# Community Participation in Water Management for Agriculture in Phra Phloeng, Khao Chakan, Srakaew, Thailand

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## Abstract
This research aims to study (1) the context of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province, which facilitate the community participation in water management for agriculture and (2) the community participation in water management for agriculture. The research methodology is the interviewing 6 key informants and using questionnaire with 400 water users in Phra Phloeng Sub-district. The results show that (1) An agricultural area of Phra Phloeng Sub-district is 164,675 rai. The area is plateau and there are two lines of small natural canals and one swamp which become water resources for agriculture and consumption plentifully. Moreover, an agricultural land use of Phra Phloeng Sub-district is farming, field of fruit trees and vegetables respectively. The important agricultural water resources in Phra Phloeng Subdistrict are Phra Sathong canal and Phra Phloeng canal and various natural water sources. The important economic crops in Phra Phloeng Sub-district are rice, corn, sugarcane, etc. (2) The most effective way to manage water resources for agriculture in Phra Phloeng Sub-district is to develop social capital and to encourage community participation and also to create networks and cooperation from all sectors. The emphasis on the participation process is an important supporting factor. The short-term management is to develop the existing water resources. The Medium-term management is to procure new water storage. The Long-term management is to induce the "Forest Mountain" Sustainable Forest Management and new theory of His Majesty King Bhumibol Adulyadej to be water management guideline.
**Keywords:** Participation, Water Resource Development Needs, Water Management for Agriculture, Water Resource Development Guideline

## Introduction
Water is an important resource for life. Thailand is facing water shortages because of the population growth and the expansion of economic activities that increase water demand every year. Water problem is a long-term continuous problem that it is not only caused by physical problems or insufficient water supply but also a water allocation inefficiently. Water problem can led to economic disparities and increased social conflicts. Therefore, we need to adjust the water management system for the benefit of production, consumption and flood prevention Integrated to increase or create competitiveness and sustainable development in the country. (Rachartcharoen, 2015: 78)
Water management problem occurs because the community cannot plan to use water appropriately and there is not enough water in some seasons. It leads to community conflict and also the consumer water shortage in the area. (Research team, 2019: 82)

Based on the problem above, Thailand had been made the 8th National Economic and Social Development Plan (1997-2001) to solve water problem by promoting an integrated water resource management. An activity is the provision of water resources, water quality improvement, pollution control and water allocation efficiently. The objective of water resource management plan is: (1) to provide governance mechanisms and also to coordinate about water resources development in both national and international level consistently. (2) to organize, allocate and share water resources appropriately by considering a necessity, priority and fairness in water management. (3) to impose water payment with the people who use water for industrial, agricultural, and consumption and also to improve the structure and water rates payment for consumption and industrial by considering the cost of procurement, production, distribution and waste water treatment. (4) to improve the water transmission and water supply system for irrigation and consumption in the community to reduce water leakage. (5) to campaign and disseminate for water saving, especially the introduction of water saving methods or the use of water-saving devices in the community. (Rachartcharoen, 2015: 78)

Most of the population in Phra Phloeng Sub-district is agricultural occupations (85 percent), such as cassava, sugarcane, corn, papaya, rice fields (in-season rice fields and off-season rice field), bamboo shoots, melons, cantaloupe and orchards. The topography is a rain shadow, Sandy loam, lack of moisture, drought and farmers cannot plant crops in summer.

In addition, the above-mentioned crop planting requires a lot of natural water from rain. In Phra Phloeng Sub-district area only have small wells and pond that it is not enough for planting in dry season. If local people and government agency realize the importance of water management in both local and household levels, it may affect the process of solving water problems more interestingly.

Phra Phloeng Sub-district is a suitable area for development as an agricultural industry because most of the land documents are por.bor.tor. 5; this documents are land tax return (property tax return) and receipt given to anyone who comes to pay land tax in local administration offices, and sor por kor. 4-01; it refers to land allotted by the Land Reform Committee with the strict provision of agricultural or forestry usage for certain persons (such as farmers). Moreover, the degraded forest area that the law has not been canceled. There are 3434 Khao Chakan-Tha Ta Si (Khao Laem) road and Phra Phloeng - Choreography road were cut through the area. Most of the area was plant for farming such as corn, cassava, rice, papaya, eucalyptus field, fruits, raising cattle and buffalo and people tend to plant more rubber and oil palm. Water is an important factor in an agricultural industrial area development (Phra Phloeng Subdistrict Administrative Organization, 2018a).

Therefore, the drought problem every year has affected to people in both the agricultural occupation and the availability of water usage in dry season. If local people and government agency are able to integrate and create a participation process in water management development together, it will affect the potential development or people capacity to solve water shortages problem for agriculture in the dry season effectively.

Therefore, as shown above, it is important to study the community participation in water management for agriculture in Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province.

## Research objectives

1. To study the context of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province, which facilitate the community participation in water management for agriculture.
2. To study the community participation in water management for agriculture of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province.

## Literature Review

### The concepts of watershed management: people, community, and watershed

The community-based watershed management is another way for local communities to play a role in management. The watershed management has an important concepts and principles to encourage the sustainable watershed management as follows. (Integrated Research Coordination Office Maejo University, 2011 cited in Ketima, 2012: 11-16)

1. Relation and dependence system

The watershed management concepts is the people relationship and natural resources in various ways, including a work and management guidelines that based on community culture. The watershed management concepts must involve a comprehensive problems with solutions and also a mix of knowledge in modern science and local wisdom. The watershed situations must be viewed as a common problem or mutual fate that will lead to people cooperation and create a learning platform together.

2. Management and utilization system

There are three important characteristics of community-based watershed management:

- Holistic resource management is resource management according to the beliefs of the local people by considering a relationship of forest, water and land and a benefits and duties of each type of natural resources. Moreover, a holistic resource management is the relationship between human and natural resources in both physical and psychological relationship such as beliefs or supernatural dignity.
- Community participation in resources management is the way that gives more decision-making authority to community or people such as community forest management or weir water management. Special characteristics of these local resource management are community. The community members participated in the management in various forms such as tradition groups, seniors, north groups, weirs group, etc. They have a rule for their own management, punishment and fine offenders who break the rule and also allocate mutual benefit for community member.
- Resource management based on moral principles are designed to control and inspect community member in resource management and also to prevent depletion of natural resources.

3. The elements of community-based watershed management

The result of the local community have been involved in watershed management lead to knowledge and wisdom accumulation which have the following elements: 1) beliefs and rituals 2) natural resource knowledge management 3) utilization knowledge.

4. Community organization

The community member use and maintain their natural resources that are controlled by their belief system, production system, and sustainable utilization system.

The watershed management is a relation system between people and natural resources. It is a characteristic of mutual dependency by using the community's belief system as a basis to organize relationships to achieve a natural resource management goal. The important thing is knowledge exchange, situation analysis, community member development to prepare when social changes increasingly.

### Public participation in water management

Government organization should give an opportunity to people to have a right to access all public sector's information on water management, offering opinions, setting directions, and also to cooperate in various activities to prevent conflicts in the government's water management operations. It is a relations process between the government and the public to find the best option on water management effectively. (Phansuwanno,1996: 6 cited in Lohpakdisawad and Jesadalak, 2015: 1457)

The thinking and planning participation. Community member, who live in area of water transmission and maintenance projects, join the meeting and discuss with government official and propose their opinions about water management to solve water shortage problem together.
The play-role participation. Community member, who live in area of water transmission and maintenance projects, participate and play a role or suggest a various ways to make a decisions in water management with the public sector. They also have authority to set a penalty, rule, or any regulation about water resources management.
The participation in monitoring and evaluation. Community member, who live in area of water transmission and maintenance projects, join the meeting to evaluate the performance of water management, to monitor the progress of activities and projects, or to resolve conflicts that occur from the project, and also to propose opinions, improvements or guidelines for development to meet an expected needs together.
The Participation in community ownership. Community member, who live in area of water transmission and maintenance projects, have responsibility to solve their community problems. They have to feel that they are part of the community and ready to help with willingness.

**The concept of public policy and public policy implementation**

Thomas R. Dye (cited in Ketima, 2012: 22) defines public policy as "whatever the government chooses to do or not to do". The government chooses to do are all activities including routine activities and occasional activities. For the government chooses not to do, Dye considered a public policy as well, such as the government's cancellation of the military policy, which the government choose a military volunteer policy instead of all able-bodied men to be soldiers.
James Anderson (cited in Ketima, 2012: 22) defines public policy as a state's operation that must be one or more goals, objectives or even proposes. Public policy must be performed by one person or a group of people in order to solve problems. Public policy has four key elements: an objective, a guideline, an action, and a positive or negative practice.
Policy Implementation (Uttaradit Rajabhat University, 2011 cited in Ketima, 2012: 27) is an importance part of public administration study because it related to policy decision making process. Public policy will be able to solve the problem or not, it depends on policy implementation process. If the policies are successfully implemented, it reflects a decision making process that response to people's needs effectively.

**The concept of strong community**

Wichit Thinwattanakun (2006 cited in Ketima, 2012: 40) noted that strong community is a community ability to solve their own problems and also have talented leaders and learning together based on culture, beliefs, values, religion and economy. Each community has used their potential to solve problems under cooperation and support from external organizations.
The community is defined as a group of people who have an interrelated and a connection with each other continuously because they have a common area or have a mutual career or business operation, a common purpose, or a culture of belief or mutual interest. (Ketima, 2012: 41) Being a community is a certain number of people who have a common purpose or communication or grouping together with generosity or learning together in management action for the achieve success together. (Ketima, 2012: 41-42). The definition above, it can be noted that community is the individual people who created a relationship with the principles, conditions, and rules that we call "norms of coexistence". The community is therefore characterized as a social organization that respond to people needs. The strong community means that people with a common purpose gather together in the form of "community organization" that they learn management and also solve community problems effectively

such as economic, social, cultural and the environment issues. The community is a group, association, cooperative, or network for mutual benefit in society.

## Research Methodology

The study was a mixed method that involve qualitative and quantitative data collection. The data was collected into two ways:

1. The documentary study. It's a secondary data that related to literature review, documents, publications, journals, community physical information, water use characteristics, or water resource management research, etc.

2. The field study. It's a primary data that was collected through interview forms in various issues such as the causes of water shortages for agriculture in Phra Phloeng Sub-district, the water shortage problem solving policies, plans or projects of the state, and the suggestions or guidelines for solving water shortage problems of public and community leaders in the area (the president of Phra Phloeng Subdistrict administrative organization, the vice president of Phra Phloeng Subdistrict administrative organization, the secretary of Phra Phloeng Subdistrict administrative organization). Moreover, the researcher collected data through questionnaires with farmers about the water usage problem, the intensity of problem, and also the community management.

The research population and samples consisted of three informant groups:

Group 1: two community leaders (one village chief and one village headman). The researcher used the purposive sampling technique and the sampling method is selected based on the village leaders who have experienced about water shortages for agriculture from Phra Phloeng Sub-district and also have a role and duty to coordinate with the government agencies.

Group 2: four government officials.

- one president of Phra Phloeng Subdistrict administrative organization
- two vice president of Phra Phloeng Subdistrict administrative organization
- one secretary of Phra Phloeng Subdistrict administrative organization

The researcher used the purposive sampling technique and the sampling method is selected based on executive local government officials and experts or scholars who have experienced and knowledge about water management for agriculture in Phra Phloeng Sub-district.

Group 3: twelve villages farmers consisted of Moo 2, Ban Na Khan Hak, Moo 4, Ban Bueng, Rama 5 Village, Ban Phu Ngern, Moo 6, Ban Tha Phak Chi, Moo 8, Laemthong House, Moo 9, Ban Tha Chung Village Moo 10, Ban Mai Pattana Village, Moo 11, Nong Pak Lung Village, Moo 12, Submun House, Moo 16, Ban Suk Charoen, Moo 17, Ban Non Somphon Samakkhee, Moo 19, Ban Noen Siam. The researcher used the quota sampling technique by determining the proportion from 12 villages (the total population of 2,995 households). The proportion was calculated by 30% of one village. The sample group was selected in the study involving 400 farmers who use water and suffer from water shortage as respondents.

**Data Analysis**

1. Data analysis included content analysis to analyze interview data about community participation in water management for agriculture guideline between public sector and the Phra Phloeng Subdistrict administrative organization.

2.Descriptive statistics included frequencies, percentages, means and standard deviation for demographic data.

## Research finding

1. the context of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province, which facilitate the community participation in water management for agriculture.

1.1 Area condition and agricultural information

Phra Phloeng Subdistrict Administrative Organization is a local government organization that located in the south of Khao Chakan district, Srakaew province and also away from the Khao Chakan district about 11 kilometers, with a total area of 263.48 square kilometers or 164,675 rai. The area is a plateau and there are many small mountains that make a small natural canal into two lines and one swamp which become water resources for agriculture and consumption plentifully. A total population of approximately 15,877 people are under the control of Phra Phloeng Subdistrict Administration Organization which consisted of 8,035 men and 7,842 women (Phra Phloeng Subdistrict Administrative Organization, 2018b).

1.2 Agricultural land use

The most of the agricultural areas of Phra Phloeng Sub-district is farming such as crops farming, orchard or rice field, and livestock respectively. A total agricultural area of approximately 88,812 rai which consisted of a cassava plantation area of approximately 36,510 rai or 41.10 percent of the total agricultural area, a land area of approximately 18,395 rai or 20.71 percent of the total agricultural area, a sugarcane planting area of approximately 8,770 rai or 9.87 percent of the total agricultural area, a rubber plantation area of approximately 4,450 rai or 5.01 percent of the total agricultural area, a maize cultivation area of approximately 2,970 rai or 3.34 percent of the total agricultural area, a vegetable crop area of approximately 2,746 rai or 3.09 percent of the total agricultural area, a perennial plant area of approximately 2,035 rai or 2.29 percent of the total agricultural area, a papaya plant area of approximately 1,839 rai or 2.07 percent of the total agricultural area, a soybean plant area of approximately 1,820 rai or 2.04 percent of the total agricultural area, a mungbean plant area of approximately 1,700 rai or 1.91 percent of the total agricultural area, a cantaloupe plant area of approximately 817 rai or 0.91 percent of the total agricultural area, and an off-season rice area of approximately 500 rai or 0.56 percent of the total agricultural area (Phra Phloeng Subdistrict Administrative Organization, 2018b).

1.3 Water resources for agriculture

The important water resources for agriculture in Phra Phloeng Subdistrict is the rain water basin, the Phra Sathong canal, Phra Phloeng canal, a various natural water resources and groundwater, village water supply and provincial water supply (Phra Phloeng Subdistrict Administrative Organization, 2018b).

1.4 The important economic crops and crops cultivation area of Phra Phloeng sub-district in 2007

The important economic crops includes a 31,750 rai of in-season rice field, 400 rai of out-of-season rice field, 21,480 rai of maize, 31,950 rai of cassava, 8,730 rai of sugar cane, 11,850 rai of soybean, 6,120 rai of mung beans, 11,850 rai of sesame, 560 rai of kenaf, 490 rai of jute, 32 rai of organic guava, 480 rai of sweet bamboo, 485 rai of hedge bamboo, 2,500 rai of rubber, 100 rai of oil palm, 1,250 rai of vegetable, 11,303 rai of wood, 270 rai of cotton, 3,480 rai of papaya, 125 rai of cantaloupe, 230 rai of sweet corn.

2. The community participation in water management for agriculture of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province

**Qualitative data analysis results**

The qualitative data analysis study, by interviewing all 6 community leaders and government agencies, showed that all aspects of the community participation in water management are link and concordant such as (1) Planning participation process in situation analysis, problem analysis and operational guidelines. (2) Operational participation in staffing, budgeting, coordinating and also promoting in decision-making by meeting attendance and public hearings. (3) The follow-up participation about operations accountability and performance report. (4) The community sustainability is a conservation, restoration and protection of community environment and also a quality of life and community empowerment. The

economic sustainability is an economic growth, occupational security and adhering to the principles of vision, mission, and strategy of government agency. Recently, an executive of government agency always give precedence to a large utilities building such as weirs, reservoirs, etc., rather than educating or suggesting people to preserve water resources in community. Moreover, local government officials should be a consultant, advising and using new techniques in water management to the people in community.

**Quantitative data analysis results**

The statistics data of respondents consisted of 248 male (62.0%) and 152 female (38.0%)

1. The water resources usage study illustrates that natural water resources (Huai Nong Bueng) appeared to be the highest rank at a sufficient level (1.91 percent). The next rank is a tap water with a sufficient level (1.92 percent) and the lowest rank is the pool or pond or pond where storing water for use with a sufficient level (2.27 percent).

2. The water resources usage problems for agriculture

Table 1 shows the responses of water level problem towards the water resources usage for agriculture. The item "the existing water resource in community is not enough for plant" appeared to be the highest rank ($\overline{X}$ = 3.42) and the next rank was the item "no water resource for agriculture" ($\overline{X}$ = 3.40), while the lowest rank was the item "the canal or water resource is not conducive to use" ($\overline{X}$ = 2.71). The all three water level problems for agriculture showed at moderate level.

**Table 1** Mean and standard deviation of the water level factor.

| **The water level problem** | $\overline{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| Existing water resource in community is not enough for plant | 3.4275 | .00285 | moderate |
| No water resource for agriculture | 3.4050 | .87159 | moderate |
| Canal or water resource is not conducive to use | 2.7175 | .26954 | moderate |
| **Total** | **3.2369** | **.47343** | **moderate** |

Table 2 illustrates the responses of agriculture problem towards the using water resources for agriculture which indicates that the highest ranked items was "Lack of effective community leaders in water management for agriculture" ($\overline{X}$ = 3.45) while the item "Lack of cooperation among farmers" was the next rank ($\overline{X}$ = 3.44). The lowest rank was the item "People migrate outside the area to find work that caused family problems and lack of warmth" ($\overline{X}$ = 2.90). The all agriculture problems shown occurred at moderate level.

**Table 2** Mean and standard deviation of the agriculture factor.

| **The agriculture** | $\overline{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| Lack of effective community leaders in water management for agriculture | 3.4500 | .94267 | moderate |
| Lack of cooperation among farmers | 3.4400 | .80500 | moderate |
| People migrate outside the area to find work that caused family problems and lack of warmth | 2.9050 | .94510 | moderate |
| **Total** | **3.1860** | **.35506** | **moderate** |

Table 3 describes the mean scores related to the responses of the government support towards the using water resources for agriculture where all items were ranked moderately high. The highest mean was ranked for the item "people do not have water usage knowledge for plant" ($\overline{X}$ = 3.41), followed by the lack of cooperation between relevant agencies ($\overline{X}$ = 3.20) and

followed by the item "government agencies have no plans/projects such as digging ponds, irrigation canal, reservoir construction to solve water shortage problem" ($\overline{X}$ = 3.06)

**Table 3** Mean and standard deviation of the government support factor.

| **The government support** | $\overline{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| People do not have water usage knowledge for plant | 3.4150 | .92732 | moderate |
| Lack of cooperation between relevant agencies | 3.2025 | .91848 | moderate |
| Government agencies have no plans/projects such as digging ponds, irrigation canal, reservoir construction to solve water shortage problem | 3.0625 | .85757 | moderate |
| **Total** | **3.2144** | **.53024** | **moderate** |

2. Table 4 shows the suggestions towards the using water resources for agriculture which indicates that the highest level was a public relations or promotion for farmers about water management regularly ($\overline{X}$ = 3.46) and followed by the item "collaboration between government officials and local farmers to determine sustainable water management guidelines" ($\overline{X}$ = 3.37). The lowest rank was the item "To train and educate people about water management for agriculture, establishment of water user group, creating water storage, and water allocation" ($\overline{X}$ = 3.11). The all water management suggestion shown occurred at quite agree level.

**Table 4** Mean and standard deviation of water management suggestion.

| **The water management suggestion** | $\overline{X}$ | **S.D.** | **level** |
|---|---|---|---|
| To promote or encourage farmers about water management regularly | 3.4637 | .85246 | Quite agree |
| To collaborate between government officials and local farmers to determine sustainable water management guidelines | 3.3725 | .02536 | Quite agree |
| To train and educate people about water management for agriculture, establishment of water user group, creating water storage, and water allocation | 3.1175 | .93320 | Quite agree |
| **Total** | **3.2395** | **.35269** | **Quite agree** |

3. The water management participation for agriculture

Table 5 describes the mean scores related to the responses of physical factor towards the water management participation for agriculture where all items were ranked quite agrees level. The table indicates that the highest ranked was the item "you attended a water user group meeting" ($\overline{X}$ = 3.38). The next rank was the item "you participate in activities related to water management" ($\overline{X}$ = 3.23). The lowest rank was the item "you often work to solve water problems" ($\overline{X}$ = 3.05).

**Table 5** Mean and standard deviation of physical factor.

| **The physical factor** | $\overline{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| You frequently attended a water user group meeting | 3.3850 | .05573 | Quite agree |
| You participate in various activities related to water management | 3.2375 | .86159 | Quite agree |
| You often work to solve water problems | 3.0550 | .85955 | Quite agree |
| **Total** | **3.2070** | **.42047** | **Quite agree** |

Table 6 illustrates the responses of idea factor towards the water management participation for agriculture which indicates that the highest ranked items was “water resources should be shared” ($\bar{X}$ = 3.26) followed by the item “idea to develop water resources with other water users” ($\bar{X}$ = 3.18) and followed by the item “the punishment for the offender about water usage” ($\bar{X}$ = 2.98). The all ideas factor shown occurred at quite agree level.

**Table 6** Mean and standard deviation of idea factor.

| **The idea factor** | $\bar{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| Think of allocating water resources | 3.2650 | .07362 | Quite agree |
| Think of the way to develop water resources with other water users | 3.1850 | .99913 | Quite agree |
| Propose a punishment for the perpetrator of water usage | 2.9850 | .99108 | Quite agree |
| **Total** | **3.1215** | **.47719** | **Quite agree** |

Table 7 shows the responses of emotional factor towards the water management participation for agriculture. The all emotional factor shown occurred at quite agree level. The item “confidence in the community's ability to manage water resources” appeared to be the highest rank ($\bar{X}$ = 3.36) and the next rank was the item “to solve unfair water problem as soon as possible” ($\bar{X}$ = 3.18). The lowest rank was the item “a feeling that you have enough water to use” ($\bar{X}$ = 3.08).

**Table 7** Mean and standard deviation of emotional factor.

| **The emotional factor** | $\bar{X}$ | **S.D.** | **Level** |
|---|---|---|---|
| Have confidence in the community's ability to manage water resources | 3.3650 | .88245 | Quite agree |
| Solve unfair water problem as soon as possible | 3.1875 | .97558 | Quite agree |
| Feel that you have enough water to use | 3.0850 | .93539 | Quite agree |
| **Total** | **3.1885** | **.51051** | **Quite agree** |

Table 8 describes the mean scores related to the responses of ownership factor towards the water management participation for agriculture where all items were ranked quite agrees level. The table indicates that the highest ranked was the item “You feel that you are a part of community in water management” ($\bar{X}$ = 3.37) and the next rank was the item “You will preserve and maintain water resources” ($\bar{X}$ = 3.30). The lowest rank was the item “You have enough water that meet your needs and public” ($\bar{X}$ = 3.08).

**Table 8** Mean and standard deviation of ownership factor.

| **The ownership factor** | $\bar{X}$ | **S.D.** | **level** |
|---|---|---|---|
| You feel that you are a part of community in water management | 3.3775 | .96036 | Quite agree |
| You will preserve and maintain water resources | 3.3050 | .91601 | Quite agree |
| You have enough water that meet your needs and public | 3.0850 | .86871 | Quite agree |
| **Total** | **3.2680** | **.41691** | **Quite agree** |

## Discussion

The study found that most of the sample groups participated in water management for agriculture in the Phra Phloeng sub-district.

1. the context of Phra Phloeng Sub-district, Khao Chakan District, Srakaew Province, which facilitate the community participation in water management for agriculture.

1.1 Area condition and agricultural information

Phra Phloeng Subdistrict Administrative Organization is a local government organization that located in the south of Khao Chakan district, Srakaew province and also away from the Khao Chakan district about 11 kilometers, with a total area of 263.48 square kilometers or 164,675 rai. The area is a plateau and there are many small mountains that make a small natural canal into two lines and one swamp which become water resources for agriculture and consumption plentifully. A total population of approximately 15,877 people are under the control of Phra Phloeng Subdistrict Administration Organization which consisted of 8,035 men and 7,842 women.

1.2 Agricultural land use

The most of the agricultural areas of Phra Phloeng Sub-district is farming such as crops farming, orchard or rice field, and livestock respectively. A total agricultural area of approximately 88,812 rai.

1.3 Water resources for agriculture

The important water resources for agriculture in Phra Phloeng Subdistrict is the rain water basin, the Phra Sathong canal, Phra Phloeng canal, and a various natural water resources.

1.4 The important economic crops and crops cultivation area of Phra Phloeng sub-district in 2007

The important economic crops includes a 31,750 rai of in-season rice field, 400 rai of out-of-season rice field, 21,480 rai of maize, 31,950 rai of cassava, 8,730 rai of sugar cane, 11,850 rai of soybean, 6,120 rai of mung beans, 11,850 rai of sesame, 560 rai of kenaf, 490 rai of jute, 32 rai of organic guava, 480 rai of sweet bamboo, 485 rai of hedge bamboo, 2,500 rai of rubber, 100 rai of oil palm, 1,250 rai of vegetable, 11,303 rai of wood, 270 rai of cotton, 3,480 rai of papaya, 125 rai of cantaloupe, 230 rai of sweet corn.

2. Community participation in water management for agriculture in Phra Phloeng Sub-district, Khao Chakan district, Sa Kaeo Province can be concluded that water management for agriculture in the Phra Phloeng sub-district is most effective. The development of sustainable social capital must be encouraged participation and created networks and cooperation from all sectors to connect families and communities, religious institutions, government agencies, private sector continuously (Kalyanamitra, 2018: 314) and also emphasis on the participation process. (Kalyanamitra, 2017: 36). The royal initiative of His Majesty the King water energy project should be apply to a community. The first important point is Rain (Nam Fon) to solve drought problems by creating artificial rain which we are well known as “the royal rain” to increase water to the land. The next point is to store water by making weir to reduce leach rate in the mountain area and also to store water for people’s daily life (His Majesty King Bhumibol Adulyadej’s Footsteps, 2004: 59). Moreover, the vetiver grass planting is the way to prevent soil erosion and retaining soil moisture (Sumet Tantivejkul and group, 2005: 58). The water management can be arranged into short, medium and long term as follow: (Ketima, 2012)

The short-term management is to develop the existing water resources and obtain water supply from nearby areas.

The Medium-term management is to procure a new water storage.

The Long-term management is to induce the "Forest Mountain" Sustainable Forest Management: Reforestation of forests in the upper reaches of the forest, three kinds of forestry, four benefits and new theory of agriculture of His Majesty King Bhumibol Adulyadej to be a water management guideline in conjunction with the community participation process.

## Suggestion

### Policy suggestion

1. Local government agency should give an opportunity to community to participate in situation analysis planning, water content and usage survey, and identifying major watershed problems.
2. Local government agency should decide an environmental policy to create sustainability in the Phra Phloeng sub-district watershed community by cultivating consciousness in conservation and preservation natural resources.
3. Local government agency should decide a social policy to create sustainability in the Phra Phloeng sub-district community by emphasis community self-sufficiency.
4. Local government agency should create an economic sustainability policy in a higher level.

### Practical suggestion

Community participation in water management for agriculture of Phra Phloeng Sub-district should be proceeded as follows:

1. Phra Phloeng Subdistrict Administrative Organization should organize water management project continuously to stimulate an environmental restoration perfectly.
2. All sections, including subdistrict administrative organization, Royal Irrigation department, community leaders, farmers and water user groups, should manage a forum for brainstorming in development planning by exploring the community resources, especially water shortage in households.
3. The government should promote and create agricultural strategies, including extension of sustainable agriculture project, weir project, and Canal Dredging Project. The Subdistrict Administrative Organization should facilitate the community participation water management continuously.
4. Phra Phloeng Subdistrict Administrative Organization should set up a sufficiency economy learning centre by using a community potential and available resources to find community management problems and needs to obtain a career that generates sustainable income.
5. Sa Kaeo provincial agency should cooperates with universities or agencies that have knowledge and expertise in water management to develop water management and increase agricultural income for local people.

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