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## Challenges of Farmer Water User Communities in Participatory Irrigation Management and Development in Pursat Province, Cambodia

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**Mekong Institute**

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Communities in Participatory Irrigation  
Management and Development  
in Pursat Province, Cambodia**

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## List of Abbreviations

ADB	:	Asian Development Bank
AS	:	Anlong Svay
AVSF	:	Agronomes and Vétérinaire Sans Frontières
CC	:	Community Council
FGD	:	Focus Group Discussion
FO	:	Farmer Organization
FWUC	:	Farmer Water User Community
FWUG	:	Farmer Water User Group
ISF	:	Irrigation Service Fee
KI	:	Key Informant
KS	:	Krouch Saeuch
MoWRaM	:	Ministry of Water Resources and Meteorology
PDA	:	Provincial Department of Agriculture
PDoWRaM	:	Provincial Department of Water Resources and Meteorology
PIMD	:	Participatory Irrigation Management and Development

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## **Abstract**

Since the large-scale physical extent of irrigation schemes tends to be a major obstacle to their effective and efficient management and development, two Farmer Water User Communities (FWUCs), the Krouch Saeuch and Anlong Svay FWUCs, were established in 2010 to manage the secondary and tertiary schemes of the Damnak Ampil irrigation system. This research study aims to assess the performance of these two FWUCs, and to uncover what challenges were encountered during the five years of their operation. This study also recommends any necessary interventions for the improvement of the performance. The performance was assessed based on five criteria: organizational management, the level of participation of water users, operations and maintenance, financial management, and organizational linkages. For the challenges, the internal and external factors were examined. The results showed that the level of the performance of the Krouch Saeuch FWUC was average, while that of the Anlong Svay FWUC was poor. The overall 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. Interventions by relevant actors are required to improve the quality of the irrigation systems, and thereby, improve the performance of the FWUCs in ensuring the adequate and timely supply of water.



## **1. Introduction**

### **1.1. Overview**

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 (Silva *et al.*, 2013). 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 rice sector is important to government strategy and has become the most important agricultural export commodity (Yu and Diao, 2011).

Through irrigation, rice productivity has significantly improved, especially due to the expansion of the size of the dry-season rice cropping area. The availability of sufficient water and the use of fertilizers can produce large increases of 6 t/ha on average in rice yields, enabling farmers to sell any surplus rice and obtain cash to use as capital, which has contributed to household poverty reduction (Silva *et al.*, 2013).

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. To ensure the effective, efficient and sustainable management and operation of the irrigation system, Participatory Irrigation Management and Development (PIMD) was introduced in 2000 by MoWRaM (Chea *et al.*, 2011). PIMD aims to increase the involvement of local communities in irrigation system management through the establishment of the Farmer Water User Community (FWUC) (Chem *et al.*, 2008). PIMD has been conceived as the area of thrust in effective irrigation management by involving and associating farmers in the planning, operation and maintenance of the irrigation system (Fatima, 2013).

### **1.2. Research Rationale**

The expectations of establishing FWUCs for effective, efficient and sustainable irrigation management have not been met (Silva *et al.*, 2013). CEDAC (2009) reported that of 2,525

irrigation schemes in 13 provinces, only 230 have FWUCs, of which only 4 (2%) are considered as highly functional, another 83 (36%) as averagely functional, and the remaining 143 (62%) as not functional (CEDAC, 2009).

Damnak Ampil (DAP) FWUC, located in Pursat Province, was reported as not functional. The large-scale physical extent of the DAP irrigation system is the major constraint on this FWUC, as well as the effective and efficient operation and management of the system based on the PIMD approach. To solve this problem, in 2010, PDoWRaM established two FWUCs, Krouch Saeuch (KS) FWUC and Anlong Svay (AS) FWUC, to manage the secondary and tertiary schemes of the Damnak Ampil irrigation system. This research aims to assess the performance of these two FWUCs and to uncover the most pressing issues that inhibit their performance during the five years that the system has been in operation.

### **1.3. Objectives of the Research**

1. To assess the performance of KS FWUC and AS FWUC in participatory irrigation management and development.
2. To identify the challenges faced by these FWUCs in participatory irrigation management and development.
3. To recommend the interventions that are necessary to improve the performance of these FWUCs

### **1.4. Research Questions**

1. To what extent have the KS FWUC and AS FWUC been successful in participatory irrigation management and development?
2. Are there any challenges faced by these FWUCs in participatory irrigation management and development?
3. What interventions should be taken to improve the performance of these FWUCs?

### **1.5. Scope and Delimitations**

This study focuses on the performance assessments of the irrigation management and development-based participatory approach of Krouch Saeuch FWUC and Anlong Svay

FWUC, as well as the identification of the challenges faced by these FWUCs, of which all of the key stakeholders are the target groups for this study.

## **2. Review of Literature**

### **2.1. Participatory Irrigation Management and Development**

Following the shift in the water management paradigm from large-scale and centrally managed schemes to small-scale and locally managed ones, in 1999, the ADB introduced Participatory Irrigation Management and Development (PIMD) to Cambodia (Chem *et al.*, 2008). PIMD aims to:

- empower farmers with decision-making and responsibility for managing irrigation systems;
- improve the financial and physical sustainability of irrigation systems;
- improve water management and agricultural productivity; and
- reduce pressures on government finances (Gandhi and Namboodiri, 2008).

### **2.2. Farmer Water User Community**

In PIMD policy, the FWUC holds the authority in the operation and management of the irrigation systems. FWUC takes the roles and responsibilities of:

- collecting the irrigation services fees (ISF), as determined by the FWUC;
- preparing a work plan for the FWUC;
- formulating the statutes (constitution), contracts and internal regulations of the community;
- maintaining the irrigation system in good condition to enable the provision of irrigation for the whole season;
- managing and distributing water to all members;
- strengthening the use, management and improvement of the irrigation system in an efficient manner;
- resolving problems occurring within the community (Chem *et al.*, 2008).

### **2.3. Performance Assessment of FWUC**

Until now, there has been no standard to evaluate the performance of FWUCs in operating and managing their irrigation systems. However, some authors have tried to develop a valid format to assess the performance of FWUC. For instance, Hamada and Samad (2011) developed the format for assessing Water User Association performance in India by looking at the five aspects of the level of participation, operation and maintenance, water management, financial management and organizational linkages. The situation in Cambodia is not very different, and the water management aspect is included in the operation and maintenance tasks (Ministry of Water Resources and Meteorology, 2003). Agronomes and Vétérinaire Sans Frontières (AVSF) (2012) assessed the performance of the Farmer Organization of Cambodia by putting more importance on the criteria of organizational management than on the other four aspects of finance, identity, communication, and activities (Agronomes et Vétérinaires Sans Frontières, 2012). The combined criteria used to assess the performance of FWUC for this research are: (1) organizational management, (2) level of participation, (3) operations and maintenance, (4) financial management, and (5) organizational linkages.

### **2.4. Challenges of FWUC**

Some major constraints in implementing PIMD policy by the local community (FWUC) has been documented by many research studies. Silver *et al.* (2013) found that the main constraints of 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 over institutional roles, and lack of planning and coordination at broader hydrological scales (Silva *et al.*, 2013). Chea *et al.* (2011) found that the human resources, technical and financial capacity, the lack of the participation of the farmers in ISF payments and community meetings, and the lack of local coordination in conflict management were the major constraints on the implementation of PIMD policy by FWUCs (Chea *et al.*, 2011). Ros (2010) wrote that low benefits from irrigation schemes had discouraged farmers from participating in irrigation management. Another constraint was the lack of external support,

since FWUCs do not have the financial capacity to rehabilitate and develop the irrigation schemes, and to undertake large-scale repairs (Ros, 2010). Swain and Das (2008) raised several challenges, including the inefficiency of the physical systems, socio-economic heterogeneity and the capture of power, as well as gaps in information, education, training and incentives (Swain and Das, 2008). Vuren *et al.* (2002) discussed some challenges, such as water scarcity, traditional agricultural practices and high rates of illiteracy among local leaders, faced by the local community (Vuren, Papin, and El-Haouari, 2002). Chandrasekaran *et al.* (2001) found that some of the problems faced by water user associations included funding constraints, inadequate supply of water, low level of support from the government, poor attendance of the members at community meetings, and unresolved conflicts (Chandrasekaran *et al.*, 2001).

### **3. Research Methodology**

#### **3.1. Method of Data Collection**

##### **3.1.1. Primary Data Collection**

Primary data is the raw data collected in the field by using the methods described in the following sections.

- **Key Informant Interviews**

Representatives of the Cambodian Provincial Department of Water Resources and Meteorology (PDoWRaM), Provincial Department of Agriculture, and of the FWUCs were interviewed in order to obtain information on water-related issues through a set of guiding questions on the topics of the creation of the FWUCs and the rehabilitation of the schemes, water management, the participation of the water users, characteristics of the irrigation systems, financial and technical support, operations and maintenance, ISF collection, water issues and communication within the communities.

- **Interviews with Members of FWUCs**

Members of the FWUCs were chosen to represent a range of geographic locations across the schemes: lower, middle and higher schemes. The information obtained from these interviews



was used to assess the performance of the FWUCs and to identify the challenges they face. Included in the questionnaire survey were questions about socio-economic status, expenses of and income earned from the irrigated rice fields, market access, the management of the community, operation and maintenance of the systems, financial management, participation, challenges to water access and rice production, and evaluation of the management of the committees.

▪ **Focus Group Discussion**

Information was also collected through FGDs, of which three were chosen from each community: two FGDs to represent the members of the FWUC, and one from the community bodies. FGDs together with members of the FWUCs were selected to discuss the problems related to water access and irrigated rice production, along with the solutions to these problems. The FGDs from the community bodies were chosen to discuss the potentials and challenges in their community, and the solutions to the community’s problems.

Table 1: KI and FGD in target areas

	<b>Actors</b>	<b>KS FWUC</b>	<b>AS FWUC</b>	<b>Others</b>
KI	Committees	4	4	
	Chiefs of secondary canals	3	2	
	FWUGs	6	6	
	Village leaders	2	2	
	Heads of DAP FWUC, PDoWRaM and PDA			3
FGD	Committees, Chiefs of secondary canals, CCs, FWUGs	1	1	
	Members of FWUCs	2	2	

**3.1.2. Secondary Data Collection**

Secondary data was collected from related stakeholders or sources, such as PDoWRaM, PDA, the library of the RUA and the Internet.

### 3.2. Methods and Techniques of Data Analysis

The performances of FWUCs were assessed based on the format developed by Hamada and Samad (2011) for assessing the performance of water user associations, and the scoring method developed by Agronomes and Vétérinaire Sans Frontières (AVSF) (2012).

Hamada and Samad (2011) covered five aspects: the level of participation, operations and maintenance, water management, financial management and organizational linkages (Hamada and Samad, 2011). The level of performance was measured using the Likert scale: 1. Very poor, 2. Poor, 3. Average, 4. Good, 5. Excellent. AVSF (2012) developed scoring criteria to evaluate the farmer organizations on five aspects: management, finance, identity, communication and activities.

For this thesis, the performance of the FWUCs was assessed using five criteria: (1) organizational management, (2) level of participation, (3) operations and maintenance, (4) financial management, and (5) organizational linkages (Table 2).

Table 2: Format for assessing FWUC performance

Activities	Level of Performance				
	Excellent (5)	Good (4)	Average (3)	Poor (2)	Very Poor (1)
<b>1. Organizational management</b>					
- organizational structure					
- statutes and internal regulations					
- formal lists of members					
- functioning of FWUGs					
- leadership capacity					
- annual plan of action					
<b>2. Level of participation</b>					
- community meeting					

Activities	Level of Performance				
	Excellent (5)	Good (4)	Average (3)	Poor (2)	Very Poor (1)

- payment for ISF
- water distribution
- system maintenance

**3. Operations and maintenance**

- adequate and timely water supply
- information about water distribution
- dispute management
- repairs/maintenance of structure

**4. Financial management**

- report income and expense
- ISF collection
- incomes and expenses

**5. Organizational linkages**

- finding external supports
- horizontal linkage with other FWUCs
- vertical linkages
- information sharing

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The scores were interpreted by midpoint ranges: 1.00-1.80 means the performance of the FWUC is very poor, 1.81-2.60 is poor, 2.61-3.40 is average, 3.41-4.20 is good, and 4.21-5.00 is excellent.

For the challenges of the FWUCs, the internal and external factors were examined. The internal factors were weak management, lack of participation, physical system inefficiency, low level of outcomes from the irrigation scheme and low socio-economic status. For the external factors, financial and technical support along with market access were identified.

Data from the literature review and FGDs, as well as from the interviews of the farmers and KI were cross-checked and compiled. This “triangulation” method ensures the reliability of the data, so that the data analysis is more convincing. Information derived from the interviews of the FGDs and KI were analyzed using conceptual content analysis, and the sample survey data were analyzed using statistical analysis.

### **3.3. Selection of the Study Area**

Two FWUCs, the Krouch Saeuch (KS) FWUC and Anlong Svay (AS) FWUC, were selected as cases of large-scale irrigation systems that want to transfer their power in irrigation scheme management to the local communities for the operation and management of segments (secondary and tertiary canals) of the scheme. Both FWUCs are located along a large-scale irrigation system, the Damnak Ampil (DAP) irrigation system in Pursat Province.

Households were selected from these two FWUCs by using a stratified sampling technique (Yamane, 1967), as indicated below:

$$n = \frac{N}{1+N(e)^2} \quad (\text{Yamane, 1967})$$

$$n = \frac{1021}{1+1021(0.1)^2}$$

$$n = 91$$

Where:

N: total population of the two selected FWUCs

e: standard error 10%

n: sample selected

In the above equation (Yamane, 1967), the sample size is 91. The selected samples were then drawn out proportionally from each FWUC based on the formula below:

$$ni = \frac{n \times Ni}{N} \quad (\text{Yamane, 1973})$$

Where:

ni: sample selected from each FWUC

Ni: population of each FWUC

- KS FWUC

$$n_i = \frac{91 \times 453}{1021}$$

$n_i = 40$

- AS FWUC

$$n_i = \frac{91 \times 568}{1021}$$

$n_i = 51$

For the calculations, 40 samples were selected from the KS FWUC and 51 from the AS FWUC.

Table 3: Samples selected from target FWUCs

FWUCs	Commune	Village	Total members	Sample
<b>Krouch Saeuch FWUC</b>	Khnar Totueng	1. Krouch Saeuch	74	11
		2. Phteah Sla	63	10
	Trapeang Chorng	3. Ou Rumchek	20	3
		4. Steung Kambot	104	16
			<b>Sub-total</b>	<b>40</b>
<b>Anlong Svay FWUC</b>	Rumlech	5. Koun Tnaot	112	17
		6. Rumlech	19	3
	Ou Ta Paong	7. Prasat	152	22
		8. Robaoh Reang	64	9
			<b>Sub-total</b>	<b>51</b>
			<b>Total</b>	<b>91</b>

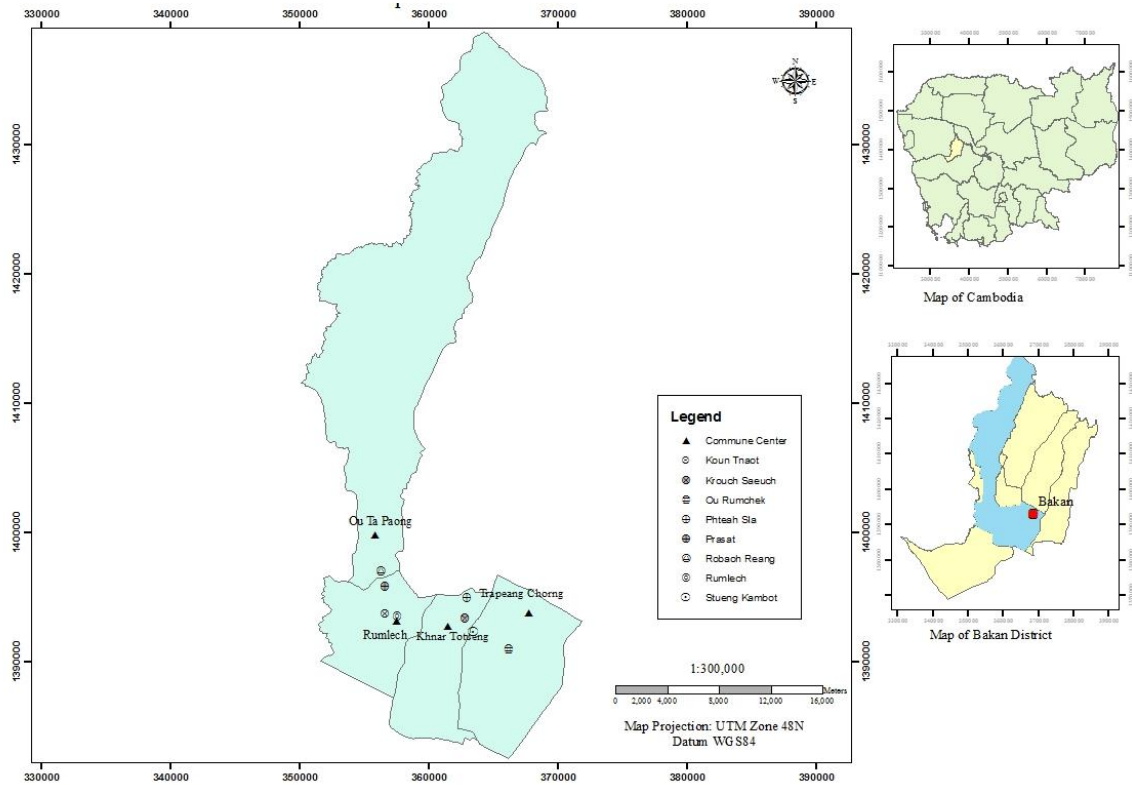


Figure 1: Maps of research sites

## 4. Results and Discussion

### 4.1. Performance Assessment of FWUCs

#### 4.1.1. Krouch Saeuch FWUC

Table 4: Performance assessment of KS FWUC

Assessment Criteria	Score	Meaning
<b>Organizational management</b>		
KS FWUC has a clear organizational structure, and 85% of its members joined in a community vote to elect the community bodies, but the members can recognize only the representatives from their villages and the head of the community.	3	Average

<p>The statutes of this community were established. The objectives of establishing the community, responsibilities of community bodies and its members, sources of income and expenses, and internal regulations were clearly defined. However, more than 50% of the members do not know their responsibilities, and almost all members do not know what has been included in the community statutes and internal regulations.</p>	3	Average
<p>All members of the community were listed clearly, and their irrigated fields within the boundaries of the community irrigation system were well-recorded, but the information about the changes in the ownership of the rice fields is not reported. It is estimated that about 2% of the land has changed owners.</p>	4	Good
<p>For the FWUGs, 25 groups were established, but only 3 (12%) are functioning well in collecting ISF, while 10 (40%) attend the community meetings regularly.</p>	2	Poor
<p>Annual plans are made about rice cultivation, ISF collection, repair and maintenance, and water distribution. For rice cultivation, only 70% of the members adopt the same variety of rice and the same crop calendar. Only 40.61% of ISF has been collected, 30% of the repair and maintenance has been completed, and 50% of the water distribution has been accomplished.</p>	3	Average
<p>The leadership capacity is average. The attributes of the leaders regarding commitment, honesty and transparency, and willingness were assessed to be average by the members of the community. The attribute of knowledge and skills were divided into technical and organizational. For technical skills and knowledge, the committees used to join the programs for training members in the repair and maintenance the systems, and rice cultivation technology, but for organizational knowledge and skills, the committees of FWUC still face some problems in motivating the members, solving disputes, enforcing rules and executing financial and administrative tasks. The final attribute to consider is authority. The leaders of the two FWUCs hold the authority over most aspects of irrigation management, including planning, water distribution, system maintenance, financial management, and conflict resolution. However, the performance of the leaders in carrying out these tasks has been unsatisfactory.</p>	3	Average

	<b>Sub-total</b>	18/6= 3	<b>Average</b>
<b>Level of participation</b>			
The level of participation of the members in community meetings is average (3.08/5 scores). Of the members, 5% always, 35% usually, 25% sometimes, 32.5% rarely and 2.5% never participate in community meetings.		3	Average
For the payment of ISF, only 189 (40.57%) out of 465 members on average have paid for irrigation service fees. Of the members, 58.92% (274 members), 37.63% (175 members) and 25.16% (117 members) paid the ISF in the years 2011, 2012 and 2013, respectively.		2	Poor
For the participation of the members in water distribution, the committees reported that only about 50% of the members have followed the community's water distribution plan.		3	Average
For the repair and maintenance of the systems, up to 95% of the members have contributed to system maintenance and repair. Of the members, 65% have contributed both money and labor, 27.5% have contributed only money, 2.5% have contributed only labor and 5% have contributed nothing.		3	Average
	<b>Sub-total</b>	11/4= 2.75	<b>Average</b>

### **Operations and Maintenance**

In 2014, 85% of members had access to water in the rainy season, and of these, only 63.82% were able to irrigate their fields. In the dry season, 65% of the members had access to water, and of these, only 66.15% were able to irrigate their fields.		3	Average
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The performance in sharing information about water distribution is average (2.75/5 scores). Of the members, 22.5% never, 15% rarely, 27.5% sometimes, 35% usually and 0% always receive the information.	3	Average
The community members evaluated the performance of the committees in dispute management as 2.84/5 scores on average, which means that the performance in dispute management is average.	3	Average
For the repair of the systems, only 30% of the total damage of the whole system has been fixed.	2	Average
<b>Sub-total</b>	11/4= 2.75	<b>Average</b>

### Financial Management

The management committee stays updated and sometimes reports to the members on the FWUC's incomes and expenses.	3	Average
ISF has been collected every year since 2011. The average percentage of the collected fees is 40.61%. The percentages of the total fees collected in the years 2011, 2012 and 2013, are 58.96%, 37.65% and 25.21%, respectively. The ISF of 2014 is collected at the end of 2015.	2	Poor
KS FWUC generates income only from ISF and can cover only 30% of total expenses.	2	Poor
<b>Sub-total</b>	7/3= 2.33	<b>Poor</b>

### Organizational Linkages

KS FWUC has contact with PDoWRaM for intervention in solving related water issues, including dispute management and repairing the main canal. Moreover, the community has recently received support from an NGO, Punleu Kuma, to build community capacity through the provision of training in technical matters, operations and maintenance, administration and financial management. However, the present support cannot fulfill the demand of the community, while support for repairing the irrigation schemes is urgent and necessary. The KS FWUC is recognized by local authorities (at the commune and village levels) and has their intervention in dispute management, as well as repair and maintenance of the irrigation systems.	3	Average
KS FWUC has some contact with AS FWUC for discussing the water distribution plan. Representatives from KS FWUC have visited the Steung Chinit FWUC in Kampong Thom Province in order learn from the experience of the latter FWUC.	2	Poor
The communication among the committees was scored 3.23 on average. Of the respondents, 22.5% scored the communication as excellent, 17.5% as good, 37.6% as average, 5% as poor and 17.5% as very poor.	3	Average
The information sharing among the committees was scored 3.25 on average. Of the respondents, 20% scored the information sharing as excellent, 30% as good, 22.5% as average, 10% as poor and 17.5% as very poor.	3	Average
<b>Sub-total</b>	11/4= 2.75	<b>Average</b>
<b>Total</b>	<b>57/21= 2.71</b>	<b>Average</b>

#### 4.1.2. Anlong Svay FWUC

Table 5: Performance assessment of AS FWUC

Assessment criteria	Score	Meaning
<b>Organizational management</b>		
AS FWUC has a clear organizational structure, and 85% of its members joined in a community vote to elect the community bodies, but the members can recognize only the representatives from their villages and the head of the community.	3	Average
The statutes of this community were established. The objectives of establishing the community, responsibilities of community bodies and its members, sources of income and expenses, and internal regulations were clearly defined. However, more than 50% of the members do not know their responsibilities, and almost all members do not know what has been included in the community statutes and internal regulations.	3	Average
All members of the community were listed clearly, and their irrigated fields within the boundaries of the community irrigation system were well-recorded, but the information about the changes in the ownership of the rice field is not reported. It is estimated that about 5% of the land has changed owners.	4	Good
The number of FWUGs established is 19, but all had lost their function in the collection of fees, since the community could not supply water adequately. Only 42.10% (8/19 groups) of the FWUGs have regularly attended the monthly community meetings.	2	Poor
Annual plans are made about rice cultivation, ISF collection, repair and maintenance, and water distribution. For rice cultivation, only, only 60% of the members adopt the same variety of rice and the same crop calendar within blocks. The plan for collecting ISF each year had stipulated at least 30% to be collected, but the ISF has never been collected so far. For repair and maintenance, only 20% of total damages have been fixed, and 50% of the water distribution has been accomplished.	2	Poor
The leadership capacity is average. The attributes of the leaders regarding commitment, honesty and transparency, and willingness were assessed to be average by the members of the community. The attribute of knowledge and skills were divided into technical and organizational. For technical skills and knowledge, the committees used to join the programs for training members in the repair and maintenance the systems, and rice cultivation technology, but for organizational	3	Average

Assessment criteria	Score	Meaning
knowledge and skills, the committees of FWUC still face some problems in motivating the members, solving disputes, enforcing rules and executing financial and administrative tasks. The final attribute to consider is authority. The leaders of the two FWUCs hold the authority over most aspects of irrigation management, including planning, water distribution, system maintenance, financial management, and conflict resolution. However, the performance of the leaders in carrying out these tasks has been unsatisfactory.		
<b>Sub-total</b>	17/6= 2.83	<b>Average</b>
<b>Level of participation</b>		
The level of participation of the members in community meetings is average (2.82/5 scores). Of the members, 5.9% always, 21.6% usually, 25.5% sometimes, 43.1% rarely and 3.9% never participate in community meetings.	3	Average
For the payment of the ISF, no members have ever paid, since they have never received adequate supplies of water.	1	Very poor
For the participation of the members in water distribution, the committees reported that only about 50% of members have followed the community's water distribution plan.	3	Average
For the repair and maintenance of the systems, up to 94.11% have contributed to system maintenance and repair. Of the members, 66.66% have contributed both money and labor, 17.65% have contributed only money, 9.80% have contributed only labor, and 5.89% have contributed nothing.	3	Average
<b>Sub-total</b>	10/4= 2.5	<b>Average</b>
<b>Operations and Maintenance</b>		
In 2014, only 17.64% of members had access to water in the rainy season, and of these, only 37.78% were able to irrigate their fields. In the dry season, only 2.51% of the members had access to water, and of these, only 70.25% were able to irrigate their fields.	1	Very poor
The performance in sharing information about water distribution is average (3.12/5 scores). Of the members, 7.8% never, 29.4% rarely, 21.6% sometimes, 25.5% usually and 15.7% always receive the information.	3	Average

Assessment criteria	Score	Meaning
The community members evaluated the performance of the committees in dispute management as 3.18/5 scores on average, which means that the performance in dispute management is average. Of the members, 3.9% assessed the performance of the committees as very poor, 5.9% as poor, 66.7% as average, 15.7% as good, and 7.8% as excellent.	3	Average
For the repair of the systems, only 20% of the total damage of the whole system has been fixed.	1	Very poor
<b>Sub-total</b>	8/4= 2	<b>Poor</b>
<b>Financial Management</b>		
Management committee keeps updated and sometimes report to members about FWUC incomes and expenses.	3	Average
ISF has never been collected, since the members of the FWUC have not received sufficient supplies of water.	1	Very poor
AS FWUC does not have any source of income.	1	Very poor
<b>Sub-total</b>	5/3= 1.66	<b>Very poor</b>
<b>Organizational Linkages</b>		
AS FWUC has contact with PDoWRaM for intervention in solving related water issues, including dispute management and repairing the main canal. Moreover, the community has recently received support from an NGO, Punleur Kuma, to build community capacity through the provision of training in technical matters, operations and maintenance, administration and financial management. However, the present support cannot fulfill the demand of the community, while support for repairing the irrigation schemes is urgent and necessary. The AS FWUC is recognized by local authorities (at the commune and village levels) and has their intervention in dispute management, as well as repair and maintenance of the irrigation systems.	3	Average
AS FWUC has some contact with KS FWUC for discussing the water distribution plan. Representatives from AS FWUC have visited the Steung Chinit FWUC in Kampong Thom Province in order learn from the experience of the latter FWUC.	2	Poor
The communication among the committees was scored 3.39 on average. Of the respondents, 43.1% scored the communication	3	Average

Assessment criteria	Score	Meaning
as good, 54.9% as average and 2% as very poor.		
The information sharing among the committees was scored 3.25 on average. Of the respondents, 27.5% scored the information sharing as good, 70.5% as average and 2% as poor.	3	Average
	<b>Sub-total</b> 11/4= 2.75	<b>Average</b>
	<b>Total</b> 51/21= 2.42	<b>Poor</b>

## 4.2. Challenges of FWUCs in Irrigation Management

### 4.2.1. Internal factors

- **Physical System Inefficiency**

Table 6: Demand and supply of water in KS FWUC and AS FWUC

Water consumption	KS FWUC	AS FWUC
Water demand for rice fields (ha)	1000	795
Area of access to water supply during rainy season in 2014 (ha)	850 (=85%)	140.24 (=17.64%)
Water received (%)	64	38
Area access to water supply during dry season in 2014 (ha)	650 (=65%)	20 (=2.51%)
Water received (%)	66	70

Source: Author's survey

Lack of water still poses challenges to the farmers who depend on the KS and AS irrigation systems. For the KS irrigation system, since the start of the project, 1,000 hectares of rice have been cultivated in both the rainy and dry seasons. There are 465 households who depend on this irrigation scheme. However, in 2014, only 85% of the community members could access the water during the rainy season, and of these members, only 63.82% could irrigate their fields. During the dry season, 65% of the members could access the water, and of these members, only 66.15% could irrigate their fields.

For the AS irrigation system, in 2014, 795 hectares and 20 hectares of rice were cultivated during the rainy and dry seasons, respectively. There are 568 households who depend on the water from this irrigation system. In 2014, only 17.64% of the community members could access the water during the rainy season, and of these members, only 37.78% could irrigate their fields. During the dry season, only 2.11% of the members whose rice paddy fields were near the Anlong Svay Lake could access the water.

Inadequate water supply is not due to the lack of water in reservoirs and catchment areas, but also the lack of an irrigation system or damage to such a system from flooding. For KS FWUC, the expenses of repairing and maintaining the systems, as well as extending the canal, was 79.59% of the total expenses on average from 2011 to 2013. For 2014, the ISF has not yet been collected, but this FWUC has decided to repair the system to ensure more efficiency in supplying water to its members. Only 30% of the total damage has been repaired.

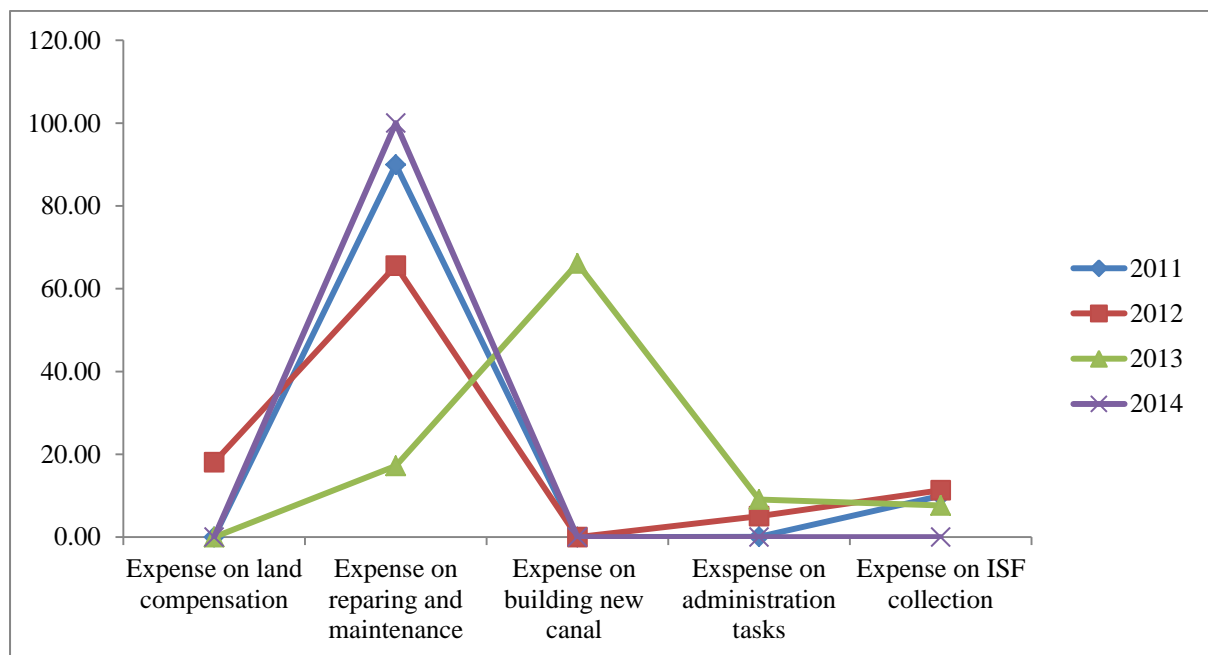


Figure 2: Sources of Expenses of KS Community

Source: Author's survey

▪ **Weak Governance and Management**

Two attributes, decision-making structure and leadership capacity, of governance and management were examined.

### **The Decision-making Structure**

The decision-making structures of both the KS FWUC and AS FWUC consist of three levels that were identified by MoWRaM. At the highest level is the committee of the FWUC, of which the first committee is the chairman in charge of general supervision, the second committee is the first vice-chairman in charge of maintenance and repair, the third committee is the second vice-chairman in charge of water distribution, and the fourth and final committee is the treasurer in charge of finance. The second level is the chiefs of the secondary canals whose roles are to manage and maintain each of the secondary canals. The last level is the FWUGs, whose roles are to implement the work plan, as well as the coordination and collection of fees from the farmers.

Even though both FWUCs have the proper decision-making structure, the implementation has not worked well. Most of the FWUGs have lost their responsibilities. For KS FWUC, 88% (22/25 groups) of FWUGs have not functioned well in terms of ISF collection, 60% (15/25) of the FWUGs have not participated in community meetings to prepare the work plans. For AS FWUC, 68.42% (13/19 groups) of the FWUGs have lost their responsibilities of attending the community meetings to organize the work plans, and all FWUGs have not functioned in terms of ISF collection.

### **The Leadership Capacity**

The leadership capacity of both the KS FWUC and AS FWUC is average and needs to be improved. The villagers, whose rice fields are located by the downstream canal, raised some inequitable distribution of water, and have complained to their inability leader. Basically, the committees of the FWUCs are facing problems in motivating their members, solving disputes, enforcing rules and executing financial and administrative tasks.

- **Low Profits from Irrigated Rice Production**



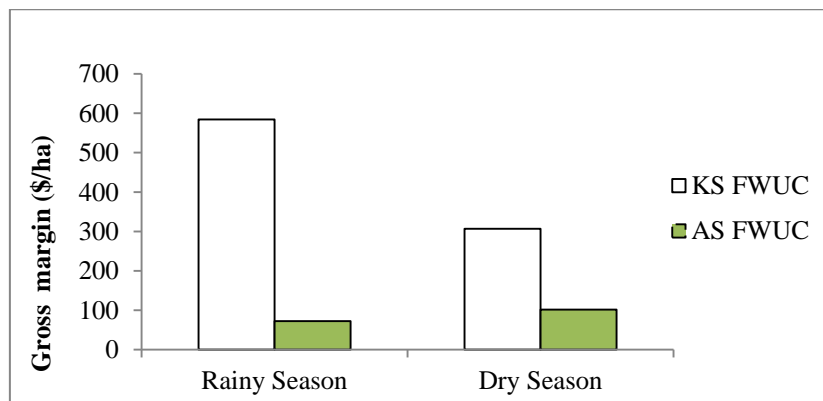


Figure 3: Gross Margin of Irrigated Rice Production in KS FWUC and AS FWUC

Source: Author's survey

The outcome of the irrigation scheme is still at a low level. The members of the AS FWUC can earn only USD72.41 per hectare annually from their irrigated rice during the rainy season. They have put major constraints on an inadequate water supply, high input prices, and the high costs of land preparation and harvesting services. Whenever the members receive low profits from their irrigated rice production, they tend not to pay the ISF, without which the communities have no income for covering their expenses.

#### ▪ Lack of Incentives for Committees

The committees of the KS FWUC and AS FWUC have worked without any incentives, since the project started. The incentives of the committees were expected from the division of the income from collecting the ISF. In the case of the KS FWUC, 79.59% of the income from ISF during 2011-2013 was recovered for maintaining and repairing the systems, and building new canals (Figure 4). Only 30% of the total damages can be recovered from the ISF. In the case of the AS FWUC, the ISF has never been collected, so the total expenses for repairs and maintenance have come from the contributions of the members. The lack of incentives will tend to encourage the committees of the FWUCs to give up their jobs. For instance, 22 of 25 FWUGs of the KS FWUC have given up their responsibilities in collecting ISF, while a council and 15 of 25 FWUGs have stopped attending the monthly meetings. For AS FWUC, 13 FWUGs have stopped attending the monthly community meetings, and all FWUGs have lost their function in collecting the ISF. Moreover, without earning any profits from working for the community, the rate of loss in the community bodies will increase.

▪ **Lack of Participation of Water Users**

The lack of the members' participation is still a challenging task for FWUC. The willingness of the members to participate in community meetings, the payment of the ISF, the participation in water distribution, and the repair and maintenance plans all require improvements. The participation of the members in community meetings is necessary for the reporting of problems related to irrigated rice production and access to water, as well as for the voicing of the decision-making process in community planning, which includes planning for production, water distribution, ISF collection, and repairs and maintenance. The lack of participation will not allow the community planning process to represent the whole community, and will lead to adverse impacts on the performance of the FWUCs.

For KS FWUC, the level of the participation of the members in community meetings is average (3.08/5 scores). Of the members, 5% always, 35% usually, 25% sometimes, 32.5% rarely and 2.5% never participate in community meetings. For the payment of ISF, only 189 out of 465 members (40.57% of the members) on average have paid for irrigation service fees. Of the members, 58.92% (274 members), 37.63% (175 members) and 25.16% (117 members) paid the ISF in the years 2011, 2012 and 2013, respectively. For the participation of the members in water distribution, the committees reported that only about 50% of the members have followed the community's water distribution. For the repair and maintenance of the systems, up to 95% of the members have contributed to system maintenance and repair. Of the members, 65% have contributed both money and labor, 27.5% have contributed only money, 2.5% have contributed only labor, and 5% have contributed nothing.

For AS FWUC, the level of participation of the members in community meetings is average (2.82/5 scores). Of the members, 5.9% always, 21.6% usually, 25.5% sometimes, 43.1% rarely and 3.9% never participate in community meetings. For the payment of ISF, no members have ever paid, since they have never received adequate supplies of water. For the participation of the members in water distribution, the committees reported that only about 50% of members have followed the community's water distribution plan. For the repair and maintenance of the systems, up to 94.11% have contributed to system maintenance and repair. Of the members, 66.66% have contributed both money and labor, 17.65% have contributed only money, 9.80% have contributed only labor, and 5.89% have contributed nothing.

#### **4.2.2. External Factors**

##### **▪ Low External Supports**

External support is an important factor in improving the performance of the FWUCs. The main reason for external support comes from the lack of the financial capacity to rehabilitate and develop the irrigation schemes, as well as to undertake large-scale repairs. The second reason is the advantage conferred by external support on capacity building, which is the improvement in the knowledge and skills of the members and leaders of the FWUCs. Such an improvement for the farmers would lead to an increased level of participation in irrigation management, and for the leaders would enhance their leadership capacity in managing and operating the irrigation systems. The third reason is the enhancement of the governance and management of the scheme through the assistance provided during the formation of the FWUC, the assistance with rule enforcement and conflict resolution, and the provision of finance.

Both FWUCs have stated that an insufficient supply of water from the Damnak Ampil reservoir is the major problem, so they really need help from external actors to solve this problem. Replenishing this reservoir and finding other water resources is one of the major tasks of handling this issue. Moreover, the improvement of the quality of the existing irrigation systems through the rehabilitation of the main canal and drainage systems is quite necessary. However, these two FWUCs do not have the financial capacity to do so and would require support from various external actors.

##### **▪ Natural Disasters**

Natural disasters, including droughts and floods, are threats to the performance of the FWUCs. Flooding during 2011-2014 damaged some parts of the irrigation schemes within the boundaries of the FWUCs. For the KS irrigation system, approximately USD22,742 was estimated to be the cost of the total damage by the flooding; however, KS FWUC was able to contribute only USD6,823, which is 30% of the total damage. This expense was 65.67% of the total income derived from the ISF on average. For the AS FWUC, there have been no reports on the expenses of repairing and maintaining the systems. Flooding in 2014 reduced the FWUC's rice yield from 2.90 tons/ha (baseline survey from KCC, 2010) to 1.92 tons/ha (Author's survey, 2014). For the KS FWUC, there was a slight drop from 3.70 tons/ha

(Baseline survey from KCC, 2010) to 3.47 tons/ha (Author’s survey, 2014). In 2015, the members of these FWUCs have complained of drought and the lack of water in the reservoir. The drought had damaged their young rice seedlings, so the FWUCS have started to broadcast again.

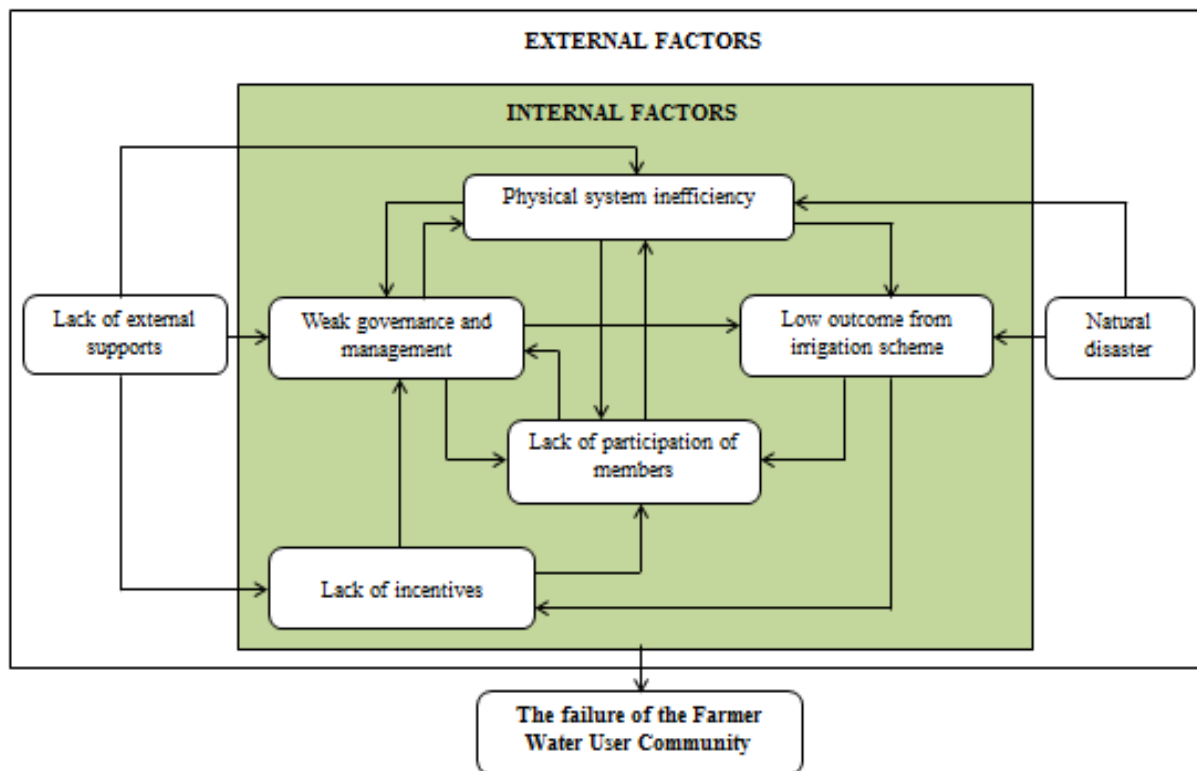


Figure 4: Summary of Overall Challenges of KS FWUC and AS FWUC

### 4.3. Necessary Interventions

Table 7: Necessary interventions for improving the performance of KS FWUC and AS FWUC

Issues	Solutions	Actors
Physical system inefficiency		
- System deficiency	- Repair and restore the main and secondary canals, as well as the drainage system - Extend the field canals	- PDoWRaM - FWUCs

- Uncertainty about availability of water	- Formulate water distribution plan	- PDoWRaM - FWUCs
Weak governance and management		
- Poor technical knowledge and skills for system operations and maintenance	- Provide training on operation and maintenance of the system	- PDoWRaM - NGO(s)
Low income from irrigated rice production		
- Inadequate water supply	- Improve the quality of irrigation systems	- PDoWRaM - FWUC - NGO(s)
- Lack of technical knowledge about rice production	- Enhance the extension services of rice technology	- PDA

Source: Author's survey

## 5. Conclusion and Recommendations

### 5.1. Conclusion

This study evaluated the performance of the FWUCs by examining the organizational management, the level of the members' participation, operations and maintenance, financial management and organizational linkages. The results show that the performance of the KS FWUC was average, and that of the AS FWUC was poor. KS FWUC has the potential to strengthen their performance with their own support, but AS FWUC will tend to stop functioning if there is no intervention from outsiders in improving the quality of its irrigation systems.

The challenges of these FWUCs are the physical inefficiency of the irrigation system, weak governance and management of the FWUC bodies, lack of participation of the water users, low level of outcomes from the irrigation schemes, lack of incentives for the FWUC bodies,

low financial and technical external support, and natural disasters, including droughts and floods.

Interventions from the relevant actors to improve the quality of the irrigation systems are necessary for improving the performance of the FWUCs, so that the FWUCS can ensure the adequate and timely supply of water. Technical capacity-building supports for the operation and maintenance of the systems have to be provided to the FWUCs in order to enhance their management. Moreover, the extension services of rice technology have to be improved in order to increase the productivity of irrigated rice production.

## **5.2. Recommendations**

- To prevent the failure of establishing the FWUC, MoWRaM should first consider the availability of the irrigation system and its quality.
- Committees of the FWUCs should be trained in the technical knowledge and skills for system operation and maintenance in order to ensure the effective, efficient and sustainable management of the irrigation systems.
- MoWRaM should provide the financial support based on the agreement to support the FWUCs in the operation and maintenance of the system before the FWUC can become financially self-reliant.

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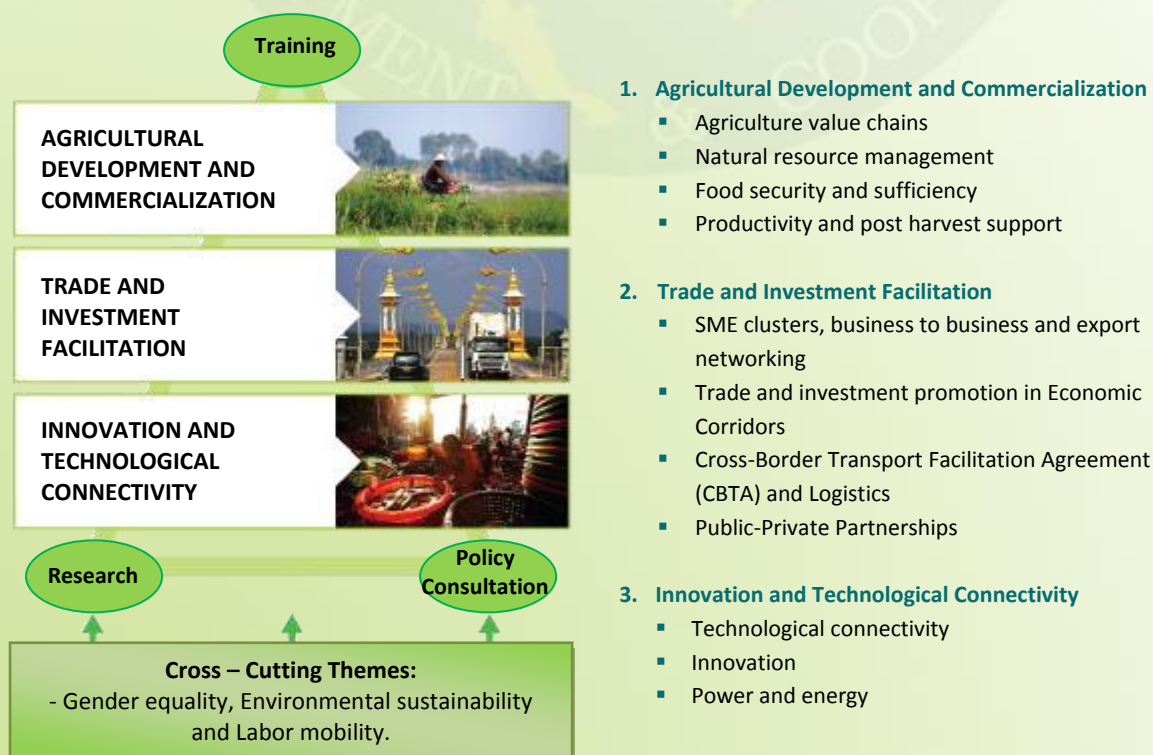
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