Securing the Food Systems of Asian Mega-Deltas for Climate and Livelihood Resilience (AMD): Work Package 4: Inclusive Deltaic Systems Governance

Technical Report on

Assessment of the Current Status of Water Management and Challenges: Implication to the Water Issues of the Irrigation Scheme, Community Fisheries and Community Fish Refuge

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Executive Summary

Main Occupation

In both targeted sites, the average HH's size was 5 members, 3 females. In Kokoh commune, about 63% are rice farmers followed by 17% of fishers and 13% of selling labor. However, small proportion (4%) was both rice farmer and fishing and sell labor. The minority of their occupation are both, fishing and farmer ad small merchant. While 60% of them having single occupation followed by 40% multiple occupation. In Beoung Sneh, main occupation depends on rice dry and wet seasonal cultivation (90%) around the lake, followed by small merchant, fish growth-out, government officer, with 5%, 2% and 1% respectively.

Demand for rice exportation to the neighboring countries, Vietnam and Thailand, price of rice leads to increase of number of dry seasonal rice cultivation. In the both studied areas, three different crop cycles practiced. However, about 60% of farmers cultivated 2 crops/year, 27% of three crops and 13% of 1 crop.

Water Source

Five main water sources such as irrigated canal, directed pump from the lake, rainfed, underground water and swamp or pond reported commonly source. About 44 % of rice farmers used irrigated canal for their rice field, followed by 26 % depending on rainfed, 17 % direct pump from the lake, 14% using underground water and about 1% use swamp or pond water (figure 4.17). While 79% of rice farmers using multiple sources of water followed by 21% from single sources. Farmers used different sources of water supply depending the availability sources of water at the nearest to their rice field.

In Kokoh commune, the main source of water receives from the Stung Chinith river through Taing Krasang Irrigation Scheme and and rain-feed. Beoung Ream (CFR location) connects to the Karav Lake before flowing down to the Stung Kmorch. Beoung Ream CFR mainly depends upon on the seasonal flood but between March-May total area of the lake becomes drying up and remains small part of the fish conservation which is sometimes depends on Taing Krasaing Irrigation water supply. In Beoung Sneh depends on rain feed while during the stress of water supply in dry season, FWUC in Beoug Snei sometimes request water supply from the Vaiko River. About 56 % of rice farmers used irrigated canal, 24 % depends on rain-fed, 12 % directs pump from the lake and about 8 % reported receiving water from swamp or pond water.

Water, Fee Demand and shortage

Every year, high water demand starting from Jan to May but the highest stress is in February and March. Visited farmers in Beoung Ream reported to pay water fee between 10,000 – 50,000 riels/ha/crop while in Beoung Sneh the water fee is ranged from 40,000 – 70,000 Riels/ha/crop. The fee was varied depending on how far of the rice field location from the irrigation canal. Moreover, water fee from the company was much higher in Theay Commune, which was between 250,000-300,000 Riel/ha/crop. However, the demand for water supply to the rice field was about 12,300 cubic meter crop/ha while the pumping was at least 8 times/crop, with water height of 15cm/time.

The factor contributed to the water shortage during dry season t was 39% from high demand of dry seasonal rice, 22 % high temperature, 18 % high evaporation, 11 % with no canal connection to the main rivers, 5 % from their rice field and from the shallow canal from year to year. However, in

Beoung Sneh most of visited farmers, the cause of water shortage was due to clean water company but amount of water being used by the company did not know.

Current Solution Mechanism

The current solution mechanism at the commune level, particularly from the FWUC is limited. Visited farmers reported they have to find their own solution while they faced water shortage during the dry season. About 50% of them pumped water from other sources as they can but about 44% reported that they leaved the rice to death and 6% concern on water saving. Moreover, intervention was made by the local commune authorities, district office of Agriculture, Environment and Natural Resource Management, Provincial Department of Water Resource and Management and Provincial Department of Agriculture but materials support reported limited. During the stress of water shortage, main water source reported depending on Vaiko rivers, which is need more gasoline and long distance while in Beoung Ream was mainly depended on Tang Krasaing irrigation scheme. However, local perception in Beoung Ream indicated that, about 47% reported on the current water management is bad, followed by 40% moderate and 13% not fair while 66% visited farmers in Beoung Sneh area indicated moderate, 26% bad management and 8% good management.

There conflicts observed among water user groups were observed. About 52% of visited farmers indicated that conflict occurred among rice farmer, 30 % rice farmer and FFWUC, 11% between rice farmer and local authorities and 07 % between rice farmer and CFR's committees. The most conflicts observed to be occurred ever year from February to April coinciding with the water shortage, which indicated that the highest water demand and water scarcity is the main driven consequently brought water conflict. However, the current mechanism on solving conflict was commonly practiced, about 38% of farmers trusted on local authority coordination, 21% trusted on provincial department of water resource and meteorology, 13 % on farmer trusted on WUC and 08 % on official from Natural Resources, Agricultural and environmental office and chief of community fish refuge. However, local perception suggested that there should have a good mechanism for the improvement on water governance among the users in their area, 58% of farmers requested to have proper water distribution planning and schedule and 37% requested to rehabilitate the irrigated canal, lake for more water storage.

Water Completion and Conflict

Water competition observed to be occurred from March to April while high demand for water supply for the dry seasonal rice. Driver caused the conflicts among water user groups was 89 % rice farmer and rice farmer, followed by 5% rice farmer and FWUC and rice farmer and local authorities and private company.

Intervention Mechanism and Main Decision Maker

Main actor for intervention and decision making are local authorities, FWUC, ANRE, FWUC and PDWRM. The results indicated that 56% of farmers trust on local authorities followed by 18% trust on farmers themselves to solve problem, 17% trust on official from district Agricultural, Natural Resources and Environmental (ANRE) Office, 8% on FWUC and 2% on Provincial Department of Water Resource and Meteorology (PDWRM)

About 64% visited farmers suggested to rehabilitate the canal, 16% on water distribution planning and schedule, 13% on the rehabilitation of lake/reservoir for water storage, 4% on pumping from well at the rice field, 2% on enhancement the contribution collection and 1% on law enforcement of land encroachment.

The management of water within the Taing Krasang and Beoung Sneh's irrigation schemes is generally managed by the FWUC committees, which is basically supplied water for thousand hectares of paddy field downstream. However, conflict of water management reported to be occurred during the stress of water supply in the dry season while the demand for two or three crops of rice cultivation is relatively high during these few years, coincided with high price of rice. During the stress of water supply, a strong intervention activities was made by the commune and district authorities as well as district agriculture and natural resource management official and from the provincial agriculture department and provincial department of water resource and management. Saving water is a real practical mechanism that WFUC's committee is commonly advised to rice-growing farmer.

Moreover, the water management within the Beoung Ream CFR for brood-stock fish protection reported to be management by the CFR committee, particularly more active patrolling during the dry period. CFR conservation zone mainly depends upon water supply from the rain-feed and connected canal from the Taing Krasaing Irrigation during the rainy season. The water management at Beoung Ream CFR is mainly faced during the dry season while little water from Taing Krasaing Irrigation is limited where most of the water extracted and supplied to the paddy field. Moreover, during the dry season, the CFR committees regularly monitors and protects water level in the conservation zone while brood-stock fish gathering. There is a lack of coordination between FWUC and CFR in water management due to different purposes of these two communities observed. This disconnection was also observed occurring at Theuy community fisheries (CFi), Beoung Sneh where many complicated actors such as water supply companies, FWUC, rice farmer and CFi observed very high competition in water management and demand. The coordination among the competent authorities such as commune, district and provincial authorities is weak where most of the local perception, particularly households visited complained the main cause shortage of water in Beoung Sneh during the dry season comes from the huge amount of water extracted by the two clean water supply companies. Moreover, it is observed that, among the involved stakeholders within the Beoung Sneh do not know exactly how much amount of water supply during the dry season for two or three crops rice and water extracted by the clean water companies, therefore the knowledge of water management at local communities, commune and district levels limited.

However, the current existing observed to be practiced while conflicts and shortages. Commune authorities is the main coordination body which solve the problem when the conflict between rice farmer and between FWUC and rice farmer while less conflict was observed between CFi/CFR and rice famer even conflict has been reported at Beoung Ream CFR but famer aware and participate in the protecting of water resource in the fish conservation zone during dry season.

Role of Commune Authority in Water Management

Water management within the irrigation scheme is mainly managed by the Provincial Department of Water Resource Management (PWRM) whereas FWUC's committees is the ground implementer and manager of water resource. However, the conflict among the water user groups arisen during the stress of water supply in dry season while demands of water supply relatively high for two or crops rice cultivation. The current solution mechanism at the commune level is limited whereas commune authorities observed to be a main actor to coordinate all conflicts.

Kind of Conflict in Water Usage and Resolved Mechanism

High competition among farmers on water conflict were found during the dry season while the change from traditional rice cultivation into modern for a short period and two or three crops rice cultivation per year. Conflict on water usage was commonly occurred in both study sites, particularly during the stress of water shortage during dry season while high demand in water supply for two or

three crops of rice cultivation. The conflicts commonly occurred while rice growth-out farmer who have plots of rice-field located close or upper part of the irrigation canal and farmer which have their plots of rice-field in the lower part or far away from the irrigation canal. Moreover, in Beoung Sneh, most of the local perception, particularly local authorities informed that two clean water are currently operating is the main of water shortage. Although there is no conflict between rice farmer and clean water company but most of them have expressed their concern. Moreover, the conflict of local perception on the clean water companies around the Beoung Sneh was concerned. Most visited farmers raised their concerns that clean water companies around the lake is the main cause of drying up of water in the lake where the demand of water supply for domestic consumption during the dry season is high as well as at the same time of high demand for rice cultivation.

In Beoung Ream, contrasted purposes between CFR and FWUC was observed while the concept of water management was relatively different and disconnected. Moreover, the collaboration in water supply to the CFR conservation during the stress of water in April and May was not set up while fish conservation zone is necessarily needed for the brood-stock fish protection. However, other causes of water shortage reported to be attributed from the high demand of water for rice field, so that some farmers who have their rice-filed close to the CFR sometimes pumps water from the conservation zone to supply their rice field. Moreover, saving mechanism of water still need to improve among the rice farmer as much as possible but the common practice they try to get more water as much as they can for their rice field. The collection of water fee from the farmer is not well functioning as some of farmers are not willing to pay to the committee therefore the maintenance cost for the irrigation is limited. The main problem observed that, FWUC committee do not manage well on water supply to rice farmers.

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Acronyms

AFD:	Agence Française de Développement
ASSDP:	Agriculture Sector Strategic Development Plan
CDC :	Cambodia Development Concil
CISIS:	The Cambodian Information System On Irrigation Schemes
AMD :	Asian Mega Deltas
CFis :	Community Fisheries
CIAT :	International Center for Tropical Agriculture
CFRs :	Community Fish Refuge
CGIAR :	The Consortium of International Agricultural Research Centers
DTWG:	District Technical Working Group
FAO :	Food and Agriculture Organization
FiA :	Fisheries Administration
FWUC:	Farmer Water User Community
IWMI :	International Water Management Institute
IRRI :	International Rice Research Institute
MoWRAM :	Ministry of Water Resources and Meteorology
MAFF :	Ministry of Agriculture, Forestry and Fisheries
DTWG:	District Technical Working Group
NR :	Natural Resource
PDoWRAM :	Provincial Departments of Water Resources and Meteorology
WF:	WorldFish Center
WP:	Work Package

I. Introduction

1.1. Background of the Project

Asian Mega Deltas, including the Mekong Delta, are densely populated areas, biodiverse, fertile and productive food baskets, dominated by rice, fisheries, and aquaculture that also support millions beyond the deltas. Asian Mega Deltas are the world´s most important rice-growing areas. However, delta food systems are reaching a significant tipping point5. The Asian Mega Deltas are likely to be hit by serious impacts of climate change, including more frequent and more intense floods, salinization, water shortages and climate extremes that will slow down economic growth, further erode food security, and trigger new poverty traps and emerging hotspots of hunger.

The CGIAR initiates the AMD Initiative - "**Securing *the Food Systems of the Asian Mega-Deltas for Climate and Livelihood Resilience (AMD)"*** - to support the creation of resilient, inclusive, and productive deltas. At the same time, transformed food systems need to provide pathways out of poverty for millions, as they have done previously in certain parts of the Asian Mega-Deltas. As accelerated change is risky, the AMD Initiative also addresses challenges to nutrition security, financial investment, gender equity, and social inclusion, and to the natural resources on which the resilience of the entire system depends. It does so by building strong policy-science partnerships working with diverse actors and aligning them towards common goals. The AMD Initiative has five working packages (WPs), implemented by the Consortiums of CGIAR' Centers (IRRI, IWMI, WorldFish & CIAT):

- WP1: Adapting Deltaic Production Systems led by IRRI
- WP2: Nutrition-sensitive Deltaic Agri-food Systems led by WorldFish
- WP3: De-risking delta-oriented value chain led by CIAT
- WP4: Inclusive deltaic NR-Food Systems governance led by IWMI
- WP5: Evidence-based delta development planning led by IRRI.

The Mekong Delta in Cambodia is under the threat of increased population pressure, urban development, and climate change. Small farmers have struggled in the changing environments to sustain their living and support their support. There is no infrastructure in place to support production in the context of climate risks. These have affected the food systems to support millions of people and small landholders. The food systems are transforming rapidly to multiple demands and supply-side drivers, resulting in changing consumption and production practices. This TOR is designed to address the WP4, which is addressing the "Inclusive deltaic NR-Food Systems governance" in Prey Veng province, focusing on Boeng Sneh. WP4 identifies three key barriers to more inclusive, sustainable, and climate-resilient food systems governance: (1) Policy disconnect, (2) Lack of institutional coordination and capacity of various natural resources (NR) and food systems sectors, and (3) Lack of capacity and agency of grassroots actors, particularly marginalized communities to engage effectively in NR-water-agriculture governance. The WP4 of the AMD Project is designed to support the governance of water and land resources to maintain/recover landscape functionality. It examines the soloed policies and interventions, the fragmented landscapes, eroded ecosystem services, and lost multi-functionality & resilience to intensified trade-offs, aiming to improve the governance of the food system.

1.2. History of Community Fisheries and Legal Framework

Community Fisheries (CFi) is a voluntary fisher organization, officially established and legally recognized by the state with the provision of legal frameworks, which never been before in the history of fisheries management in Cambodia. The imitative idea came after the abolishment of the fishing lot, which is the main local empowerment by handing over to local community in managing their fisheries resource. It is a prime objective and achievement of the Governments' fisheries policy reforms, in 2000 and 2012, to ensure that the local fisher communities and small scale fishers can obtain access to the fisheries resources for food, livelihood and poverty alleviation. The achievements and results produced after the fisheries policy reforms are due to the support of the legal frameworks for CFi that was provided at the right time and direction. Through these CFi legal frameworks, the small-scale and poor fishers are receiving benefits and rights to share their roles and responsibilities for the co-management of their natural fisheries resources for sustainable development. These are the most important factors that guide and drive the functionality and effective operation of the CFis. However, there are still key areas that are facing challenges for the CFis to be more functional and effective in co-management of the fisheries resources in the long run, which included the improvement of CFi legal frameworks. The CFi respondents recommended the improvement of the legal frameworks to consider the provision of guiding the CFi to generate income to self-finance their activities, suitable fisheries related livelihoods, and harvesting their resources. Finally, the CFis recommended to define clearly the rights of the CFi members and non-members/outsiders in fishing in the CFi fishing areas. They suggest that they should be given higher benefits for being a CFi member as well as a CFi committee member as prime incentives for their participation and efforts to actively protect and co-manage the natural fisheries resources development in an effective and sustainable manner.

In 2001, aware of the need to safeguard fish stocks and in an attempt to resolve long-standing conflicts between small-scale and large-scale fishers, the government embarked on a reform of the country's fisheries management and regulations. This happened in two phases. First, in 2001, 56 percent of total fishing lots, previously allocated for private owners, were designated as open access. Then, in 2012, the remaining fishing lots were abolished and fishing rights given to all Cambodian citizens to manage natural fisheries resources in their area through the establishment of community fisheries (Kaing, 2013)

Fisheries management suffers from a number of problems that are mostly related to governance issues. Another important issue is lack of community involvement, or rather, failure to engage local communities in conserving fisheries resources. Despite the release of fishing grounds for community use, illegal fishing and conflict remain a challenge (CDC, 2015).

Community fisheries were initially introduced into Cambodia in the late 1990s as a means to improve the management of local fisheries and ensure local food security.

MAFF's Annual Report with data for 2016 reported 516 community fisheries covering 332,168 individuals. Of the total, 475 are inland fisheries while 41 are marine fisheries (MAFF, 2018) 394 of these community fisheries have been officially registered with MAFF while others are in the process of registering. The 2006 Fishery Law defines community fishing areas as "the fishery domain of the state handed over to the community fishery under the agreement between the chief of Cantonment of the Fisheries Administration and the communities or groups of citizens living inside or around the fishery domain. However, in 2007 the government issued a Sub-decree on Community Fisheries Management which sets out rules for the establishment, management and use of CFi. Only small-

scale fishing gear can be used in CFi. By law, CFi come under the general jurisdiction of MAFF. Although remarkable progress has been made, CFi continue to face such challenges as weak law enforcement and lack of capacity, incentives and income for people to actively participate in the sustainable management of CFi (CDC, 2015).

1.3. History of Community Fish Refuge and Legal Framework

Rice field fisheries (RFF) have supported Asia's rice growing communities for generations. They form an integral part in the annual cycle of rice farming & fishing. Research on RFF was first carried out, in Udorn Thani, NE Thailand in 1975 1. In the 1990s there was still very little ecological information available on RFF species and their collection. From 1993, the AIT Outreach Project in Cambodia working with former DoF found that many small farm ponds were being used to trap wild fish originating from surrounding ricefields. Sophisticated traditional techniques & management existed. Studies in Svay Rieng found that the average amount of fish and other aquatic animals caught in rice fields and surrounding areas ranged from 155 kg/HH/year – 604 kg/HH/year. Clear that the only manageable part of the RFF system was the small ponds and wetlands where fish could survive the dry season. In Svay Rieng the pumping of ponds in the dry season to collect fish is common practice. Traditional practices existed of returning some snakehead & catfish to these trap ponds, to help maintain future stocks. Small water bodies managed by communities for this purpose seemed to have potential. Key to their management would be connectivity, i.e. Open canals linking the CFR to the surrounding rice fields is important. The first pilot CFR in Cambodia was established in 1995 in Kok Kandal village, Svay Chrum, Svay Rieng. Local people supportive of the idea is stocking of locally extinct indigenous fish species into the CFR resulted in their reappearance in the RFF the following wet season., helped convince people that the idea worked. Other pilot projects were launched in Prey Veng and Kompong Speu. Senior DoF staff showed an interest in the approach and studies were carried out (Thouk, 2029).

Statement on the National Fisheries Policy" (May 15th 2005) "CFRs should be developed all around the country where environmental conditions are suitable". In 2007, our former Prime Minister declared "the promotion of CFRs at the district and commune levels should be discussed so that these areas can be kept as state property and fish releasing activities can be organized in those areas". However, in 2008- RGC prioritized CFR development as way to enhance fisheries, with MAFF launching an advocacy campaign "One Commune, One Community Fish Refuge whereas in the Strategic Planning Framework 2015– 2024, states that rice field fisheries yields will be maintained". by targeting 1200 CFR by 2019. • ASSDP 2019-2023 recognised 864 fish habitat community ponds were established and as result there is a gradual increase in the number of natural fish yields in the rice field.

1.4. History of the Farmer Water User Group and Legal Framework

The Cambodian Information System On Irrigation Schemes (CISIS) being developed at MoWRAM. Presently more than 2300 irrigated schemes in Cambodia, which can theoretically be used to irrigate nearly one million hectares in the rainy season and half this area in the dry season which can irrigate two rice crops in more than 600 schemes. One fifth of these schemes (~450) are said to be highly degraded, nearly half (~900) degraded, one quarter (~600) partially functional, and the rest (~350) is said to be in good condition following recent rehabilitations. Most irrigation schemes are located in the south-eastern provinces of the Mekong floodplain (the Preks of the Kandal province, and the Kampong Chhnang, Kampong Cham, Prey Veng, and Takeo provinces); the north-western part of the country, around the Tonle Sap Lake, is another area of concentration (Siem Reap, Kampong

Thom, Battambang, Banteay Meanchey, and Pursat provinces). Close to half of the existing schemes irrigate between 50 and 200 ha; the other half irrigating between 200 and 5000 ha whereas few dozen large schemes with a theoretical control area of more than 5000 hectares are identified.

In the early 1990s, at the end of a long period of civil war, the UNDP and the European Union are the major donors supporting the irrigation sector. Irrigation investments take place as part of multi-

sectoral and multiple-objective projects. AFD, which opened its office in Phnom Penh in 993, quickly become a major donor in the sector - alongside the ADB, the World Bank and FAO- through dedicated projects. The beginning of the 2000s marks a turning point from a logic centred on emergency responses to one of “development” and the establishment of a strong partnership between AFD and ADB, which will be the two main actors in the sector throughout the decade. Things changed drastically in the early 2010s; the Australian (AusAid) and Japanese (JICA) Cooperation Agencies increase their contributions while new actors (the Chinese cooperation and, shortly afterwards, the Korean Collaboration Agency) emerge and invest unprecedented amounts in the development of major infrastructures. The chart below clearly illustrates the sharp increase in the amounts invested in the irrigation sector - managed by MoWRAM - from close to $100 million USD for the period 1998-2005 to more than $800 million USD in 2011-2015, more than half of which is coming from China. The boom in Chinese investments (at concessionary rates of 2% or less) is linked to the Cambodian government’s diplomatic relationships with China, and notably ongoing discussions regarding rice-trade agreements. There are no social or environmental conditionalities attached to these loans, unlike loans from the ‘historical’ donors - however, they do have very clear geopolitical dimensions.

The beginning of 2015 marked a significant evolution of the Cambodian Government’s policy to support the agricultural water sector with the promulgation of the sub-decree formalising the FWUCs (Farmer Water User Communities), which had been awaited for nearly ten years. That same year, Ministry of Water Resources and Meteorology (MoWRAM) also developed its first programme aiming at maintaining existing irrigation infrastructures, a program funded by the MEF (Ministry of Economy and Finance). Until then, the ‘maintenance fund’, created in 2008, had been used on an ad-hoc basis without much planning. This study consists of an historical analysis of AFD interventions in Cambodia, and how it relates to those of other international actors involved in the sector, and to the trajectory of public policy making in the field of agricultural water and the role of MoWRAM.

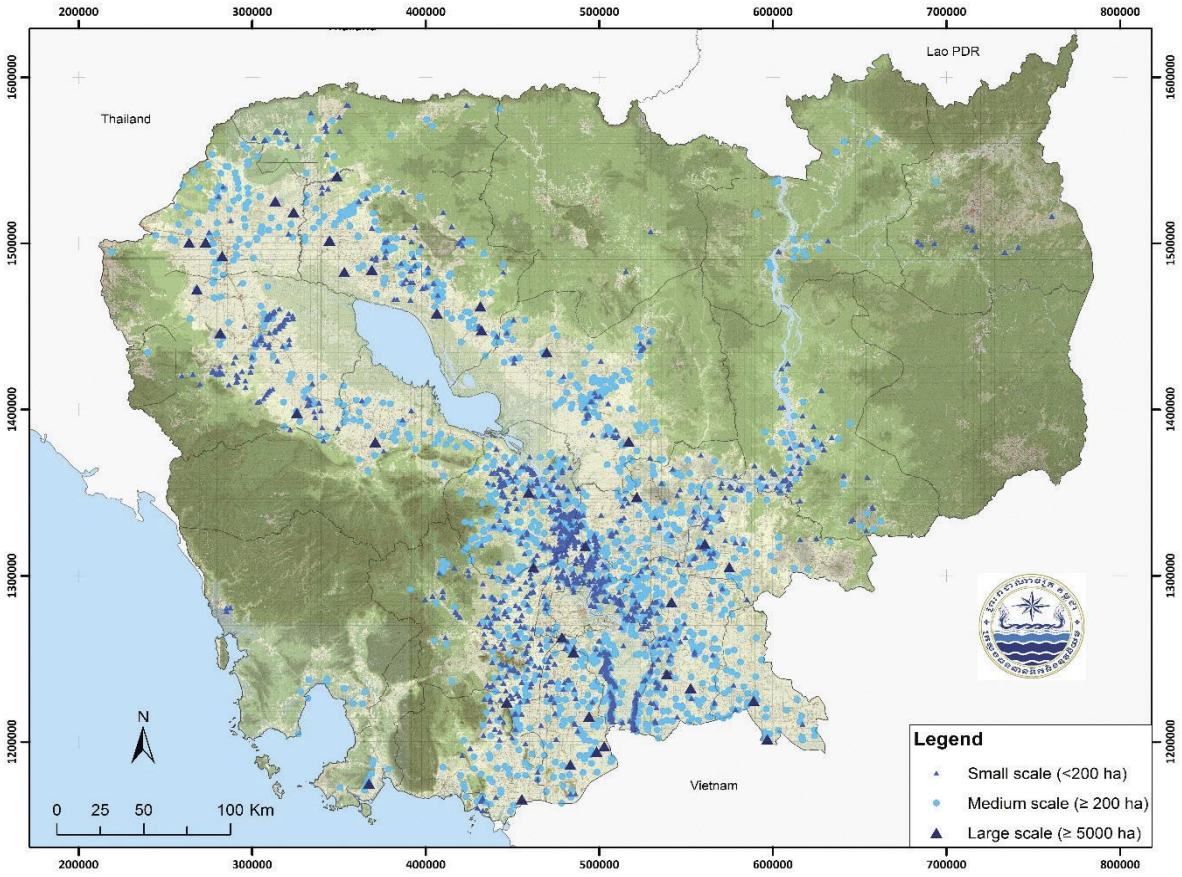


Figure 1: Indicates large, medium and small scale of irrigation in Cambodia (Source: Brun, 2015)

1.5. Strengths and weaknesses of CFi/CFR and FWUC

Constraints and opportunities of the CFi/CFR and FWUC has commonly occurred during the implementation, particularly management transaction although all those communities equipped by law. The strengths, opportunities, weakness and threats is shown in Annex 1.

Strengths of CFI and CFR

- Positive Effectiveness of Co-management in Community Fisheries and Farmer water user community
- Illegal activities have been reduced
- Rich natural resources and biodiversity
- Most of the community members are well aware of the importance of natural resources and forest
- Contribute to local consumption and provides nutrition
- The community boundaries are clearly defined
- Increased awareness on natural resource management at community level
- Decision makings are approved by both sides-members and committees
- Commitment to self- management after the project ended.

Weakness of CFI and CFR

- Need to maintain water body in order to protect brood-stock fish
- Despite the release of fishing grounds for community use, illegal fishing and conflict remain a challenge.
- CFi continue to face such challenges as weak law enforcement and lack of capacity, incentives and income for people to actively participate in the sustainable management of Cfi
- Some community members did not want to report on illegal activities
- Lack of cooperation and communication between committees and members
- Limitation of knowledge among committees and members
- Internal conflicts on benefit sharing and using natural resources
- Poor participation from community members
- Some members have to engage in other activities for their household income
- Less motivation mechanism by community to member to act in community
- Limited skill to handle internal and external conflicts.
- Ecosystem threats: The ecosystem is threatened by the conversion of flood plains to agriculture, the destruction of mangrove swamps, and the reduction of river flow.

Strengths of Famer Water User Community (FWUC)

- Irrigation is targeted at reducing dependency on rain-fed farming and strengthening the resilience of poor food-insecure farmers, as well as improving their ability to cope with natural disasters, such as floods and drought, and the problems brought about by increasing rainfall variability.
- Irrigation is mainly done for increasing rice productivity, since rice has become a strategic commodity for income growth, poverty reduction, and national and household food security.
- The Government of Cambodia has invested much money in the building of new irrigation schemes and restoring of the existing irrigation systems for the developing rice cultivation sectors

Weakness of CFI and CFR

- Need to use water in order to farming
- Threatened by the flood plains to agriculture of river flow or raining season.
- Number of FWUCs: As of January 2024, there were 544 FWUCs in Cambodia.
- FWUC activity: Many FWUCs are inactive, with only 10% currently active.
- FWUC challenges: Some challenges FWUCs face include weak management, low participation rates, and low socio-economic status.
- FWUC support: FWUCs need a variety of skills to implement their tasks, such as meeting organization, database management, and accounting.
- FWUC support services: External services can be expensive and difficult to access, so alternative service providers are needed to help FWUCs.
- However, the participation rate among farmers in the FWUCs is less than 50%. The reasons for such low participation rates include a lack of trust in the government among farmers, low participation rates among local governments, and a lack of finance
- A detailed action plan is needed to help convince farmers to participate in the FWUCs; however, landless people do not have an interest in becoming FWUC members, and in fact in many places landless people only fish, and farming activities often conflict with fishing.
- FWUCs were the lack of water in the catchments, the lack of irrigation infrastructure and a proper water allocation mechanism, high levels of poverty among the members, low agricultural productivity and deteriorated irrigation systems, financial constraints, loss of authority and independence, lack of planning and coordination at the scheme level, underdeveloped participation and lack of ownership, uncertainty and conflict

II. Objectives

1. To implement the pilot on Innovation Model for the Integrated Decentralized Food System Governance at District Level.
2. To conduct the research and documentation on improving food system governance to support the food system decentralization processes.
3. To build the connectivity between the CFis, the irrigation system, and rice farming as an integrated food production system through improving water governance.
4. To promote the collaboration between the CFis and FWUC, community ecotourism and other relevant stakeholders to work together to manage the fishery, water, rice farming, and irrigation management based on collective approaches and interests to produce foods and support the livelihoods of local communities.
5. To promote the role district administration and Agriculture, Natural Resources and Environment Office in coordination with relevant stakeholders as integration approach.
6. To build the capacity of local communities, concerned stakeholders, and government agencies at the district levels.

III. Study site and Methodology

3.1 Study site selection

Two targeted natural lakes located in two different provinces are selected for this assessment. Boeng Ream is one of the study sites located in Kokoh commune, Santuk district of Kampong Thom province and Boeng Sneh is located in three different districts of Prey Veng Province. The assessment survey in Santuk district, Kampong Thom Province was covered in 3 villages of Kor Koh Commune which is directly involved in water usage from Boeng Ream, while three villages from each of 6 communes in Ba Phnom, Peam Ror and Svey Antor districts were also choosen. It was Teay commune of Baphnom district, Prek Kandeang Coimmune of Peam Ror district, Damrey Poun commune, Teuk Thlar commnune, Samrong commune and Me Bon commune. The above communes selected were based on the involvement of water usage from two target pilot sites for the Innovation Model for the Integrated Decentralized Food System Governance of AMD.

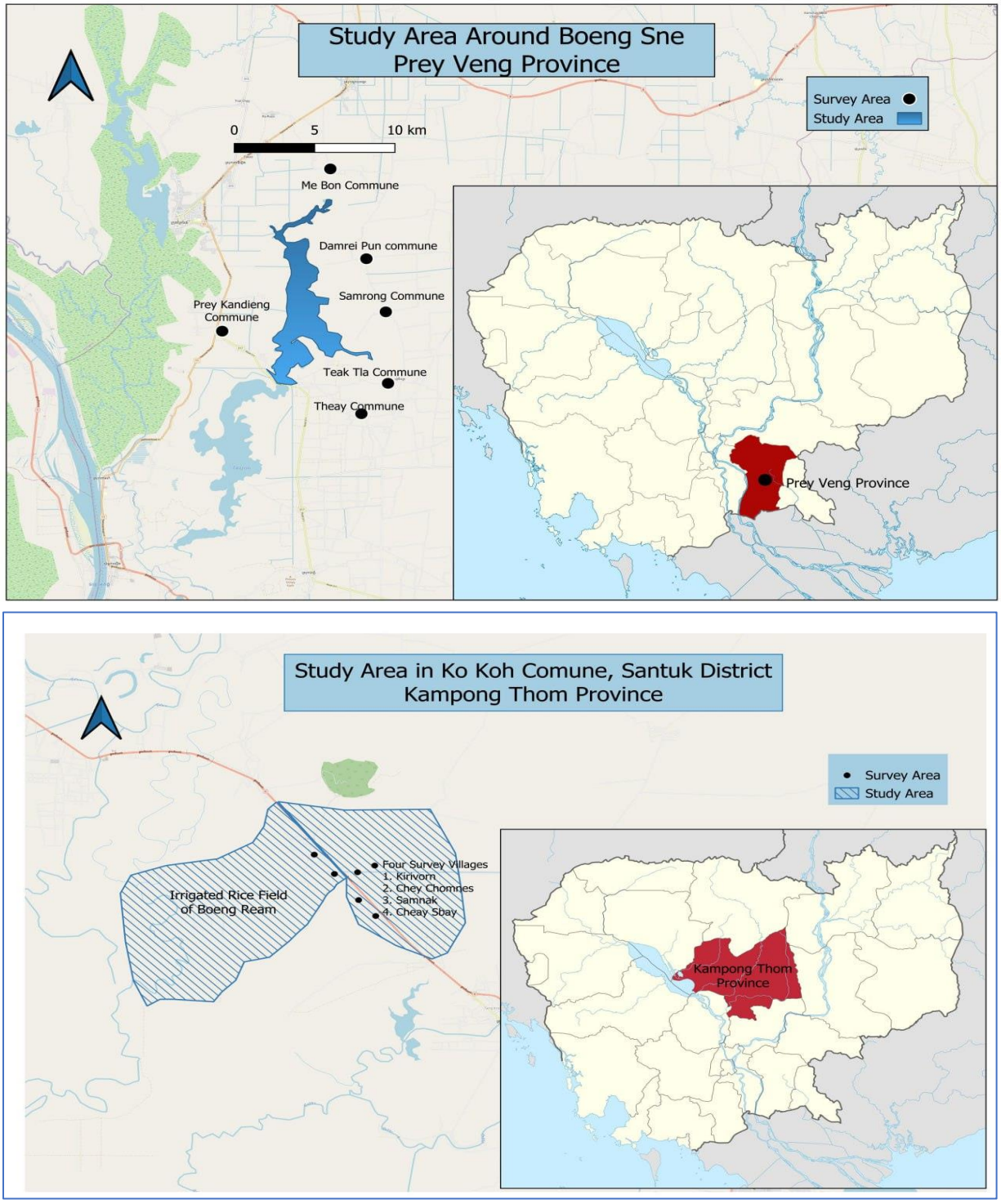


Figure 1: Indicates location of targeted study sites (in red color)

3.2 Assessment Methodology

3.2.1 Field Survey

Semi-structure interview was applied with 15 rice farmers in each village of targeted commune to address the real challenges in water issue has been faced within their commune/community. However, household demography and occupation and key informants interview with commune head/council and head of District Agriculture and Environment office, which mainly captures some information relating with (1). total area of rice field (dry and wet seasonal rice), (2). current mechanism or intervention in the water governance, (3). solving problems with those challenges/conflicts and (4). proposed idea/intervention to improve the existing practice (see more detail in Annex 1). All target rice farmers are randomly selected for interview.

3.2.2 Focus Group Discussion (FDG)

A separated FGD with FWUC, CFi and CFi were conducted, which is mainly targeted on information related to current water management, main actor in decision making, conflict among water user groups and proposed intervention to improve their management and participation.

IV. Result

4.1. Local community perception on the current management of water resource at Boeng Ream, KoKoh commune, Santuk district

4.1.1. Average size of Household and Occupation Rice Farmer and other crops

The average interviewed household size was 5 members, 3 females (table 1). Five main occupations were observed, about 63% are rice farmers followed by 17% of fishers and 13% of selling labor. However, small proportion was both rice farmer and fishing and sell labor, with the percentage of 4. The minority of their occupation are both, fishing and farmer ad small merchant (figure 4.1). While 60% of them having single occupation followed by 40% multiple occupation (figure 4.2)

Table1. Average size of household respondent

No.	Average size per household	Average size of Household (Women)
Number	5	3

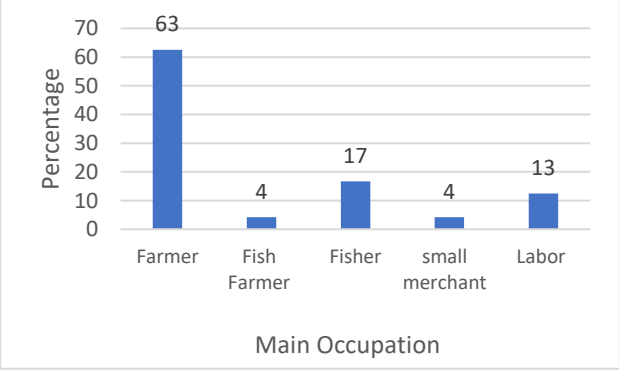


Figure 4.1 Respondent Main Occupation

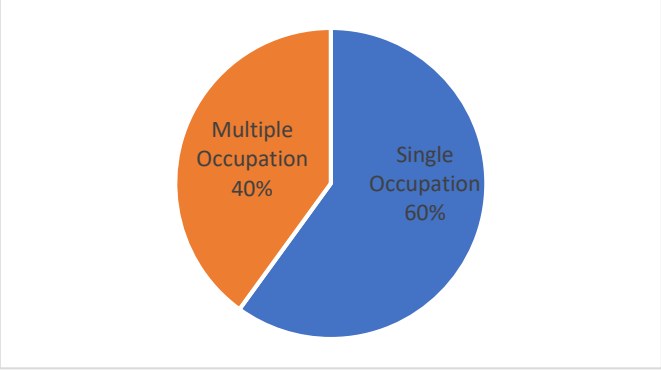


Figure 4.2 Multiple and Single Occupation

4.1.2. Number of crops per year

Market price of rice leads to increase of number of rice cultivation. The results shown that there are three different crop cycles during the year. 60% of rice farmers implemented 2 crop cycles per year followed by 27% of three crop cycles and 13% of 1 crop cycle (Figure 4.3).

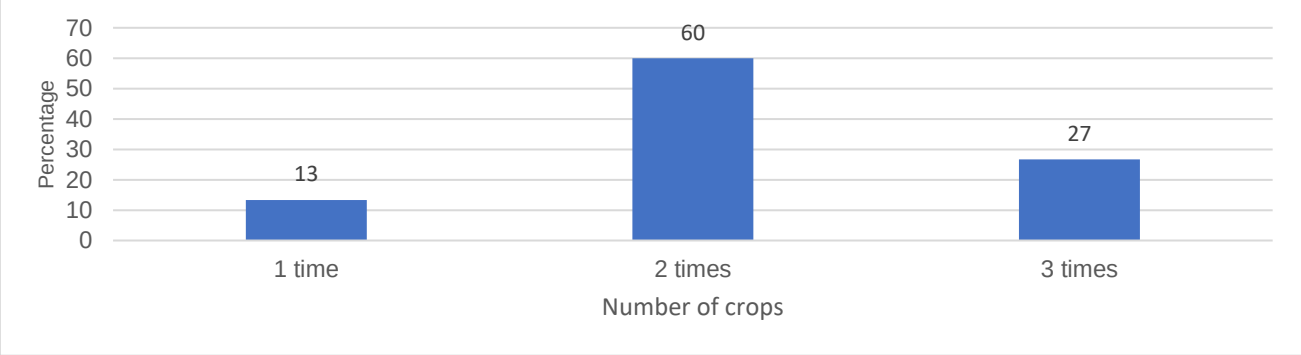
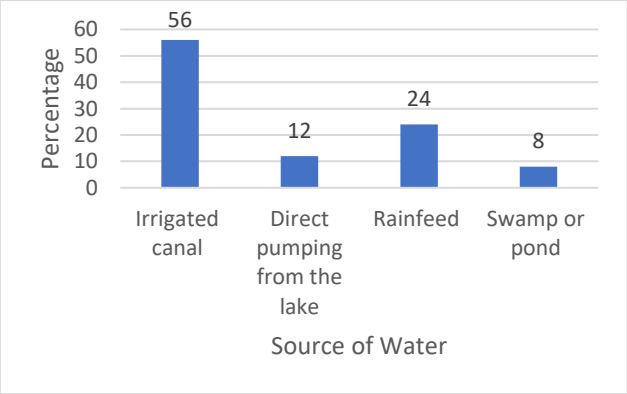


Figure 4.3 Number of crops per year in both study sites

4.1.3. Source of Water Supply

Irrigated canal, direct pump from the lake, rainfed and swamp or pond are the four main sources of water supply for rice farming. About 56 % of rice farmers used irrigated canal, followed by 24 % depending on rainfed, 12 % direct pump from the lake and about 8 % reported receiving water from swamp or pond water (figure4.4). About 53% of rice farmers supplied only single source of water followed by 47% from multiple sources (figure4.5). Farmers used different sources of water supply depending the water source availability where located nearest to their rice fields.



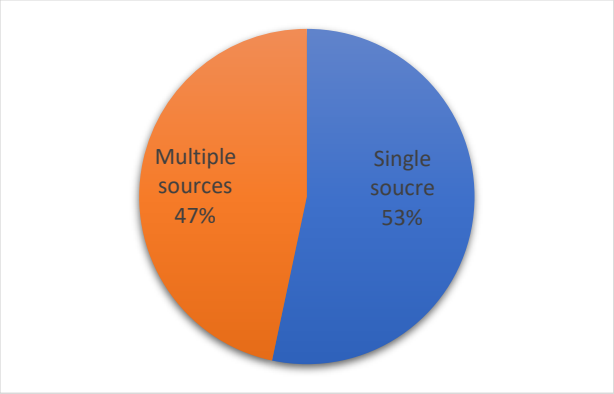


Fig 4.4 Source of water supply

Fig 4.5 Single and Multiple Sources of Water Supply

4.1.4. Volume of water usage per dry rice crop

The average of water supply per crop was about 11000 cubic meter per hectare for their dry season rice. The farmers pumped water from the nearest sources to their rice field for at least 8 times/crop and demand of water supply each time was about 14cm height/time (Table 2).

Table 2. Volume of water usage per crop

Average water height (cm)	Average number of waters added/crop (time)	Average water volume/crop/ha (m^3)
14	08	11000

4.1.5. Demand of Water Supply

High water demand starting from November to May every year but the highest was in February and March. The rest of the months based on the availability of rainfed (figure 4.5). Actually, water shortage starting of January until July while some years may delay rain and varied from year to year depending on the early or delay of rainy season. In both locations, the highest demand for supply and water shortage was observed mostly in March (figure 4.6).

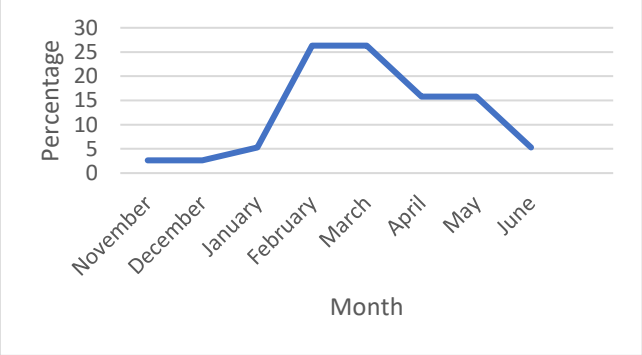


Figure 4.5 Monthly demand of water supply

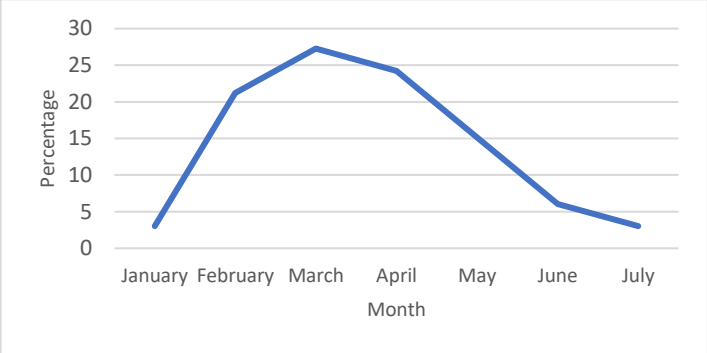


Figure 4.6 Monthly shortage of water supply

4.1.6. Water fee per hectare/crop and who you usually paid

Farmers have to pay water fee with the amount ranged from 10,000 – 50,000 riels/hectare/crop. The fee was varied depending on how far of their rice field from the irrigation canal. Most of farmers only known the name of a person that responsible collecting fee but they did not know exactly where is this people working for and from what entity.

4.1.7. Main factor causes the shortage of water

The results illustrated that there are five main driven factors caused shortage of water. It is 37% from more demand of water during dry season for ricefied, while 23 % from high temperature, 17 % from high evaporation, 13 % with no canal connection to the main rivers that is the water source and 10 % their rice field needed water supply from the canal system (figure 4.7)

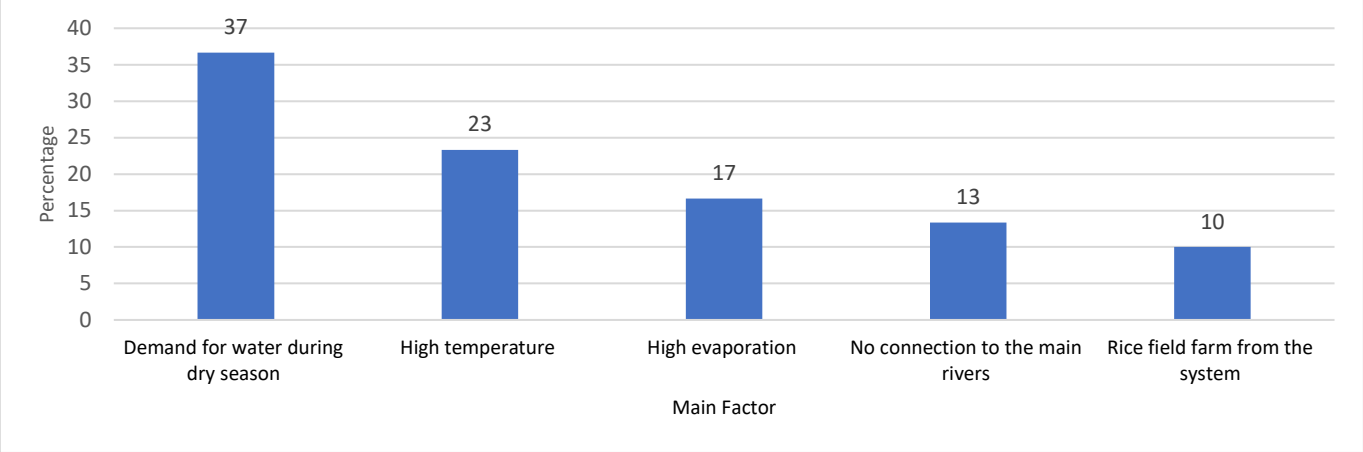


Figure 4.7 Main Factor Cause the Shortage of Water

4.1.8. Solution of Water Shortage

Farmer have to find their own solution while they faced water shortage during the dry season. About 50% of respondents pumped water from other sources as they can but about 44% of the interviewed households reported that they leaved the rice to death and 6% use water in a saving manner (figure4.8). Moreover, intervention was observed during the stress of water by the local commune authorities, district office of Agriculture, Environment and Natural Resource Management, Provincial Department of Water Resource and Management and Provincial Department of Agriculture. In Beoung Sneh, water source during the stress period was long distance from Vaiko rivers by using pumping machine while in Beoung Ream was mainly depended on Tang Krasaing irrigation scheme.

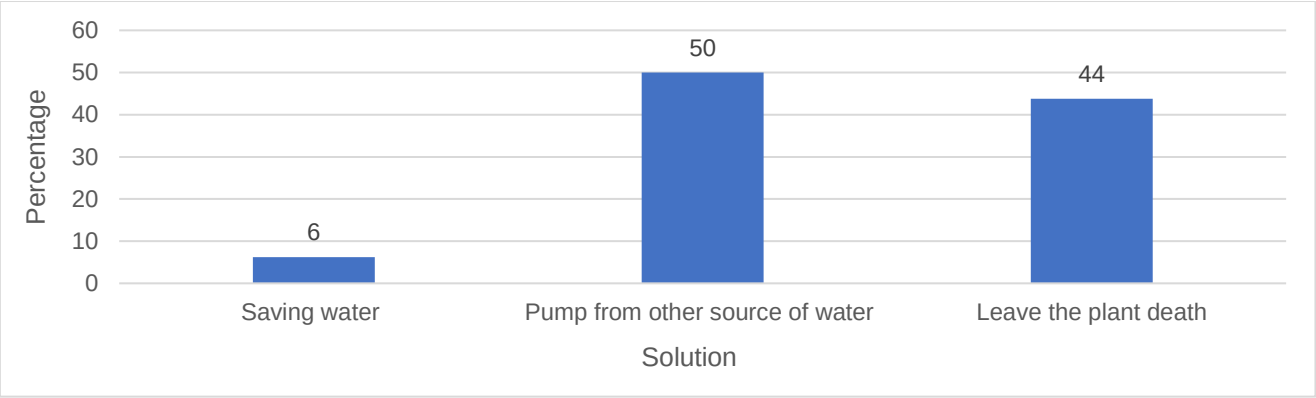


Figure 4.8 Solution of water shortage

4.1.9. Status of water management the area

The project designed 6 rate consists of satisfaction for farmers' perception in water management by Farmer Water User Community: 1). very good; 2). good; 3). moderate; 4). not good; 5). not fair and 6) other. There are three rates have been illustrated by the interviewed farmers. It was 47% reported for bad management followed by 40% moderate and 13% not fair (figure 4.9).

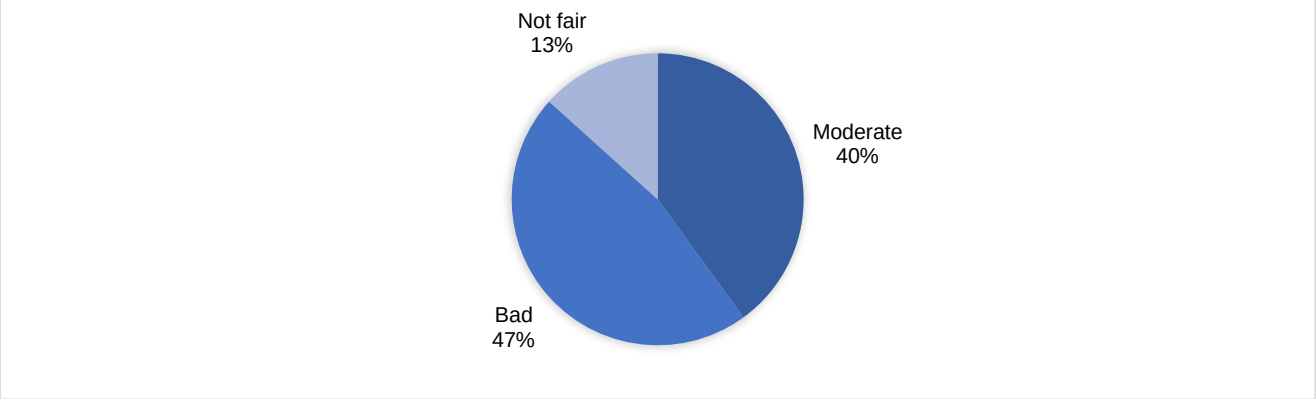


Figure 4.9 Stature of water management area

4.1.10. Kind of conflict among the water users

There conflicts observed among water user groups in the study area but those conflicts was not seriously and they could solve by themselves. Results indicated that about 52% of conflict happened between rice farmer and rice farmer followed by 30 % between rice farmer with Farmer Water User Community (FWUC), 11% between rice farmer and local authorities and 07 % between rice farmer with community fish refuges (CFR) (Figure 4).

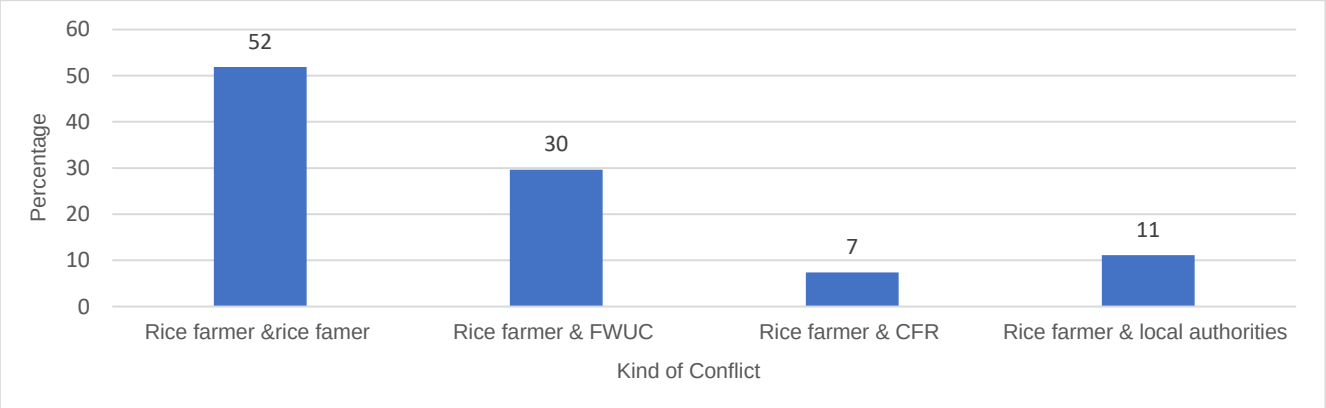


Figure 4.10 Kind of Conflict among the Water User

4.1.11. Month of the conflict among the Water User

From February to April were the most common month of water conflicts. It was aligned with the above most common month with highest water demand and highest water shortage. It was cleared that the highest water demand and water scarcity is the main driven consequently brought water conflict (figure 4.11).

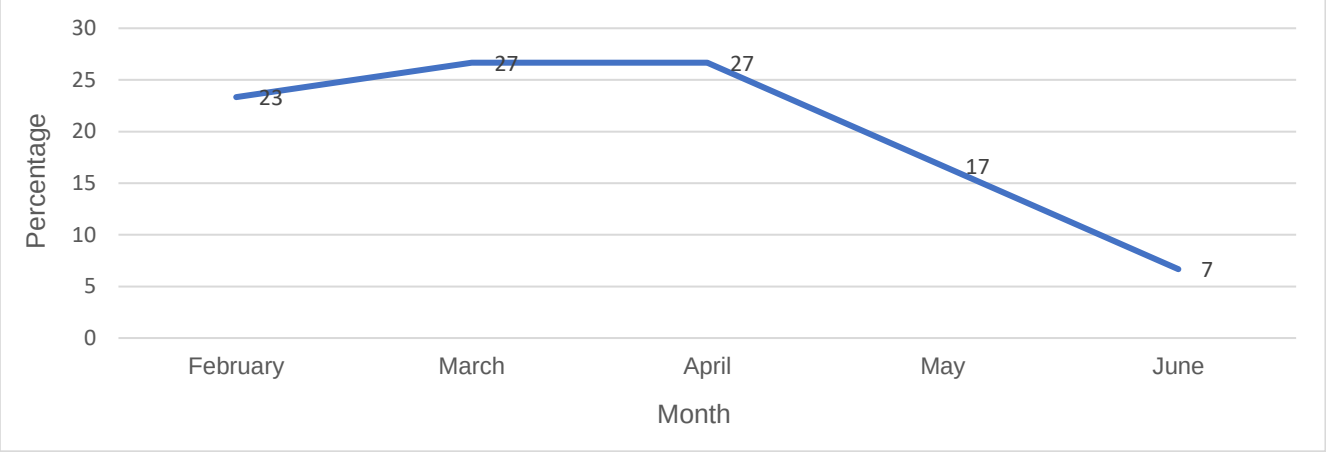
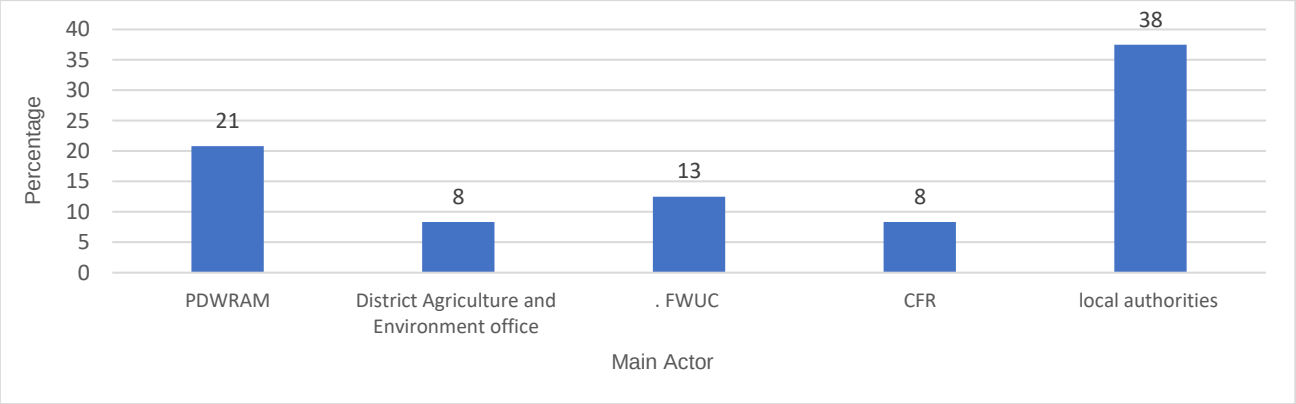


Figure 4.11 Month of the conflict among the water user

4.1.12. Main Actors to Solve the conflict among the water users

Main actors in solving conflict is another perception from water users. The results indicated that 38% of farmers trusted on local authority coordination, followed by 21% trusted on provincial department of water resource and meteorology, 13 % on farmer trusted on WUC and 08 % on official from Natural Resources, Agricultural and environmental office and chief of community fish refuge (figure 4.12).



4.12 Main actor to solve the conflict among the water users

4.1.13. Request or Suggestion from farmers on water governance

There are three main suggestion born by farmers in improving water governance among the users in their area, figure 4.13 showed that 58% of farmers requested to have water distribution planning and schedule, while 37% requested to rehabilitate the canal and 05% requested to rehabilitate the lake/reservoir for more water storage.

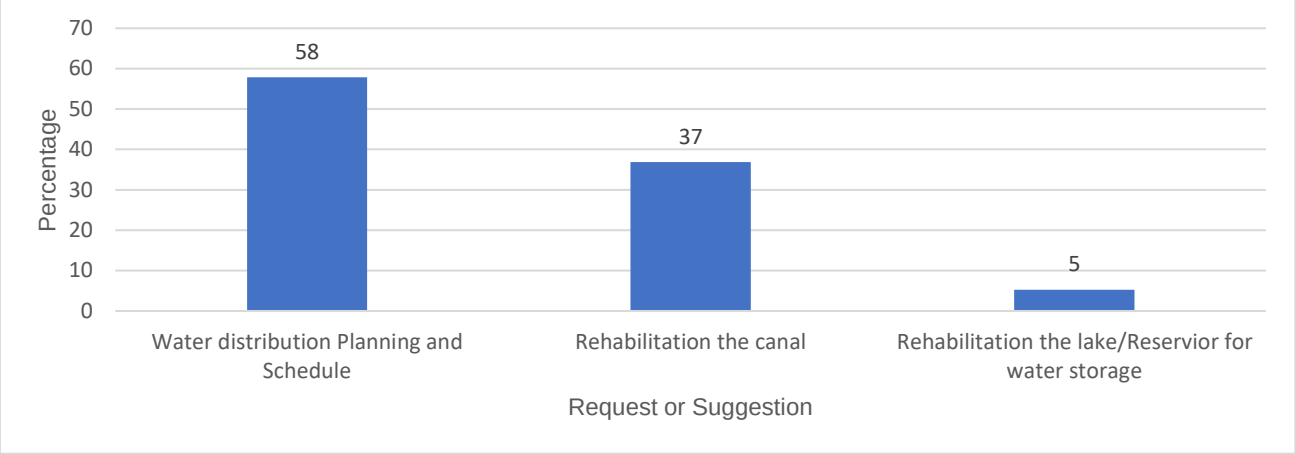


Figure 4.13 Request or Suggestion of farmer on water governance improvement

4.2. Local community perception on the current management of water resource at Boeng Sne, Prey Veng Province

4.2.1. Average size of Household and Occupation of Rice Farmer and other crops

It observed that the household's size in both survey sites was the same. The average of household member were 5 members, 3 females (Table 3). The main 6 main occupations were observed, 56% are rice farmers, followed by 10% of small merchant, 9% of selling labor and the minority is fish farmers (figure 4.14). While 58% of them having multiple occupation followed by 42% single occupation (Figure 4.15)

Table 3. Average size of household respondent

Number	Average size	Average size of Women
	5	3

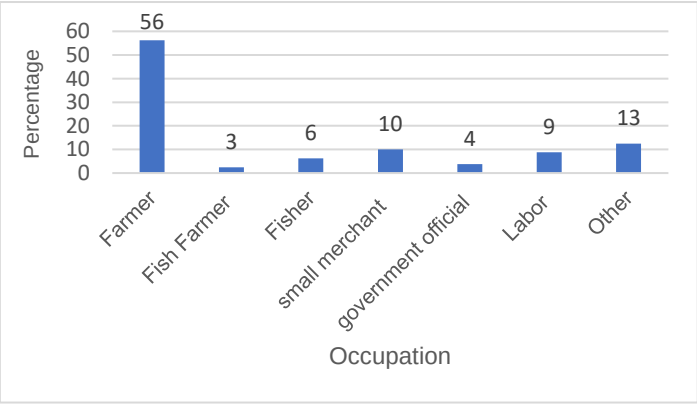


Figure 3.14 Respondent Main Occupation

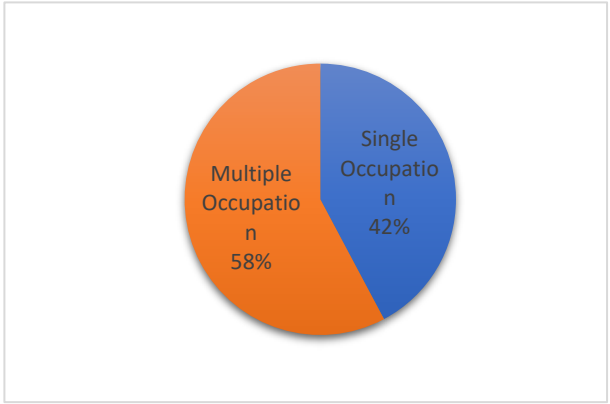


Figure 3.15 Multiple and Single Occupation

4.2.2. Number of Rice Cultivation/Crops per year

As visited households are depending on rice cultivation as the main occupation, results indicated that there were four different crop cycles during the year. About 66% of rice farmers implemented 3 crop cycles per year followed by 27% of 2 crop cycles and 7% of 1 crop cycle (Figure 4.16).

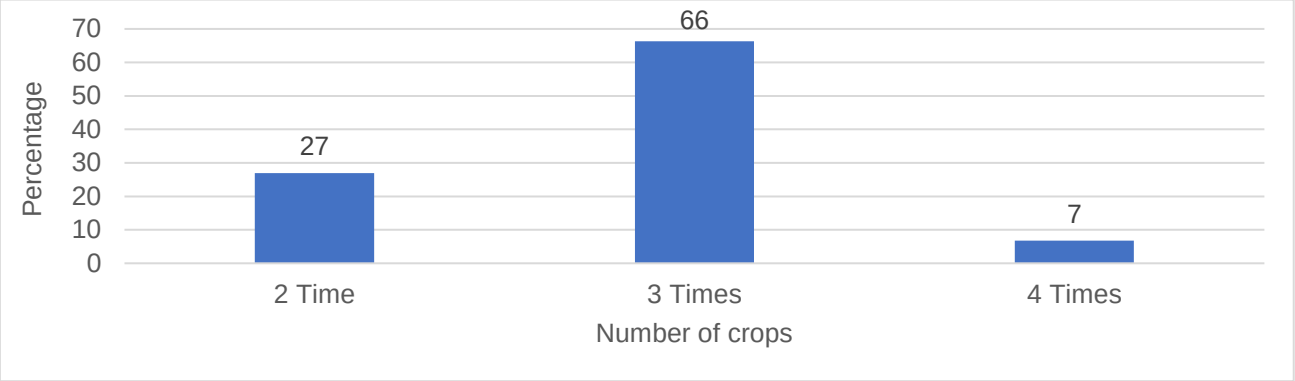


Figure 4.16 Number of crops per year

4.2.3. Source of Water Supply

Five main water sources such as irrigated canal, directed pump from the lake, rainfed, underground water and swamp or pond reported commonly source. About 44 % of rice farmers used irrigated canal for their rice field, followed by 26 % depending on rainfed, 17 % direct pump from the lake, 14% using underground water and about 1% use swamp or pond water (figure 4.17). While 79% of rice farmers using multiple sources of water followed by 21% from single sources (figure 4.18). Farmers used different sources of water supply depending the availability sources of water at the nearest to their rice field.

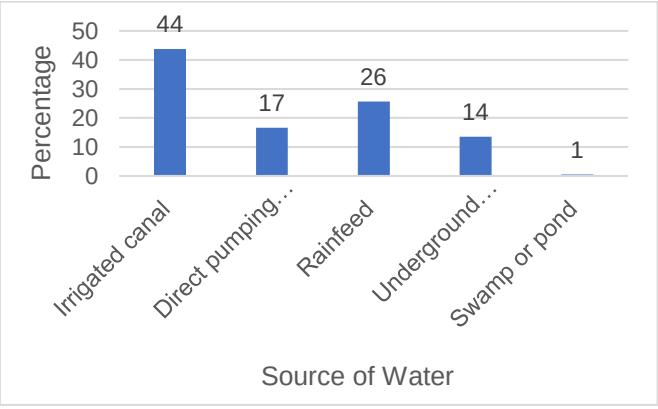


Figure 4.17 Source of water supply

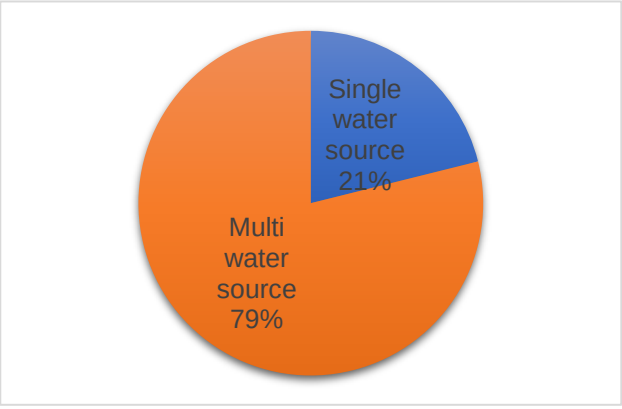


Figure 4.18 Multiple and Single Source of water supply

4.2.4. Volume of water usage per rice crop during the dry season

Table 4. In average, the amount of water supply was 12,300 cubic meter crop/ha for their dry season rice. Farmers pumped water from the nearest source to fill their rice field for at least 8 times/crop, with water height of 15cm/time.

Table 4. Volume of water usage per crop

Average water level added (cm)	Average number of water added (time)	Average of water volume/crop/ha (m^3)
15	8	12300

4.2.5. Demand Water Supply

High water demand was reported from December to May every year but the highest was in March and April. The rest of the months based on the availability of rainfed (Figure 3.18). The common month of water scarcity started April and May. However, can be varied from year to year depending on the early or delay of rainy season but the highest water shortage was mostly in April and May (Figure 3.19).

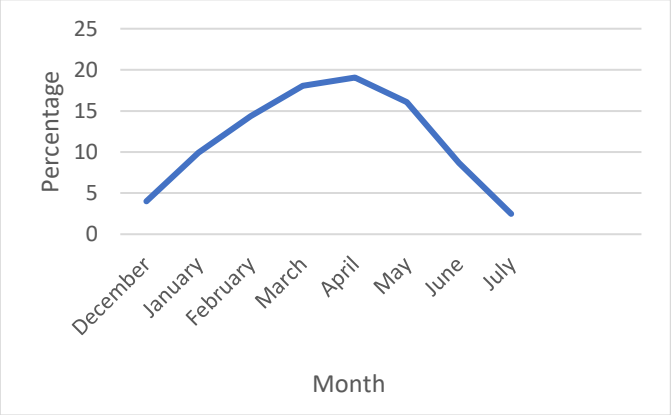


Figure 3.18 Month of high demand water supply water supply

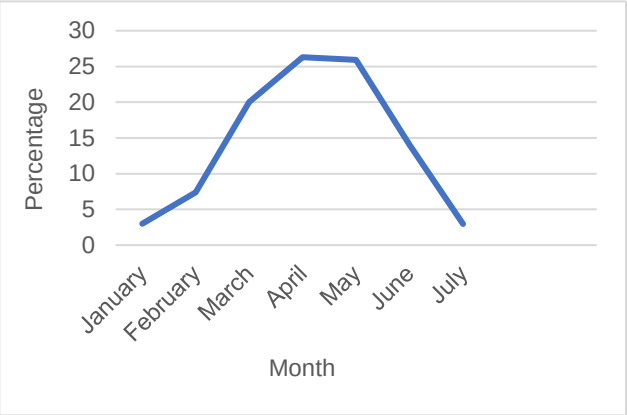


Figure 3.19 Month of high demand

4.2.6. Water fee per hectare/crop and who you usual paid

It was observed that rice farmers in Damrey Poun commune, the Chamcar Kouy have to pay water fee to FWUC committee, with the amount ranged from 40,000 – 70,000 Riels/ha/crop. The fee was varied depending on how far of the rice field location from the irrigation canal. While in Top Sdach village in Theay Commune, the clean water private company charges the water fee from 250,000-300,000 Riel/ha. At this cost, individual farmers are responsible themselves for pumping water from the canals to their rice fields. However, farmers without the FWUC's water supply have used their water-pumping machine to pump water out of the Beung Sneh's area without payment (Table 5).

Table 5. Water fee per hectare/crop and Who you usual paid

N.0	District	Commune	Village	Budget contribution (Riel)	Payment control
1	Ba Phnom	Theay	Tuop Sdach	250000-300000	Private sector
2	Svay Antor	Damrei Pun	Tbong Kdei	50000-70000	Local authority

4.2.7. Main Factor Cause the Shortage of Water

The results illustrated that there are six main driven factors caused shortage of water. It was 39% from more the high demand of water during dry season, 22 % from high temperature, 18 % from

high evaporation, 11 % with no canal connection to the main rivers, 5 % from their rice field and from the shallow canal from year to year (Figure 4.20)

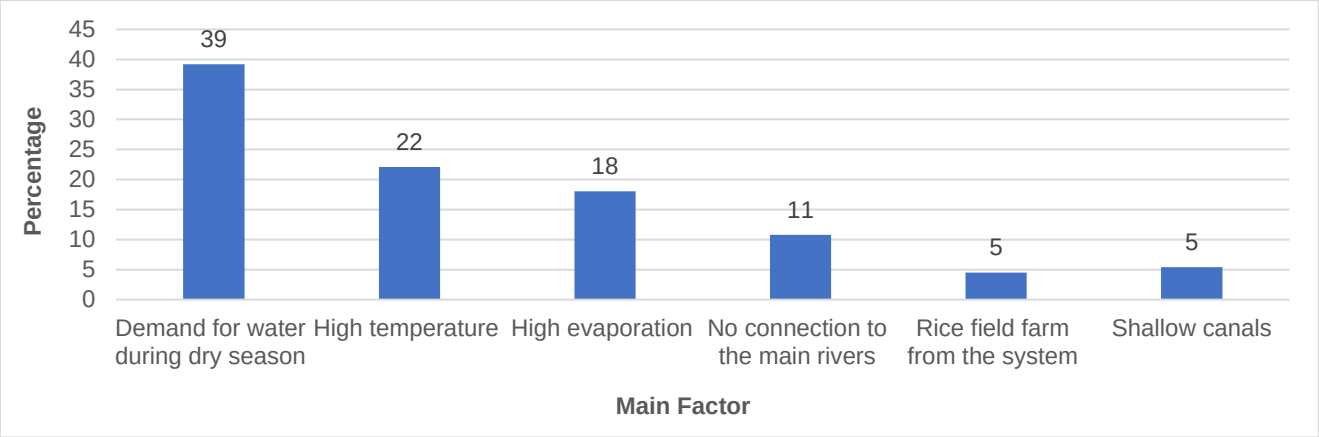


Figure 4.20 Main Factor Cause the Shortage of Water

4.2.8. Solution of Water Shortage

It observed that, the source of water supply was from different source of water availabilities during dry season. Farmer have to find their own solution, 47% of them have to pump water from underground water followed by 28 % pump from the other source of water, 17% leave the paddy rice to death and 7% use water in a saving manner (figure 4.21).

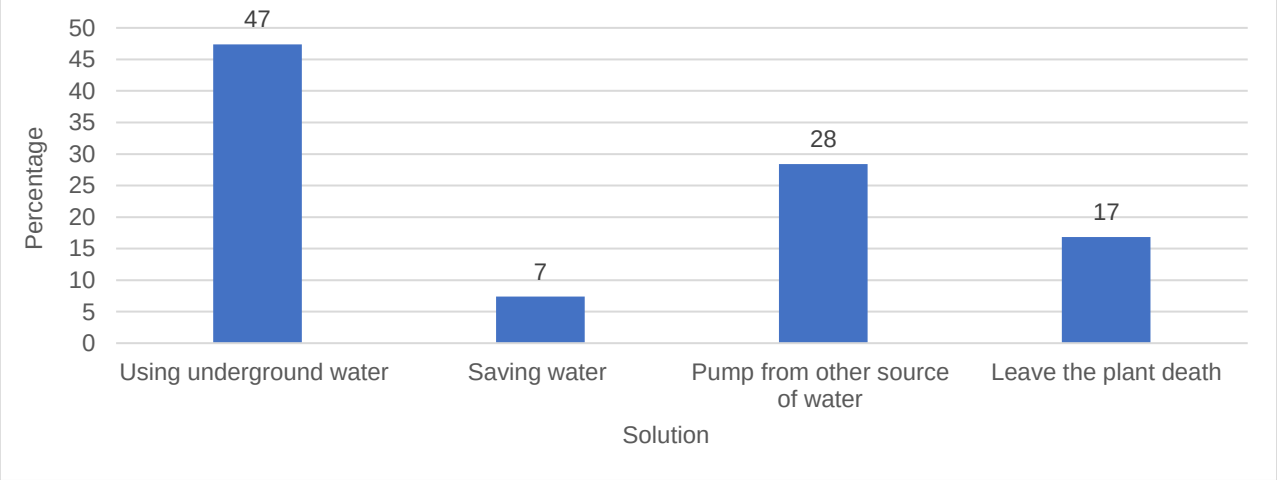


Figure 4.21 Solution of water shortage

4.2.9. Status of Water Management the Area

In Beoung Sneh area, among 6 rates satisfaction level of farmers' perception in water management, three rates of satisfaction were found, moderate, good and bad. The status of current water management indicated that 66% of local perception were responded for moderate, followed by 26% bad management and 8% good management (Figure 4.22).

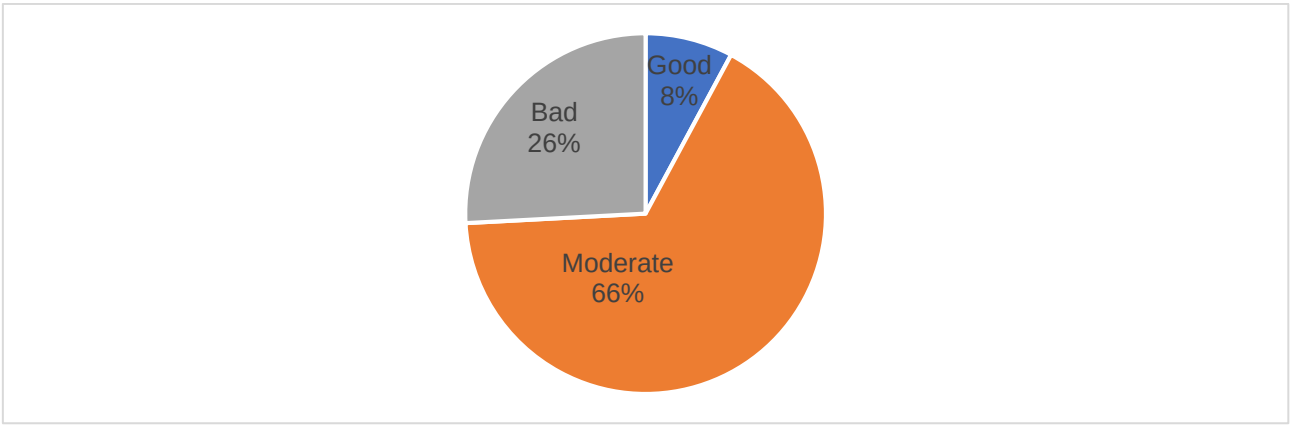


Figure 4.22 Stature of water management area

4.2.10. Kind of Conflict among the Water User Group

There were conflicts among water user groups in the study area. But it was not a serious conflict. About 89 % of conflict happened between rice farmer and rice farmer followed by 5% each between rice farmer with Farmer Water User Community (FWUC) accordingly and the rest were between rice farmer and local authorities and private company (figure 4.23). For these conflicts were normally happened from February to June but more critical happened in April (4.24).

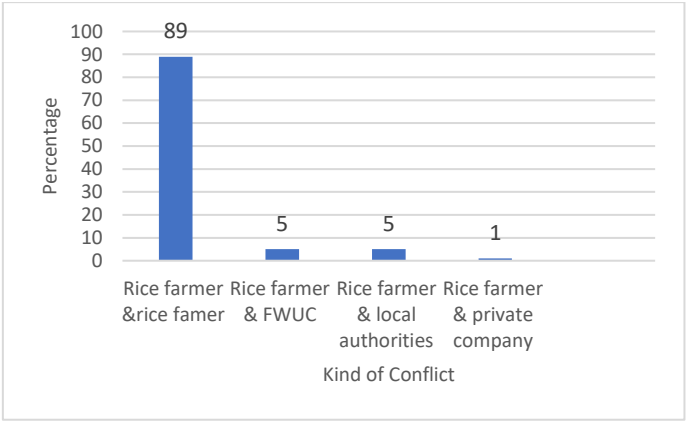


Figure 4.23 Kind of Conflict among the Water User

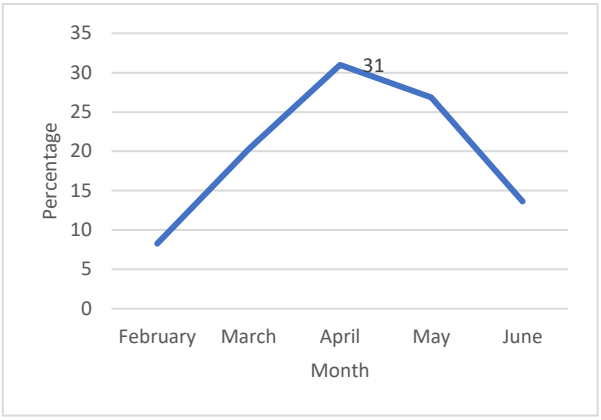


Figure 4.24 month of Conflict among the Water User

4.2.11. Main Actors to Solve the Conflict among the Water User

Main actors in solving conflict is another perception from water users. The results indicated that 56% of farmers trust on local authorities followed by 18% trust on farmers themselves to solve problem, 17% trust on official from Natural Resources, Agricultural and environmental office, 8% on FWUC and 2% on provincial department of water resource and meteorology (figure 4.25)

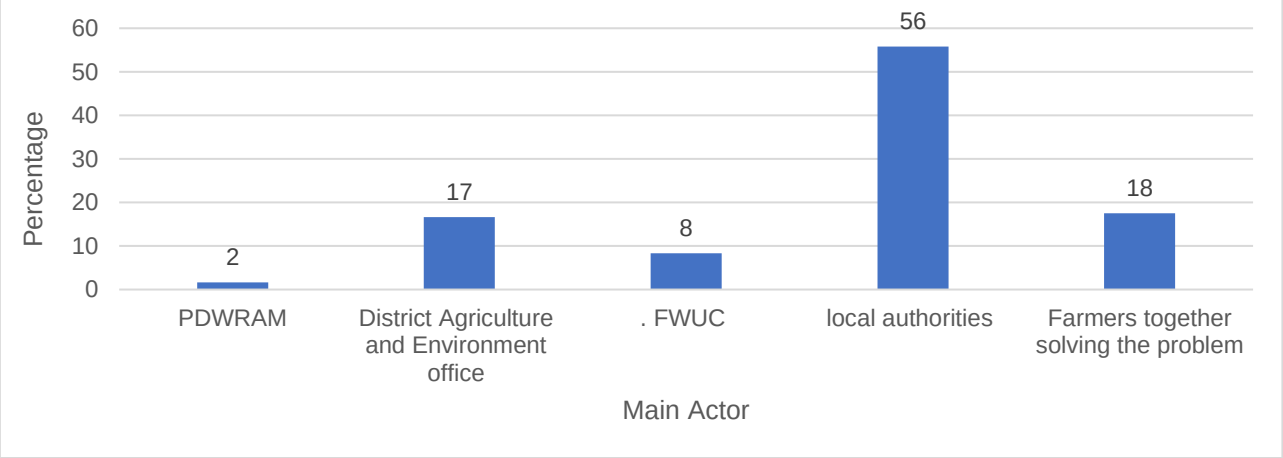


Figure 4.25 Main actors to solve the conflict among the water users

4.2.12. Request or Suggestion from farmer on water governance

There are six suggestion arisen by the interviewed farmers to improve water governance among the users in their area. About 64% of farmers suggested to rehabilitate the canal, 16% on water distribution planning and schedule, 13% on the rehabilitation of lake/reservoir for water storage, 4% on pumping from well at the rice field, 2% on enhancement the contribution collection and 1% on law enforcement of land encroachment (figure 4.26).

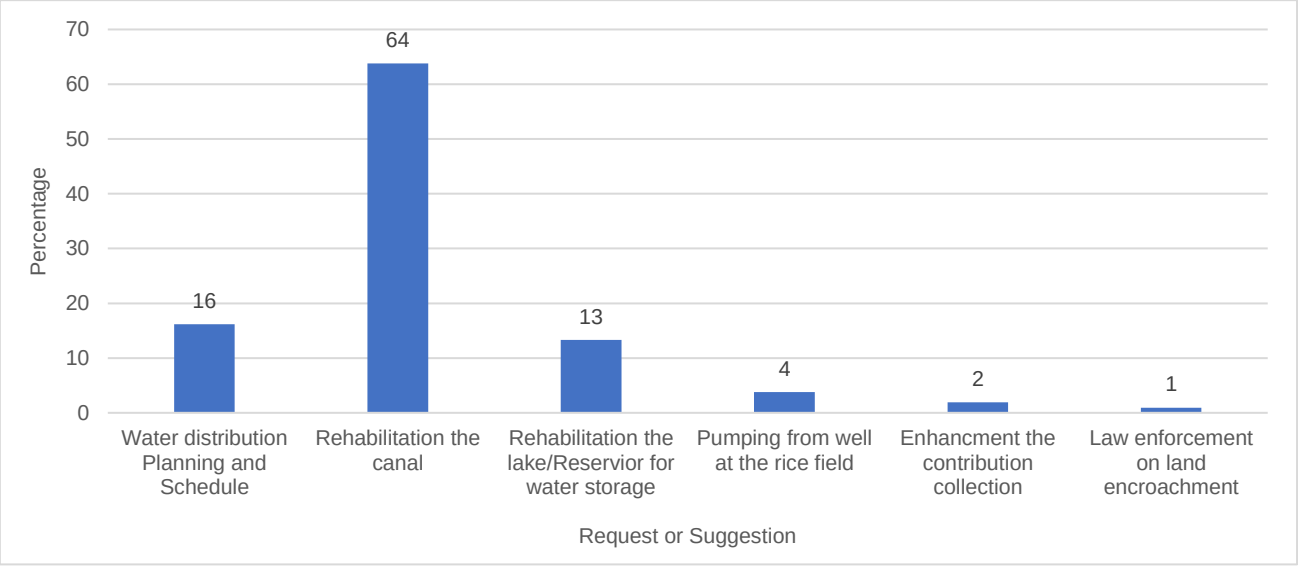


Figure 4.26 Request or Suggestion of farmer on water governance improvement

4.3. Competent Focus discussion

4.3.1. Main Occupation of Villager

The main occupation of the villager around the Beoung Sneh depends on rice cultivation, both upland (rain-feed) and receding rice around the lake, with a high proportion of about 90 percent, followed

by both rice farmer and part time fisher. However, small household's activity related to small merchant, fish growth-out farmer, government officer, with the percentage of 5%, 2% and 1% respectively.

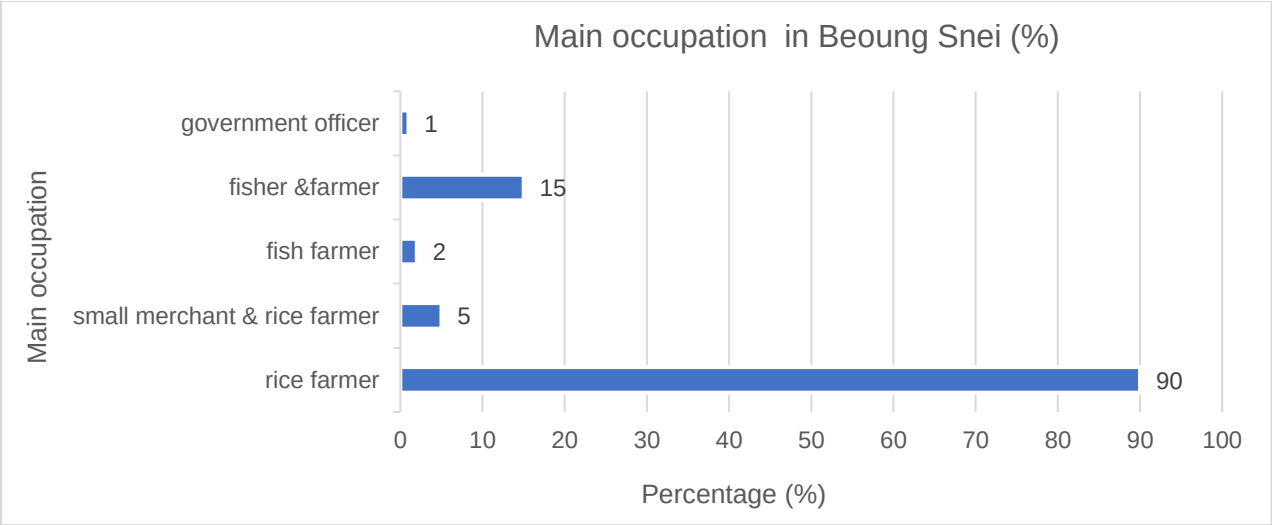


Figure 4.27 Main occupation in Beoung Sneh

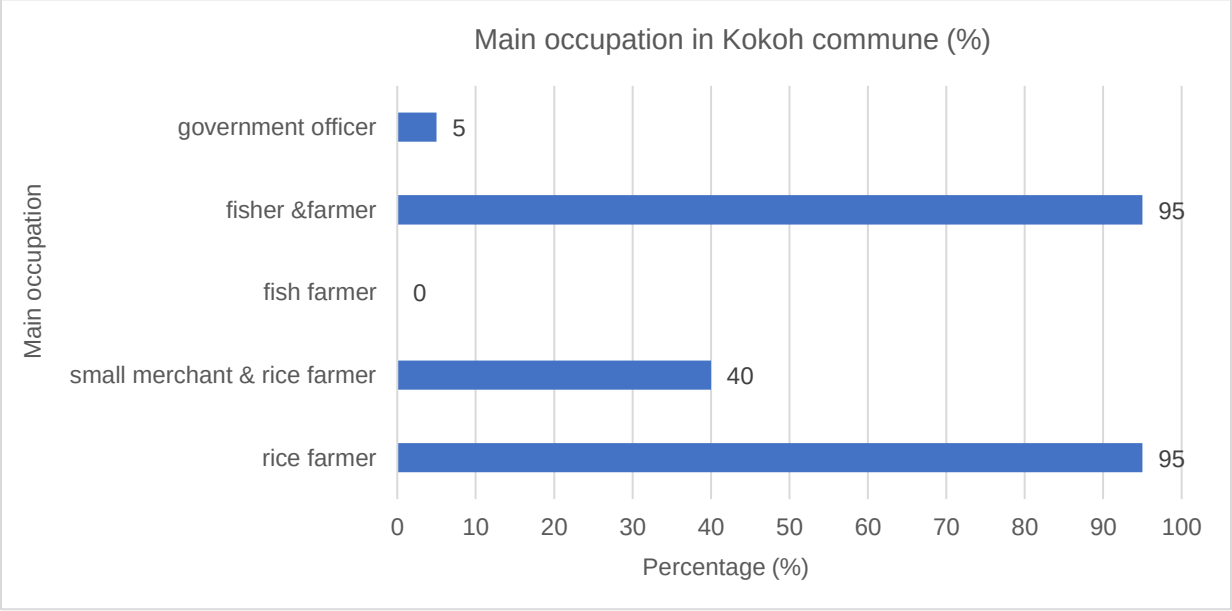


Figure 4.28 Main occupation in Kokoh commune

4.3.2. Total Area of Rice Field

Total area of wet and dry seasonal rice found to be high in Kokoh Commune, Santuk district, Kampong Thom Province where irrigation scheme more advanced, with area of 5,099 of wet rice and 2,121 hectares of dry seasonal rice. However, two communes in Prey Veng Province namely Damrei Poun and Sam Rong also found to be high in both dry and wet seasonal rice cultivation. Moreover, in Prey Kandieng and Teuk Thla communes, both seasonal rice cultivation was commonly practiced.

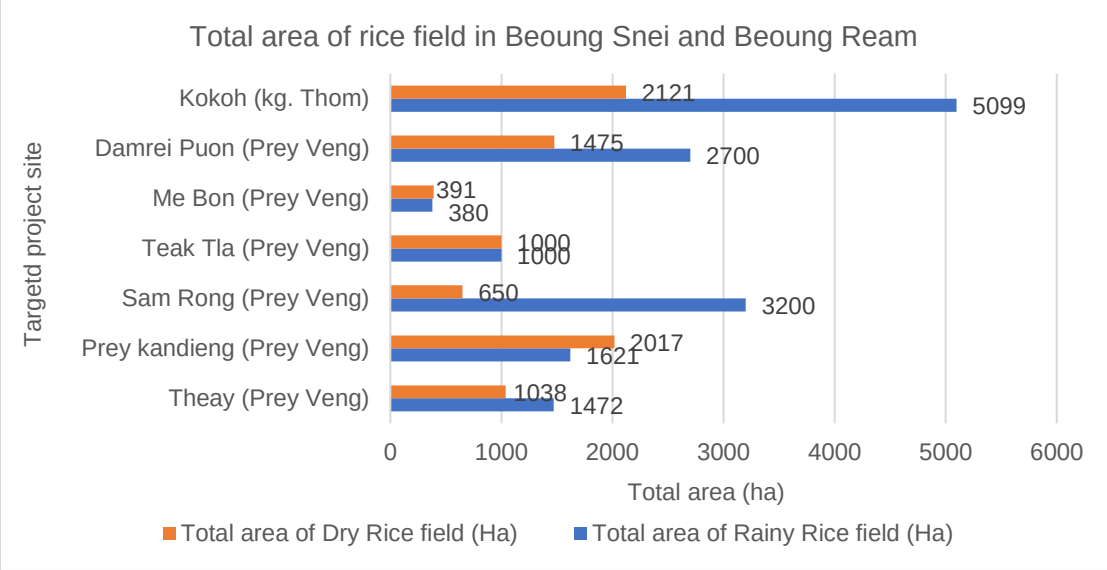


Figure 4.29. Indicates total area of dry and wet seasonal rice field in Beoung Sneh and Beoung Ream Lakes, Prey Veng and Kampong Thom Provinces

4.3.3. Source of Water Supply

In Beoung Ream, the source of water receives from the Stung Chinith river through Taing Krasang Irrigation scheme and another source of water receives from rain-feed. Beoung Ream connects to the Karav Lake before flowing down to the Stung Kmorch. However, the Beoung Ream CFR located within Beoung Ream Lake which is mainly depend upon on the water level of the Beoung Ream during the rainy season while during the driest months between March-May the lake becomes drying up and small part of the fish conservation remain and mainly sometimes depend on small canal connected to the Taing Krasaing Irrigation. In Beoung Sneh is a kind of landlock Lake which mainly depend upon rain feed. During the stress of water supply in dry season, FWUC in Beoug Snei sometimes request water supply from the Vaiko River.

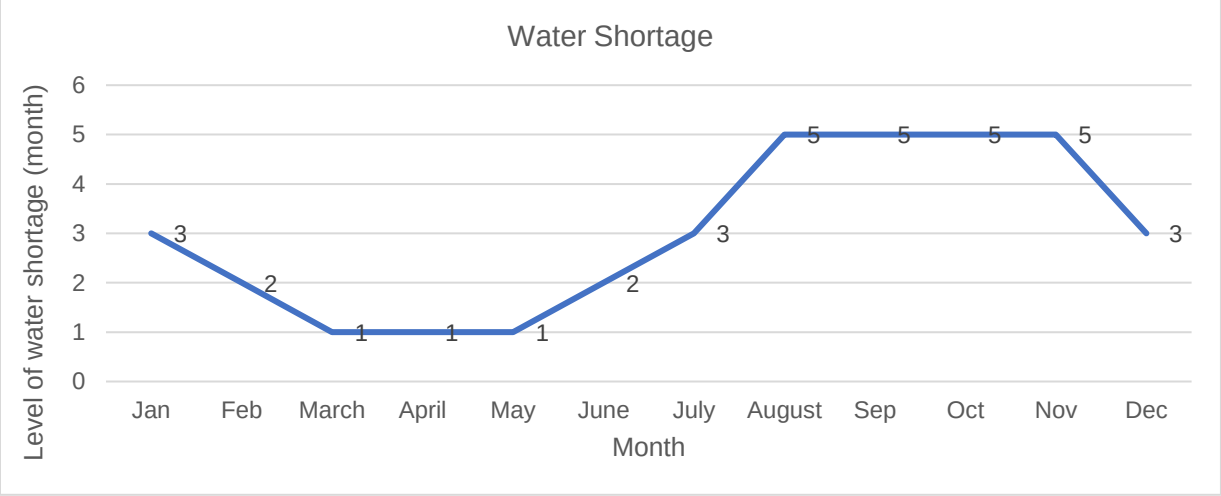


Figure 4.30: Indicates water shortage within year. 1 (high shortage), 2 (shortage), 3 (not shortage), 4 (plenty of water) and 5 (completely plenty)

4.4. Intervention Mechanism and Main Decision Maker

Lack of water supply is generally occurred during the dry season between March to May. The management of water within the Taing Krasang and Beoung Sneh's irrigation schemes is generally managed by the FWUC committee and reservoir operator upstream, which is basically supply water for thousand hectares of paddy field downstream. However, conflict of water management/supply reported to be occurred during the stress of water supply in the dry season while the demand for two or three crops of rice cultivation is relatively high during these few years, coincided with high price of rice. During the stress of water supply, a strong intervention activities was made by the commune and district authorities as well as district agriculture and natural resource management official and from the provincial agriculture department and provincial department of water resource and management. Saving water is a real practical mechanism that WFUC's committee is commonly advised to rice-growing farmer.

Moreover, the management of water within the Beoung Ream CFR for brood-stock fish protection reported to be management by the CFR committee, particularly more active patrolling during the dry period. CFR conservation zone mainly depends upon water supply from the rain-feed and connected canal from the Taing Krasaing Irrigation during the rainy season. The water management at Beoung Ream CFR is mainly faced during the dry season while little water from Taing Krasaing main irrigation is limited while most of the water extracted and supplied to the paddy field. Moreover, during the dry season, the CFR committees regularly monitors and protects water level in the conservation zone while brood-stock fish gathering. There is a lack of coordination between FWUC and CFR in water management due to different purposes of these two communities observed. This disconnection was also observed occurring at Theuy community fisheries (CFi), Beoung Sneh where many complicated actors such as water supply companies, FWUC, rice farmer and CFi observed very high competition in water management and demand. The coordination among the competent authorities such as commune, district and provincial authorities is weak where most of the local perception, particularly households visited complained the main cause shortage of water in Beoung Sneh during the dry season comes from the huge amount of water extracted by the two clean water supply companies. Moreover, it is observed that, among the involved stakeholders within the Beoung Sneh do not know exactly how much amount of water supply during the dry season for two or three crops rice and water extracted by the clean water companies, therefore the knowledge of water management at local communities, commune and district levels limited.

However, the current existing observed to be practiced while conflicts and shortages. Commune authorities is the main coordination body which solve the problem when the conflict between rice farmer and between FWUC and rice farmer while less conflict was observed between CFi/CFR and rice famer even conflict has been reported at Beoung Ream CFR but famer aware and participate in the protecting of water resource in the fish conservation zone during dry season.

4.5. Level of stakeholder participation, involvement and role in water management

4.5.1. Role of Commune Authority in Water Management

Water management within the irrigation scheme is mainly managed by the Provincial Department of Water Resource Management (PWRM) whereas FWUC's committees is the ground implementer and manager of water resource. However, the conflict among the water user groups arisen during the stress of water supply in dry season while demands of water supply relatively high for two or

crops rice cultivation. The current solution mechanism at the commune level is limited whereas commune authorities observed to be a main actor to coordinate all conflicts.

4.5.2. Kind of Conflict in Water Usage and Resolved Mechanism

High competition among farmers on water conflict were found during the dry season while the change from traditional rice cultivation into modern for a short period and two or three crops rice cultivation per year. Conflict on water usage was commonly occurred in both study sites, particularly during the stress of water shortage during dry season while high demand in water supply for two or three crops of rice cultivation. The conflicts commonly occurred while rice growth-out farmer who have plots of rice-field located close or upper part of the irrigation canal and farmer which have their plots of rice-field in the lower part or far away from the irrigation canal. Moreover, in Beoung Sneh, most of the local perception, particularly local authorities informed that two clean water are currently operating is the main of water shortage. Although there is no conflict between rice farmer and clean water company but most of them have expressed their concern. Moreover, the conflict of local perception on the clean water companies around the Beoung Sneh was concerned. Most visited farmers raised their concerns that clean water companies around the lake is the main cause of drying up of water in the lake where the demand of water supply for domestic consumption during the dry season is high as well as at the same time of high demand for rice cultivation.

Table 6: Indicates stakeholder's conflict in water management (red: conflict, green: no conflict at all & grey: less conflict)

No.	Famer	Gardener	CFi	CFR	FWUC	Local authority	Clean water company
Famer							
Gardener							
CFi							
WFWUC							
CFR							
Local authority							
Clean water company							

In Beoung Ream, contrasted purposes between CFR and FWUC was observed while the concept of water management was relatively different and disconnected. Moreover, the collaboration in water supply to the CFR conservation during the stress of water in April and May was not set up while fish conservation zone is necessarily needed for the brood-stock fish protection. However, other causes of water shortage reported to be attributed from the high demand of water for rice field, so that some farmers who have their rice-filed close to the CFR sometimes pumps water from the conservation zone to supply their rice field. Moreover, saving mechanism of water still need to improve among the rice farmer as much as possible but the common practice they try to get more water as much as they can for their rice field. The collection of water fee from the farmer is not well functioning as some of farmers are not willing to pay to the committee therefore the maintenance cost for the irrigation is limited. The main problem observed that, FWUC committee do not manage well on water supply to rice farmers.

V. Conclusion and Recommendation

5.1. Challenges and Constraints

The intersection of water management and conflict highlights the critical importance of sustainable practices and cooperative governance. However, the current global of water scarcity intensifies due to climate change, population growth, and mismanagement, the potential for conflict over this vital resource increases. Freshwater plays many important roles in daily life for example, agriculture is responsible for nearly 70% of that withdrawal volume, and it is therefore, the most water-intensive sector (Carlo et al., 2023). However, the effective water management strategies, including equitable distribution, community engagement, and cross-border collaboration, are essential in mitigating tensions and fostering peace. The improvement of irrigation technologies and practices was identified as an important major way to reduce water scarcity (Carlo et al., 2023). However, within the two piloting sites (Beoug Snei and Beoung Ream Lakes), the water governance is still poor although legal supports by the sub-decree.

The management plan for FWUC, CFR and CFi is well developed but the real actual implementation at the ground level is limited due to lack mechanism of monitoring and adjustment against to their practices. Moreover, through this legal framework, the coordination of local authorities at commune level has not clearly defined on role and coordination mechanism. It is observed that the collecting of water fee from the rice farmers who need water supply from irrigation canal is not well functioned. This current issue will impact on the willingness of it committee's participation and to the maintenance of the physical irrigation infrastructures. The local participatory approach may need to improve so that fair water supply can be managed and rice farmers are willingness to pay for the fee. However, both CFi and CFR has not incentive to its committee, which is voluntary work. Therefore, improves livelihood models needed and designed. The engagement of women into the planning is also the important factor through establishment of sefl-help group or floating garden.

In conclusion, addressing water-related conflicts requires a multifaceted approach that prioritizes sustainability, equity, and diplomacy. Sustainable water supply and water resource management relies on effectively engaging stakeholders in decision making (Stacy and Hall, 2022). Ultimately, proactive water management is not only secure access to this essential resource but also contributes to broader social stability and resilience. With water conflicts increasing due to stressors such as population growth, climate change, and aging infrastructure, stakeholder engagement holds the promise to improve decisions, save time and money, and improve relationships between governing bodies and stakeholders.

The current challenges faced by the FWUCs is the competing for water resources as the demand for two or three crops intensified rice production, combining with the huge amount uses of pesticides and fertilizer uses, which undermine the fishery productivity, degrade the natural resources in rivers and water bodies, and increase water conflicts among farmers and sectors in the face of climate change. To enhance water governance in Cambodia, it is critical to integrate it at the district level. This will promote sustainable water use and management across the country and pave the way for a brighter future. However, the common challenges are the inefficiency of the physical irrigation systems, weak governance and management, lack of participation by water users, low level of outcomes from the irrigation schemes, lack of incentives for the FWUCs‟ leaders, little external support for the financial and technical aspects, and the threat of natural disasters, such as drought and flooding (Mekong Institute, 2015). However, our pilot project aims to engage the involvement

from all related stakeholder in the management and water resource user through establishment of District Technical Working Group (DTWG). The DTWG will acts as the district and commune coordinator, provide local community technical and administration support when conflict and water scarcity happening.

5.2. Opportunities for Improvement

Capacity Building through providing training on water management, conflict solution and climate change adaptation to FWUG committees and members can enhance their skills in water management. However, investment in irrigation systems and maintenance can improve water distribution and efficiency. The encouragement inclusive participation in decision-making processes can help address conflicts and ensure equitable access to water. The collaboration by strengthening partnerships between FWUGs, government agencies, NGOs, and other stakeholders can foster better resource management and support. Moreover, through DTWG the local community people could use this channel to approach them directly when they face problem. Digital Climatic Advisory Service may need to set up so that they know when, how much water should manage and what they avoid the loses or accident when they are patrolling.

In Cambodia, rural community about 90 percent are depending on rice field fisheries, both fish and OAAs for their daily consumption. Integrated model between fast growing fish species and irrigation scheme may establish to support the local food security as most of irrigation scheme and flooded lowland are plenty of water during the rainy season. Moreover, as current face by the climate change by increasing of temperature and high evaporation as well as prolong the period of dry season, floating garden may help to introduce into the irrigation scheme or within the CFi/CFR conservation zone. This approach encourages the engagement women group in the water resource management, coping the change of climate as well as generating their income.

Annex 1. Indicates Strengths and weaknesses of FWUC and CFi

Strength	Weakness
CFi/CFR	
• Positive Effectiveness of Co-management in Community Fisheries and Farmer water user community • Illegal activities have been reduced • Rich natural resources and biodiversity • Most of the community members are well aware of the importance of natural resources and forest • Contribute to local consumption and provides nutrition • The community boundaries are clearly defined • Increased awareness on natural resource management at community level • Decision makings are approved by both sides-members and committees • Commitment to self- management after the project ended. • Set up women floating garden group	• Need to maintain water body in order to protect brood-stock fish • Despite the release of fishing grounds for community use, illegal fishing and conflict remain a challenge. • CFi continue to face such challenges as weak law enforcement and lack of capacity, incentives and income for people to actively participate in the sustainable management of Cfi • Some community members did not want to report on illegal activities • Lack of cooperation and communication between committees and members • Limitation of knowledge among committees and members • Internal conflicts on benefit sharing and using natural resources • Poor participation from community members • Some members have to engage in other activities for their household income • Less motivation mechanism by community to member to act in community • Limited skill to handle internal and external conflicts. • Overfishing: Fish stocks are declining due to overfishing, with some stocks projected to decline by 30% by 2030. • Illegal fishing: Illegal fishing is a major challenge, and conflicts arise from it. • Ambiguous regulations: Ambiguous fishery laws and regulations make it difficult for fishermen to know what is permitted. • Lack of financing: Fishermen and traders lack the financing and techniques to preserve fish quality. • Ecosystem threats: The ecosystem is threatened by the conversion of flood plains to agriculture, the destruction of mangrove swamps, and the reduction of river flow.
FWUC	
• Irrigation is targeted at reducing dependency on rain-fed farming and strengthening the resilience of poor food-insecure farmers, as well as improving their ability to cope with natural disasters, such as floods and drought, and the problems brought about by increasing rainfall variability • Irrigation is mainly done for increasing rice productivity, since rice has become a strategic commodity for income growth, poverty reduction, and national and household food security. • The Government of Cambodia has invested much money in the building of new irrigation schemes and restoring of the existing irrigation systems for the developing rice cultivation sectors • Set up women floating garden group • Integrate fish and irrigation scheme to improve local food secuity	• Need to use water in order to farming • Threatened by the flood plains to agriculture of river flow or raining season. • Number of FWUCs: As of January 2024, there were 544 FWUCs in Cambodia. • FWUC activity: Many FWUCs are inactive, with only 10% currently active. • FWUC challenges: Some challenges FWUCs face include weak management, low participation rates, and low socio-economic status. • FWUC support: FWUCs need a variety of skills to implement their tasks, such as meeting organization, database management, and accounting. • FWUC support services: External services can be expensive and difficult to access, so alternative service providers are needed to help FWUCs. • FWUC impact: FWUCs can help farmers weather climate change by encouraging them to grow crops during the dry season. • An FWUC that does not function refers to one in which the leaders are not active • However, the participation rate among farmers in the FWUCs is less than 50%. The reasons for such low participation rates include a lack of trust in the government among farmers, low participation rates among local governments, and a lack of finance • A detailed action plan is needed to help convince farmers to participate in the FWUCs; however, landless people do not have an interest in becoming FWUC members, and in fact in many places landless people only fish, and farming activities often conflict with fishing. • FWUCs were the lack of water in the catchments, the lack of irrigation infrastructure and a proper water allocation mechanism, high levels of poverty among the members, low agricultural productivity and deteriorated irrigation systems, financial constraints, loss of authority and independence, lack of planning and coordination at the scheme level, underdeveloped participation and lack of ownership, uncertainty and conflict

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