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Water use efficiency improvement at local level via training process -Case study in the Thor Tong Daeng (TTD) Irrigation Project area, Kamphaengphet Province Thailand-

Chitsanuwat Maneesrikum
Creative Intelligence Co Ltd.
tanate091@hotmail.com

Teetitorn Chullapram
Chula Unisearch, Chulalongkorn University
teetitorn@gmail.com

Introduction

Thailand has long been developing large water reservoirs and irrigation systems consisting of a lot of medium and small. But when analyzing the utilization from the development and use of existing resources, it is found that operations are clearly segregated in terms of water management including local level, land use, farming, production, and marketing resulting in inefficiency in view of integrated management. In rainfed areas, it is based on individual management. Agricultural productivity is also relatively low in contrast to the higher demand for water in cultivation. Land use patterns have also changed. All these factors tend to lead to the problem of poverty and inequality of farmers.
In recent years, both problems of water shortage in the dry season and floods in the rainy season have been experiencing more frequent and more severe due to increasing climate vulnerability.
Thus, the sustainability transitions (Derk Loorbach, et al.,2017) are crucial for agriculture communities adaptation that includes the hard-side factor, soft-side factor, and people-side factor (UNRISD, 2016). There were studies on good practices (J.B. Foundation, 2010: Water Aids in Nepal (2011)), guidelines (Institution of Civil Engineers (2011), and research works (Ellie Chowns (2017): Henry Bikwibili Tantoh, et. al (2019)) to strengthen community water management for more water security and water management improvement at local level.

Research objectives

The research, under the TSRI-NRCT Spearhead Research Program (Sucharit K., 2020), aims to improve water management efficiency at local level; to reduce the disparity in access to water resources of people in the community within the Thor Tong Daeng (TTD) Irrigation Project area, Kamphaengphet Province, Thailand, that the local agriculture communities have long been traditionally adopted the conjunctive use of water for their crop production (Thailand Climate Change Adaptation Information Platform (T-PLAT)); and to summarize key characteristics of good water management practices at local level achieving through the process of participatory and training approach (PAR/CBR) for future applications of capacity assessment of water community organisation (Chitsanuwat M., 2020).

Research methodology

Community-based action research (CBR) is a core method of research operation by organizing a small group meeting, an in-depth interview, collecting community data using online tools. The key focuses are to encourage community leaders (Water Community Organization) on the participatory and integration and to find ways to increase the efficiency of water management at local level in the area among water users, farmers, and government staffs.
The emphasis is placed on the study in 3 key steps as follows: (1) to study of content patterns and training processes/co-operation mechanisms among the leaders of the irrigation water management group; basic water users groups, farmers, irrigation officials ,local government officials and related agencies in the area through the research process for localities, (2) to study the results, outputs and impacts of water management in the project in order to optimize water management at local level in the area of the Thor Tong Daeng (TTD) and leads to (3) to synthesise process

patterns/mechanisms/methods used to summarize key characteristics that enhanced and expanded the learned knowledge and practices and improved water management efficiency at the local level through the local participatory research process in the area of the Thor Tong Daeng (TTD) Irrigation Project with follow up capacity assessment of water community organization (see Figure 1).

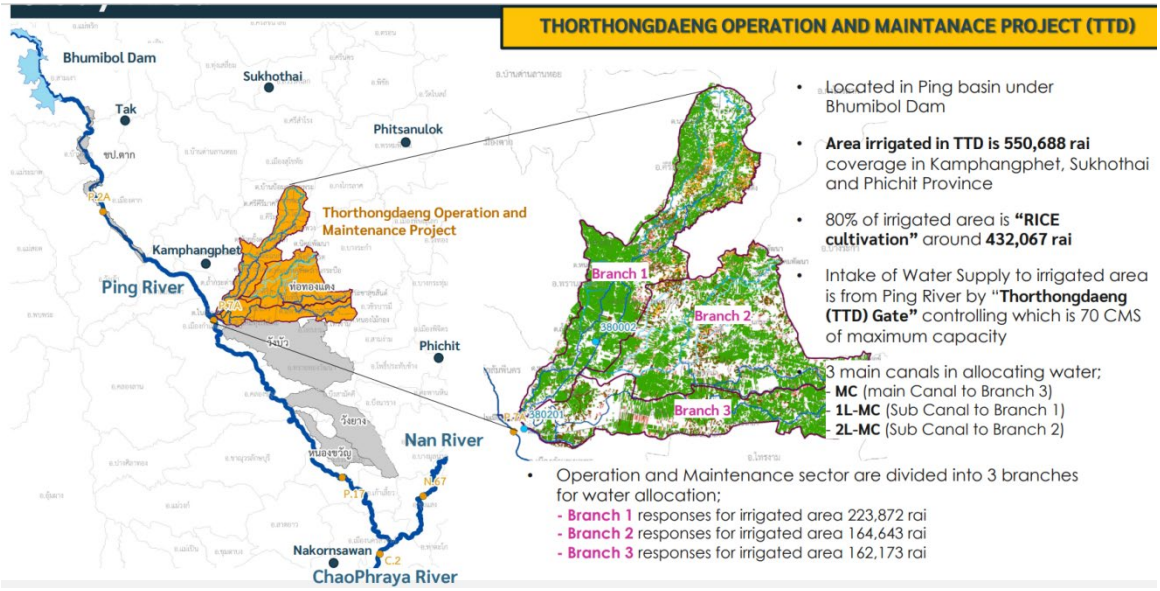


Fig.1 Study area and location

Method used

Aiming at the local level that includes leaders of water user groups, irrigation officials, and communities, the implementation process focuses on building engagement through local level action research; building a good relationship; collecting data (such as community funds, waterway maps, crop calendar and crop cultivation timeline, etc.); developing the training process to create (1) group power, and joint vision, (2) local coach on water community organization management process and practices and (3) powerful data analysis and synthesis for the preparation of water community organization plans; and creating processes, formats /mechanisms for promoting the cooperation among the expanded local level covering leaders of the irrigation water management group, water users, basic groups, farmers, irrigation officials, local government officials, and related agencies in the study area.

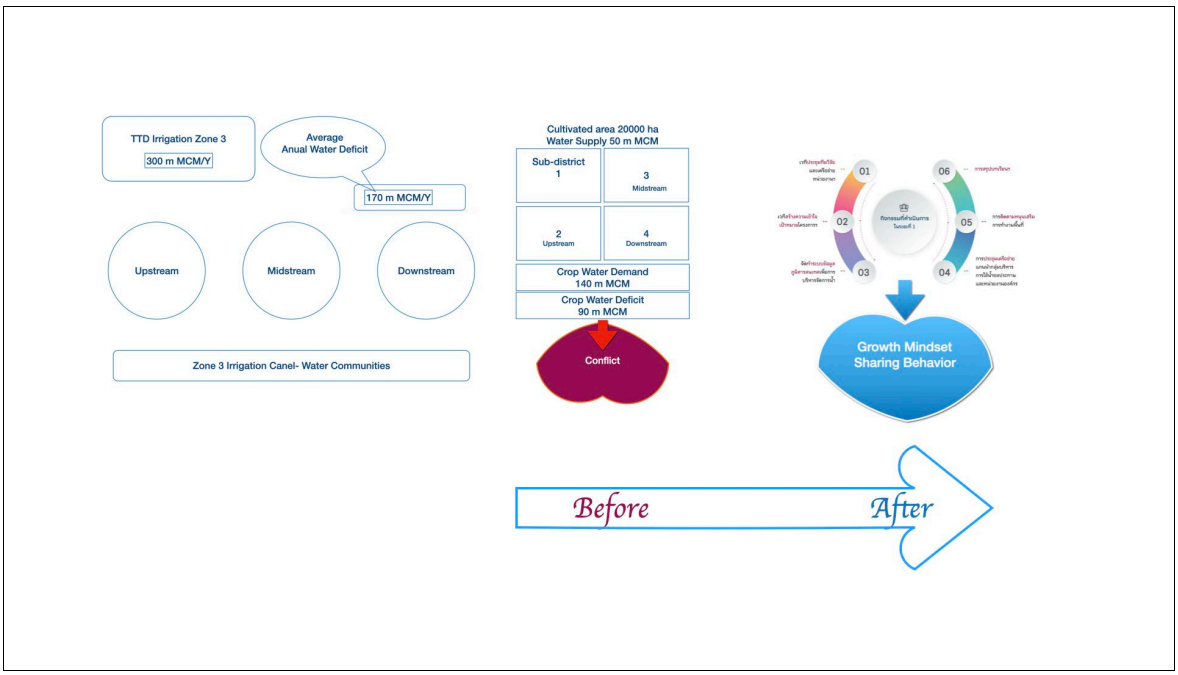
Research results

From the implementation in the pilot sub-district in 3 zones, it was found that the total water demand was 299,511,096 cubic meters/year, but the irrigation water supply in the area was only 129,677,342 cubic meters/year, resulting in the water deficits up to 169,833,754 cubic meters/year. This had caused the necessity for representatives of the water users in each sub-district to communicate with each other. Thus, the problem situation has induced an opportunity to create a neutral and safe arena for each sub-district in the same irrigation canal to exchange information on problem situations including constraining factors and conditions affecting the water management of the area until they all are becoming a network of irrigation water users who reach mutual understanding and become aware of the importance of irrigation water sharing among upstream, midstream and downstream with joint benefits. Particularly in the area of zone 3 (Sorbor. 3) of 4 sub-districts, consisting of NikhomThung Pho Thale Subdistrict, Sa Kaeo Subdistrict, Nong Mai Kong Subdistrict, and Mahachai Subdistrict with a total cultivation area of 126,290 rai (about 20200 ha.) covered upstream to the downstream area, the total irrigation water supply is 50,506,964 cubic meters/year but the water demand is as high as 140,801,874 cubic meters/year, resulting in deficits as high as 90,294,907 cubic meters/year and in Mahachai Subdistrict and Nong Mai Kong Subdistrict which both are in the downstream area with a total cultivation area of more than 57,902 rai (about 9200 ha).

This required a good collaboration on the planning in the water management at local level and led to a common water management action plan in 3 important elements:

1) Developing a group of people or communities (people-side factor) that focused on group management both in the water users in the sub-district and the canal network group. All 4 sub-districts had a water users group meeting once a month to exchange information on the water situation of the area and every 2 months there was a water users network forum that allowed each sub-district to explain the water situation of the area as well as problems encountered from irrigation water management. This participatory process enabled sympathy in each canal network management
2) Defining processes, rules, regulations (soft-side factor) that created the working atmosphere with a good degree of acceptance for having a joint implementation together. This was not only at the sub-district level, but linking to create a network of the integration of water users in each zone (Sor Bor.) having joint activities throughout the upstream, midstream to the downstream end of the canal.
3) Infrastructure development (hard-side factor) including development of water resources especially small water reservoirs in the area to support drought-flood situations under climate vulnerability, including the underground water artificial recharge, constructing water trap wells to increase in water seepage, digging a pool, constructing regulating reservoirs (small-sized monkey cheek), making troughs, installing rain gauges and installing solar panels to reduce the cost of using groundwater pumping. All of these activities increased career opportunities for people in the community throughout the year from the agriculture and land utilization planning in accordance with the situation of water supply deficits and climate vulnerability. The realization and a good understanding of the cause and effect factors had caused an altering into the cultivation of plants that required less water and a farming model that reduced water use in the lead farmers who participated in the activity

The common water management action plan of all 4 sub-districts in zone 3 (Sorbor. 3) helped reduce the conflicts among irrigation water users within the area and in different areas (different sub-districts). And it raised a better understanding of the problem situation and the mutual awareness arising from communication to exchange the information. The team of staff and officials from the Thor Tong Daeng (TTD) Kamphaengphet Province had gone down to discuss the irrigation plan and explain the situation periodically for the agricultural water users to gain sufficient knowledge in doing crop planning and crop cultivation. In addition, under the circumstances of the irrigation water deficits, this had caused people in the sub-district to adjust the crop planning of the agricultural production, for example, in NikhomThung Pho Thale Sub-district in which there had been a reduction in the area of lemon cultivation for the people in the sub-district. They shifted to focus on the production of the crop that produced more value. While Nong Mai Kong Subdistrict, Sa Kaeo Subdistrict, and Mahachai Subdistrict, there had been a change in plant species in cultivation, not focusing on farming alone as in the past. They also made a change to grow crops that used less water, such as lemongrass, pumpkin, squash-fang, as well as medicinal plants. That helped generate more income for the people in the community and led to the water users grouping to raise the level of occupation that is consistent and related to irrigation water management at the local level in the area.



Capacity Assessment of the Water Community Organisation

The research synthesized and developed good water management practices at local level and found that there are 10 characteristics in three aspects for strong engagement from stakeholders and better water management at local level, i.e.,

<u>Social, economic and environmental aspect</u>

1) Opening areas for participation of all sectors
2) Taking the “community” as the basis for managing the problem
3) Community costs and community structure systems that are conducive to operations
4) Creating a “joint ownership” in water management throughout the ecosystem
5) “Authorities and Local Administrative Organizations”

<u>Engineering and technology aspect</u>

6) Combining knowledge in applying modern technology to match the way of the local community
7) The use of information systems to help for analyzing and presenting information until it leads to planning and decision making.

<u>Management aspect</u>

8) The presence of staff in the agency to support water users closely and continuously in the role of "coach“
9) There is a three-tiered information system at community level, agency level and research results level
10) There is a course to develop the capacity of community leaders and staff in water management

Based on these characteristics, the capacity assessments were conducted in each water use area to compare engagement level by number of characteristics (yes or no) before and after training process. The results showed that the training process helped improve the water management level at local level from low to intermediate or high in each area as shown in Table 1.

Table 1 Assessment of community participatory water management at local level by number of characteristic measured (before-after training process)

Target Area (Tambon)	Number of characteristic passed (Before)			Number of characteristic passed (After)		
	Low (1-4)	Intermediate (5-7)	High (8-10)	Low (1-4)	Intermediate (5-7)	High (8-10)
1.Khui Ban Ong Tambon, Phran Rabbit Amphur	✓	-	-	-	✓	-
2.Tham Kratai Thong Tambon, Phran Rabbit Amphur	✓	-	-	-	-	✓
3.Nong LuangTambon, Lan KrabueAmphur	✓	-	-	-	✓	-
4.Chong Lom Tambon, Lan KrabueAmphur	✓	-	-	-	✓	-
5.Bueng Thap Rat Tambon, Lan KrabueAmphur	✓	-	-	-	✓	-
6.Noan PhluangTambon, Lan KrabueAmphur	✓	-	-	-	✓	-
7.Sa KaeoTambon, Mueang Kamphaeng PhetAmphur	✓	-	-	-	-	✓
8.Nikom ThoongPhotalaeTambon, Mueang Kamphaeng PhetAmphur	✓	-	-	-	-	✓
9.Mahachai Tambon, Sai NgamAmphur	✓	-	-	-	✓	-
10.Nong MaikongTambon, Sai NgamAmphur	✓	-	-	-	-	✓
	10	**0**	**0**	**0**	**6**	**4**

Conclusions

From the research work, water distribution in the irrigation area from the upstream, midstream and downstream area created a new way of water sharing and became fairer and widespread especially the 4 sub-districts in zone 3 (Sor Bor. 3), consisting of Nikhom Thung Pho Thale Sub-district, Sa Kaeo Sub-district, Nong Mai Kong Sub-district, and Mahachai Subdistrict which covered the area of 126,280 rai (approx. 20,000 ha). The level of achievement assessed by number of characteristics proposed were improved via training process which reflected the result of the participation and networking of all sectors at the local level through developing people; developing information systems; developing processes, rules, and regulations; as well as developing additional water resources. All of these required good cooperation among stakeholders from all sectors including government officials, private agencies in the areas, groups of water users, and a network of affected canal users. The water user group or JMC (Joint Management Committee for Irrigation) has participated in the systematic planning throughout the value chain covering water use, agricultural production, productization, product

distribution, and commercialization and marketing with the objective to maintain ecological balance. The participatory research process has developed community water management practices with 10 characteristics which shown good results of the new training approach in water management at local level in the irrigation area achieving a viable and more sustainable solution under the irrigation water deficits situation of the affected local communities.

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References

(1) Jal Bhagirathi Foundation (2010). Good Practices in Water Security, UNDP India.
(2) The Institution of Civil Engineers (2011). Managing water locally: An essential dimension of community water development, Oxfam GB and WaterAid.
(3) Nepal in WaterAid (2011). Training manual on Water resource management: Integrated planning and management at community level, September.
(4) UNRISD (2016). Understanding Transformation for Sustainable Development. Flagship Report Chapter 1, 28 pp. (www.unrisd.org).
(5) Derk Loorbach, et al., (2017). Sustainability Transitions Research: Transforming Science and Practice for Societal Change. Annual Review of Environment and Resources 42(1) DOI:10.1146/annurev-environ-102014-021340. Nov.
(6) Ellie Chowns (2017). Is Community Management an Efficient and Effective Model of Public Service Delivery? Lessons from the Rural Water Supply Sector in Malawi. Public Administration and Development Public Admin. Dev. 35, 263–276 (2015). Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/pad.1737.
(7) Henry Bikwibili Tantoh, Danny Mulala Simatele, Eromose Ebhuoma, Kwabena Donkor, Tracey J. M. McKay (2019). Towards a pro-community-based water resource management system in Northwest Cameroon: practical evidence and lessons of best practices, GeoJournalhttps://doi.org/10.1007/s10708-019-10085-3(0123456789(), Vol 01234567, Nov.
(8) Chitsanuwat Maneesrikum, et al.,(2020). Water Use Efficiency Improvement in local level within Tor Tong Daeng Irrigation Project area, Final Research Report submitted to TSRI-NRCT, September (in Thai).
(9) Sucharit Koontanakulvong (2020). Summary of TSRI-NRCT Spearhead Research Program Year 1. Research Brief Document. Chulalongkorn University, December (in Thai).