community water resource management 2008. Hydro and Agro Informatics Institute, Ministry of Science and Technology

In 2008, the water committees in Ban Limthong came up with the plan to add more monkey cheek ponds in the area. The good model of success in Ban Limthong has drawn more attention to the collaboration and more farmers in the neighborhood would like to be a part of this water network. The plan was put in action on 20th August 2008 and it exceeded the goal by adding 20 rai of monkey cheek ponds, instead of 15 rai. Eight are more monkey cheek ponds were added to the area with the total capacity of 83,882 cubic meters as follows:

Table 5: The Sizes of the Monkey Cheek Ponds in 2008

NO	Area (rai)	Depth (meter)	Capacity (cubic meter)
1	5	4	27,824
2	1	3	3,432
3	1	3	3,432
4	1	3	3,432
5	5	3	20,898
6	4	3	15,228
7	1.5	3	4,488
8	1.5	3	5,148

Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

There are commitments for the land contributors that the water supply has to be shared with other nearby households and the land contributors will have to sign the letter to give the members an access to the water supply. The number of members depends on the size of the pond. The members of the pond will take turns to use the water supply and they are required to do productivity plans corresponding to their available supply.

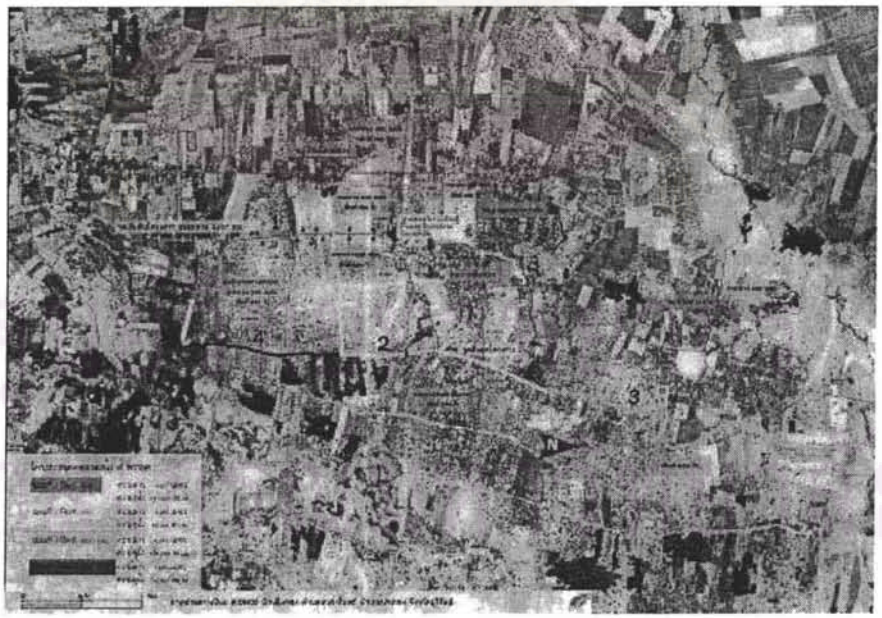
Following the renovation and repair of canal's embankment in April 3 2008, the new embankment has a total distance of 3 kilometers. The canal's renovation enlarge community's catchments to store 121,000 cubic meters of water in the rainy season and 72,600 cubic meters in summer, which can prevent damage during the dry season over an agricultural area of 700 rai.

In 2008, monkey cheek ponds increased by 20 rai in Ban Limthong. Buri Ram, The community has used IT to plan for water resource management. The conclusion from the community analysis was that the problem could be solved by adding more water storage in the area to reserve water for agricultural purposes. The most important matter is how the community will use the available water supplies effectively.

Ban Limthong is a learning community and they have a strong commitment to make their life better in a sustainable way. The community water committee has been formed to establish the rules for the villagers to share the advantages of the facilities. Water in the monkey cheek ponds will be shared among neighbors; they take turns to do agriculture following by the rules. The success of the project is that water supplies have improved the living of people in Ban Limthong by increasing incomes and strengthening community collaboration.

In the cultivating season, the new monkey cheek ponds have a total capacity of 83,882 cubic meters and the community has available water supplies to cover 840 rai of cultivated areas in the dry season. Out of the season, the total capacity of the ponds is 50,330 cubic meters and able to cover 126 rai of cultivated areas. [35]

Figure 8: An aerial map showing project work in the years: 2005, 2006, 2007 and 2008 covering 12 villages.



Source: Hydro and Agro Informatics Institute, Ministry of Science and Technology

[35] Hydro and Agro Informatics Institute, **The Report of Community Water Resource Management** (2009).

Besides the monkey cheek ponds, there is a plan to grow vetiver grass and shading plants on riverbanks for holding soil moisture, preventing landslides, and lessening moisture evaporation. This shows that the community has learned how to manage their local water resources in a systematic manner and that collaboration among people in the community and their neighbors is efficient.

The plan to dredge up farm ponds connected to the monkey cheek ponds was to increase the cultivated areas. The expansion of water resources and "the New Theory" was to establish the network of management at the community level.

3.3.2 Community Water Resource Management Fund

The Development Cooperation Foundation supported the community to dredge up their farm ponds connected to the monkey cheek ponds. The foundation set up a fund of 500,000 baht called "Water and Hearts for the King". The fund should reach the highest potential and create the most advantages for the community. Recipients of the fund had to follow the regulations and pay back the money so it could be lent to other households to dredge up more ponds. The fund would help the community to develop water resources and people who were eligible to share their ideas and wisdom on water resource management would receive the money.

The fund "Water and Hearts for the King", called "Truthful Saving Fund" by the villagers of Ban Limthong, supervised the selected committees to form the regulations for money saving, interest rates, and loan payments. The plan was to dredge up 10 ponds a year, 20,000 baht for each pond, and a 4-year loan for each participant to be repaid, 7,800 baht per year or 650 baht a month, and more details such as the following:

1) The membership fee is 50 baht per person;

2) The participants were required to attend training or study visits to learn about farm ponds and their advantages as well as "the New Theory";
3) Loans were for farm pond construction or other related issues covering the objectives of the proposed plan only;
4) Loans for agricultural purposes with a low interest rate were available to reach the potential of farm ponds and incomes; and
5) The benefits from the fund would be used only to support the members of the fund, other public interests, and the learning of "the New Theory".

When a participant is approved for a loan and becomes a member of the fund, other members will coach the newcomer on how to improve cultivation with farm ponds for at least six months. The member starts paying back the loan in the seventh month. The fund will have 20,000 baht of interest annually. This benefit will be used to arrange for training for at least 10-15 members a year. The committees of the Truthful Saving Fund look after the fund and report to The Development Cooperation Foundation every year.

The first ten farm ponds were finished in June 2007. The members were eager to follow the King's initiative in "the New Theory". They started to grow vegetables such as bananas, coconut, morning glory, straw mushrooms, Chinese pears, onions, galangal, lemongrass, string beans, chilies, limes, and pumpkins. The community strongly lives by following the King's initiatives.

Since the community had water supplies, they should be concerned about how to manage them for cultivation. Agricultural productivity should correspond to the demands of the market to get good prices; otherwise the villagers would not be able to get rid of their debts and will remain in the same cycle of troubles. To create the change, the villagers had to think further to apply what they had learned. In this respect, Mrs. Saman

Lothong (สามัญ โล่ห์ทอง), previous chairman of community water committee and Phu yai ban of Ban Kok Phluang, voiced, "Since people in the village start to manage water successfully, they now have been able to set up the effective agricultural plan. They also transfer their knowledge to the neighboring communities."[36]

3.3.3 Productivity Planning

In the process of productivity planning, the villagers found that they did not have sufficient data and did not know how to collect it. They had no idea what they were doing or if the production had any benefits or losses. They needed to start learning how to do productivity plans. They searched out data on household expenses, debt payments, income, and annual investment for cultivation in the form of tables using Microsoft Office Excel program. They started classifying their income used for different expenses they had in the household and estimating their income after investing in their agriculture productivity.

Supporting community productivity planning, Mr. Pairat Saengrat (ไพรัตน์ แสงรัตน์), the community water committee, said, "Watercourse and water retention is the pride of people in the community. Villagers have more income and do not have to migrate from the village because it is now possible to grow vegetable all year long. Water is the focal point that encourages people to work and solve problems together."[37]

In addition, the community also contacted Don Kwaen (ดอนแขวน) Market, one of the largest vegetable markets in Amphoe Soeng Sang (เสิงสาง), Changwat Nakhon Ratchasima. The market was a center to sell vegetables from Amphoe Nang Rong, Amphoe Nong Ki

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[36] Interview with Saman Lothong, Previous chairman of community water committee and Phu yai ban of Ban Kok Phluang, 23 January 2008.

[37] Interview with Pairat Saengrat, the community water committee, 11 May 2008.

(หนองกี่), Amphoe Soeng Sang, and Amphoe Khon Buri (ครบุรี). There were many distributors from different places coming to buy agricultural products. In May 2007, the community invited some distributors from Don Kwan Market to exchange information at Ban Limthong so the farmers could learn about marketing, pricing, demand, and distribution. What the community learned would be used to create marketing and productivity plans corresponding to the needs of the market. The villagers collaborated to sell their products and negotiate for product prices. The production would make possible a steady income for the farmers.[38]

3.4 Summary of Community Water Resource Management

In the past, after annual rice planting, people had no other sources to make a supplementary income. Once they started borrowing money, their income from rice farming was to pay off the debts. A major problem in Ban Limthong was accumulating debts. The community was also facing the problem of drought and had limited access to clean fresh water for household consumption. Agricultural activities, the only source of income, were also hopeless to solve their debt problems given the inadequate water supply. Most people in Ban Limthong were once living aimlessly and fell deeply in their accumulated debts. Due to lack of knowledge, people in Ban Limthong did not know how to begin to improve the standard of their life.

Villagers could benefit from gaining knowledge about the experiences of others. There are numerous "traditional" systems elsewhere in Isan and in Northern Thailand around which strategies for water regulation, leadership, penalties for misuse, and dispute settlement have already evolved. A compilation of strategies for

[38] Interview with a group of community water committee board, 20-21 November 2006.

the management of local irrigation systems could be of great value to participants in new government schemes, and to the officials who are involved in them.

Community water resource management in Ban Limthong is a case study of one village's cooperation with inside and outside networks in water resource. At the beginning of community water resource management, the community set up regular meetings to figure out how to solve the water supply problems for consumption and agriculture. In the year 2005, they started to survey their areas to and try to find ways to solve problems without requesting help from others.

Their initial plan and first success was the community water system with the cooperation of the Hydro and Agro Informatics Institute, the Coca-Cola Foundation and the Population and Development Agency. Ban Limthong had faced the problem of a scarcity of clean fresh water for a long time. The problem was solved with the Tank Farm system made up of tanks, water treatment, and piping. People in those communities have access to clean water 24 hours a day, changing from taking turns. This community water system has been able to serve people not only of Ban Limthong, but also its neighborhood. The earnings from this water system are enough to maintain the system, plus extra to support other community activities. The community water system served the people from 160 households, and the success of the watercourse improvement covers 3 sub districts, 5 communities, and 1,038 households.

For the second plan, the community water committee used GPS and Satellite Image Maps to collect data on sub and main canals, agricultural areas, and farm ponds in order to set a better plan for water allocation and increase the number of water storage areas by linking different canals into a systematic pattern. The community has

also gathered other data such as living areas, community forests, and groundwater ponds to put on the community website.

The outcome from the application of technology is a map of watercourses in the area on the community website to use for community management and agricultural activities. People have also read the map and have come up with a clear plan of water resources in the area. The plan was submitted to the Local Royal Irrigation Department asking for corroboration in improving the watercourses and was subsequently granted.

For solution and management, villagers learned how to do household accounting with the Education and Public Welfare Foundation and Community Based Involvement in Rural Development (CBIRD). Villagers have the knowledge to improve a community learning center for the young with knowledge of such technology as computer skills, GPS receiver, and satellite images. Villagers set up community water committees, created a map of watercourses in the area, improved the watercourses as proposed, and increased up water storages in the area to create effective water resource management. They improved the community system for household consumption and included management account for water users. They also made a plan for agricultural activities corresponding to the available water supplies using Microsoft Office Excel program and agricultural test plot to find ways to grow each kind of plants; for example, organic agriculture, water drop system, crop rotation, mixed agricultural produce, and sustainable agriculture. Villagers have marketing plan with cooperative produce and trade, members of the group work to find together more markets.

For water quality control, villagers improved the community system by adding a water quality control system for household consumption, not drinking quality. For effective use of water, villagers have learned the knowledge to hold water in the community pond in order to reuse it, to monitor water quality by checking sediment, to plant vetiver grass and perennial plants on the riverbanks to hold moisture, and to make a cycle of community water supplies to be reused in agricultural activities.

CHAPTER IV

COMMUNITY SOCIAL LEARNING PROCESS IN WATER RESOURCE MANAGEMENT

The community's water resource management in each area varies depending on its socio-geographical environment, in other words its geographical and social characteristics. Each community has its own unique way of managing their water resources that goes in line with its geographical environment and the villagers' way of life. This means each community's distinctive way of managing its water resources is an interesting and important social learning project that other communities can learn from and adapt that to suit their own recently water resource management scheme.

Social learning in Ban Limthong has later successfully resolved problems resulting from drought, soil degradation and the lack of water resources by incorporating their initial traditional knowledge, with additional experience gained and making full use of the King's initiatives, such as "the New theory", planting vetiver grass and the Sufficiency Economy philosophy in order to better manage their resources. Their success stories have become interesting examples of water resource management for communities in other dry areas or locations where water is scarce. People in the communities suffering from the same problem can then learn from these success stories and make use of them to their maximum benefit.

This chapter will analyze factors contributing to the success of Ban Limthong in community's social learning process and water resource management.

4.1 Community Potentiality in Social Learning

For social learning in search of remedies for problems relating to communities' water resources, Ban Limthong and its neighbouring communities had suffered drought and insufficient water year after year. The reservoir built by the Royal Irrigation Department blocked water from Lum Mat, a tributary of the Mun river, which used to flow past their village, leaving the ancient waterways dried up. 3,800 rai or 1,520,000 square meters of land was deprived of the benefits it should get from the Royal Irrigation Department's canals. The villagers, therefore, were left to find a way to solve the problems on their own. Under the circumstance, they have built up knowledge and managed to improve their situation. These activities include:

1) Acquiring the knowledge about how to create and keep household accounts;
2) Establishing community development centers, encouraging the learning of information and communication technology related activities, including the use of computers, GPS and satellite photomapping;
3) Appointing a water committee in each and every community so that the committee takes responsibility for drafting plans and proceeding with the canal network installation, water retention reservoirs and smaller reservoirs on farmland in order to establish efficient water resources management at community level;
4) Establishing a Tank Farm system, putting together and keeping accounts of the number of people using water;
5) Creating a production plan that supports water management for crop plans with Microsoft Office Excel program;

6) Establishing demonstration plots to allow members of the community to test their knowledge in various farming disciplines such as organic farming, drip irrigation farming, integrated farming and intensive farming; and
7) Introducing a marketing strategy involving production and sales which means members in the pilot group have to identify the market and sell their products in the name of agricultural groups.

In addition, through their battle against water shortages, they have realized the true value of water and learned to use it effectively as vindicated in the locals' directing water from the water treatment tank of the Tank Farm irrigation system back to the water storage tank in order to be reused again. They also check the quality of sediment in the irrigation system in order that water can be reused. Vetiver grass and big trees have been grown around the reservoir and along the stretch of the canals in order to reduce unnecessary evaporation. They have even planned for the future regarding recycling water from household use for agriculture.

All along this process, members of community have been involved in every step of the process by appointing a community water committee to jointly manage on their behalf the water resources. The villagers have set out to survey waterways and identify the location for water retention reservoirs. To show their involvement, some donated their own land in order to increase the space for their community's water storage. In addition, the villagers have joined forces in laying down water pipelines connected to the Tank Farm so that everyone in the community has equal access to water. In addition to managing their water supply, the villagers have also worked on the pilot agricultural farm as well as planning their production and marketing strategy, synchronizing that with their water supply.

4.2 Factors Contributing to the Success of Community Water Resource Management

There are four main factors contributing to the success of community water resource management: strong leadership, participation of the community, the use of community participation transmitted local wisdom, and collaboration and networking with stakeholders.

4.2.1 Strong leadership

Developing a winning strategy for sustainable water resource management is not an easy task. It is driven from the community up. For example, a community that has strong leadership from the head of the community is more likely to have a successful implementation and sustainable water resource management.

Ban Limthong community's first step was sparked by an internal change, led by Aunt Noi. Aunt Noi is just a leader of a community who has constantly tried to solve her own problems and family's debts with the learning process along the line of Constructionism.[39] She started off in 1999 by introducing household account keeping, livelihood planning and a debt clearing scheme, including starting up the community's Computer and Internet Learning Center. It is the Computer and Internet Learning Centre that encouraged Aunt Noi, some villagers and young people in the area to improve their personal knowledge. These people have then become the community's leaders in problem solving.

[39] Constructionism theory developed by Professor Saymour Papert of Massachusetts Institute of Technology, Constructionism is a theory emphasizing on learner centered learning methodology which the learner acquires his/her knowledge from past experiences, practices, and real life problems solving i.e. self-learning or self-educating.

Women have taking the initiative in the community by using household accounting to prove the success of water resource management. The evidence of strong communication skill of women in the community also presented. Old and young people are working hand in hands. Old people investigate the flow of old canal in which direction it has gone while younger people start using new technology to gather and analyze data. Those youngsters are very proud to take part in the community water resource management effort. All members have participated and contributed their ideas in how to manage their water.

Even with youth activities, the Learning Center and the benefit of information technology the villagers have enjoyed for almost 6 years (1999 – 2005), problems relating to livelihood, debts, income and the villagers' quality of life remained unsolved despite the fact that several other problems had been eradicated within a short period of time.

In an attempt to tackle these recurring problems, especially the one about livelihood, she resolved that water needed to come first, as the King has put it: "water is life". Then she wondered where she could get water from because this village where she lives has never had enough water. So, while others discussed roads and other community development issues, she wondered if it would be better if they switched to talking about their livelihood and whether it would be possible to dig a canal.

Aunt Noi started off with just a thought and translated that into practice. She introduced the water problem to the whole civil community. When more people realized that this was their problem, the community's leaders began to take action, and together they planned to solve the problem. Agreeing that thinking does not make much of a difference, they set out to survey, plan and organize things on their own, as best they

could. They started off being self-reliant and learned by doing. This was an important turning point as solving the water problem was now seen as a community issue, in which everyone has a part and people could be self-reliant.

The villagers set up community water committees to plan water resource management. The committee had the plan for surveying watercourses and locations for monkey cheeks as water storages. Some villagers' contributed their land to construct monkey cheeks. Villagers laid pipe for the community water system to provide water to more users. At the present, they joined in the project of agricultural test plots, produce plans, and marketing plans.

4.2.2 Community Participation

Community members cooperate in water resource management in order to identify the problem of drought in Ban Limthong, share the learning process, discuss experiences of how to manage water resources, and set up the plan together. The integration of these activities encourages dynamism among people who join the network, creating more collaboration, efficiency, and productivity.

Regarding community participation, Mr. Yuenyong Tipphot (ยืนยง ทิพย์โภชน์), the Former Chief Executive of Nongbode Administrative Organization, mentioned, "I admired of what the community has been doing and I am glad to be a part of the community. The community earns benefits from the new watercourse and ponds and makes better living. Water is our life and an essential part of our livelihood and household consumption. The change from having water supplies is our abundant areas filled with greenery. People smile and they are in harmony. The TAO helps make a plan for the use of the supplies in the watercourses and ponds by setting up a water committee.

Our objective is to reach the most potential of the community and support the budget in their learning and career development as well as the whole marketing plan for the community."[40]

The first valuable lesson of the community water system strengthened the sense of ownership within the community, so they started to survey the area to find water for agriculture. Since the community had water supplies, they should be concerned with how to manage the supplies corresponding to cultivation. Agricultural productivity should correspond to the demand of the market to get good prices; otherwise the villagers would not be able to get rid of their debts and still be in the same cycle of troubles. To create the change, the villagers had to think further to apply what they had learned. The value question was on how to apply the knowledge about household accounts and life plans to productivity plans. For community problem solving and management process are the following:

1) Learn to keep household expenditure accounts;
2) Develop a community-learning center; encourage youth activities related to information technology such as computers, GPS and the use of the satellite photo-mapping;
3) Appoint committee members for the community water management committee and build canals, water retentions reservoirs and reservoirs on local plots in order to introduce an efficient way to manage water resources at community level;
4) Establish a Tank Farm irrigation system and a water resource user account;

[40] Interview with Yuenyong Tipphot, the Former Chief Executive of Nongbode Administrative Organization, 11 May 2008.

5) Plan a production process that is consistent with water management, including the water utilization plan from the primary sources of water and crops cultivation plan on Microsoft Office Excel program;
6) Establish demonstration plots to allow members of the community to test their knowledge in various farming disciplines such as organic farming, drip irrigation farming, rotation farming, integrated farming and intensive farming; and
7) Formulate a marketing plan involving joint production and distribution as well as encouraging members to locate markets and proceed with the distribution themselves, under the name of farmer groups.

In the process of productivity planning, the villagers found that they did not have sufficient data and did not know how to collect it. They had no idea if the productivity made benefits or losses. They had no estimation of products. They needed to start learning how to do productivity plans. The learning followed from what they had learned from household accounting. They had data of household expenses, debt payments, incomes, and annual investment for cultivation in the form of tables on Microsoft Office Excel program. They started classifying their incomes for different expenses they had in the household and estimating their incomes after investing in their agriculture productivity.

A pilot team who were learning about information technology had prepared for their cultivation by using Microsoft Office Excel program and did what they planned at the pilot site from 2007-2008. The team recorded their investments, marketing issues, prices, benefits, and household accounts, corresponding to available water supplies. Success of the pilot team would be applied by other households in the community.

A first activity at the pilot site was to grow cucumbers with the dripping system. This task was to try the system that helped save water supplies for productivity. The system helped lessen the amount of work to look after the plant. The data from the pilot site were recorded to compare with other methods of growing vegetables in order the find the best way corresponding to the available water supplies in the area.

Straw mushrooms seemed to be the best for Ban Limthong because the plant took only 15 days to grow one batch and could be sold at a good price, from 25 to 40 baht per kilogram. There were regular customers to pick up the product and after harvesting a next batch could be started immediately. The plant required very little water good for an area with water scarcity. Straw mushrooms would be a good choice to make more income for the community.

For community participation, originally Ban Limthong village did not have any form of water resources management and as a result they suffered severe damage from a lack of water. In fact some forty percent of the villagers' problems resulted from water shortages. In their attempts to seek solutions, Ban Limthong villagers set out to explore the area where they live as well as the waterways in the locality and built up a database on water resources in order to lay out inundation canal routes with the help of camera and satellite photo mapping technology to locate the exact coordinates. The villagers have also jointly established a water management system to accommodate an efficient network of reservoirs, which can effectively and thoroughly divert, feed and distribute water to agricultural areas within the community. Apart from these efforts to solve water resource related problems, villagers have also cooperated with each other in formulating ideas and planning for joint production as well as distribution. Later villagers started donating part of their plots in order expands the water retention and water distribution areas. Young

people in the village have had a chance to join in on this project as well, by participating in the account analysis and data collection about water and to assist with the management of water in every reservoir. Through their participation, young people have learned about their family's income from agriculture and are therefore highly likely to continue staying in the agricultural sector. Even if they received an opportunity to further their studies, they would choose a field that is beneficial to their family's profession in the agricultural sector.

For household change, the community was certainly changed in a better way. The change was also in the families. It would not be worth it if the family was not affected by this change. The community earns benefits from the new canal and ponds and people make a better living. Water is their life and essential for their livelihood and household consumption. They change now have water supplies and abundant areas filled with greenery. Their objective is to reach the highest potential of the community and support the budget in their learning and career development as well as the whole marketing plan for the community.

Through learning by doing, Ban Limthong residents have gradually mastered water resource management. With a self-reliant attitude and strong determination, they translated ideas into practice, with some degree of trial and error and learning from their experience. They developed the learning process, enabling the villagers to think and translate their ideas into practice. Networking, social involvement and continuous self-improvement were also vindicated in their attempt to improve their situation. The tertiary canals and water retention reservoirs have taught these villagers the true meaning of "water is life". More importantly, every member of the community feels a sense of belonging and therefore jointly takes care of, manages and makes use of these man-made

water resources more effectively and sustainable as the slogan says: along with water comes intellect and sufficient living.

Cooperation among people in a community is the key factor or major force for individuals and communities to meet their ultimate goals and to create a sense of full responsibility for the care, development and solution of problems. The villagers can help each other to find new approaches to learning and thinking, thus leading to the development of wisdom valuable for solving problems, making plans or new inventions, and enhancing the establishment of a "knowledge-based-society" and the development of a strong community at last.

4.2.3 The Use of Transmitted Local Wisdom

Ban Limthong's rather unfriendly environment has made the villagers tough. They have learned to face hardship with amazing courage. Furthermore they have built on their knowledge and understanding of their surroundings, which in turn has shaped their lifestyle, cultures, practices and belief.

The locals' way of life, as elaborated above, shows that their traditional production system is based entirely on a high level of self-sufficiency living. Such production system is meant to enable the villagers to make enough and have enough to meet their basic needs without unnecessary additional struggles. The system equips them with the necessary means to achieve the four basic needs, which are shelter, clothing, food and medicines.

Water is the key to the locals' traditional production system. In places where the land is well nourished by natural water resources, the villagers will develop efficient schemes to protect and take care of their precious resources. For example, the villagers

have developed and implemented rules and measures on water resources management as well as sharing. The villagers have adopted a belief that those who block the waterways will become ill and they can only be cured by removing that water blockage.

In the past the villagers were fond of deepening existing ditches or pond beds and building moats and canals within the community compound to reserve water and manage the resources for the year's use. The villagers relied most heavily on the rain. This need is reflected in their prayers. In ceremonies related to their community, they tend to include in their prayers for "the rain to fall at the right time". This means they want and pray that they get enough water from the rain during the time they transplant rice and that the rain doesn't disappear for too long while their crops are growing.

For participation in community problem solving, its people's experiences in dealing with drought has lead them to find ways to store water for use during the dry season and to share water among neighbours. As water is the key to good living, when natural water resources are out of reach, the villagers work together to build a reservoir for the whole community. They will build houses close together on high land so that flood waters cannot harm them during the rainy season.

Before deforestation started, the villagers valued forests highly and showed their appreciation through preserving the forest near their community by linking it with their belief in supernatural powers. The villagers also share and look after their communal water resources well.

These villagers therefore had to take out loans and borrow more money, which in turn increased their existing debt because of insufficient produce from their farms. The villagers here had long suffered from this chronic problem and subsequently increasing

poverty. The huge amount of land they own did not help improve their situation at all because there was not enough water. Plus the village was in a highland area where there were no irrigation ditches to pass water along either. All that was there were just barren yellow-soiled plots.

At the beginning of 2005, the villagers tried to find a way to solve the problem of drought. They realized that even though they worked really hard, they still lived with debt because there was not enough water for agriculture, the main reason why they didn't have enough production for selling. The villagers went out to survey possible water routes in the area.

In indicating how the old and new local wisdom are combined, Mr. Satae Wuthgreinggrai (สเต๊ะ วุฒิเกรียงไกร), 60 years old, is one of the Ban Limthong leader who had troubles with water, the community water committee, explained, "At the beginning, the villagers were out to survey possible water routes in the area. I am not only a villager leader, but also a farmer who has the same troubles with water as others. I, then, joined the team. It was incredible of what we had accomplished. A part of it was done by the unity of people in the community. Another part was done by the support from other agencies outside the community. In the first year, we had a watercourse forwarding water into the community area and farm ponds in our fields. Our hope was up with all the change that we had; however, there were things that we needed to learn more about water resource management to share water supplies to all people evenly."[41]

It was incredible what he had accomplished from the survey. He drew a watercourse map by hand before they surveyed with GPS. A part of it was done by the

[41] Satae Wuthgreinggrai, 60 years old, is one of the Ban Limthong leader who had troubles with water, the community water committee, 11 May 2008.

unity of people in the community. Another part was done with the support from other partners outside the community. In the first year, they had a canal to forward water into the community area and farm ponds in their fields. Their hopes were up with all the changes that they had; however, they still needed to learn more about water resource management to share water supplies to all people evenly

The community's annual harvest is for household consumption, for merit making, as well as other ceremonies, for seedling, and for keeping as their back up when hit with famine. This scale of production hardly irritates the environment in the area because it does not require chemical fertilizer or massive machinery for working over the plot. The natural fertilizer and hand-made equipment found in the area, together with the locals' devotion, are enough to yield sufficient produce to last them through the year and even two.

For chores that require more than one person or a whole family to complete - for example transplanting and harvesting rice - the whole community will lend their hands to the ones in need. Members of the community will take turns helping each other in these circumstances. That is why this production system does not at all require any monetary investment to achieve the set target.

Even today, when mass production has infiltrated into the locals' traditional production system and in many places has replaced the old one, the practice of lending each other help and assistance still exists. As to how much they are willing to stick to the old pattern, which depends on the environment.

The villagers mix the old practice with the new one, aiming at producing enough supplies for household consumption as well as for sale. This mixed-style of production is

called "semi-self sufficiency production system". Such a change has, of course, affected the locals' traditional production system, their lifestyle and cultures to a certain degree.

For self-sufficient life style, the villagers' local wisdom has developed from their way of life which is still very much reliant upon nature and the environment but in a very self-sufficient style. However, the villager's way of life is distinct and unique because of the different environment and their experiences built up over the years as they adjusted to their surroundings.

Adaptation is a continuous process, and villagers have to make efforts to analyze their situation in order to make appropriate decisions. Modern society tends to disaggregate community life and individualism prevails, and the fact that villagers stick together, as much as possible, can be seen as an effort at adaptation to this new situation. They must organize themselves if they are to live with the wisdom of their ancestors.

4.2.4 Collaboration and Networking with Stakeholders Neighboring Communities

The community successfully manages its water resource, as a learning center, and has passed on its experience of how to manage water resources and develop processes in order to establish a social network. The real power of these networks is created by local wisdom, linking community members together. The community collaborates in water resource management with other communities.

Concerning social learning in the area of water resources management, communities in the areas where water is scarce have managed their water resources and land in order to cope with drought, soil degradation and the lack of water. The villagers started off with digging a reservoir on their land for agricultural use all year round. In

solving these problems, they applied their local knowledge, together with the King's new initiatives, which are growing vetiver grass, Sufficiency Economy, implementing the same methodology to other communities and expanding the learning network to cover the neighboring communities.

Some of the various steps these communities took to achieve a suitable solution for their problems included implementing the same methodology as other communities and social learning, which then led to success in managing their water resources.

The villagers discussed among themselves the lack of water. They then found out more about the natural waterways in the area from elders in the community, and looked for solutions. Following this they launched an initiative to manage water resources in the community, starting with dredging and expanding the existing natural canal in order to divert water to the waterway and let it flow along to the retaining reservoir for use in the dry season and during the absence of rain. The community could then use it for agriculture following the New Theory. Having successfully managed water resources in their community, the same approach has been introduced to and implemented in other neighboring communities.

Ban Limthong, together with their network in neighboring villages, has formed a committee and a team of local researchers to manage the water supply in their community. Jointly, they produced an analytical report on solutions to the lack of water in their community. The report highlighted the geographical characteristics of the area and the locals' demands for water and a solution. Locals resolved that they would:

- Look for more water reserve storage;

- Build a 3.6 kilometers long canal to transfer water from Lum Mat to the village;
- Improve on the efficiency of the canal, culvers underneath the road surface and dams; and most importantly
- Encourage participation of community members in order to actively and seriously manage the community's water resource.

For gearing up towards sustainable development, the community water committee had joined forces and planned ahead in order to systematically manage their water supply and use the canal network more effectively. For this, they have introduced an idea about reservoir networks in the rice paddies. The project includes building massive water retention reservoirs, and linking them with the water canals. The locals have also donated pieces of their land to accommodate the public water resources. A total of seven retention reservoirs, together covering an area of 14 rai or 5,600 square meters, with a maximum capacity to store 657,000 cubic meters of water, are to be built. Along with the construction plan, the committee has also come up with a scheme to manage and allocate water to agricultural areas around the reservoirs, prepared a plot to grow vetiver grass and shady plants along the side of the canals and the water retention reservoirs in order to stop the canal bank from collapsing and prevent further erosion. These plants are also meant to reduce water evaporation and increase moisture in the earth's surface.

1) Nongovernmental Organizations

- **Suksapattana Foundation** (มูลนิธิศึกษาพัฒน์)

For the establishment of social management on water resources among networks, the beginning of the change in Ban Limthong was lighted by Mr.

Bangkok Chaowkwanyeun (แบงกอก เชาวน์ขวัญยืน), Suksapattana Foundation (SF) in 1999. Inspiration for learning was started and the community has walked far from the starting point on their own in the growing direction. The connection between the community and the foundation is strong.

Mr. Bangkok Chaowkwanyeun had visited Ban Limthong Community for several times to teach the villagers how to make a household account and introduced Mr. Kittichai Keawbunthid (กิตติชัย แก้วบัณฑิต) or called Khun Nuang from PDA to assist the community on this matter. In the process of productivity planning, the villagers found that they did not have sufficient data and did not know to collect ones. They had no idea of what they were doing if the productivity made any benefits or losses. They had no estimation of products. They needed to start learning on how to do productivity plans. The learning established from what they had learned from Mr. Bangkok on household accounting. They had data of household expenses, debt payments, incomes, and annual investment for cultivation in the form of tables on Microsoft office Excel program. They started classifying their incomes for different expenses they had in the household and estimating their incomes after investing in their agriculture productivity.

The Learning Center or Computer/Internet Club is located at No. 82, Mu 4, where Aunt Noi and her family are residing. This learning center serves as a knowledge fountain for everyone in the village, including the children and young adults who can learn useful things and knowledge appropriate for everyday life. This allows them to learn all sorts of subject matters right in the village without the

need to travel into the city. It gives a great opportunity for the locals to catch up with modern and advanced technologies.

As a result of the long collaborative effort and allied partners on the Village that Learns Project, there has been continuous change in Ban Limthong, for instance an expansion of networking to nearby communities in order to exchange and share their past experiences and achievements.

- **Thaicom Foundation** (มูลนิธิไทยคม)

Thaicom Foundation have financially supported the Center since 2001. The Foundation endowed the center with Internet access, aiming to widen the learning world of the community through the Internet.

- **Education and Public Welfare Foundation and Community Based Involvement in Rural Development Center, the Population and Community Development Association** (มูลนิธิเพื่อการศึกษาและประชาสงเคราะห์)

Education and Public Welfare Foundation by Mr. Bangkok Chaowkwanyeun contributed the fund for farmers to start their agricultural activities. The total of the fund was 320,000 baht, supervised by Community Based Involvement in Rural Development Center, Nang Rong (CBIRD, Nang Rong). The center started registering members who needed a loan and planning repayments for the loan based on their expected income after the harvest. The plans of repayments by the borrowers were submitted to the community water committee. After the loan was approved, the committee would instruct the members of the fund to do household accounts and productivity plans, and they helped monitor the productivity as proposed.

- **Foreign Development Foundation** (มูลนิธิวิเทศพัฒนา)

The construction of smaller reservoirs has been funded by the Foreign Development Foundation. Tertiary canals have also been dug in order to feed water from these reservoirs to agricultural areas and to reach out to farmlands as far as possible. With enough water and good coverage with the irrigation system, a widespread agricultural area yields abundant produce. This truly is a result of the effort to allocate water to all residents in the area, allowing everyone equal access to water supplies. Leaders appointed to take care of each pool have also jointly started to do integrated farming, following "the New Theory", in order to foster new ideas and plan their vegetation so as to sell their crops together. Together they learned how to become local researchers. Members of each and every small reservoir follow their plan, collect data of their products and exchange their experiences as well as learn from people in their group. Then they exchange their findings with a bigger network of those who work on the main water retention reservoirs before condensing all the information and passing it on to the rest of the community. This way they have gradually become stronger, following the sufficiency economy philosophy.

- **Coca-Cola Foundation**

For the community's way of tackling the problem, the first problem was water for consumption. The locals' situation then was that their original down feed irrigation system was discontinued and the supply from the system was being shared between two villages, Ban Nong Thong Lim with 80 households and Ban Limthong comprising 60 households.

The locals then summed up the problems and figured out a solution, based on the success story of the Tank Farm irrigation system. They came up with a design for a similar system, including nine 3-meter high tanks, three of which are for filtering and treating water. The other six are clear water storage tanks. Before being stored in these tanks, the water is filtered and treated with alum and chlorine. Water from these tanks is distributed to each and every household in the community via the village's existing irrigation system, which was connected to the tanks in order to increase the distribution power. They then embarked on building and setting up this irrigation system in 2006 with the financial support of Coca-Cola Foundation. Hundreds of people from both villages, including monks from Wat Suwannaram, to which the space accommodating these tanks belonged, joined forces in building the body of the tanks and digging ditches for installing pipelines to join to the temple's irrigation network. This gave the locals a sense of belonging to this Tank Farm irrigation system because they can still remember clearly how they jointly built up this water network.

A committee has been set up to monitor and manage the water supply so that every household has sufficient water and to transfer the remaining income to assist other activities beneficial to the public within their community. The Tank Farm irrigation system not only gave the locals enough water for consumption and use, but also yielded a lesson on the thinking process as well as community members' contribution.

Coca-Cola Foundation has been the main financial support from the private sector in community water resource management in the past four years.

- **Crown Property Bureau Foundation** (มูลนิธิทรัพย์สินส่วนพระมหากษัตริย์)

Crown Property Bureau Foundation has been supported Ban Limthong since 2007. The main reason for the support is to help this community plan, and expand its community knowledge and network.

- **Microsoft (Thailand)** (บริษัท ไมโครซอฟท์ (ประเทศไทย) จำกัด)

Microsoft (Thailand) has supported Ban Limthong in the past two years. The activities includes community IT training for IT readiness in Ban Limthong and neighboring village.

2) Governmental Organizations

- **Tambon Administration Organization (TAO)**

Ban Limthong water committee was set up under TAO at the beginning of Ban Limthong water resource management. TAO also has set the budget to support the activities under Ban Limthong water resource management plan and to maintain Ban Limthong water resource infrastructure.

- **Hydro and Agro Informatics Institute (HAII), Ministry of Science and Technology**

From their lessons learned through independently solving their own problems relating to the lack of water for household consumption, Ban Limthong came up with their own solution for insufficient water for agricultural use. They started by studying local topography, and then moved on to exploring their

potential water resources and looking for possible areas to dam water, in order to gather more information.

For applying technology with water management, various kinds of technology have been used to survey and identify the location for laying down canal networks, building water retention reservoirs as well as planning for water distribution and increasing the amount of water storage with the cooperation of HAII. Mr. Satae Wuthgreinggrai is one of the Ban Limthong leader who had troubles with water, the community water committee infrastructure has all been systematically connected with the pre-existing canal network. These technologies are, for example, GPS and satellite photo mapping.

In cooperation with HAII, new technologies such as satellite photo mapping and GPS are important and valuable tools the community has learned to use. With the information in hand, the locals set out to look for water resources around the area where they live. Experience had taught them to consider how they could transfer water from a particular area to their village, what they needed to do and how they were supposed to manage and network it. They also had to work out the amount of water that could be taken from the resources; the period of time they could keep it; who would benefit from the water and the consequences that would follow. All these led to the villagers trying to find a way to make use of the information so that they could locate a water resource, store the water and know how to use it properly as well as sustainably manage it. In May 2009, Ban Limthong has become one of the leading among other 15 villages selected by Ministry of Science and Technology as the best practice for others to follow.

- **Royal Irrigation Department (RID)**

The locals' representative proposed their project to the RID in zone 8, in Changwat Nakhon Ratchasima on the 13th July 2006. A civil engineer was then sent out to survey the possible route for an irrigation ditch, together with the community water committee. Villagers subsequently submitted documents to willingly give their consent to sacrifice the land in their possession that coincided with the canal route, as they realized that they couldn't grow anything on a plot deprived of water. The villagers were overjoyed, having learned that they would then have water running by their farm. To them, a small sacrifice for the community was made voluntarily. Villagers there were lucky that government agencies as well as its own network started digging canals and building water retention reservoirs, according to the plan, between April and May 2007.

They were proud of this project, which had resulted from their effort, co-operation and plans and were glad that their dream project had come true. The canal is spacing 3.637 kilometers long and its average depth is 3 meters. The project cost 1.96 million baht. Residents of Ban Limthong and ten other neighboring villages, up to 1,038 households, have benefited from the irrigation ditch project, in an area of up to 3,800 rai or 1,520,000 square meters, which covers 3 tambons: Tambon Chum Saeng; Tambon Thung Saeng Thong (ทุ่งแสงทอง); and Tambon Nong Bot. The eleven villages are namely Ban Salao, Ban Chum Saeng, Ban Khok Phluang, Ban Limthong, Ban Nong Thong Lim, Ban Non Si Suk, Ban Thai Thong, Ban Sa Kham, Ban Nong Mama (หนองมะมา), Ban Nong Kong (หนองกง), and Ban Nong Bua (หนองบัว).

The canal project was completed just when the rainy season arrived. Water brought life to the locals' land and turned their farms green. Before the canal was put in place, villagers could only watch streams of water pass away right before their eyes. Since the canal was built, covering an area of 25 rai or 10,000 square meters, it can store up to 121,000 cubic meters of water at its maximum capacity. Now the canal network has become a virtual reservoir for the villagers, supplying them with a much needed water reserve during the dry season and allowing them to continue growing their crops. The canal also receives water during the flood season, helping to abate problems by acting as a detention area, taking in water from Ban Khok Phluang in the west. In any case, besides having solved their problems, the villagers now have to learn to manage the water and irrigation effectively, a major capital investment, in order to plan ahead for their livelihood. This way they will be able to increase their productivity, have other alternative means of earning outside their rice farming season, elevate themselves from poverty, clear their debts, save and come up with a long term plan for their vegetation.

Royal Irrigation Department has supported the village to expand irrigation system from one village to one tambon. Today, RID has been able to integrate water resource management with other governmental organization and expand irrigation area to other tambons in Amphoe Nang Rong.

- **Office of the Royal Development Projects Boards**

(สำนักงานคณะกรรมการเพื่อประสานงานโครงการอันเนื่องมาจากพระราชดำริ (กปร.))

In the past two years, Office of the Royal Development Projects Boards has funded several projects for Ban Limthong. Because of its success in using Information Technology, household accounting system, and agricultural plan, Office of the Royal Development Projects Boards also selected Ban Limthong as one of the best case for water resource management.

3) Other Communities

Under the intensive farming project, an agricultural calendar has been created in order to help manage farmland continuously and make an annual crops plan. This has resulted in daily, monthly and annual income as well as various types of products for household consumption. It has also provided the villagers with additional income outside their rice-farming season. The crops plan allows farmers to harvest their produce at the time when there is high demand and therefore a high sale price. The villagers have also joined forces with Ban Non Kwang establishing an additional Sufficiency Economy Learning Center by turning a public area of 5 rai or 2,000 square meters in the community, next to the reservoir, into an agricultural area. Water in the reservoir is used so that villagers who still have not had the space to grow any crops could join in and learn about agriculture and how to generate income.

In the past, people in the area had no irrigated water resource for agricultural use, household use and consumption and used to be swamped with debts. However, after having applied the Sufficiency Economy philosophy and the New Theory to their water and land management for agricultural purposes, they have achieved an adequate supply of

water, improved their livelihood and subsequently been able to rid themselves from debt. The locals' quality of life has since improved too.

For marketing networks, the community also contacted Don Kwan Market, one of the largest vegetable markets in Amphoe Soeng Sang, Changwat Nakhon Ratchasima. The market is a center to sell vegetables from Amphoe Nang Rong, Tambon Nong Ki, Tambon Soeng Sang, and Tambon Khon Buri. There were many distributors from different places come to buy agricultural products. In May 2007, the community invited some distributors from Don Kwan Market to exchange information at Ban Limthong, so the farmers could learn about marketing, pricing, demand, and distribution. What the community learned was used to create marketing and productivity plans corresponding to the needs of the market. The villagers formed cooperatives to sell their products and to negotiate for product prices. The productivity would make steady incomes for the farmers.

For knowledge networking, through efforts to rid them of water related problems, each community has learned, worked together and built up a cooperative network and mastered the water resources management skill. These movements are evidenced both intra-community and inter-community. In solving their problems, communities have also interacted with government agencies and the private sector in order to achieve a sustainable way of managing water resources.

Each community made use of different local knowledge, experience, know-how and methods to manage their water resources. Thus, when people from different communities get together to share their experience and learn from each other, they can adapt to and apply others' success stories in managing water resources in such a way that

leads to improvement with their situation. This way a person's experience and knowledge can be passed on to his or her community as well as to neighboring communities. Realizing the importance of water resources management at the community level, this effort has been encouraged by both government agencies and the private sector. With this support, a learning and cooperative network for community water resources management will lead to a balanced, secure and sustainable way of managing communities' water resources.

4.3 Analysis of the Success of Ban Limthong Water Resource Management

Following the community's efforts to manage their water resources, Ban Limthong now has 562,547 cubic meters more of water in reservoirs and water reserves for agricultural use and consumption. As a result, should the community be hit by drought, villagers would still have enough water in reserve to feed to over 500 rai (2,000,000 square meters) of rice paddies, saving the villagers from over one million baht worth of flood damage. Farmers in the area have subsequently enjoyed a better quality of life and as well as an increase in their earnings. They have been able to make 105% more than what they did in the past. Within three to four years, the community's debt dropped by 50%. The remaining debts are the ones incurred within the community's own system and debts as a result of investment for agricultural purposes which have been thoroughly planned for. At present, the whole community's debt stands at 947,200 baht. In 2008, community members enjoyed an increase in the amount of savings as well as assets, averaging out at 4,800 baht per household. The household, which holds the highest record of profit, was as high as 784,823 baht per year, or two times greater than others.

Three more rice mills have been established. Ban Limthong has been made the center for networking and set up Community Water Management Committees for networking water management at community level under TAO. The expansion of the water management network now requires cooperation between three different Tambons, including Tambon Chum Saeng and Tambon Thung Saeng Thong, covering the area of 60,000 rai (24,000 square meters). These networks are responsible for systematically maintaining and care taking of water resources in each different area, as well as coordinating with various organizations in establishing more effective and efficient water management networks. Eventually, the Ban Limthong community has successfully introduced the same concept of water management, which has been proved beneficial to their situation, to other neighboring communities, assisting them in their process of solving the problems and sustainable development.

In terms of community development, villagers can find new approaches to learning and thinking which lead to the development of wisdom valuable for solving social and economic problems, making plans, and enhancing the establishment of sustainable community development.

Results of community water resource management through social learning are the following:

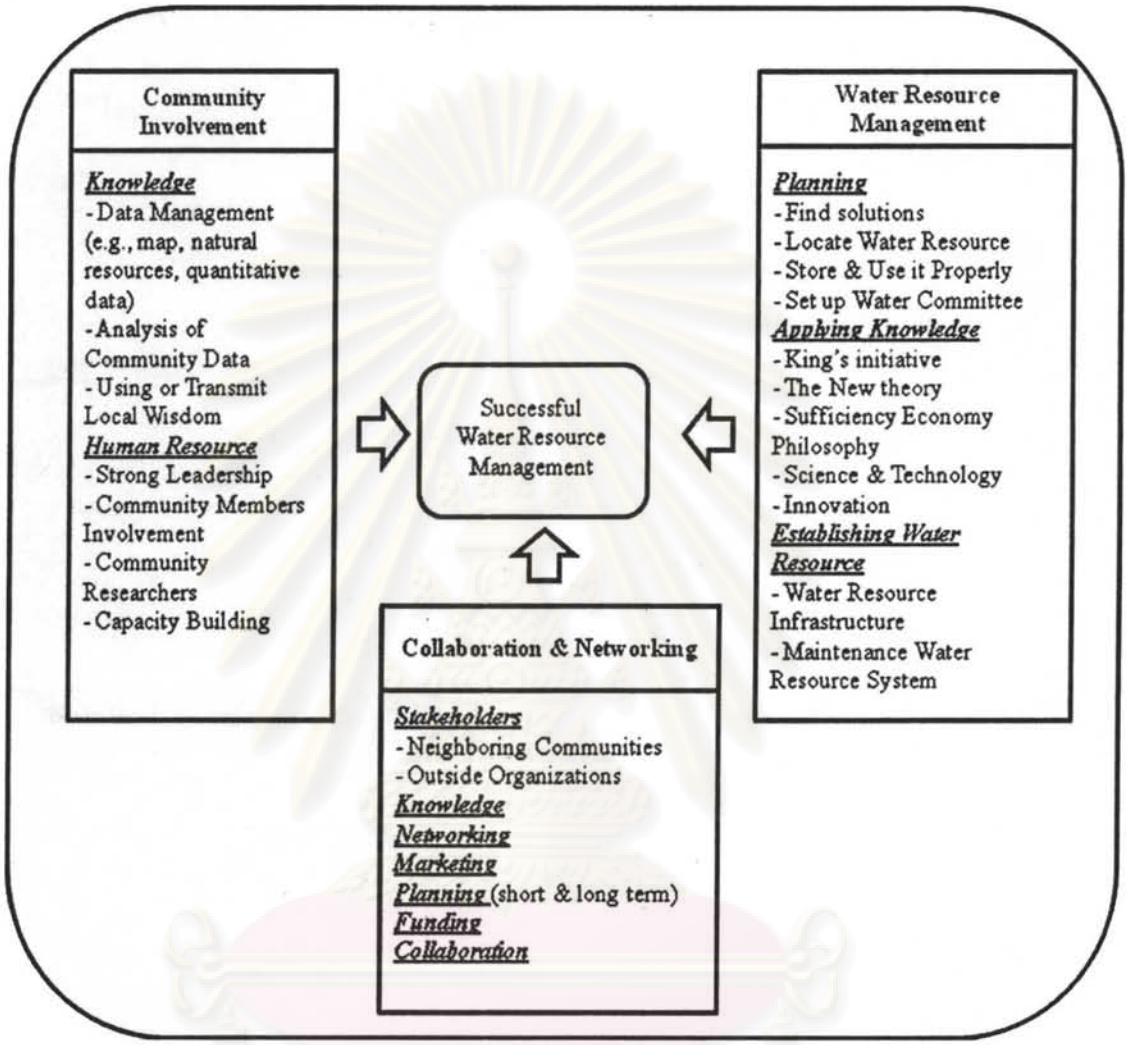
1) Transform an abstract plan into reality;
2) Show the realistic indications which in turn lead to the analysis of problems and finding solutions;
3) Enhance effective decision-making and suitable career planning and apply to the natural resources available; and

4) Modify and apply the gathered useful information, the acquired knowledge, and experiences derived from the learning to making a living.

Ban Limthong community has the capability to identify problems, locate water resources, and use them efficiently. Community members maintain a network in order to provide members with access to water resources. In this case, the amount of agricultural produce has increased substantially with much impact on social development such as income growth, better standards of living, and sustainability of water reserves. Social management impacts on management philosophy, degree of sharing, and process of developing sustainable community water resource management.

Figure 9 shows a model of social learning for sustainable community water resource management. The success of water resource management lies on three factors namely community readiness, water resource management, and collaboration and networking of all stakeholders. These three factors are the magnesium that drives people in the community to work together and make sure that they can manage water resource successfully.

Figure 9: A Model of Social Learning for Sustainable Community Water Resource Management



Source: Author

The model of social learning in sustainable water resource management has three main components namely *community involvement*, *management*, *collaboration and networking*.

Community involvement includes knowledge and human resource. Members of the community take the role as local researchers working together to collect, manage, and analyze the existing community data. They also incorporate old and new local wisdom in community water resource management process.

Management includes water resource planning, how they apply knowledge, and establishing water resource. Water resource planning is determined by how people locating, storing and using water properly. Setting up water committee is essential for the community for them to work together and able to find solutions for their problems.

Collaboration and networking among local stakeholders and neighboring communities enable Ban Limthong to manage water resource successfully. The successful collaboration and networking depends on stakeholders, knowledge, networking, marketing, planning (short and long term), and funding.

The steps for implementing sustainable community water resources management involves both government agencies and the local community in jointly developing and allocating water so that the community has a sufficient water supply for consumption and reserve. The purpose of community water resources management is mainly to sustain life, which includes household consumption and agricultural uses or for keeping livestock as an occupation, to use in cottage industries and for environmental preservation. These steps include:

1) Establish a civil society at the village level in order to analyze problems and jointly seek solutions;
2) Research into community water resource management in order to develop projects and formulate plans beneficial to the community, with the community as the main body in charge of the studies;
3) Propose projects to related government agencies or the local administration organization;
4) Hold meetings with community members in order to reach decisions or an agreement on aspects of implementation and sign an agreement with related agencies; and

5) Hold meetings with community members in order to report the result of considerations to the community before proceeding with implementation.

Such findings have confirmed that the success of Ban Limthong is influenced by local wisdom and social learning factors which include preservation, adaptation, renewal, and innovation. Thus, each case has its own unique style of community water resource management. Ban Limthong can solve problems with drought since the people have learned how to manage agricultural water resources and water consumption, particularly their practical solutions and their social learning process for water resource management that affects the overall situation in terms of sustainable development.

The findings from this research lead the following general conclusions. The greater the collaboration, social learning, and local wisdom, the more sustainable it will be in managing community water resources. The greater the sense of belonging to the community, the more sustainable it will be in managing community water resources. The more support from the government, private sector, and NGOs, the more sustainable it will be in managing community water resources.

4.4 Comparative Cases with Other Isan Communities

By reviewing relevant research and case studies concerning water resource management by villager in various regions of Thailand and also elsewhere in the world, it is possible to conclude that social learning take place both across and within cultural boundaries. Both methods are complementary for the matter of water resource management. Community participation is also considered as mandatory in managing water resource. The more local communities get involved with the design,

implementation, and how to share benefits, the more successful the water resource management.

Because water is a central component in the long-term functioning of society, a systemic view of social and natural relationships must be used to understand the water issues. To become sustainable in managing water resources, social learning is required to build and sustain the capacity for communication across cultural boundaries. The differences in scale, style, culture, behavior, income, and others among the cases being explored are breathtaking. However, most cases suggest the similar findings that to understand how to manage water resources, we must also recognize how management contributes to the economic improvement in the area. Growth and better living standards are the most important things to the community when they are thinking about water. Thus, in most developed countries water is just mainly a production factor, while in most developing countries, water is for survival.

Local wisdom reflects stockholder's view on how to manage water. Most small scale cases tend to pay attention to how people in the community think and feel. In contrast, the larger scale cases are likely to focus on the engineering aspect of how to manage water. For example, the lower Isan areas in Thailand have four main ways for the use of local wisdom in solving problems as follows: self-sufficient style; the art of choosing a place for cultivation; the Isan clever choice of settlement; and community organization structure.

Many cases define sustainability in different ways, some as how to gain public support and legitimacy in managing water resources, others as sufficient water to meet the local demands. Interestingly, there are some areas that do not want to manage water

resources by using other means except natural ways. They believe that humans must adapt to nature, not the opposite. Implementing water resource management is difficult in these areas. Of course, culture plays the important role on how community thinks and feels.

Most cases have a tendency to agree that the greater the sense of belonging to the community, the more successfully the people will sustainable manage community water resources. National cultures determine the nature of cooperation. Local cultures such as farmers' beliefs and practices may be more significant than national cultures for some stakeholder groups.

There are three different methods of building sustainable community water resource management perspectives on drought areas of lower Isan, Thailand, namely self reliance on water resource management, water resource management network, and the establishment of social management on water resources among networks.

For the establishment of social management on water resources among networks, Ban Limthong successfully manages its water resources, as a learning center, and has passed on its experience of how to manage them and develop processes in order to establish a social network. The real power of these networks is created by local wisdom, linking community members together. The community collaborates in water resource management with other communities, the government sector, the private sector, and NGOs. It also passes along new ideas through local specialists and lures more participants and stakeholders to take part in water resource management.

There are two case examples of how the use of local wisdom can solve such social and economic problems.

(1) Self Reliance on Water Resource Management: Ban Non Kwang (บ้านโนนขวาง), Tambon Non Kwang, Amphoe Ban Dan (บ้านด่าน), Changwat Buri Ram

Mr. Thongkum Yimrum (ทองคำ ยิ้มรัมย์) is a good example for the method of self-reliance on water resource management. Ban Non Kwang has a serious problem in the upland area with poor soil quality and soil that does not retain water. Salinity is also a problem, as salty groundwater percolates through the soil to the surface. He realized that intensive farming was the way to solve the problem of drought. The most important thing was that he had to rely on himself and had to store water from rainfall. He started in 1993 by digging 8 ponds by himself and growing everything that his family required for consumption and finding the needs of the market. Within ten years, the community accepted his method of self-reliance on water resource management and he became the village headman. His house became a center for his method with the support of the government sector to set up training for other villagers. Now, about 3,590 people have adopted his method. Most of the households are relatively prosperous and have a pond which stores water and provides enough for agricultural use throughout the year.

A leader of the community has relied on himself to solve the problem of drought. It took many years for him to get the acceptance of his method. After that, the community members have helped each other to manage their water resources successfully but they do not depend on other stakeholders in order to assist them with how to manage their own water. The community also helps get the creative water resource activities flowing. The overall improvement in managing water resource in the community is also substantial.

For Non Kwang village, 75% of its population are Suay, the rest are Thai-Lao and Thai-Korat. Mr. Thongkum, a former village headman, is still working extensively to

ensure that there is enough water in the farm ponds all year long. His daughter (Laddawan) also helps him transfer her father knowledge to other villages and coordinate all members to set up Community Water Committee. Interestingly, there are many young generation who participate in this process.

From the investigation, we found that household water resource management is more successful than community water resource management. This may due to the fact that Most of people in Nong Kwang do not participate in social learning process activities. Nongkwang needs stronger cooperation with Tambon Administration Organization. The communication gap also exists between Tambon Administration Office and people in the community. Today, there are several existing group in the community namely woman group and young people group. These groups will take part in further collaboration process by becoming a mechanism to drive the collaboration and knowledge sharing with in and across communities.

(2) Water Resource Management Network: Ban Non Rang (บ้านโนนรัง), Tambon Taradsai (ตลาดไทร), Amphoe Chum Phuang (ชุมพวง), Changwat Nakhon Ratchasima

Mr. Chantee Pratumpa is a good example for the method of water resource management network. Mr. Chantee, 69 years old, is the community intellectual who has become the trainer for Sufficiency Economy and Intensive Farming center. In the year 1982, he was like other farmers who wanted to go and work abroad and earn more money, but was cheated by the company who arranged the trip for him. As a result, he was 200,000 baht in debt. Even though he sold most of his property, there was still not enough money to pay off everything. In 1986 he went to work in Malaysia for one year and used the money to clear his debt. He could then claim his land back, but after

growing rice for three years he was again in debt. His family gathered to discuss ways to pay off these new debts. Finally, they listened to and watched radio and television programs about integrated farming. His family got some information from Mr. Pai Soisaklang (ผาย สร้อยสระกลาง), who was the community intellectual who started integrated farming in 1991. They realized that integrated farming was an impressive process that may help them clear their debts. The most important issues were that they had to rely on themselves and had to stock and manage water supplies. They started digging a half-rai pond about six meters wide, twenty meters long and three meters deep and, since 1994, they have been growing everything their household needs to consume. On their 22-rai land, they now have 10 ponds (since 1998), as well as enough livestock and fruit and vegetables for the whole household which includes children and grandchildren. Living self-sufficiently, they have the opportunity to live happily for the rest of their lives. They have also been able to save money since 1998.

In Non Rang, all population is Thai-Lao. Most of them are relative and leaded by a strong leader, Mr. Chantee. Local government office supports this group by setting up a learning center to transfer its local wisdom to people in the community. By working with Tambon Administration Office, women and young leaders are able to use technology and plan the plantation process effectively. Thus, the community has a very high potential to take part in sustainable water resource management as well as Ban Non Kwang.

Communities participate in water resource management in order to identify the problem of drought in their area, share the learning process, discuss experiences of how to manage water resource, and set up the plan together. The integration of these activities encourages dynamism among people who join the network, creating more collaboration, efficiency, and productivity.

In reviewing relevant research and case studies concerning water resource management by villager in various regions of Thailand and also elsewhere in the world, questions and concerns have often been raised about to what extent cultural factors count for the attempt and the success of building sustainable community water resource management. Regarding community development in Isan Thailand, lower Isan has its own unique style of community water resource management.

The purpose of my research is to identify key elements that might be common to a wide diversity of "building sustainable community water resource management schemes" operating within context. Such communities can express themselves by extending the forum for interaction of an existing workgroup, or more typically, as a self-sustaining "virtual" association existing across cultural boundaries which is different from other research cases concerning water resource management. I hope that my research will lead to the creation of wealth of local knowledge that will produce effective concepts of water resource management in making Thai culture accessible on a national, regional, and global scale.

CHAPTER V

DISCUSSION AND CONCLUSION

The remarkable success of Ban Limthong's social learning from 1988 to the present (2010) owed much to the community support, financial, intellectual and technical assistance given by the allied partners, as well as collaborative efforts of young adults and the concerned Limthong villagers, all of whom promoted sustainability for the community.

To understand how some communities can build a sustainable water resource management program while many cannot do the same, we must be clear on the varieties of paradigms that provide more plentiful views of the phenomenon, and use these findings as a lesson learnt which can be applied to other drought areas with the same conditions.

This chapter will present, first, the discussion on the issue of sustainable water resource management, second, suggested methods of sustainable managing community's water resources in drought affected areas: lessons from Ban Limthong, third, conclusion of the thesis and suggestion for further research.

5.1 The Discussion on the Issue of Sustainable Water Resource Management

To manage community water resource management, it is necessary to have both short and long term plan. The committee also sets up rule, regulation, and fund for all stakeholders in order to maintain the infrastructure of water in the area. The case of Ban Limthong indicates that combining old and new wisdoms together with the King's initiative of sufficiency economy can lead to high potential of success in sustainable water

resource management. The successful collaboration depends on how local community can assess the need and communicate with all stakeholders in order to plan their production properly.

When considering the expenditure on community water resources management the TAO receives, which averages out at 2.92% per year, it is found that the budget allocated is not sufficient to efficiently manage the community water resources and sustainable resolve problems in the area of community water resources management in the long run. Therefore, the budget allocated for TAO for the sustainable development of community water resources management should be no less than 10% of the grand total received.

The appropriate future community water resources management framework should be one that emphasizes the development of such resources toward having sufficient water reserve for consumption and agricultural use, as well as for a water reserve in case of extreme floods and drought.

Tambon Administration Organization should have the rights and responsibility to manage the community water resources jointly with the community's leader as well as its members, the Royal Irrigation Department, the River Basin Committee, private sector and the NGOs. TAO should be the main agency responsible for following:

1) Coordinating and facilitating meetings, data collection and following up on operations in order that the community water resource management is put into practice for the greatest benefit of the community;
2) Advising and organizing public hearings among community members and related agencies in order that the community water resource management

projects and plans are efficiently implemented and yields good outcome, as well as assisting the villagers in building up their knowledge for life-long learning and organizing activities related to community water resources management on a regular basis;

3) Jointly managing water from both the main irrigation systems and reserved irrigation system in order that such systems are merged with water resources in the community and water is fairly distributed to farmlands in the community;

4) Developing, rehabilitating, protecting, reserving and preserving the community's water resources;

5) Overseeing the plot utilization, developing flat plain areas as well as agricultural plots and empty spaces toward their appropriate and maximum use; creating a registration system and maps for and providing information on canals, dams, reservoir, natural water resources, community's small water resources, water source areas, wetland, water routes, flood risk areas, drought risk areas, an area protected in case of encroachment, basin groups, catchments, water routes and water usage in the area; and

6) Proposing and requesting the budget for community water management to the government.[42]

The mutual interaction among stakeholders and social involvement in the process of water resource management implies that cooperation among people in a community is the key factor or major force in getting individuals and communities to meet their

[42] คณะกรรมการธิการวิสามัญพิจารณาศึกษาการแก้ไขปัญหาน้ำ สภาผู้แทนราษฎร, **รายงานการศึกษากำหนดกรอบแนวทางการบริหารจัดการทรัพยากรน้ำของประเทศไทย**, (2551).

ultimate goals and to create a sense of full responsibility for development and solution of problems.

The small scale water resource management case studies focus on local participations and local contributions that can play a major role in improving water supplies. The community water resource management case studies concentrate on how local activity to manage and improve water supplies has occurred and has been stimulated in Thailand. There is a need to learn more about the capacity of households and communities to manage and improve water supplies.

5.2 Suggested Methods of Sustainable Managing Community's Water Resources in Drought Affected Areas: Lessons from Ban Limthong

Many areas in the Isan part of Thailand suffer from both severe flash floods and drought. These two problems should therefore be addressed as one as they are interconnected and share the same cause, which is down to water management. The best way to tackle the problem is, therefore, to look at the geographical features of these areas. An example of that is the way Ban Limthong villagers adapted the geographical features which have caused water shortages. The villagers decided to lay out a canal route across a slope, allowing them to retain water and prevent flooding. With this technique, the villagers also have enough water for use when there is an absence of rain. This means the villagers now have water for both consumption and agriculture all year round. All this was made possible thanks to the Public Private Partnership.

The Isan region of Thailand receive approximately 200,000 cubic meters of rain water a year but could only keep 3% of the amount, leaving them short of water of approximately 4,000 cubic meters. According to the figures, the region does receive a

sufficient amount of rainwater. All they need are an appropriate method for retaining rainwater in a dry area as well as the right technique for adjusting the soil quality so that it can retain water. One way to make achieve that is by coating the bottom of the reservoir or a pond with clay or letting the cattle stamp on the damp earth at the bottom of the reservoir or pond to increase the soil consistence at the bottom of the reservoir or pond so that water cannot seep through so easily. On top of that, the community members also grow vetiver grasses all along the canals and around the bank of the reservoir in order to keep the reservoir as well as its surrounding area moist.[43]

Ban Limthong's success story began from villagers' cooperation in an attempt to rid them of poverty. They discovered that their problems resulted from water shortages, the lack of information, maps and surveying. Having noticed all these, they then decided to work together to solve the problems. In so-doing, they made use of their local knowledge and with the help of government and private sectors, they established a local community learning network for managing water supply as well as various funds for the community, formulating agricultural plans, production plans and joint marketing plans. Having achieved all these, they decided to introduce the same discipline to their neighboring communities. This discipline includes:

1) Discussing water shortage related issues and gathering information about the existing natural water resources from elderly people in the community and seeking solutions to the problems;
2) Introducing water management to the community by building more canals and expanding the existing natural canals in order to retain flood water in these waterways and divert the water to water retaining reservoirs and store it

[43] Interview with Dr. Royol Chitradon, Director of Hydro and Agro Informatics Institute, 27 January 2010.

for use during the dry season or the period during which there is absence of rain; and

3) Making use of the water for agriculture following "the New Theory" according to the His Majesty's initiatives.

"The New Theory" according to His Majesty's initiative is a guideline or practices for managing land and water for agricultural purposes suitable for small plots, allowing farmers to make the most of their land with the sufficiency theory, which includes three different processes as follows:

1) Production: Introducing the concept of self-reliance, enabling the community to slowly increase their productivity, starting from producing just enough for their consumption;
2) Cooperation in a form of cooperatives: Joining people together in the areas of production, marketing, quality of life, welfare, education, social life and religion; and
3) Joint venture: Introducing the idea of a joint venture among members of the community with everyone helping out with general coordination, locating investments and funding.

The key principles and guidelines for agricultural operations under "the New Theory" according to His Majesty's initiatives are based on the following:

1) A self-sufficient production system, allowing farmers to start, primarily, with an economic investment to produce sufficient for household consumption;

2) Rice included, meaning the crop needs to be part of the cultivation as it is considered the main factor for sustaining life and, hence, every household needs to grow enough rice for a whole year's consumption;
3) Sufficient water supply for use throughout the year both for agricultural use during the dry season and the absence of rain, and for consumption; and
4) Land management by a ratio of 30:30:30:10, separating the plot into four by the purposes of use, which applies to both small plots and those greater than 15 rai (6,000 square meters) eg. 30% for water retention reservoirs, 30% for growing vegetables, fruit trees, field crops and trees, 30% for rice paddies and the other 10% for accommodation and other uses.[44]

Villagers in Ban Limthong realize the benefit of water resource management that goes beyond water. It includes how they learn to manage their debt and solve other problems that usually occur in the community. Mr. Bangkok, from Suksapattana Foundation, has been involved with this community in the past ten years. He encouraged women group to keep record on their spending via simple household accounting system.

Aunt Noi, a local leader, realized how to solve problems in the community by conducted agricultural and life plan. HAII also provides local community with technology and innovation supported to solve drought and improve quality of soil in the area. Other NGOs are also helping the community by allocate funding and provide knowledge with subjects that community needed.

Ban Limthong has used social learning as the tool to get all stakeholders in the community to be involved in the process of water resource management.

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[44] Office of the Royal Development Projects Board, **The New Theory According to the King's initiatives** (Online), 25 January 2010, www.rdpb.go.th

5.3 Conclusion

The overall goal of my research is to give strategic focus to implementation of the water resource management components of the corporate strategies which need to be adapted to lower Isan situations in providing relevant knowledge guiding transitions to more sustainable futures.

It also shows the Isan people's ways of deciding their own future and uniting efforts to solve problems within their community. This is why capitalism and individualism cannot distort or overshadow their traditional way of life.

Community development in Thailand is the key factor to meet communities' ultimate goals. There are four major community development components in Thailand which include the existence of any community development aspects, involvement, cooperation, and local wisdom. There are three aspects for the existence of any community development which include self-sufficiency in an economic aspect, self-control in a decision-making aspect, and existing good value in a cultural aspect.

In terms of community development in Isan, Isan people can find new approaches to learning and thinking which lead to the development of wisdom valuable for solving social and economic problems, making plans, and enhancing the establishment of the sustainable community development.

Research findings reveal that factors contributing to the success of community water resource management are strong leadership, community participation, the use of transmitted local wisdom, and collaboration and networking with stakeholders.

Strong leadership can lead to successful water resource management implementation particularly in the case of Ban Limthong. Findings suggest that all community members including women, older and younger generation have been taking strong initiative role in working together to ensure the collaboration process has gone smoothly.

Community participation shows the villagers' ways of deciding their own future and uniting to solve problems within their community. This is why capitalism and individualism cannot distort or overshadow their traditional way of life.

The use of transmitted local wisdom indicates that women, older and young generation apply modern technology into water resource management. Thus, to ensure the sustainable future, a proper strategy must be formed to cope with local situations in order to make sure that relevant knowledge will stay and the transformation process is ongoing.

The collaboration and networking of stakeholders not only exist in the community but also include people from outside. Involvement from outsiders is as equally importance as the participation in the community.

In order to meet communities' ultimate goals, a key factor of success includes the diffusion of local wisdom to people in the community. There are four major community development components in Thailand, namely the existence of any community development aspects, involvement, cooperation, and local wisdom. There are three aspects for the existence of any community development which include self-sufficiency in an economic aspect, self-control in a decision-making aspect, and existing good value in a cultural aspect.

Water shortages have become a common problem in Ban Limthong due to an increase in demand for water, which grows higher every year. For community water resource management, success means different things to different people. The problem is that it deals not only with the technical aspect but also other essential factors such as social, government, culture, and participation in all levels. The management alone is not enough to come up with the solution to water resource management. That means ongoing learning, negotiation procedure, information sharing, communication skill, and analytical skills for problem solving are the basis of social learning.

Moreover, social learning is a complementary policy instrument in water governance and its successful conduct needs to be much better understood, as a conceptual framework, an operational principle, a policy instrument and a process of systematic change.

The findings for this research have identified that the success of Ban Limthong is influenced by local wisdom and social learning which include preservation, adaptation, renewal, and innovation. Thus, each case has its own unique style of community water resource management. In the end it may take some time to manage a water resource successfully.

5.4 Suggestion for Further Research

For further research, it is recommended that other villages in Isan with similar water problems should be studied and compared. The research should explore how local communities manage water resources, expertise in collaboration process, lessons learned from other failure or successful communities, and the sustainability of water resource management. Furthermore, it is also suggested that research on cross-regional comparison

should also be conducted, namely, a comparative study between Isan and northern villages taken cultural differences into consideration.

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APPENDIX

Appendix: List of Interview Informants

Community Water Resource Management Group Discussion

Community Water Resource Management Group 2007 (Discussed on 17-19 February 2007 at the Sirindhorn International Environmental Park)

Community Water Resource Management Group 2007 (Discussed on 20 November 2007 at Khao Hin Sorn Royal Development Study Center)

Community Water Resource Management Group 2008 (Discussed on 15-16 September 2008 at Khao Hin Sorn Royal Development Study Center)

Community Water Resource Management Group 2008 (Discussed on 23 January 2008 at the Sirindhorn International Environmental Park)

Community Water Resource Management Group 2009 (Discussed on 12-13 October 2009 at Huai Hong Khrai Royal Development Study Center)

A Group of Ban Limthong Water Committee Board at Ban Limthong

A group of community water committee board (Interviewed on 20-21 November 2006)

Ban Limthong Villagers

Paveena Tipnangrong, a head of youth leader (Interviewed on 10 February 2008 and 11 May 2008)

Plan Boonkongchart, a former head of the village (Interviewed on 6 April 2008)

Sanit Tipnangrong, a chairperson of community water committee (Interviewed on 10 May 2008)

A group of elders: Koon Thongsaard; Boonsong Boonrod; and Somchai Angkabpetch (Interviewed on 11 May 2008)

Hydro and Agro Informatics Institute

Dr. Royol Chitradon, Director of Hydro and Agro Informatics Institute (Interviewed on 27 January 2010)

BIOGRAPHY

Royboon Rassameethes has a Bachelor's degree in History from the Faculty of Social Science, Kasetsart University and a Master's degree in Communication Arts from the University of West Florida, USA. She is currently a Director of Management Division at Hydro and Agro Informatics Institute (HAII), a public organization under Ministry of Science and Technology in Thailand. She also has experienced in the field of strategic planning, information management, international relations, community development, and water resource management. She joined the Ph. D Program in Thai Studies at the Thai Studies Center, Faculty of Arts, Chulalongkorn University in 2006. Her research was partially funded by the Empowering Network for International Thai Studies (ENITS), Institute of Thai Studies, Chulalongkorn University with support from the Thailand Research Fund (TRF).