An Oxbows-Lake Management: A Case Study of Ban Kutchum in Warinchamrap District, Ubon Ratchathani Province

การจัดการกุด: กรณีศึกษาบ้านกุดชุม อำเภอวารินชำราบ จังหวัดอุบลราชธานี

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(Received: *July 8, 2017*; Revised: *August 6, 2017*; Accepted: *August 15, 2017*)

ABSTRACT

The research aimed to study the surface water quality of the swamps locally known as 'Kut' in Isan dialect of Thailand, the benefits of the Oxbow-Lake and to find the guidelines for using the swamps in a sustainable way through the public participation. The research found that the surface water quality was classified as Type III of the surface water quality standard criterion in Thailand. The strength of the community participation was high level. The local residents used water from the swamps for agricultural purposes, and growing vegetables. Water resources management of Oxbow-lake occurs through the water management committee that appointed to supervise and coordinate regarding the use of water from the swamps.

บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาคุณภาพน้ำผิวดินของบึงหรือที่เรียกว่า "กุด" ในภาษาอีสาน การใช้ประโยชน์ของกุด และแนวทางในการใช้ประโยชน์ของกุดอย่างยั่งยืนผ่านกระบวนการมีส่วนร่วมของประชาชน ผลการศึกษาพบว่า คุณภาพน้ำอยู่ในเกณฑ์มาตรฐานน้ำผิวดินประเภทที่ 3 ของประเทศไทย การมีส่วนร่วมของชุมชนมีความเข้มแข็งอยู่ในระดับสูง ประชาชนในท้องถิ่นใช้น้ำจากหนองน้ำเพื่อการเกษตรและปลูกผัก การจัดการทรัพยากรน้ำของกุดเกิดขึ้นผ่านคณะกรรมการจัดการน้ำที่ได้รับแต่งตั้งให้ดูแลและประสานงานเกี่ยวกับการใช้น้ำจากหนองน้ำ

Keywords: Management, Oxbow-Lake, Participation

คำสำคัญ: การจัดการ กุด การมีส่วนร่วม

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Introduction

The problems related to the water resources are water management, water scarcity, floods, and pollution. For the water resources to be sustainably developed and managed, it is necessary to integrate all relevant parts in a multidisciplinary manner. Using the research to solve the problems is a most likely and sustainable method. For the water resource management to be more efficient, a relevant database from all sections is required [1]. A research process is to be utilized to find out the problems, needs and causes as well as innovation from the research and to develop a management system in response to the country's wants. The northeast of Thailand is the region mainly dependent upon agriculture. In this part of the country, natural resources and environments are improperly used. As a result, they are continuously destroyed. Resource management at a local level is important as it provides both knowledge and education on the potential of water sources to the locals. Community participation is a process enabling people to involve in the planning and implementation of development with collaborative thinking and decision-making on their problems. A participatory approach to water management is viewed as having greater likelihood of empowering local people, including traditionally disadvantaged groups, and greater effectiveness in sustainable water resource provision. Stakeholder participation lies at the heart of the new policy approaches to management of lakes and reservoirs. The community in water resource management is individuals or representatives of a group who make use of, have an impact on, or are impacted by the issue of concern [2].

The northeast of Thailand has three main rivers: Mekong, Chee and Moon. The latter has a lower part which is 426 kilometers long. It has five tributaries. In addition, there are small water sources which are crucial to local residents who rely on the sources for their agricultural purposes. In the rainy seasons, there are annual floods. People are affected and agricultural crops are substantially damaged. Many people depend on the small water sources such as swamp and creeks. These water sources are very important to the residents who live in the downstream of the Moon River. Water use conflict has been occurred among water users along the Moon river basin. Social approach through participation process is a meaning full tool for water resolution on any natural resource use including water use. Thanks to the problems described above, the research was conducted in accordance with the government policy concerning water resources and integrated water management and the prevention of floods and droughts.

The objectives of this research were to study the surface water quality, benefit of community water resource, and analyze the consistency between the level of public participation in relation to the water resources management.

Research Methodology

Study area

The study was conducted case study Ban Kutchum, Warinchamrap district, Ubon Ratchathani province, Thailand (Fig.1). It is a plain region area of the lower Moon river basin. The total area of Ban Kutchum is 25.8 acres including 5 swamps or oxbow-lake; Kut-kanun, Kutta-ngao, Kut-faimai, Kut-plado, and Kut-wangbao. The occupations of villagers are mainly fish pen aquaculture raising, rice field, and crop cultivation.

Surface water quality

The water quality was evaluated by collecting water from 5 Oxbow-lake areas in Ban Kutchum, Ban Nongkinpen sub-district, Warinchamrap district, Ubon ratchathani province [fig.1] by using grab sampling method during December 2013 – July 2014.

Water analysis was under taken in both the field study and the laboratory examination to include: pH, temperature (T), electrical conductivity (EC), suspended solids (SS), dissolved suspended solids (DS), dissolved oxygen (DO), and biological oxygen demand (BOD) [3]. Analytical and chemical methods were based on procedures from APHA (1992) And the surface water quality standard criteria of Thailand is compared to the classify water quality type [4].

Public participation and oxbow-lake benefit

The public participation in water resource management was conclusively divided into three phase. The first phase was to study the benefit of water resource, the existing conditions and problems of communities for water use, data collection by using questionnaires in 254 head households of water resource management. The second phase was to study factors that were influencing the community water management, using focus group approach to collect data. Finally, the analysis and interpretation took place after the upper stages were completed: the findings from the upper stages were used to analyze and interpret the collaboration pattern in managing community water resource and classify the strength of community. At the present stage, the public participation should be introduced into the process of water resource protection and water-saving behavior to improve the participation ability and level of the public. When the ability reaches to a certain level, the public will be encouraged to participate in the policy-making of public. The participation from the community is widely promoted and based on practices. The community with good participation awareness and ability can be selected as the exemplary community to expand the channel of public participation in water resource.

Results

Water quality in oxbow-lake

The surface water quality data for the five swamps in Ban Kutchum are shown in table 1. The results found that the water quality was classified as Type I of the standard surface water criteria of Thailand. This type of water needs to be improved and disinfected before use. It can be conserved as water ecology.

Benefits from the swamps

The swamp areas are very important to the community way of life of Ban Kutchum. The community residents are dependent on the swamps for their sustenance and family income. The local inhabitants not only collect and gain the products from their natural surroundings; they also heavily rely upon the water sources for their consumption purposes. Ban Kutchum of Nongkinpen sub-district in Warinchamrap district of Ubon Ratchathani province is situated in the areas which close to the Moon River. The areas in question are annually flooded during the rainy season. The rice crops are thus damaged. The rice farmers in finding the alternative had resorted to the off-

season rice farming between the months of November and February and again between March and June. About 310.3 acres of rice farming areas can get benefits from the swamps or creeks. The remaining parts of the areas do not get benefit from the water sources. The available swamps do not contain enough water for the rice farming. For the farming to be covered by the water sources, it is necessary to make the swamps deeper to retain more water. Increasing the swamps to keep water that can be done by expanding their banks to 15 meters. They have to be dug to five-meter depth so that the swamps can store up to 7,980,000 cubic meters of water. There are five swamps locally known as 'Kut' as shown in table 2.

Off-season rice farming dependent on the irrigation pipe system from the public water sources

The rice cultivating area of Ban Kutchum , Nongkinpen sub-district in Warinchamrap district of Ubon Ratchathani province is a low-lying zone. In the rainy season, the area is flooded. Hence, rice farming can be made twice a year. The first rice farming is done from November to February. The second one is between March and June.

Some communities living in the areas have to adjust their way of living so that they can cope with the fluctuating conditions caused by floods. Their seasoning rice farming is frequently flooded. Therefore, have to find out the way to compensate the damage caused. Gradually, the communities learn how to do the off-season farming as it is necessary for them to learn how to make the most of the available sources.

Growing a water morning glory

Growing a water morning glory (*Ipomoea aquatic)* for a commercial purpose has been practiced for about 20 years. As the communities close to the swamps and creeks are frequently flooded, the local residents have to look for an alternative. The flooding averages six times in the past ten years. Seasonal rice farming is particularly affected as the farming areas are relatively low. The purpose of growing a morning glory for a commercial purpose is to raise an income for the families which are affected by flooding. Initially, few families engaged in this occupation. Subsequently, a morning glory growing was increasingly popular among the community members. The reasons for the rise of this occupation are a reasonable income, low cost and increase productivity.

However, this occupation is sometimes affected by water quantities in one way or another. Water levels are unpredictable. Some years, water is in short supply. If that happens, it is very essential for the communities to learn how to manage water sources appropriately and efficiently. In other years, there is more water. Then, the vegetable might flow along with the water. The growers learn how to tackle an immediate problem by tying the vegetable to the trees or stabilized sticks. Besides, there are other troubles. The plants are plagued and damaged by pests and insects. To deal with this, the vegetable farmers use naturally extracted substances to get rid of the pests. They are avoiding the chemicals and they want to increase the price of their products. Importantly, the vegetable is safe for the consumers.

Growing a *Limnophila geoffrayi* Bonati

After the floods have receded, the local residents of Ban Kutchum grow the indigenous vegetable locally called "Phak kha yaeng*"* (*Limnophila geoffrayi* Bonati). The objective of growing this plant is to increase an income to compensate the damage caused by the floods. So that, the community can copes with the flood situations and live a happy life. An income as earned by the locals of Ban Kutchum is about 227,700 Thai baht/acre/year. The amount

they earn is higher than the one they gain in rice farming. Importantly, the community residents have the work in their community. They do not need to migrate to other areas to seek the jobs following the rice harvesting season. As a consequence, the families in the community grow stronger and more affectionate to one another.

However, growing *Limnophila geoffrayi* Bonati is sometimes problematic thanks to the floods. It is expected that growing this vegetable plant is expected to continue due to an increased demand of the consumers and an expanding market proportion. Other contributing factors include a short distance to the market, convenient transport and fertile soil and abundant water.

Sustainable oxbow lake use through the public participation

Community strength

The factor which features the community strength is the social structure. Considering individual cases, it was found that the community members were cooperative and mutually dependent. An average value of this aspect was 3.83. It indicates community strength at a high level. Relations between the agencies, also state officials and community averaged 3.55. It indicated community strength at a high level.

As regards the community economic system, it was found that a proper management of the community economy is very crucial. It averaged 3.68. A strength level was high. With respect to values and religious belief, the communities held a high education in a high esteem and they also held a firm religious belief. It averaged 4.18. Given a life-long learning, the communities learned how to adjust their life to enable to live happily in the flood-related situations. It averaged 3.45, which indicated community strength at a high level.

Considering the community leaders, they were found to retain their traditional values and culture. They were willing to sacrifice for the common interest of the communities. The point averaged 3.78. Community strength was at a high level. As for a community relation, the community had a strong relation among its members and it focused more on a common living than a benefit of individuals. It averaged 4.05. Community strength was at a high level. Concerning the interaction and communication, it was found that the community members held a discussion and gave a coordination to solve problems confronting their communities. It averaged 3.80. Community strength in this aspect was high. As regards the administrative system, the communities in the study had clear policies, plans, projects, and activities. It averaged 3.98. Community strength in this respect was high. The factors which are described are the infrastructure. They are responsible for the stability, unity and harmony for the communities.

The guidelines for water resource management through public participation

As far as the management of the oxbow-lake is concerned, the local residents want the water management committee to be established. The committee members are to be chosen from the communities. They are to be given knowledge on management of water sources. In addition, there should be strict rules and regulations regarding the use of water sources.

The state and private sectors should play a role in providing a financial assistance, coordination in building a canal, a budget and supervision. The local inhabitants should be informed of water source conservation and environmental management. They should play a part in supervising the public's water consumption.

Conclusion and Discussion

The study results showed that the water quality of the swamp and creek in the surface water quality was classified as Type III of the surface water quality standard criterion in Thailand. It was overall found that it was at a fair level. In other words, water can be used for the consumption purposes without a germ-killing process and a water quality improvement process. Agriculturally, the local residents have adjusted themselves to the changing situations triggered by annual floods. They make the best use of the swamp by doing off-season rice farming, growing a water morning glory and a *Limnophila geoffrayi* Bonati. Considering the community strength, the following factors were found to be strong and they were at a high level: social structure, community economic system, values and religious belief, a life-long learning, community leaders, social relation system, interaction and communication mechanism, and strong administrative system. A water management model is based on a concept of a participation process as proposed [5]. Five factors are to be considered in water management: qualifications of the community leaders, community members, community strength, budget and academic information support. These five factors are acquired by means of the questionnaire and data analysis. The findings from the study are similar to the study [1] who found that in water management, the committee had to participate in the issues of training, and practice. The present study was also in accordance with the work [6] who found that in the development process, the committee had to participate in conserving the water sources, imposing the penalty to the offenders or violators and implementing the policies.

Acknowledgement

We would like to extend our thanks to the Program of Environment Technology, Faculty of Science, Ubon ratchathani Rajabhat University. We are also grateful to the Office of the National Research Committee for its support for the research. Our thanks go to the royal research and development project and Ubon ratchathani Rajabhat University for the research budget.

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Table 1 An analysis of the quality of water in the swamp during the dry season and high water season (December 2013-July 2014)

Parameter	Results										water standard [2]
	KutKanun		Kutta-angao		Kutfaimai		Kutplado		Kutwangbao		
	1	2	1	2	1	2	1	2	1	2	
Temperature (^{0}C)	22	29	24	28	24	27	25	29	25	30	Not higher than 3 ^{0}C
E.C (µsimen /cm)	283	411	316	408	304	298	259	140	234	267	
SS (mg/l)	78	22	92	20	92	36	74	16	4	4	
TDS (mg/l)	96	136	22	78	68	106	70	124	24	83	
pH	7.75	7.46	7.31	72	6.75	6.5	6.26	6.62	6.43	6.52	5.0 - 9.0
DO (mg/l)	5	5.35	4.8	5.2	3	4.25	4.25	4.5	5.45	6.8	More than 4.0
BOD (mg/l)	1.85	1.46	2.95	2.6	1.5	1.4	1.65	1.3	1.85	1.67	Not more than 2.0

Table 2 Details of the oxbow lake in Ban Kutchum of Nongkinpen in Warinchamrap, Ubon ratchathani province

Name	Width (meter)	Length (meter)	Depth (meter)	Stored water quantity (cubic meter)
1. Kutkanun	40	500	4	80,000
2. Kutta-ngao	40	1,000	4	160,000
3. Kutfaimai	40	2,000	4	320,000
4. Kutplado	40	800	4	128,000
5. Kutwangbao	40	500	4	80,000

Figure 1 Study area of Oxbow-lake management in Ban Kutchum, Nongkinpen sub-district, Warinchamrap district, Ubon Ratchathani province; 1 Kutkanun, 2 Kuttangao, 3 Kutfaimai, 4 Kutplado and 5 Kutwangbao.