

**VIETNAM – NETHERLANDS PARTNERSHIP  
WATER FOR FOOD AND ECOSYSTEMS**

**ADDITIONAL CASE STUDY #3**

**Impact of Participatory Irrigation Management (PIM) to Local  
Communities and Environment in Hop Tien Commune, Dong Hy  
District, Thai Nguyen Province**

**FINAL REPORT**

**IMPLEMENTING INSTITUTION**

**Department of Water Resources (DWR)  
Ministry of Agriculture and Rural Development (MARD)**



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## ABBREVIATIONS

ADB	Asian Development Bank
CIDSE	Coopération Internationale pour le Développement et la Solidarité
Co-op	Cooperative
CPC/DPC	Commune People's Committee / District People's Committee
DANIDA	Danish International Development Agency
DARD	Department of Agriculture and Rural Development
DWR	Department of Water Resources
FMC	Financial Management Specialist
GOV	Government of Viet Nam
GS	Gender Specialist
GSO	General Statistics Office
HHs	Households
IDMCs	Irrigation and Drainage Management Companies
IDS	Irrigation and Drainage Specialist
ISF	Irrigation Service Fee
IUCN	The International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
LNv	The Netherlands Ministry of Agriculture, Nature and Food Quality
MARD	Ministry of Agriculture and Rural Development
MB	Management Board
NIAPP	Natural Institute of Agriculture Planning and Projection
O&M	Operation and Maintenance
PC / PPC	People's Committee / Provincial People's Committee
PDS	Participatory Diagnostic Survey
PIM	Participatory Irrigation Management
PRA	Participatory Rural Appraisal
RDS	Rural Development Support
TA	Technical Assistance
TOR	Terms of Reference
W/S	Workshop
WB	World Bank
WFE	Water partnership on water for Food and Ecosystem
WU	Water User
WUO	Water User Organization

**Case Study #3: Impact of Participatory Irrigation Management (PIM) on  
Local Communities and Environment in Hop Tien Commune,  
Dong Hy District, Thai Nguyen Province**

# **FINAL REPORT**

## **1. INTRODUCTION**

### **2.1. Background**

This case-study is designed to support the development of the Viet Nam – Netherlands Water Partnership on Water for Food and Ecosystems. The partnership is between Viet Nam's Ministry of Agriculture and Rural Development (MARD) and the Netherlands Ministry of Agriculture, Nature and Food Quality (LNV). IUCN has been asked to coordinate the Partnership development process, including through undertaking study that will identify strategies for the management of water resources that balance agricultural production with the maintenance of the integrity of critical ecosystems that depend on adequate water flows.

They will build on the overall strategy of the global Water for Food and Ecosystems Programme, which seeks to promote an ecosystems approach to agricultural production and a productive services approach to ecosystems management. This will in turn provide a basis for ensuring more effective synergies between agriculture and ecosystems, the two largest water users, within an Integrated Water Resources Management (IWRM) framework.

The approach to the WFE Partnership will be to build a consensus on innovative approaches to balancing production and sustainability through developing the knowledge base and the involvement of key stakeholders in dialogue and discussion.

The case study is being carried out in Hop Tien commune, Dong Hy district, Thai Nguyen province, Vietnam. The purpose of the case study is to identify mechanisms based on that water resources management, which are traditionally approached as single purpose management regimes, should be enhanced to become more integrated, multi-stakeholder based management systems. At the irrigation scheme level, water resources management is considered as irrigation governance and management. The integrated approach is carried out with considerations of various interests such as irrigation, domestic water supply and fishery in Hop Tien commune. On the other hand, issues of saving water, water resources protection should be paid attention in the case study to ensure sustainable water resources development in the area.

On 15 March 2008, the Inception Report of the case study has been completed and submitted to IUNCVN by DWR. In this Inception Report the scope, deliverables, methodology, activities to be done, expected outputs and timeline, activity plan, consultant input schedule, TORs of the consultants and budget allocation of the case study have been clearly presented. The Midterm report has been submitted to IUNCVN by DWR by 25 April 2008. All initial results of the study including assessments on agricultural production, water sources, crop diversification, forestry development, environment, PIM etc. have been presented in the midterm report in order to get comments from IUNCVN. The Inception Report and Midterm Report are considered as foundations for this Draft Final Report

### **2.2. The Case Study Area Introduction**



Hop Tien commune, Dong Hy district, Thai Nguyen province is 26 km far from headquarter of Dong Hy district in South-East direction, 33 km far from Thai Nguyen city, and 120 km far from Hanoi capital. It is bordered with Yen The district (Bac Giang province) in East, Vo Nhai district (Thai Nguyen province) in North, Cay Thi commune and Tan Loi (Dong Hy district, Thai Nguyen province) in West and Phu Binh district (Thai Nguyen province) in South (Please see the map below).

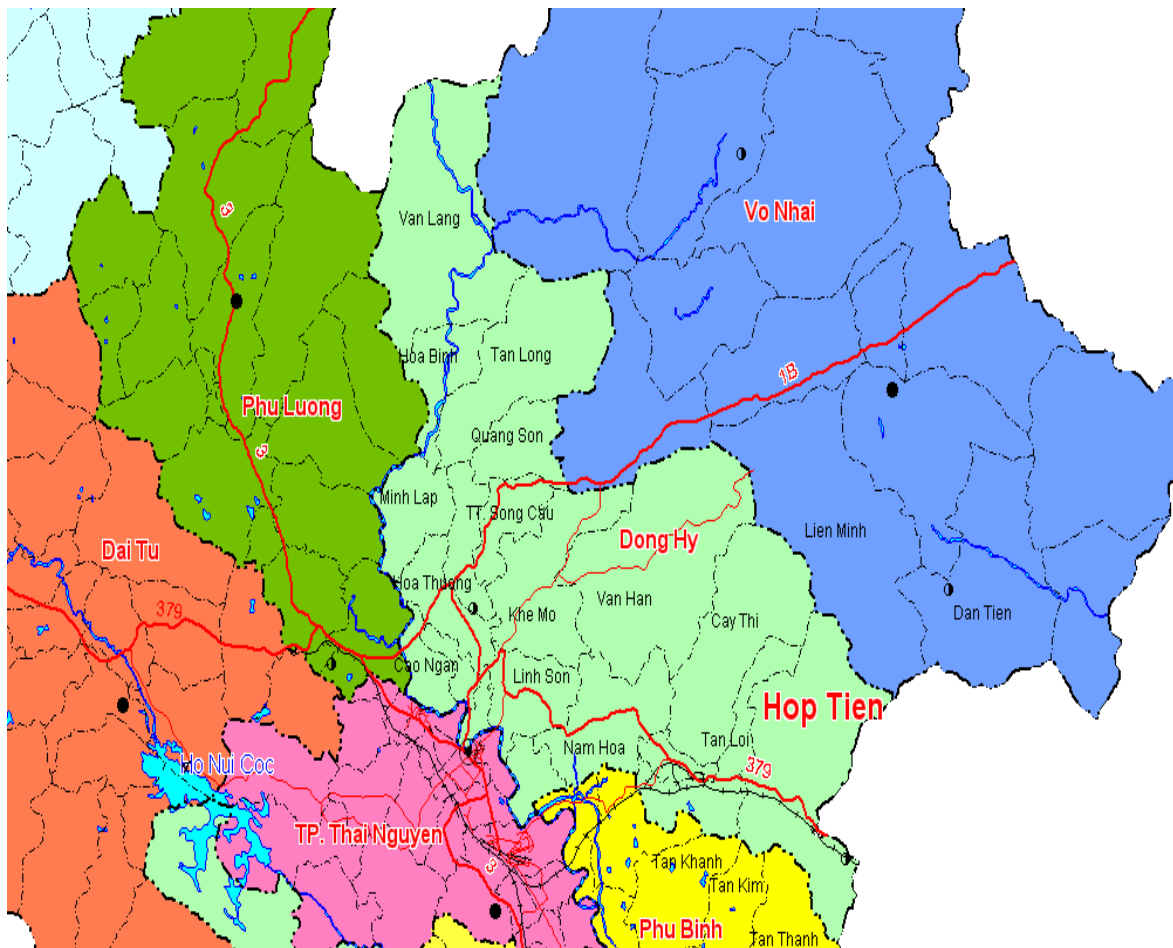


Fig.1 Location of the case study – Hop Tien commune, Dong Hy district, Thai Nguyen province

Hop Tien is a remote mountainous commune that is classified as a special disadvantage commune. There are 6 ethnic groups in the commune including Kinh, Tay, Nung, San Diu, Cao Lan and Dao with low and unequally educational standards.

Gross area of the commune is 48.0 km<sup>2</sup>. Commune population is 5,875 with 1,396 households. There are 10 hamlets in the commune. Rice area is 230 ha (100 ha of spring rice, 230 ha of summer rice).

Transportation to the commune is quite good with main route connecting to Dong Hy district and Thai Nguyen city. In the commune, 20 km of road are made of asphalt and 6 km of the road are earthen one.

Agriculture and forestry are main jobs of the local people. Because industry is not available and services have not been developed, local people's income is low and their lives are facing with many difficulties.

Since 1992, some irrigation structures in the commune have been built under the State budget. Cap Ke dam is one of these. It is the biggest dam in the commune.

The Cap Ke stream watershed is within Hop Tien commune, Dong Hy district, Thai Nguyen province. The stream originates from mountain with elevation of over 300 m arranging in Northeast – Southwest direction. The dam's location is at 21°34' Northern latitude, 105°58'20" East longitude. The geometric characteristics of the watershed are defined on the basis of the topographic map with scale of 1:100,000 as below:

- Watershed area: 2,2 km<sup>2</sup>;
- Stream length: 2,3 km;
- Watershed surface slope: 228‰;
- Average stream slope: 14 ‰;
- Average width: 1 km;
- Stream density: 1.005 km/km<sup>2</sup>

According to the designed data of the Cap Ke dam calculated by Thai Nguyen DARD the Cap Ke dam's technical configurations are:

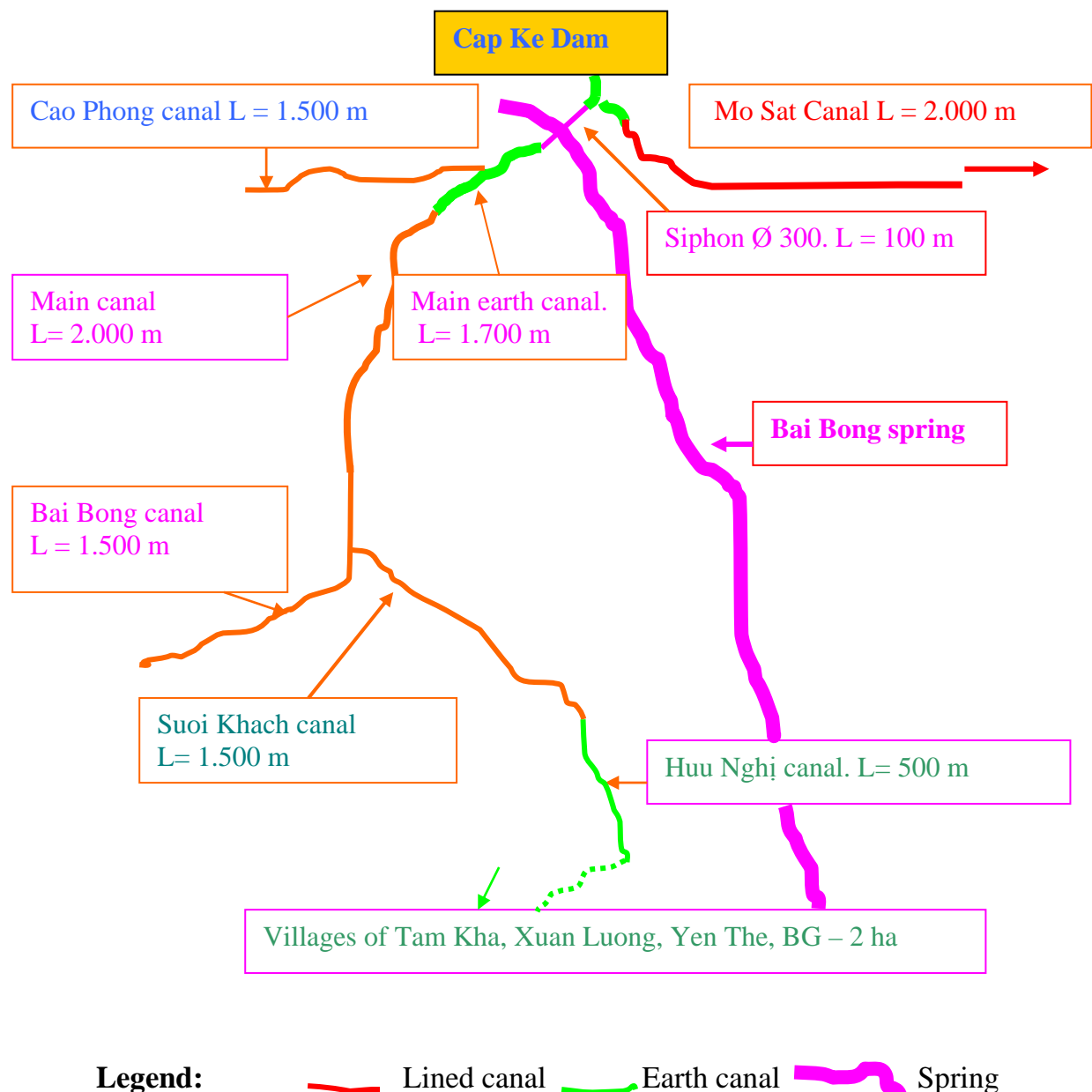
Gross capacity: 723 x 10<sup>3</sup> m<sup>3</sup>

- Useful capacity: 585 x10<sup>3</sup> m<sup>3</sup>
- Dead capacity: 30 x10<sup>3</sup> m<sup>3</sup>
- Flood retention capacity: 108 x10<sup>3</sup> m<sup>3</sup>
- Dam crest: 59.5 m
- Dam length: 63 m;
- Dam height: 18 m;
- Surface dam width: 5 m;
- Spillway length: 6.6 m
- Irrigation area: 74 ha.

The Cap Ke irrigation scheme has around 3,500 m of main canal of which 1,500 m are lined in year 2000, rest of 2,000 m are earthen one and around 5,000 m of on-farm canals (most of them are lined).



Fig 2. Cap Ke dam from upstream view in dry season



**Fig 3: Cap Ke Irrigation canal system**

The irrigation area of the scheme could be divided into two sub-areas by Bai Bong spring flowing from Cap Ke dam to the end of Bai Bong village field. The east sub-area is fields of Bai Bong village (sub-area is 23 ha). The west sub-area including fields of Suoi Khach, Cao Phong, Huu Nghi and Bai Bong villages (sub-area is 49 ha).

At present, the earth dam is at very good status. The upstream slope of the dam is rip raped. The downstream slop is grassed with a good drain system. The existing earth dam quality is good. No any seepage occurs at the dam body. The intake consists of 7 tiers (stairs). This form of the intake was very popular in mountainous zones in last time. However, now it shows a lot of disadvantages in operation leading to water loss and complicated operation in flood season.





Fig. 4 Upstream slope of the Cap Ke dam



Fig.5 Downstream slope of the Cap Ke dam

In-take of the Cap Ke Dam

The total lined canal length is 4,000 m. The designed canal slope is reasonable. Irrigation water is well distributed through the lined canal. On the canals, no regulator gates exist but stones and soils are used to block the flow to the secondary canals. This makes the canal suffer significant water loss.

The earth canal length is 1,700 m. It is divided into two canals. Canal No.1 is 200 m long. It is from downstream of the dam to the siphon of Bai Bong spring (see Fig.2). This canal is on right hill slope. The canal quality is good. Its slope and cross section is appropriate. However, it has not been well maintained. Hence, dense weed causes obstruction to flow of the canal. Canal No.2 is 1,500 m long from the siphon of Bai Bong village to Suoi Khach, Huu Nghi and Bai Bong villages. From the main canal to this secondary canal there is no regulator gate. At present, quality of canal No.2 is no good. The canal is suffering from serious sedimentation leading to over bank flow, water loss, bank erosion of 100 m long close to Mr. Duong Quy Hong, Bai Bong village.





Fig.6 The lined canal in good operation status



Fig. 7 The earth canal No.1



Fig.8 Junction of the Mo sat canal and siphon



Fig. 9 The Siphon through spring and eroded canal sections





Fig.10 Poor maintenance for secondary canal

According to the PDS taken by the study consultant team and related stakeholders (see Annex 2) it is necessary to dredge and clear weeds in canal beds, to repair eroded canal section (100 m long) and install regulator gates to reduce water loss along the canals.

The Cap Ke dam management station is responsible for operation and management of head works of Cap Ke dam. Therefore, all expenditures of management, operation, maintenance of the dam should be covered by the Thai Nguyen IDMC. However, the subsidized budget is annually insufficient, it is enough for management and operation, but not sufficient for repairs and maintenances. Monthly, the irrigation station has to pay for following items:

Table 1: Monthly expenditures of Cap Ke Dam Irrigation Station  
(data of 2007)

No.	Description	Unit	Quantity	Unit price (VND)	Amount (VND)
1	Monthly salary:				
	Technician	Man-month	12	1,270,080	15,240,960
	Engineer	Man-month	12	1,516,320	18,195,840
	Sub-total				33,436,800
2	Insurance and others				6,687,360
3	Office expenditure	Month	12	1,500,000	18,000,000
4	Transport allowance	Month	12	200,000	2,400,000
5	Telephone allowance	Month	12	30,000	360,000
6	Allowance for shift's meals	Month	12	572,000	6,864,000
Total					67,748,160

It can be seen that, annually, Thai Nguyen IDMC has to pay around 67 mil VND for its staff in operation and management of the Cap Ke Dam. No any budget is available for repairs and maintenance of the dam. Degradation of the dam is becoming an issue to the dam's safety and efficiency. Budget of O&M should be considered and appropriately allocated.

In term of O&M issues, according to verbal reports of the relevant units related to O&M of Cap Ke Reservoir irrigation scheme show that People Committee of Hop Tien commune



play the role of a local state management body to approve irrigation schedule based on the proposals submitted by villages. Role of the multi-purpose cooperative has almost not yet been promoted meaningfully here, especially in the irrigation services.

The recording and keeping of data and document related to irrigation are very important for O&M analysis but these activities have not yet been organized under a standard management procedure, especially to water users. In fact, it is not easy to obtain an O&M plan or irrigation plan, even recently previous season. Clearly, the scheme's irrigation management has not yet been paid attention properly.

There are not any guidelines on planning O&M based season shown during the survey.

The water gauging instruments and structures are not applied in the operation management of this scheme.

During discussion in the workshop held at Hop Tien, the representatives of 5 benefited villages from Cap Ke reservoir shared that although there have been arrangement of irrigation schedule among villages but households at head of canal always take water earlier regardless of their order were arranged later. Consequently, irrigation water distribution has been inverted and irrigation plan has been upset. This problem made households at tail of canal have spent a longer time to wait for irrigation water. The existing limitations of Cap Ke scheme lead to inequality and losses in water use. Therefore water loss is still significant. Although no any technical test of water losses has been done but according to irrigation practice as described in the workshop, water losses are obviously not avoidable since cultivation area at the head of canal have had many "chances" of over-irrigation, in some cases even this excessive water must be drained immediately after irrigation has just ended. This issue is more frequent and widespread where physical condition of head of canal is not well-constructed and irrigation time is longer than planned.

The writing documents on beneficiaries' contribution for remunerating the water watching persons as well as for maintaining canals and other irrigation structures managed by farmers have not been shown and provided during the survey.

There are also issues related to canal reinforcement need to be reviewed. The inspection and survey reveal that although the west main canal that serves a large proportion of cultivation land but 1700 m of its first haft is still earth canal and not yet been constructed, meanwhile a latter haft have been done already. The participants taking part in the discussion have complained that the said-above earth canal often are over-topped and leaked. It is clear that the canal reinforcement procedure has not conformed to an appropriate planning. The reason why the canal has not constructed as principle is the canal section to be used jointly by 4 villages. This matter shows that organization and mobilization of farmers' participation have not yet been well as expected.

Cap Ke reservoir irrigation scheme is similar as many other schemes in the country, the support and transfer of techniques to farmers have been paid attention considerably, particularly in agricultural extension. However, irrigation activities has been recognizing as one of sectors that have the important contributions in celebrating agriculture and rural development, but in fact, farmers have not yet received technical supports as actual requirements in this sector, Almost farmers have not yet been trained as well as attended in the training courses or workshops regarding to the basic irrigation and simple maintenance techniques, particularly in dissemination of State's policies for irrigation.

The below tables obtained from the field surveys show the present status of operation and maintenance in the Cap Ke reservoir scheme.

Data in the table 2 show that number of informants who did not respond or have had no participation in planning O&M account for a fair high proportion (66.7% and 30.6% respectively). These indicators explain that farmers have not yet understand clearly what, how and when the operation plans have done

In contrary, number of participants in preparing the maintenance plan presents a fair high proportion. Obviously, the maintenance activities have considerably affected to water users. In fact, the beneficiaries are seasonally mobilized to dredge and repair canals.

Table 2: Farmers' participation in planning O&M activities

Description	Response		No answer	Total
	Participated	No		
1. Farmers' participation in operation planning				
Frequency	1	11	24	36
Percentage	2,8	30,6	66,7	100,0
2. Farmers' participation in maintenance planning				
Frequency	15	7	14	36
Percentage	41,7	19,4	38,9	100,0

Annual maintenance activities undertaken by farmers mainly concentrate in dredging and repairing canals and on-canal structures such as small intakes, broken sections or holes. However, data in the table 3 shows that benefited farmers has not yet identified clearly the bodies that are responsible for organizing the scheme maintenance activities. These are the obvious consequences of inadequate participation in preparing the O&M plans.

Table 3: Informants' identification on the bodies who are responsible in organizing the maintenance activities

Description	Response					No answer	Total
	CPC	Co-op	Co-op + Head of village	Head of village	MB of village		
Frequency	8	0	3	6	5	13	36
Percentage	22,9	0,0	8,6	17,1	14,3	37,1	100,0

Main canals of Cap Ke scheme go through almost villages, in which the west main canal run through 4 villages including Cao Phong, Bai Bong, Suoi Khach and Huu Nghi. The east main canal serves particularly Mo Sat village. The table 4 shows informants' assessment on canal maintenance status. Number of informants responds that canal maintenance status is good occupying 33.3%. These people majorly belong to Suoi Khach and Huu Nghi villages. Two these villages locate in the tail area of west main canal. In fact, this canal section has been constructed. Besides, these are also 2 villages where almost of informants identified co-op and village management board are bodies that organize the maintenance activities. Clearly, the bodies who organized the maintenance activities has affected considerably to maintenance status of scheme.

Table 4: Assessment of informants on canal maintenance status

Description	Response		No answer	Total
	Good	No		
Frequency	12	10	14	36
Percentage	33,3	27,8	38,9	100,0

Confliction or disputes in water access for irrigation have a tendency to occur easily in the localities where water users' organizations lack enough strong competence or where management mechanisms are still loose, unclear or lack. The table 5 shows that the water disputes are not so much in this scheme, only 13.9 % of informants' answer that the disputes occurred in the scheme. Almost these informants belong to Suoi Khach village.

This also is suitable with actual situation because Suoi Khach village located in the latter half of the west canal where people normally bear disadvantages in taking water, especially in early season.

Table 5: Assessment of informants about water dispute status in the Cap Ke scheme

Description	Response		No answer	Total
	Yes	No		
Frequency	5	20	11	36
Percentage	13,9	55,6	30,6	100,0

Every dispute is able to be resolved through the dialogue mechanisms. Resolving timely disputes in water use contribute into increase of the stability of scheme operation. In order to control actively disputes or conflicts raised in the water distribution, the appropriate mechanism and sanction for settling these problems should be set up. Data in the table 6 show that informants still are unclear and confusing in identifying the bodies those are responsible in solving water dispute.

Table 6: Informants' identification on the bodies that are responsible in resolving the water disputes

Description	Response			No answer	Total
	Co-op	CPC	MB of village		
Frequency	0	0	3	33	36
Percentage	0,0	0,0	8,3	91,7	100,0

Data in table 7 and 8 indicate that number of informants who took more than 9 times for lifting water per season account for a high proportion. Number of informants with high water-taking times mainly belongs to Suoi Khach and Huu Nghi villages. Both two villages are located in the tail haft of west canal. During the survey, farmers of these villages complain that they always spend much time to Waite for water, in contrary, water-receiving time are rather short. Almost informants answered that water looses of earth canal section and inconformity of irrigation schedule are the reasons leading to the above problems.

Table 7: Number of irrigation water delivery intervals per a season

Description	Number of irrigation intervals per a season					No answer	Total
	T<=3 days	3<T<=5	5<T<7	7<T<=9	T>9 days		
1. W-S season							
Frequency	2	1	1	5	12	15	36
Percentage	5,6	2,8	2,8	13,9	33,3	41,7	100,0
2. S-A season							
Frequency	2	8	0	0	0	26	36
Percentage	5,6	22,2	0,0	0,0	0,0	72,2	100,0

Table 8: Number of water-taking days for an irrigation interval

Description	Number of water-taking days per an interval					No answer	Total
	t≤3 days	3<t≤5	5<t<7	7<t≤9	t>9 days		
1. W-S season							
Frequency	14	4	1	1	2	14	36
Percentage	38,9	11,1	2,8	2,8	5,6	38,9	100,0
2. S-A season							
Frequency	7	3	0	0	0	26	36
Percentage	19,4	8,3	0,0	0,0	0,0	72,2	100,0

It seems that training on irrigation has not paid attention. Data in the table 9 shows the proportion of informants participated in the irrigation training courses and workshops are very low. This will limit farmers' awareness and capacity in the process of irrigation socialization.

Table 9: Number of informants participated in the irrigation training course

Description	Response		No answer	Total
	Trained	No		
1. Trained on O&M				
Frequency	1	25	10	36
Percentage	2,8	69,4	27,8	100,0
2. Attended in irrigation W/S				
Frequency	4	16	16	36
Percentage	11,1	44,4	44,4	100,0

The above data and information are considered as a good foundation for further assessments and recommendations presented in next sections of this report.

## 2. APPROACHES USED FOR THE CASE STUDY

To implement the study, the participatory commune-characteristic approach has been applied. Some aspects of the study (such as crop yields, meteorological hydrologic information) are not limited in Hop Tien commune but in province, district and neighboring communes. The study followed the approach of inheriting and completing in combination. Other relevant reports, studies have been referred. Contents and spirits of these approaches are reflected in the following approaches applied for the case study:

### 2.1. Participatory Diagnostic Survey (PDS)

Purposes:

The PDS is to give answers to the following questions:

- Whether the physical works and O&M activities are good to optimize impact, i.e. achieve maximum benefits at minimum cost;
- If the physical works and the O&M activities are not good, the PDS then needs to identify and specify what activities should be done to improve efficiency of the water works;

PDS implementation steps

a) Desk study: The case study consultants have had an initial analysis to identify key issues of the case area before implementing the study. These issues include: water sources, agricultural production, irrigation management and PIM, water quality and environment protection, living standards, crop diversification.

b) Information/data collection: data and information of social, economic development, natural conditions have been collected from Year Books (from 1995 to 2007) published by Statistic Offices of Thai Nguyen province, Dong Hy district and Hop Tien commune. Reports related to economic development of Thai Nguyen, Dong Hy and Hop Tien have been also collected

c) Information/Data Analysis: The collected information and data have been analyzed to find out issues related to agricultural production, water sources, environment, irrigation services, crop diversification etc.

d) Field visit

Field visit to headworks and main System:

A team of the main stakeholders (including staff of Cap Ke dam management station, representatives of Hop Tien PC, leaders of agriculture cooperative and irrigation team of Hop Tien, village leaders and the case study consultants) jointly inspected the relevant headworks and main, secondary canals of the Cap Ke irrigation scheme on 13 March and 21-22 April 2008 to:

- Confirm problem areas;
- Identify the main infrastructure and non-infrastructure causes of poor water services;
- Identify, discuss & agree interventions to alleviate constraints and improve performance.

The field visit's outputs have been filled in the survey form (please see template of the survey form in Annex 1)

Field visit to On-farm Systems:

A team of the stakeholders and consultants was formed for on-farm system surveys: The team jointly diagnosed constraints and formulated alternative improvements to on-farm (commune/cooperative managed) irrigation systems. The team assessed financial and economic implications and chose preferred option with local stakeholders. The discussions between the stakeholders and consultants were held through meetings of 13 March and 22 April 2008 (see Annex 2).

## **2.2. Participatory Rural Appraisal (PRA):**

Participatory rural appraisal (PRA) is a label given to a growing family of participatory approaches and methods that emphasize local knowledge and enable local people to make their own appraisal, analysis, and plans. PRA uses group animation and exercises to facilitate information sharing, analysis, and action among stakeholders. Although originally developed for use in rural areas, PRA has been employed successfully in a variety of settings. The purpose of PRA is to enable development practitioners, government officials, and local people to work together to plan context appropriate programs.

Participatory rural appraisal evolved from rapid rural appraisal-a set of informal techniques used by development practitioners in rural areas to collect and analyze data. In PRA, data collection and analysis are undertaken by local people, with outsiders facilitating rather than controlling. PRA is an approach for shared learning between local people and outsiders, but the term is somewhat misleading. PRA techniques are equally applicable in urban settings and are not limited to assessment only.

In order to implement PRA, the consultant team conducted direct interviews and questionnaire surveys. The questionnaire surveys were implemented from 13 March to 2 April 2008 in 5 villages of Hop Tien within the Cap Ke dam scheme. The questionnaire

template is shown in Annex 3. The number of survey samples is determined by using ADB Resettlement Guideline (1995, page 49) and Yamane's formula as following:

$$n = N / (1 + N (e)^2)$$

Where n : Required number of samples;

N: Total sample

e: Expected confidence

According to number of households (175 HHs) of 5 villages within the Cap Ke dam scheme, the consultant team decided the number of samples is 37. This number has met requirements of ADB guideline and the Yamane's formula as well.

The results of interviews and questionnaire surveys have been synthesized, analyzed in the below sections

### **3. LIVING STANDARDS**

#### **3.1. Demography**

According to the statistic data, population of Hop Tien commune is 5875. Number of households is 1396 (data of 2007). The study team has carried out surveys in Hop Tien commune by using questionnaires and direct interviews. Outputs of the surveys showed that ratio between male and female per total population is 49% and 51% respectively. No any two or three member households. While households with 4-5 members take account for 80.6%, over six member households take account for 19.4%. This figure means that Hop Tien commune has conformed well the State policy on population and family planning which regulates that each family should have one or two children.

In Hop Tien, most of people is Dao ethnic taking account of 65.0%, next is Kinh people taking account of around 25.0%. Rest of 10% is Tay, Nung, San Diu, Cao Lan people.

#### **3.2. Education**

According to the 2007 statistic data, Hop Tien commune has an elementary school with 28 class rooms, 38 teachers and 531 pupils. The secondary school has 14 class rooms, 499 pupils and 32 teachers.

Percentage of people holding graduate level and college level is 0.17% and 0.68% respectively. This figure shows that very few people in Hop Tien commune have got high education level. Most of people are at elementary education level (taking account 43%) and at secondary education (40%). Around 3% of population is holding high school level. Rest of 13.15% is uneducated. It means around 700 people are still illiterate (all of them are at age of over 50. Young people are at least holding certificate of elementary school level).

#### **3.3. Health and health care**

The Hop Tien clinic has a good job. Annually, the clinic carries out health examination to local people. For instance in 2007, the clinic took health examination for 8820 turns of people (got 250% comparing with the planned figures). It had medical treatment for 275 turns of people (got 215% comparing with the planned figures). The clinic could have medical treatments to normal sicknesses. To serious sicknesses, patients have to go to district or provincial hospitals.

The vaccination campaigns for children have been well implemented in Hop Tien commune.

Diseases occurred in Hop Tien from 70s to 2007 are tuberculosis (7 people), malaria (423 people, mainly during time of gold mining), mental (25 people), goiter (43 people).



In terms of domestic water use, 1060 households per total of 1372 households (77.2%) use dug well water, 52 households (3.8%) use bore well water. 260 households use clean surface water.

Now, 600 households per total of 1372 households have latrines, however, of which 561 (43.7%) latrines meet sanitary requirements. 723 households have bathrooms (accounting for 52%).

### **3.4. Labour and jobs**

The percentage of male and female in labour age per total population is 38.69% and 35.71% respectively. The difference is 2.98%. It means that male and female labour forces in Hop Tien are rather even. (see the surveyed data in Table 12).

The main jobs of Hop Tien people are cultivation, husbandry. According to the surveyed data in March and April 2008, 94.44 % of population is living on cultivation, of which 80.56% is having animal raising job. Job of food processing takes account for 8.3%. Other jobs take account for 19.4%. This figure shows that a household in Hop Tien commune could have several jobs to do in order to increase its income. However, the local people do not have any handicraft.

### **3.5. Revenues**

As said above, the local people of Hop Tien commune mainly earn their living on agriculture. Therefore, their annual income is not high. According to the surveyed data carried out in March and April 2008 by the study team, the percentage of households having various income amount as presented in Table 10 below:

At present (2007), the number of poor households in Hop Tien commune is 547 taking account for 39%. This figure is rather high in comparison with other disadvantage areas of Thai Nguyen province (29.2%). Hop Tien commune should reduce poor households in coming time by improving their income from various jobs.

### **3.6. Expenditures**

In Hop Tien, most of expenditures are used for daily living and animal raising (31.37% and 34.37 % respectively). Expenditures for children learning take account for 11.43% of the total expenditure. Percentage of expenditures for cultivation is 16.97%. Other expenditures such as gifts, wedding party, funeral etc. take account for 5.86% only.

### **3.7. Housing and assets**

All most households in Villages of Hop Tien commune have TVs and motorbikes. It shows that the living standards of people now time to time increased. This is very good for transferring information, state policies and education to the local farmers. Because electricity is available in the commune, electric facilities are purchased by the farmers to serve their lives.

The below surveyed data of assets is considered as an illustration

Houses in Hop Tien commune are mainly 4<sup>th</sup> grade houses (walls constructed of bricks and roofs constructed of tiles) taking account for 48.90%. Thatched house percentage is 36.68% and flat roof houses take account for 14.42%

Table 10 : Data of living standards in Villages of Hop Tien commune

Or.	Indicators	Unit	Villages					Mean
			Cao Phong	Bai Bong	Suoi Khach	Huu Nghi	Mo Sat	
<b>I</b>	<b>Demography</b>							
	Ratio of female in a	%	50	57	44	56	47	<b>51</b>
	Average number of people in a household	number	5	4	5	4	5	<b>5</b>
	Number of male at labor age	number	26	21	27	25	26	<b>125</b>
<b>II</b>	<b>Job and income</b>							
	Ratio of households getting incomes from cultivation and husbandry	%	100	75	100	100	83	<b>93</b>
	Ratio of household getting incomes from other jobs (food processing...)	%	36	0	0	31	0	<b>15</b>
	Average revenues of a household	mil VND	13	11.51	28.93	19.38	10.5	<b>16.66</b>
	Average expenditure of a household	mil VND	-	36.88	243	118.5	-	<b>-</b>
<b>III</b>	<b>Assets</b>							
	Ratio of households having	%	100	100	100	100	100	<b>100</b>
	Ratio of households having motorbike	%	83.3	60	100	100	100	<b>88.7</b>
	Ratio of household having telephone	%	33.3	40	85.7	50	85.7	<b>59.0</b>
	Ratio of households having small pumping machine	%	16.7	40	71.4	100	57.1	<b>57.0</b>
<b>IV</b>	<b>Housing status</b>							
	Ratio of households having flat roof houses	%	0	16.7	42.9	12.5	0	<b>14.4</b>
	Ratio of households having on stilt houses	%	0	0	0	0	0	<b>0.0</b>
	Ratio of households having thatched houses	%	42.9	83.3	14.3	0	42.9	<b>36.7</b>
	Ratio of households having other houses	%	57.1	0	42.9	87.5	57.1	<b>48.9</b>

The above data shows that housing in Hop Tien commune is an issue which should be paid much attention to improve living standards for the local people. Most of people are living in poor housing conditions.

#### 4. ASSESSMENT OF AGRICULTURAL PRODUCTION

Based on the GOS Year Books of Thai Nguyen province and Dong Hy district in recent 10 years, using regression analysis it is showed that variations of spring, summer rice yields of Thai Nguyen and Hop Tien commune with respect to time are the same (see Fig 2). Relationship between spring and summer rice yields of Thai Nguyen and Hop Tien commune is very close.

(Multiple R = 0.995588; R Square = 0.991195; Significance F= 0.000352 in spring crop and Multiple R = 0.958108; R Square = 0.917971; Significance F= 0.010228 in summer crop).

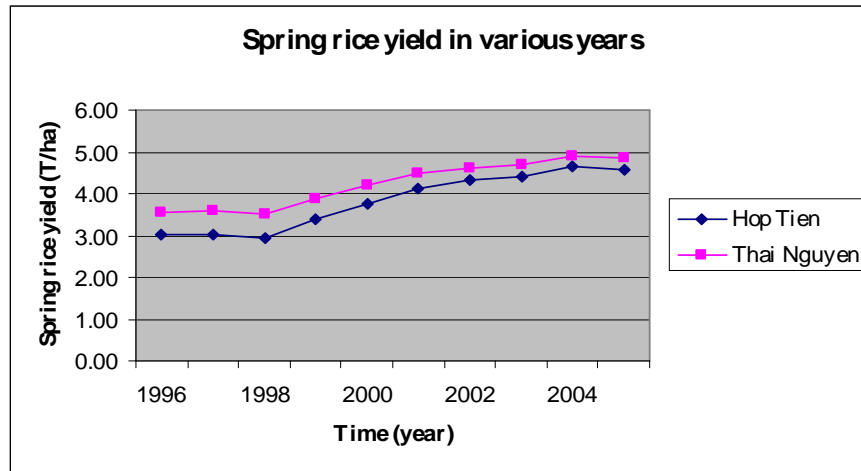


Fig 11. Spring rice yield trend in Thai Nguyen and Hop Tien

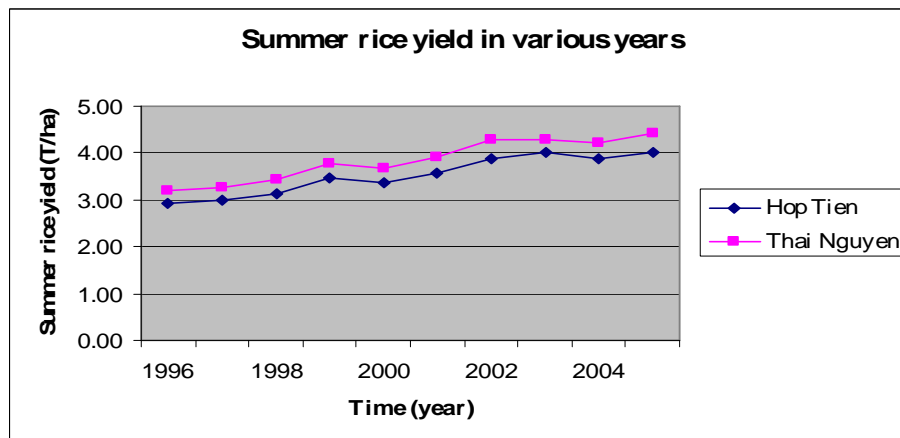


Fig 12. Summer rice yield trend in Thai Nguyen and Hop Tien

Regression equation between spring rice yield of Hop Tien and Thai Nguyen is

$$Y_{sp.ht} = 1.20 Y_{sp.tn} - 1.26$$

Where  $Y_{sp.ht}$  and  $Y_{sp.tn}$  are spring rice yield of Hop Tien and Thai Nguyen respectively.

Regression equation between summer rice yield of Hop Tien and Thai Nguyen

$$Y_{su.ht} = 0.91 Y_{su.tn} - 0.003$$

Where  $Y_{su.ht}$  and  $Y_{su.tn}$  are summer rice yield of Hop Tien and Thai Nguyen respectively

According to the GSO data it can be seen that the increasing trend of rice yield in Hop Tien commune and Thai Nguyen province is the same. Since 1999, rice yields have constantly increased in Thai Nguyen and Hop Tien. This could be explained that in recent years, new varieties, cultivation technologies and fertilizers have been applied. However, these require irrigation to be more sufficiently and timely supplied. Another word, irrigation has played an important role in increasing rice yield in whole Thai Nguyen province. From the above data, it is clear that Hop Tien's rice yields are always 9-10% lower than the average yield of the province. It is one of evidences to explain why Hop Tien commune is considered as a poor, disadvantage commune of Thai Nguyen, because Hop Tien people's life mainly depends on agriculture.

Year	Spring rice crop		Summer rice crop	
	Hop Tien	Thai Nguyen	Hop Tien	Thai Nguyen
1996	3.01	3.56	2.92	3.18
1997	3.04	3.58	2.98	3.26
1998	2.95	3.51	3.14	3.43
1999	3.38	3.87	3.46	3.77
2000	3.78	4.20	3.38	3.69
2001	4.12	4.48	3.58	3.92
2002	4.31	4.61	3.88	4.29
2003	4.41	4.71	4.01	4.29
2004	4.67	4.91	3.88	4.22
2005	4.56	4.86	4.03	4.43
2006	4.35	4.75	4.37	4.59
2007	4.38	NA	4.49	NA

Tab.11 Rice yield of Thai Nguyen province and Hop Tien commune in last 10 years

One of an important indicator of irrigation water shortage is the ratio between the spring rice area and summer rice area. In last five years in Hop Tien commune, this ratio varies from 0.39 to 0.53 while in Thai Nguyen province this ratio is 0.64 - 0.69. Potentially, it can be seen that, Hop Tien could increase its spring rice area up to around 200 ha if irrigation water is available. It also can be seen that in recent five years, summer rice area of Hop Tien commune is constant (and in Thai Nguyen the status is something the same). It means that summer rice cultivation in Hop Tien (as well as in Thai Nguyen) does not much depend on irrigation, seasonal rainfall is sufficient.

Year	Spring rice area (ha)		Summer rice area (ha)		Ratio Asp/As	
	Hop Tien	Thai Nguyen	Hop Tien	Thai Nguyen	Hop Tien	Thai Nguyen
2001	90	26829	228	41774	0.395	0.642
2002	95	27892	228	41944	0.417	0.665
2003	100	28346	228	41850	0.439	0.677
2004	121	27986	228	41650	0.531	0.672
2005	100	28285	228	41619	0.439	0.680
2006	100	28596	228	41548	0.439	0.690
2007	100	NA	225	NA	0.44	

Tab. 12 Spring and summer rice areas of Thai Nguyen and Hop Tien

No.	Village name	Spring rice (2006)		Summer rice (2006)	
		Area (ha)	Yield (T/ha)	Area (ha)	Yield (T/ha)
Within Cap Ke dam scheme					
1	Suoi Khach	11	4.45	19	4.40
2	Cao Phong	26	4.28	58	4.35
3	Bai Bong	9	4.40	16	4.30
4	Mo Sat	23	4.45	54	4.40
5	Huu Nghi	3	4.32	5.5	4.40
Outside Cap Ke dam scheme					
6	Deo Hanh	2	4.22	5	4.30
7	Don Trinh	8	4.30	30	4.40
8	Doan Ket	7	4.35	11.5	4.35
9	Deo But	9	4.25	20	4.40
10	Bai Vang	2	4.30	9	4.35

Tab.13 Rice area and yield of villages of Hop Tien Commune in 2006

According to the field survey at Hop Tien commune, agricultural production data of 10 villages has been directly collected. However, it is really sorry village agricultural production data of Hop Tien commune is available for years of 2006 and 2007 only.

No.	Village name	Spring rice (2007)		Summer rice (2007)	
		Area (ha)	Yield (T/ha)	Area (ha)	Yield (T/ha)
Within Cap Ke dam scheme					
1	Suoi Khach	11	4.48	19	4.50
2	Cao Phong	26	4.29	58	4.30
3	Bai Bong	9	4.45	16	4.40
4	Mo Sat	23	4.39	54	4.50
5	Huu Nghi	3	4.36	5.5	4.40
Outside Cap Ke dam scheme					
6	Deo Hanh	2	4.28	5	4.40
7	Don Trinh	8	4.39	30	4.45
8	Doan Ket	7	4.49	11.5	4.70
9	Deo But	9	4.28	20	4.40
10	Bai Vang	2	4.38	9	4.45

Tab.14. Rice area and yield of villages of Hop Tien Commune in 2007

Comparing yields of inside and outside Cap Ke dam schemes villages, difference of spring yields is not significant. However, cost, time and labour of farmers for lifting irrigation from natural sources are rather high. Cost for irrigation in the outside Cap Ke dam scheme villages is 32,000 VND/sao/season. While this cost in the inside Cap Ke dam scheme is 8,000 VND/sao/season (a sao is equal 360 m<sup>2</sup>).

Ratio between spring and summer areas in the inside Cap Ke dam scheme is 0.47. While this ratio in the outside Cap Ke dam scheme villages is 0.37. Therefore, it can be seen that: (i) cultivation land is available for spring paddy, however, because of topographic features and capacity of Cap Ke dam, around 100 ha have not been cultivated; (ii) thanks to Cap Ke dam, more land is cultivated and irrigation cost is more lower in comparison with the outside areas. This considered as a very good contribution of Cap Ke irrigation scheme to agricultural production in Hop Tien commune.

Now, the World is facing with food crisis. Food security is becoming very urgent and important. In order to have food security, Hop Tien commune should keep the existing rice cultivation area of 328 ha per year to meet rice per capita of 240 kg husk rice (or 20 kg of husk rice per month per head) for the present population.

## 5. ASSESSMENT OF WATER SOURCES

The annual areal rainfall in the Cau basin as a function of time is presented in Figure 4. From the Figure it is observed that the annual rainfall in the last two decades has on average been somewhat lower than in the two preceding decades.

The annual and monthly average rainfall figures for the two periods are presented in Table 5 and 6. From the Table it is observed that the months April, August, September and October follow the annual trend of lower rainfall in the recent period, whereas the picture for February and November and particularly March is opposite to the annual trend. The increase in March is important as this would mean that the Spring crop would require less irrigation water supply. From the Table it is however observed that the gain in March is fully lost in April. (Source: ADB TA 3892 – Part A, Component 1 Report)

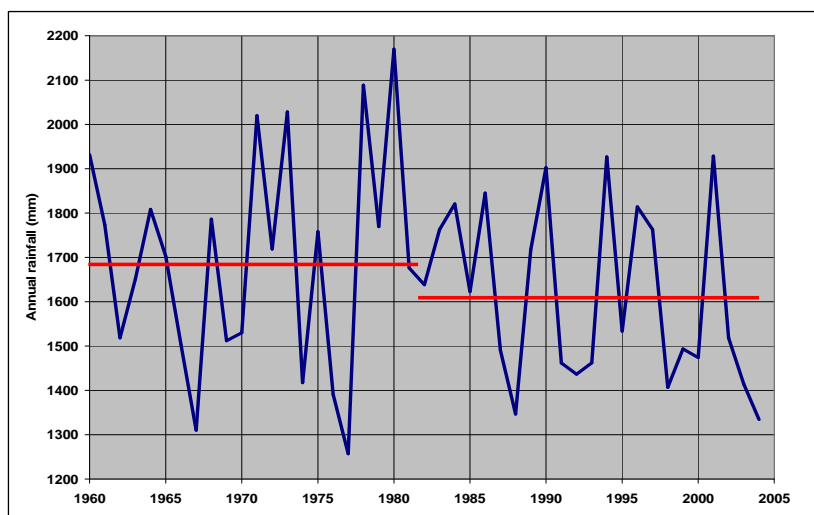


Fig.13 Annual rainfall of the Cau basin, period 1960-1981

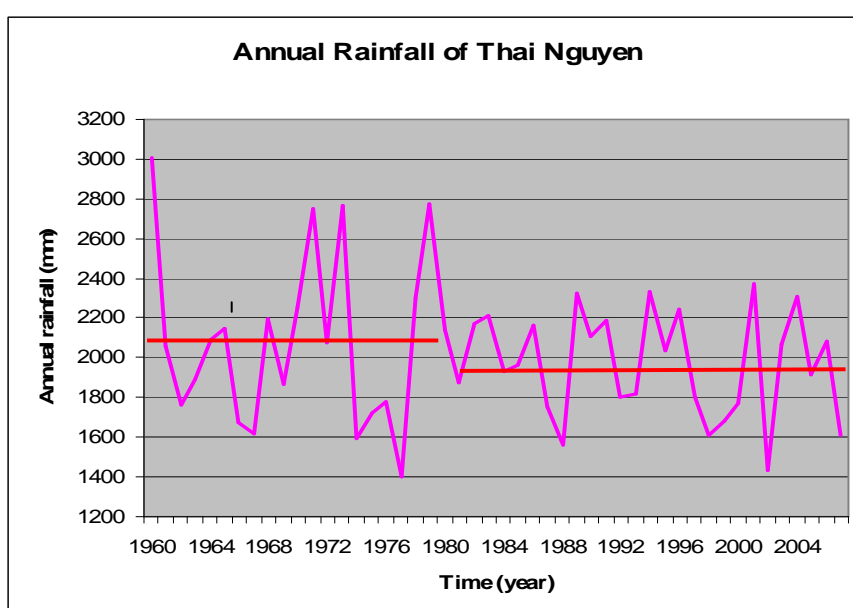


Fig 14. Annual rainfall of the Thai Nguyen station period 1960-2007

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
60-81	20.5	24.9	39.1	117.9	189.9	266.1	298.0	326.9	218.3	135.4	40.9	18.6	1696.5
82-04	22.0	28.3	62.2	91.9	197.6	263.5	322.7	276.0	167.6	113.6	50.1	18.3	1613.7
Difference	1.5	3.4	23.1	-26.0	7.7	-2.6	24.7	-50.9	-50.7	-21.8	9.2	-0.3	-82.8

Tab 15. Monthly rainfall in different periods in Cau river basin

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
60- 81	24.9	31.0	45.1	113.3	226.2	345.0	417.5	363.2	274.2	153.0	41.8	23.7	2078.9
82- 07	23.4	35.2	74.4	94.9	252.1	283.4	420.9	321.5	196.4	116.8	55.9	24.0	1972.0
Difference	1.5	-4.2	-29.2	38.4	-25.9	61.6	-3.4	41.8	77.9	36.2	-14.2	-0.3	106.9

Tab 16. Monthly rainfall in different periods in Thai Nguyen station

Comparing average annual rainfall of period (1960-1981) and (1982- 2004) in Cau river basin, the difference is 82.8 mm. While the difference of annual rainfall between period of



(1981 – 1981) and (1982-2007) in Thai Nguyen is 106.9 mm. Because rain gauge is not available in Hop Tien commune, however, Thai Nguyen station is close to Hop Tien area. Therefore, rainfall data of Thai Nguyen station should be used for Hop Tien.

The above analysis shows that Hop Tien commune, Thai Nguyen province is facing with a period of meteorological drought. Under new context of global climatic change, measures for water source protection, agricultural production adaptability should be much paid attention. Water shortage is becoming a challenge to Hop Tien commune from the meteorological viewpoint.

According to study of Component A1, Project ADB TA 3892, water shortages in the Cau river basin are caused by insufficient capacity of the system to deliver the water and not by the non-availability of water. It means that under the river basin viewpoint, if water is much more stored in the basin by construction of new dams, in the river basin will not have water shortage. In Hop Tien commune, a new dam construction is not possible. Therefore, water shortage is still a challenge to Hop Tien. On the other hand, the useful capacity of Cap Ke dam is 585,000 m<sup>3</sup>. This water volume is sufficient for around 74 ha of spring rice as the designed area. In case if spring rice area is wanted to be higher than the designed one, it is necessary to increase the canal efficiency coefficient (saving water in operation and distribution) and reduce requirement rate if possible.

In fact, the actually irrigated area in spring crop of the Cap Ke dam scheme is 54 ha only (according to the Thai Nguyen IDMC's data). This can be explained that water loss through canal system is rather high and irrigation water distribution problem occurs in the scheme.

The designed average annual rainfall of Cap Ke dam is 1919 mm (Technical Design Report of Cap Ke Dam, page 6, Thai Nguyen IDMC). This value is underestimated if comparing with the average annual rainfall in periods of 1960-1981 and 1982-2007 (2078.9 mm and 1972 mm respectively). According to observation of the Cap Ke dam operation in last years, the designed useful capacity of 585 x10<sup>3</sup>m<sup>3</sup> is underestimated. The normal water level could be 0.5 m higher to increase the useful capacity to be 651x10<sup>3</sup> m<sup>3</sup> (more 66,000 m<sup>3</sup> to be added). If the dam useful capacity is to be increased and canal system's water loss is to be reduced, the irrigated area of the scheme will be increased (approximately the irrigation area will be 80 ha).

## **6. IMPACTS ON ENVIRONMENT**

Various economic activities in Cau River Basin cause water pollution. Waste sources are derived from the following sources:

- Domestic waste,
- Industrial waste,
- Agricultural/Fishery/Forest waste,
- Mining (gold etc.).

Most of the agricultural, service, industrial and domestic waste water is not treated, but is discharged directly into the river system.

Small and large industrial zones are being established in the basin. In general, industrial technologies and equipments are old, so toxic waste is discharged into the water bodies in the basin without treatment, causing pollution of the surface and/or groundwater system.

Table 17 lists some of the main industrial establishments with information on area and quantities of waste.

As a result of the waste sources described above, the water quality in Cau basin is negatively affected, however, in different ways in the various parts of the basin.

The water quality of the Cau River has decreased seriously over the years, and river water is polluted beyond warning levels at some sites. The water quality and pollution characteristics differ between upstream, middle and downstream Cau. In general the water

quality is decreasing from upstream to downstream.

An analysis and assessment on Cau Basin surface water quality, industrial waste and groundwater in Cau River Basin has been undertaken between 1999 to 2003. Detailed water quality series exist especially from Nov 2001 to Aug 2002, but also for 2003. Basic results of surface water are:

- Heavy metal, pesticides, total coliform e.g. shows values lower than the permissible levels required by surface water –class A from 1.2-5.0 times.

Turbidity and suspended solid shows high values in Cau and middle stream of Cong River (both with sites within the Cau focus area). Values are also high in Ca-Lo River. The measured values are higher than the permissible levels required by surface water –class A (1.2- 2.5 times).

N°	Production/Processing Establishments	Location (Province/ City)	Location of the wastewater outfall	Quantities of waste water
1	Mine exploitation	Thai Nguyen City	Cau River	2.4 mill m <sup>3</sup> /year
2	Mineral processing	Thai Nguyen City	Cau River	24 mill m <sup>3</sup> /year
3	Constructional material production	Thai Nguyen City	Cau River	150,000 m <sup>3</sup> /year
4	Agricultural/Forest processing	Thai Nguyen City	Cau River	100000 m <sup>3</sup> /year
5	Dap Cau glass company	Bac Ninh Town	Cau River	100-150 m <sup>3</sup> /day
6	Kim Hoa Industrial Zone (including Honda Viet Nam and Toyota Viet Nam) in planning stage	Vinh Phuc Province	Ca Lo River, then runs to downstream of Cau River	14000 m <sup>3</sup> /day (to be proposed)

Table 17. Waste water quantity of main industries in Cau River Basin

(Source: ADB TA 3892 – Part A, Component 1 Report)

- Especially DO, COD, BOD5, NO2, and NH4 have often very high values considerably higher than the permissible levels required by surface water –class A, and even higher than the permissible levels required by surface water –class B at some points of the rivers.
- Pollution of BOD, COD, NO2, and NH4, is especially prominent during dry season.

The most polluted points are on Cau River, especially the river's course through Thai Nguyen City. Cong River and Ca Lo River are also polluted, however, to a lesser degree than Cau in the focus area.

According to the ADB TA 3892 Component A1 study, Hop Tien commune is not in the water pollution focus area. Upstream of the Cap Ke dam area, there is no any industry or domestic wastes. Picture of water quality in the Cap Ke dam is quite different from the Cau river basin's one. It can be explained that in the Cap Ke scheme (small area), economic activities have not been developed and environmental protection has been well implemented in this area (for example, a pigpen constructed by a farmer in reservoir bed was immediately removed under the Commune's instruction). In the other words, environmental impacts of the Cap Ke dam are not significant.

After construction of the Cap Ke dam, the surface water regime in the reservoir is changed from dynamic to stationary state. Time of water stored in the reservoir increases significantly resulting to sedimentation, resettlement, decay, algae development, microorganism development and bio-chemical reactions etc. However, water quality in the

Cap Ke dam and its canal is still good comparing with the Vietnamese standards (Standard category B –TCVN 5942-1995 - Annex 4). Some water quality parameters of the Cap Ke dam and its canals are presented in the below table: (according to the water quality samples taken on 13 March and 21 April 2008 and analyzed by the Laboratory of National Institute of Agricultural Planning and Projection (NIAPP))

No.	Water quality parameter	Unit	Cap Ke reservoir	Canal	Standard B
1	pH		7	7.5	5.5 to 9.0
2	BOD5	mg/l	7.0	6.5	<25
3	COD	mg/l	15	14.5	<35
4	DO	mg/l	5.50	6.00	>2.0
5	Suspended solid	mg/l	35	30	80
6	Turbidity	NTU	15	12	
7	Conductivity	ms/m	0.1	0.1	1000
8	Coliform	MPN/100 ml	1200	1000	10000
9	Fe+	mg/l	0.34	0.30	2
10	Temperature	oC	21	21	

Table 18. Some observed water quality parameters of Cap Ke dam and canal

## 7. CROP DIVERSIFICATION

Crop diversification is a natural part of agriculture that has been used for centuries. However, in these days of high yielding varieties and agricultural technology, crop diversification may have a broader basis, especially now that more farmers are getting within reach of these techniques.

The definition of crop diversification can be diversified into several focal directions, such as towards dietary improvement or towards increasing soil fertility. In this case the direction is towards water use efficiency, but it also has a general aspect that is equal in all the focal directions. Crop diversification as understood in Viet Nam is defined as the strategy of shifting from less profitable to more profitable crops, changing of variety and cropping system, increasing exports and competitiveness in both domestic and international markets, protecting the environment, and making conditions favourable for combining Agriculture-Fishery-Forestry-Livestock.

Crop diversification can be a useful means to increase crop output under different situations. Crop diversification can be approached in two ways. The main form and the commonly understood concept is the addition of more crops to the existing cropping system, which could be referred to as horizontal diversification. For instance, cultivation of field crops in rice fields or growing various types of other crops in uplands have been defined as crop diversification. However, this type of crop diversification means the broadening of the base of the system, simply by adding more crops to the existing cropping system utilizing techniques such as multiple cropping techniques coupled with other efficient management practices.

In case of water shortage, crop diversification is also understood that it should be done in order to attain a closer fit between crop water requirements and water availability, or put differently, increasing irrigation water use efficiency by diversifying crop (rotations).

According to the land use planning of Dong Hy district, all most of land of Hop Tien commune should be used for reforestation (see the map below). At present time, the local people plant a type of bamboo (local name as Cay Phan) for tooth sticks and chop sticks produced by Bac Giang's enterprises.

At present, Hop Tien has around 128 ha of tea tree (according to the surveyed data in 2007, 2008 the tea planted area is around 170 – 175 ha). The tea tree contributes rather significantly to revenue of the local people (accounting for 15% of rice production value in gross benefit. However, inputs for rice cultivation are rather high – around 55-60% of rice output value, while this figure is 15-20% for tea tree. Therefore, in fact the percentage of net benefits between tea tree and rice cultivation is 29%). (Price of tea is 3,500 VND/kg, price of rice is 7,000 VND/kg, and revenue from tea trees is 3.013 bil. VND and from rice is 20.6 bil. VND)

The tea planted area, yield and fresh product of Hop Tien commune in recent five years are shown as below:

Year	Tea planted area (ha)	Tea yield (T/ha)	Production (T)
2001	90.0	5.00	455
2002	91.0	6.35	616
2003	97.0	4.80	526
2004	128.0	6.80	870
2005	128.0	6.70	861

Tab19. Tea production data of Hop Tien commune  
(source: Year Book 2005 of Dong Hy District)

Normally, there are 6-7 times of tea harvest per a year. However, if irrigation water is available in winter crop, 3 more times of tea harvest could be increased (10 times/year). Value of winter tea crop is also higher than that of other crops (3,500 VND/kg in other crops comparing with 10,000 VND/kg in winter crop). It can be seen that irrigation becomes very important for tea production, especially in winter season.

Tea planting should be considered as a good option of crop diversification in Hop Tien commune.

Land use of Hop Tien commune in last time could be presented as below:

Description	2000 (Ha)	2007 (Ha)	Difference	
			Difference of area (ha)	Variation rate (%)
<b>Gross agriculture land</b>	3,962.2	4,070.8	108.6	3
I. Agricultural production land	530.0	563.6	33.6	6.34
1. Annual crop	250.0	282.9	32.9	13.16
- Paddy	228.0	247.2	19.2	8.42
- Upland crops	22.0	35.7	13.7	62.27
Ratio (%)	13.0	14.0		
2. Long term trees	280.0	280.7	0.7	0.25
Ratio (%)	7.0	7.0		
II. Forestry land	3,400	3,495	95.0	0.03
Ratio (%)	86.0	86		
III. Fishery land	12,2	12,2	0.0	0
Ratio (%)	0.31	0.30		

Tab. 20 Land use of Hop Tien commune in year 2000 and 2007  
(After the surveyed data provided by Hop Tien People's Committee)

It can be seen that besides of increase of paddy area, the up land crop area is also increased with rate of 62.27% (from 2000 to 2007). This means farmers of Hop Tien commune paid much attention to up-land crop cultivation, especially to maize.

The maize production status in recent years is below:

Description	2001	2002	2003	2004	2005	2006	2007
Area (ha)	53.0	78.0	105.0	107.4	123.5	105	105
Yield (T/ha)	2.91	3.00	3.04	3.06	3.14	4.30	4.30
Production (T)	154	234	312	329	388	451.5	451.5

Tab.21. Maize production data of Hop Tien commune

*Note: data of 2006 and 2007 is provided by the Hop Tien PC, others are from the Year Book of Dong Hy district.*

According to data of the above table, maize yields of 2006 and 2007 are significantly higher than previous years. This is explained that, in recent years, new high yield maize varieties were planted in Hop Tien commune.

In the present situation, water sources are decreasing. Maize cultivation, especially in winter season should be much paid attention.

Annually, other crops such as ground nut (area of 80 ha, yield 1.2 T/ha), soybean (area of 30 ha, yield of 1.4 T/ha) sweet potato (area of 35 ha, yield of 3.0 T/ha), cassava (area of 30 ha, yield of 10.3 T/ha) are also cultivated in Hop Tien commune. However, these crops do not play significant roles in living of the local people.

Hop Tien commune has a very good natural conditions for planting grasses to raise cows. Benefits from cow husbandry are very high. That's why grass planting should be considered as a very good option for development of cow husbandry



**Fig 6. Land Use Planning Map of Dong Hy District up to 2010**



## 8. IMPACTS OF FOREST

### 8.1. Current status

As other northern provinces in 90s, most of forests in Hop Tien commune were seriously destroyed. That caused significant impacts on local people's life because the forestry products were poorer time to time. In order to create new jobs for the local people and improve their living standards as well as the commune's environment, several programmes, projects of reforestation have been implemented.

The forestation development status of Hop Tien commune is shown in following tables:

Forest type	Area ( ha)	Of which managed by	
		PC of commune	Dong Hy Forestry Farm
Upstream forest	60	60	0
Economic forest	3240	1440	1800
<b>Total</b>	<b>3300</b>	<b>1500</b>	<b>1800</b>

Tab. 22. Forest management status in Hop Tien commune

No.	Name of project/program	Implementation year	Area planted (ha)	HHs involved
1	PAM Project	1994	70	70
2	Program 327	1996	30	30
3	Reforestation program of farmers	2004	70	200
		2005	50	40
		2006	30	30
		2007	30	30
4	Reforestation carried out by farmers themselves	1993-2008	350	700

Tab. 23. Forestry development status in Hop Tien commune

### 8.2. Management status and protective forest development

Before 2001, all 60 ha of the protective forest area in Cap Ke catchment were considered as an economic forest. In 1993, People's Committee of Hop Tien (CPC) commune transferred management of this forestry area to 35 households living around the dam. Because articles stated in the agreement between CPC and the households are not clear, the farmers did not much pay attentions to the reforestation. Quality of the forest was very poor. The forestry resource is depleted. The forest covering rate is very low. The forest is bushes, grass. There were few area of bamboo (Cay Phan) and Keo trees used for fire-woods.

From 2001 up to now, this area has been re-considered by the local authority to become a protective forest area. Under new policy issued by the local authority, exploitation of the forestry products has been limited. The local people are not allowed to exploit the forestry products and deforest for cultivation. Up to 2003 70% of the area is forest trees concentrated from hill-base to mid of the hills. Rest of 30% from mid to top of the hills is grasses. This area is not able to be recovery by local trees.

Now, the local people have proposed to the local authority to exploit the forest under sustainable manner and to plant Keo trees in the grass areas.

### **8.3. Management status and economic forest development**

Up to now, 1440 ha of the economic forest managed by CPC in last time have been transferred to the households. Under framework of the PAM program, Programme 327, Programmes of the Dong Hy district, reforestation has been well carried out. Besides, the local people who have signed contracts with CPC also invested in reforestation by themselves.

According to the statistic data the forest covering ratio has been increased from 40% (1993) to 50% (2004) and 60% (2008). Revenue of the local people from the forestry products has also been increased. In average, a household has 1 hectare of forest for management. At present, economic value of 1 ha of Keo tree after 7 years of planting is around 100 mil. VND ( $50 \text{ m}^3 / \text{ha} \times 2 \text{ mil. VND/m}^3$ ). Cay Phan trees have higher value. However, this tree could be planted in low land areas only. Option of planted alternately Keo and Phan trees is considered as a good one.

### **8.4. Impacts of the forest on water sources in Hop Tien commune**

Water sources of the Cap Ke catchment have a great significance to the local people's life. The local farmers take water from springs to irrigate crops and commercial trees such as: tea, litchi and vegetables. According to the interviews to the local people, in recent 15 years, water sources of the springs have decreasing trends. In dry season, water is less while in rainy season flood is very high. Differences between water levels in dry season and flood season are very high. That causes big difficulties to the cultivation and life of the local people. For instance, before 15 years ago, annually from January to March, water is available in Cai spring. The local people might lift water from the Cai spring for irrigating areas outside of Cap Ke dam scheme. However, in recent years, water is not available in the spring.

A question raised is that why the forest covering ratio has increased, however, water sources of the springs has decreased? The reasons are:

- Water demands for cultivation and animal raising are higher (rice spring area increases from 70 ha (1994) to 110 ha (2008)).
- Quality of the present forest is not as good as the previous one. Capacity of flow regulation of the existing forest is lower than that of the previous one.

It is necessary to have structural measure (such as dam construction) to store much more surface water in the catchment. In coming time, a new Ho Chuoi dam is to be constructed in Hop Tien commune to increase the water storage capacity in the Hop Tien catchment.

## **9. PIM ISSUES**

### **10.1. PIM from a National view**

PIM definition (a shortly written form of Participatory Irrigation Management) has been introduced into Vietnam for round for recent 10 years. PIM represents the participation of farmers in all aspects and governance levels in irrigation management. Such aspects include projecting, designing, constructing, O&M, financing, and related policies. Such governance levels are field canal, secondary canal, third canal, main canal, scheme, and branch.

The above concept implies the ideality with largest participation. Nonetheless, the participation depends on factors like national development, people awareness, even actual condition at different areas.

In Vietnam nowadays exists many management ways to irrigation schemes. Some IDMCs manage the whole scheme, from head-works to on-farm canals. Other IDMCs only manage headworks and main canals. Secondary and lower level canals are managed by WUOs as in Thai Binh, Binh Dinh, Quang Nam. However, some WUOs manage the entire irrigation schemes like in Tuyen Quang, Lao Cai. From actual experiences in Vietnam and several other countries over the world, management of simple irrigation works should be transferred to WUOs. Accordingly, the cost of operation and management (O&M cost) will decrease. The operation efficiency of the irrigation works will be higher and the Government's subsidy burden will be reduced. Benefits are brought about to all: Government, IDMCs, and WUs as a result of:

- Taking advantage of local participation, promoting their activeness and self-motivation in protection and O&M of irrigation works;
- Being suitable with a fact that an irrigation structure is only seasonally operated, in this case a seasonal contract should be signed (labour saving);
- Distributing water more fairly and efficiently resulting from participatory discussion of water users to be appropriate with their crops;
- IDCMs are able to save their labor resources and time.

However, challenges to irrigation management in these days are below:

- Water users are various with higher demand in service quality;
- Subsidy regime in irrigation management exists for long time, which slow down the development of IDMCs;
- Water demand increases while water sources are limited;
- Water pollution in irrigation schemes is increased because of waste water from industrial zones, trade villages, and urban areas.

In fact, IDMCs have not paid much attention to roles of service suppliers to service beneficiaries such as attentive listen to, and giving active feedback to WUOs' desire. Service beneficiaries are not trained carefully about O&M techniques and planning. They often perform tasks based on their own experience. O&M activities are not paid attentions, that effect on the efficiency of water distribution. Awareness of local people to irrigation management is poor.

For those reasons, WUOs' strengthening and improvement is one of core ways to upgrade service quality of IDMCs.

Nevertheless, to implement PIM, according to experience of many regions, it should be noted that:

- This long process requires determination, enthusiasm, and consensus among IDMC, local authorities, and WUOs.
- Transfer process takes at least some years for completion. It is necessary to have proper transfer from IDMC to WUOs on management experience and O&M, etc.

In transfer mechanism, responsibilities and rights of the two parties should be clearly defined.

In 2005, a study and survey to assess the present situation of PIM in Vietnam carried out in 15 provinces and under central GOV control cities by the Center for Science Technology consultation and water resources development with a financial support from UK Oxfam showed that:

In the country now there are the following irrigation management models: Irrigation and drainage management organizations with IDMC and without IDMC. Both these models have plentiful name and organization formation given in the following table.

No	Province	Supported organization	Organization formation	Scope	Present status
1	Lao Cai	UK Oxfam	Association Water Collective Board Agriculture collective without IDMC	Commune/hamlet	Existing water collective model is expanded to locals in province
2	Tuyen Quang	IFAD	Agriculture collective Board	Inter commune/commune	Existing, expanded to the whole province
3	Ha Tay	Australia	WUSs/WUGs with IDMC	Commune/hamlet	Not existence
4	Thai Binh	Spontaneous	Association Water Collective with IDMC	Commune, district	Existing expanded in a district
5	Hai Phong	Spontaneous	Agriculture collective with IDMC	Commune	Existing but can not be expanded
6	Thanh Hoa	ADB, Quaker, Individuals	Association Agriculture collective with IDMC without IDMC	Inter commune Hamlet/village	Existing not expanded Existing not expanded Existing not expanded
7	Nghe An	ADB, Oxfam Belgium	WUCs, ACS with IDMC, Acs, WUAs/WUGs	Commune/hamlet	Existing but can not be expanded
8	Ha Tinh	ADB, Oxfam Belgium	WUAs/WUGs Acs, IDMC Acs with IDMC	Commune Village Commune Village	Existing, not expanded  Existing, not expanded Existing, not expanded
9	Thua Thien Hue	CIDSE	WUAs/WUGs ACS IDMC	Commune Village	Existing, not expanded
10	Quang Nam	Spontaneous	ACs, IDMC	Commune, Village	Existing
11	Quang Ngai	WB	Acs, IDMC	Commune, Village	Existing
12	HCM city	Spontaneous	Water delivery groups, Acs with IDMC	Commune, Village	Existing, not expanded
13	Dong Thap	Spontaneous, Individuals	Acs, Cooperation group, Equitization	WUCs, inter-commune, village	Existing, not expanded
14	Tra Vinh	Spontaneous,	Cooperatives Village/hamlet WMGs, MB, CPC	WUCs, inter-commune, Village	Existing, not expanded
15	Dac Lac	DANIDA Spontaneous	- Association Collective water team People committee with IDMC	Commune/hamlet	Existing but can not be expanded

Tab. 24. List of PIM models applied in various provinces of Viet Nam  
(Source: Nguyen Xuan Tiep- PIM models in Viet Nam, Experience Lessons)

Given table showed that: i) name of grass-root water user organizations is rather plentiful, ii) most of these organizations was established by international (NGOs, different) organizations support, iii) only models without IDMC in 2 mountainous provinces namely Lao Cai and Tuyen Quang were expanded, in other provinces, both types of with and without IDMC models existing but can not be expanded in local areas.

The mentioned study also showed that Irrigated areas that are managed by the grass-root water user organization such as Association, collectives, etc. to be still very small. Mostly grass-root irrigated areas in present time is managed by administration agencies, this led to lack of self-control in finance and budget for O&M by this the water structures became without real owners. There are many models that have with very low effective by: authorities are not interested in its operation, scope of the structure transferred to

organizations is not inadequate, legal papers are not sufficient, IDMCs are not willing to transfer water structures to farmers, awareness of PIM of all levels is not complete.

In order to implement PIM, the Government, MARD and PPCs have issued relevant legal documents, among of which are some important ones as follows:

- Ordinance on Exploitation and Protection of Hydraulic Works issued on 4/4/2001; Decree 143/2003/ND-CP of the Ordinance on Exploitation and Protection of Irrigation Works (clearly defined in such articles as 2, 11,12, 13, 15, 16, 17, 18, 19, 20);
- Circular 75/2004/TT-BNN about guidelines on establishment, strengthening, and development of WUOs issued on 20/12/2004;
- Decree 151/2007/ND-CP issued on 10/10/2007 about organization and operation of Cooperatives;
- Strategy framework on PIM till 2015 of MARD in 2004;
- Law on Cooperatives;
- Provincial policies related to irrigation management.
- Decree 154-CP-TLP dated 15 October 2007 by the Government on abolishment of the irrigation service fee.
- Circular 26/2008/TT-BTC dated 28 March 2008 by Ministry of Finance on guidelines of implementing Decree 154-CP-TLP

## **10.2. Irrigation Management in Thai Nguyen province**

According to the 2005 surveyed data, in Thai Nguyen province there are 1,143 water works, of which there are 395 big, medium and small dams, 303 weirs, and 241 irrigation pumping stations, one drainage pumping station, 203 temporary weirs, and 2,548 km of canals including 1,430 km of lined canals. These water works have tasks of irrigating 23,500 – 24,000 ha of spring rice, 34,000 – 34,500 ha of summer rice, 15,250 ha of up-land crops such as vegetables, maize, bean etc. and supplying water sources for 2,500 ha of tea trees.

In terms of irrigation management, in Thai Nguyen province the irrigation management is divided into two tiers:

- Thai Nguyen IDMC directly manages headworks that irrigate over 50 ha of cultivated land; dams of over 15 m height, main canals and on-main canal structures;
- Districts, communes directly manage rest of the water works within the province, including 369 dams, 222 concrete weirs, 245 pumping stations, 203 temporary weirs, secondary, tertiary, on-farm canals.

According to Decision 2537-QDUB dated 13 November 2006 issued by PPC of Thai Nguyen, Thai Nguyen IDMC will control 55 dams and Cong Tao pumping station (Pho Yen district) in Thai Nguyen province.

At situation as the same as other provinces of Vietnam, O&M activities of the Thai Nguyen IDMC have not been reasonably paid attention. O&M plans are developed on the basis of traditional experiences: O&M plan of this year is mainly based on the last year plan and instructions from PPC/DPCs. The Thai Nguyen IDMC has insufficient equipment for operation and management. Professional and operational skills of the IDMC's staff, workers are not good that do not meet the actual requirements.

Concerning with management regulations for investment supports to rural infrastructure, on 24 April 2001, PPC of Thai Nguyen issued Decision 1667/2001/QD-UB. In accordance with this Decision, tertiary canal lining and on-farm structures under commune level's management have a top priority of investment from the State financial supports. The Decision also has defined rate of the financial supports. For the structures of the high land areas, special disadvantage areas the Government will finance 80% of the total cost. This is

considered as a very good opportunity for these areas in irrigation development and management.

Since 2006 according to Decision 2537-QDUB dated 13 November 2006 issued by PPC of Thai Nguyen, IDMC will be fully subsidized by the provincial government. However, the subsidized budget is very limited that is only sufficient for staff's salary, insurance and administrative expenditures. The collected ISF is used by districts, communes for WUOs' operations. Because the ISF rates defined by PPC of Thai Nguyen is lower than the rates defined in Decree 143-CP, that makes WUOs of Thai Nguyen face with many difficulties in O&M activities. It is necessary to have capacity building for WUOs to reduce O&M costs, to increase efficiency of water uses.

At present, there is only an IDMC of Thai Nguyen named Thai Nguyen One Membership State Limited Liability Company (hereafter called as Thai Nguyen IDMC). The Thai Nguyen IDMC is a State Owned one. It has functions of public services directly under control by PPC of Thai Nguyen and DARD of Thai Nguyen. During its operation, the Thai Nguyen IDMC has close co-operations with PC of districts, communes in water supply field.

At lower level, irrigation management is undertaken by co-operatives. In average, a co-operative will manage around 11 villages/hamlets with irrigation area of 150-250 ha and over 1000 households. Under a co-operative are village/hamlet irrigation teams. An irrigation team consists of around 4-5 memberships elected by the village/hamlet farmers. Payment for the irrigation team is based on internal agreement between the village/hamlet authority and the irrigation team.

The cooperatives sign water supply contracts with the Thai Nguyen IDMC through its irrigation stations. The cooperatives also have functions of distributing irrigation water to areas under management of the irrigation teams and collecting ISF from the irrigation teams, solving any conflicts between water users. Organization of tertiary canal dredging, improvement is carried out by the cooperatives.

The irrigation teams have tasks of irrigation water distribution to farmers' fields within their management areas. They are also directly involved in on-farm canal improvement, dredging and ISF collection from farmers.

According to evaluations by DARD and IDMC of Thai Nguyen, though WUOs of Thai Nguyen have been established and put into operation, they are still weak and ineffective.

Main causes are that:

- Awareness of farmers to irrigation management is poor; WUOs are not legally formed and their operations are not officially registered;
- Leaders of village/hamlet are decision-makers that make participation of farmers limited;
- Payment for the irrigation teams is low that does not encourage the irrigation teams to do their job.

In 2007, Thai Nguyen DARD has a report on WUOs' operation assessment. As this report, in Thai Nguyen there are 310 WUOs in forms of Irrigation Team, Water Service Cooperative, and Agriculture-Forestry- Water Cooperative. Of which 224 WUOs are well operated, 66 WUOs are moderately operated and rest of 20 WUOs are poorly operated.

### **10.3. PIM development in Hop Tien commune**

An irrigation team of Hop Tien commune was established in 1994. The irrigation team consisted of a team leader and 15- 20 team members (3-4 members per a village). The team had tasks of head works operation and irrigation water distribution to fields of 5 villages of Hop Tien commune.

In 2000, according to Decision 696/QĐ-UB dated 22 December 1999 issued by PC of Dong Hy district, a Agriculture Service Cooperative was formed. The Cooperative has tasks of agricultural material supply (fertilizers, pesticides, varieties etc.) and irrigation service. From that time the irrigation team was under management of the Cooperative. The Cooperative consists of a Management Board (3 persons: a Chairman, a Deputy Chairman and an Accountant) and its memberships.

At present, the Thai Nguyen IDMC is responsible for operation management of head works including earth dam, spillway, and intake. The Cooperative is responsible for irrigation distribution from main canal to the farmers' fields.

Based on the crop cultivation calendar determined consistently from the District, commune and villages, the Cooperative signs a contract of irrigation water supply with each village (on the basis of irrigation area, level of irrigation service (full irrigation or partial irrigation) and timing). The contract is liquidated at the end of every crop according to a minute of checking and approving.

Concerning with O&M activity, the irrigation team of every village is responsible for canal clearance, dredging by itself if workload is not much. If the workload is heavy, mobilization all households of the village is required. Normally, canal dredging is carried out twice per year.

In last time, rate of irrigation service fee (ISF) was 2,000 VND/sao/season for full irrigation, 1,000 VND/sao/season for partial irrigation and 4,000 VND/sao/season for fishery. 45% of the collected ISF was submitted to the district's budget, rest of 55% was remained to the Cooperative to pay for 3 members of the Management Board.

Rate of the on-farm contribution is 1,000 VND/household/turn of irrigation water distribution. This amount of contribution is used for payment to the irrigation teams of villages.

The ISF collection was implemented until 2005. From 2006, ISF was no longer for Hop Tien commune according to Decree 143/2003/ND-CP applied for the special disadvantage areas. Therefore, revenue of the Cooperative is from agricultural material supply, variety supply only. The on-farm contribution is based on agreement between the farmers of the village. For examples, in Suoi Khach village the on-farm distribution rate is 3,000 VND/sao/season, in Mo Sat village this rate is 5,000 VND/sao/season. While in other villages, farmers will operate canal by themselves in rotation (no contribution in cash but in labour).

According to the surveyed information, it can be seen that all members of the Cooperative Management Board are working in part time. Their leadership roles to irrigation services are not focused. In fact, irrigation service is taken though relationship between the irrigation teams, Commune People's Committee and Cap Ke dam management team (belonging Thai Nguyen IDMC). The Cooperation is considered as a form of Water User Organization (WUO). However, its operation has not followed an official method to ensure that its services could meet new requirements in new situations (water shortage, water loss, crop diversification etc.). Now, ISF has not been existing, no budget for the Cooperative Management Board's operation. The Board has no any incentive to carry out its tasks. On the other hand, the irrigation team members of the villages are changed year to year. That makes the irrigation teams have less experience in their job.

According to experiences from other countries in the World, WUOs should be independent to local authorities to promote their activeness and self-motivation in protection and O&M of irrigation works. However, in Viet Nam, lessons learnt from the practice are that a WUO could not be successful in operation if its local authority is not involved. This issue occurs in Hop Tien. It can be said that all final decisions related to irrigation management are made by the Hop Tien CPC. From viewpoint of PIM development, it is not so good if a local authority interferes deeply in WUO's operation. In case of Hop Tien, it is necessary to have involvement of CPC. However, the CPC should keep its leadership role in directing the

irrigation teams' operation. The irrigation teams should be trained much more to improve their knowledge of PIM development, irrigation operation skills. In other words, the irrigation teams of the Hop Tien Agricultural Service Cooperative should operate their services in the official methodologies. They should work more professionally to increase efficiencies of the scheme and benefits to the farmers.

## **10. CONCLUSIONS AND RECOMMENDATIONS**

### **10.1. CONCLUSIONS**

1. Contribution from irrigation services of the Cap Ke dam scheme to agricultural production is very significant in both aspects of increasing crop production (area and yield) and reducing costs and labour. Irrigation also has considerably contributed to poverty reduction in Hop Tien commune.
2. Hop Tien catchment is facing with low rainfall period. Water sources are in decreasing trend. Water saving is becoming a urgent task to all water users in the catchment. The Cap Ke dam scheme should improve its intake, canals, on-canal structures to reduce water loss.
3. Cultivation land in rice spring crop is available if irrigation water is available. If normal water level of Cap Ke dam is to be increased 0.5 m higher to make its useful capacity increase more 66,000 m<sup>3</sup>, the irrigated area could be 80 ha. In order to ensure food security the rice cultivation area should not be less than 325 ha per year and average rice yield should not lower than 4.30 T/ha.
4. The Cap Ke dam has had very positive impacts on environment of Hop Tien commune. There are no any problems related to water pollution in the reservoir and canal system. Water quality of the Cap Ke dam scheme meets Class B standards of Vietnam. However, drinking water should be taken from dug wells, bore wells or pipe system of Hop Tien commune. The Cap Ke dam has played an important role of increasing water table in Hop Tien commune. It means that it has significant indirect contributions to domestic water uses.
5. Concerning with crop diversification, increase of tea tree cultivation is considered as a good option for Hop Tien. However, in order to improve tea production, irrigation water should be sufficient in winter season to meet water demands of tea trees. Besides, tea trees, winter maize cultivation is also important for Hop Tien farmers.
6. Forestry development is very important for water resources protection and management in Hop Tien catchment. The forest has effects on surface water regulation. However, in order to improve this effect, quality of the forest should be increased. The forest should be diversified with various types of trees (not only Keo or Phan trees). The forest under management of the local people is reasonable.
7. O&M issues of the Cap Ke dam scheme have not been considerably paid attention. O&M budget is not available. If this issue is not well solved, serious degradation of the scheme will happen soon.
8. The irrigation teams of Hop Tien are considered as a form of WUO. The teams have had good water supply services to agricultural production, fishery in Hop Tien commune. However, their operations are not in an official methodology, not professional. It is necessary to strengthen these irrigation teams under the PIM development spirit. Capacity building in terms of irrigation management is required for the irrigation teams as well as leaders of the villages, staff of Hop Tien CPC.



## 10.2. RECOMMENDATIONS

1. Improve useful capacity of the Cap Ke dam by heightening the spillway top of 0.5 m higher (estimate cost is USD 2,000). Rehabilitate canal system to reduce water loss by lining the existing main earthen canal (For instance, Bai Bong earthen canal of 1,700 m should be lined with the estimated cost of USD 75,000). Improve the on-canal structures (siphon, gates, stoplogs) and the intake of the dam. If water source is improved through the above structural measure, the spring rice area should be increased to reach 80 ha within the Cap Ke scheme. This is feasible (the previously designed irrigation area is 74 ha).
2. Cropping patterns should be changed: increasing the later spring rice cultivation and the early summer rice cultivation, reducing the main spring rice cultivation and later summer rice cultivation in order to avoid weather risks and pests. The cropping pattern could be: 2 rice crops + winter maize or 2 rice crops + soybean. Maize cultivation area should be increased in the one crop land and in winter season. Other crops such as ground nut, soybean should be alternately cultivated. Concerning with orchard trees, low economic lichee trees should be removed by planting new variety tea trees. New variety grass should be planted for cow husbandry.
3. Water quality is not a big issue in the Cap Ke dam scheme as well as in Hop Tien commune. However, in order to avoid any pollution to surface and underground water sources, chemical inputs and pesticides should be reasonably used as advised by the local agriculture extension organization.
4. Reforestation has been rather well carried out in Hop Tien commune. However, quality of the forest should be paid much attention. The forest should be diversified, not be planted by using a single type of tree (Keo or Phan tree). Forest has played a very important role in erosion protection and water source conservation in Hop Tien commune. This aspect should be improved.
5. It is proposed that the annual subsidy budget of 67 mil. VND for the Cap Ke irrigation station might be allocated to the irrigation teams of Hop Tien Cooperative. That means the irrigation teams will cover operation, maintenance of all structures of the scheme including the headworks, canal system and on-canal structures. This requires the irrigation teams have to be technically trained before having management transfer and in initial time, the Cap Ke irrigation station's staff should stand side by side the irrigation teams to have technical supports. When the irrigation teams are sufficient capacity to operate, maintain the scheme, the technical supports will stop. This option will save the Thai Nguyen IDMC staff (a technician and an engineer) for other jobs.
6. The irrigation teams of the Hop Tien Cooperative should be strengthened through capacity building for the team memberships. Appropriate short training courses should be designed and offered for the teams by the Thai Nguyen IDMC under financial supports from in-country and international NGOs. The irrigation teams' operation should follow an official method as advised in the PIM guideline. (The PIM guidelines are presented in Annex 5).
7. Hop Tien commune has a very good potential for improvement of agricultural production, irrigation management and integrated water resources management as well. It is proposed IUCNVN should finance in Phase 2 of this study. The draft proposal for Phase 2 shall be prepared by the study consultants later and submit to MARD and IUCNVN for consideration and approval if in principle, IUCNVN accept this recommendation.

# Annex 1: SURVEY FORM

## Canal

Name of scheme.....

Name of pump station/ sub-scheme.....

Tasks:

Performance activities:	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Drainage
Area (ha):		

Designed parameters:

Discharge (m<sup>3</sup>/s):

Bottom width (m):

Depth (m):

Safe height (m):

Canal slope:

Bottom slope:

Assessment of the quality of works is done as following 10 mark ranges:

A. Hydraulic conditions

No..	Description	Assessment (%) / mark			
		>80	70÷79	50÷69	<50
a.1	Capacity of canal compared with requirement (about:.....)	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.2	Depth of water level compared with requirement	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.3	Prevention of water seepage in canal	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

B. Structure and safety condition

No..	Description	Assessment / mark			
		Excellent	Good	Average	Inadequate
b.1	Canal bed (bottom)	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.2	Canal slope	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.3	Canal bank's width	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.4	Safe height	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.5	Connection (transection bars, joints...)	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

C. Detailed requirements

C: Detailed Requirements											
No	Sub-works	Require- ment <sup>(2)</sup>	Related to <sup>(3)</sup>		Relation level				Materials, labour...	Unit	Amount
			A	B	Big	Rather big	Normal	Little			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

<sup>(1)</sup> TT: replacement; SC: repair; BD: maintenance

<sup>(2)</sup> Write in detail, for example, related to discharging pipe quality: b3; water tightness at discharging basin: a.4...

No	Sub-works	Require- ment <sup>(2)</sup>	Related to <sup>(3)</sup>		Relation level				Materials, labour...	Unit	Amount
					Big	Rather big	Normal	Little			
			A	B							
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

D. Simple drawing of structure (if necessary):

E. Overall assessment:

.....  
.....  
.....

....., date....../...../200...  
Assessment team

## Survey form Regulator of canal

Name of scheme.....

Name of pumping station/sub-scheme.....

Task:

Performance activities:	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Drainage
Area (ha):		

Designed parameters:

Capacity (m<sup>3</sup>/s):

Bottom width (m):

Depth (m):

*Assessment of the quality of works is done as following 10 mark range:*

A. Hydraulic conditions

No	Description	Assessment/ mark			
		Excellent	Good	Average	Inadequate
a.1	Capacity of supply compared with requirement (about:.....)	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.2	Regulation capacity of water level/ discharge	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.3	Water tightness	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.4	Ability used for flow measurement	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

B. Structure and safety condition

No	Description	Assessment/ mark			
		Excellent	Good	Average	Inadequate
b.1	Sluice body	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.2	Sluice shoulder	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.3	Wing wall, flow direction regulation	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.4	Slit of gate wall	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.5	Stilling basin	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.6	Gate frame, spindle of gate	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.7	Gate	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.8	Gate lock	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.9	Measurement devices	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

C. Detailed requirements

No	Description	Requirement <sup>(1)</sup>	Related to <sup>(2)</sup>		Relation level				Materials, workers...	Unit	Amount
			A	B	Big	Rather big	Normal	Little			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

<sup>(1)</sup> TT: replacement; SC: repair; BD: maintenance

<sup>(2)</sup> Write in detail, for example, related to discharging pipe quality: b3; water tightness at discharging basin: a.4...

No .	Description	Require- ment <sup>(1)</sup>	Related to <sup>(2)</sup>		Relation level				Materials, workers...	Unit	Amount
			A	B	Big	Rather big	Normal	Little			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

D. Simple drawing of structure (if necessary):

E. Overall assessment:

.....

.....

....., date....../...../200...  
Assessment team

## Survey form siphon aqueduct

Name of scheme.....

Name of pumping station/ sub-scheme.....

Task:

Performance activities:	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Drainage
Area (ha):		

Designed parameters:

Capacity (m<sup>3</sup>/s):

Bottom width, diameter (m):

Height (m):

Length (m):

*Assessment of the quality of works is done as following 10 mark range:*

A. Hydraulic conditions

Or.	Details	Assessment/ mark			
		Excellent	Good	Average	Inadequate
a.1	Capacity of supply compared with requirement (about:.....)	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.2	Ability used for flow measurement	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
a.3	Water tightness	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

B. Structure and safety condition

Or	Details	Assessment/Mark			
		Excellent	Good	Average	Inadequate
b.1	Aqueduct, siphon body	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.2	Siphon shoulder	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.3	Aqueduct supports	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.4	Wing wall, flow direction regulation	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.5	Connection to canal	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.6	Stilling basin	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.7	Measurement devices	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

C. Detailed requirement

No .	Description	Require- ment <sup>(1)</sup>	Related to <sup>(2)</sup>		Relation level				Materials, labour...	Unit	Amount
					Big	Rather big	Normal	Little			
			A	B							
					<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>			
					<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>			
					<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>			
					<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>	<div><input type="checkbox"/></div>			

<sup>(1)</sup> TT: replace; SC: repair; BD: maintain

<sup>(2)</sup> Write in detail, for example, related to discharging pipe quality: b3; water tightness at discharging basin: a.4...



# Survey form spillway, bridge

Name of scheme:.....

Name of pumping station/ sub-system:.....

Designed parameters:

Capacity (m<sup>3</sup>/s):

Bottom width, diameter (m):

Height (m):

Length (m):

*Assessment of the quality of works is done as following 10 mark range:*

### A. Hydraulic conditions

No.	Description	Assessment/ mark			
		Excellent	Good	Average	Inadequate
a.1	Capacity of supply compared with requirement (about:.....)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a.2	Flow at downstream section	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### B. Structure and safety conditions

No.	Description	Assessment/ mark			
		Excellent	Good	Average	Excellent
b.1	Spillway body	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.2	Spillway shoulder, bridge	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.3	Bridge supports	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /
b.4	Stilling basin behind spillway	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /	<input type="checkbox"/> /

### C. Detailed requirements

[illegible]

<sup>(1)</sup> TT: replacement; SC: repair; BD: maintenance

<sup>(2)</sup> Write in detail, for example, related to discharging pipe quality: b3; water tightness at discharging basin:

a.4...



No	Description	Require- ment <sup>(1)</sup>	Related to <sup>(2)</sup>		Relation level				Materials, workers...	Unit	Amount
					Big	Rather big	Normal	Little			
			A	B							
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

D. Simple drawing of structure (if necessary):

E. Overall assessment:

.....

.....

....., date....../....../200...  
Assessment team

## Annex 2

### 2.1 LIST OF PEOPLE INVOLVED IN THE FIELD SURVEY (13<sup>rd</sup> Mar 2008)

No	Name	Position
	<b>IDMC</b>	
1	Mr Dinh Khac Tinh	Vice director of Thai Nguyen DARD
2	Mr Phi Ngoc Lam	Thai Nguyen IDMC Director
3	Mr Nguyen Dinh Hung	Deputy chief of Water Resources and Structure Management Division
4	Mr Nguyen Van Nghi	Head of Dong Hy Irrigation Station
5	Mr Pham Viet Cuong	Staff of Dong Hy irrigation Station
6	Mr Tran Van Khanh	Staff of Dong Hy Irrigation Station
	<b>Hop Tien community and WUO</b>	
7	Mr Ban Phuc Thanh	Secretary of the Communist Party Unit/ Chairman of People Council
8	Ms Nguyen Thi Cam	Chairwoman of Hop Tien community
9	Ms Vu Thi Que	Standing member of the communist Party/WUO member
10	Mr Dang Van Thanh	Irrigation and Transportation Officer/ Water and Sanitation Officer
11	Mr Trieu Tien Tu	Vice chairman of the CPC
12	Mr Trieu Van Quang	Vice chairman of the CPC
13	Mr Nguyen Huu Hien	Vice chairman of the WUO/Chairman of Farmer Association
14	Mr Quoc Te	WUO member
15	Mr Trieu Tien Hau	WUO member (Reservoir management)

## 2.2 LIST OF PEOPLE INVOLVED IN THE FIELD SURVEY AND QUESTIONNAIRE SURVEY

(21-22<sup>nd</sup> April 2008)

Or.	NAME	ADDRESS
1	Trieu Tien Phuong	Cao Phong Hamlet
2	Trieu Tien Long	Cao Phong Hamlet
3	Hoang Van Tang	Cao Phong Hamlet
4	Trieu Tien Thang	Cao Phong Hamlet
5	Ban Tai Phuong	Cao Phong Hamlet
6	Ban Phuc Minh	Cao Phong Hamlet
7	Trieu Sinh Lam	Cao Phong Hamlet
8	Duong Quy Tien	Bao Bong Hamlet
9	Dang Van Ly	Bao Bong Hamlet
10	Dang Dang Quang	Bao Bong Hamlet
11	Trieu Thi Ha	Bao Bong Hamlet
12	Duong Tien Hien	Bao Bong Hamlet
13	Trieu Tien Ly	Bao Bong Hamlet
14	Duong Van Vinh	Bao Bong Hamlet
15	Trieu Van Hai	Suoi Khach Hamlet
16	Trieu Van Hao	Suoi Khach Hamlet
17	Nguyen Van Phuc	Suoi Khach Hamlet
18	Nguyen Van Vinh	Suoi Khach Hamlet
19	Duong Van Duong	Suoi Khach Hamlet
20	Trieu Van Huong	Suoi Khach Hamlet
21	Trieu Van Hien	Suoi Khach Hamlet
22	Vu Van Nha	Huu Nghi Hamlet
23	Hoang Van Thai	Huu Nghi Hamlet
24	Vu Van Hien	Huu Nghi Hamlet
25	Hoang Van Tuyen	Huu Nghi Hamlet
26	Hoang Van Ngoan	Huu Nghi Hamlet
27	Vu Van Nguyen	Huu Nghi Hamlet
28	Vu Van Kien	Huu Nghi Hamlet
29	Le Van Tho	Huu Nghi Hamlet
30	Trieu Van Phuc	Mo Sat Hamlet
31	Trieu Tien Quang	Mo Sat Hamlet
32	Trieu Van Huong	Mo Sat Hamlet
33	Trieu Tien Thang	Mo Sat Hamlet
34	Trieu Tien An	Mo Sat Hamlet
35	Ban Tai Minh	Mo Sat Hamlet
36	Trieu Tien Hoa	Mo Sat Hamlet

## Annex 3. SOCIO-ECONOMICS QUESTIONNAIRE

(APPLIED FOR HOUSEHOLDS)

### PART I. BASIC HOUSEHOLD INFORMATION

Full name of householder: .....Ward.....

1.1. Sex: 1. ☐ Male 2. ☐ Female

1.2. Age: .....

1.3 Ethnic group: 1. ☐ Kinh 3. ☐ Nung 5. ☐ Cao Lan  
2. ☐ San Diu 4. ☐ Dao 6. ☐ Tay  
7. ☐ Other (clarify) .....

1.4 Education: 1. ☐ Do not attend school 2. ☐ Elementary school  
3. ☐ Junior Secondary school 4. ☐ Senior Secondary school  
5. ☐ College/University

1.5 Number of family members: .....persons:

Male: .....person(s)

Female: .....person(s)

1.6 Number of family members in working ages

Male (from 16-60 years old): .....person(s) Female (from 16-55 years old).....

1.7 Activities contributing to household's incomes:

1. ☐ Planting
2. ☐ Breeding (cattle, poultry, aquatic animals)
3. ☐ Exploiting/producing products from natural sources
4. ☐ Processing agricultural products
5. ☐ Handicraft making
6. ☐ Doing business
7. ☐ Other: .....

1.8 Household's assets

- |   |                                       |   |
|---|---------------------------------------|---|
| 1. <input type="checkbox"/> TV                    | 4. <input type="checkbox"/> Fridge    | 7. <input type="checkbox"/> Tractor               |
| 2. <input type="checkbox"/> Telephone             | 5. <input type="checkbox"/> Motorbike | 8. <input type="checkbox"/> Wagon                 |
| 3. <input type="checkbox"/> Small pumping machine | 6. <input type="checkbox"/> Grinder   | 9. <input type="checkbox"/> Other (clarify) ..... |

1.9 Housing: Area of land tenure .....

- |  |   |
|--|---|
| 1. <input type="checkbox"/> House with flat roof | 3. <input type="checkbox"/> Thatched cottage      |
| 2. <input type="checkbox"/> House on stilts      | 4. <input type="checkbox"/> Other (clarify) ..... |

1.10 Using electricity for daily activities? 1. ☐ Yes 2. ☐ No

1.11 Domestic water sources

- |  |   |  |                                   |
|--|---|--|-----------------------------------|
| 1. <input type="checkbox"/> Tap-water  | 3. <input type="checkbox"/> Deep well-water | 5. <input type="checkbox"/> Rain-water   | 6. <input type="checkbox"/> Other |
| 2. <input type="checkbox"/> Well-water | 4. <input type="checkbox"/> Lake-water      | 6. <input type="checkbox"/> Stream-water |                                   |

1.12 Are the domestic water sources clean? 1. ☐ Yes 2. ☐ No

1.13. Materials used for cooking:

- |                                      |   |                                  |                                 |
|--------------------------------------|---|----------------------------------|---------------------------------|
| 1. <input type="checkbox"/> Firewood | 2. <input type="checkbox"/> Electricity | 3. <input type="checkbox"/> Coal | 4. <input type="checkbox"/> Gas |
|--------------------------------------|---|----------------------------------|---------------------------------|

### PART II. AGRICULTURAL ACTIVITIES

2.1 How many hectare/sao of cultivation land have you (your household) got?

Forestry land \_\_\_\_\_ \_sao      Rice land \_\_\_\_\_ \_sao

Up-land crop land \_\_\_\_\_sao      Orchard land \_\_\_\_\_sao

## 2.2 Area of cultivated land and income from agriculture?

Season	Cultivation area (sao)	Irrigated area (sao)*	Productivity (kg/sao)	Outputs (Kg)	Price (dong/kg)	Income (1,000 vnd)
1. Spring 2007						
Rice						
Up-land crops						
Other						
2. Summer 2007						
Rice						
Up-land crops						
Other						
3. Winter 2007						
4. Forestry						
5. Orchards						
<b>Total</b>						

(\*) Area of land getting water from Cap Ke reservoir.

State clearly the reasons why having no irrigation (far from the dam, field at high level, down-gradation of canal, etc.) .....

.....

## 2.3 Please choose 03 factors among these ones below, which most affecting on agricultural production:

- |  |   |  |
|--|---|--|
| 1. <input type="checkbox"/> Price of agricultural products | 5. <input type="checkbox"/> Varieties                     | 9. <input type="checkbox"/> Irrigation |
| 2. <input type="checkbox"/> Cultivation techniques         | 6. <input type="checkbox"/> Labor cost                    | 10. <input type="checkbox"/> Market    |
| 3. <input type="checkbox"/> Soil                           | 7. <input type="checkbox"/> On-farm transport             |  |
| 4. <input type="checkbox"/> Price of input materials       | 8. <input type="checkbox"/> Pestilent insects             |  |
|  | 11. <input type="checkbox"/> Other cultivation conditions |  |

## 2.4 Do you want to change your current cropping pattern?      1. ☐ Yes      2. ☐ No

If not, why?

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Unsuitable soil         | 3. <input type="checkbox"/> Don't want to change traditional farming |
| 2. <input type="checkbox"/> Inconvenient irrigation | 4. <input type="checkbox"/> Risks (unstable output of products)      |

If yes, what crops do you want to grow?

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. <input type="checkbox"/> ..... | 3. <input type="checkbox"/> ..... |
| 2. <input type="checkbox"/> ..... | 4. <input type="checkbox"/> ..... |

## 2.5 Please give your comments on current agricultural development comparing with the time of having no reservoir:

1. ☐ Increase a lot      3. ☐ Fairly      5. ☐ Decrease a lot  
☐ Increase      4. ☐ Decrease      6. ☐ No comment

### PART III. MANAGEMENT OF IRRIGATION WORKS

#### A. Annual financial contribution that your family has to pay

Details	Types of payment		
	Rice (Kg)	Cash	Labor
1. ISF			
2. Others			
Total			

#### B. Irrigation service fee (ISF)

##### 3.1 Your family's annual financial contribution to irrigation scheme

Details	Types of payment		
	Rice (Kg)	Cash	Labor
1. ISF			
2. On-farm fee			
3. Others			
Total			

3.2 Does your family pay all amount of ISF as requested? 1. ☐ Yes      2. ☐ No

If not, why .....

#### C. Operation

3.3 Do you participate in irrigation planning process? If yes, how are you involved?

.....

3.4 How do you get irrigation water?

- Self-doing: .....
- Cooperatives: .....
- Combination between the two ways above: .....

3.5 Time for taking water for your family in each season:

Spring crop \_\_\_\_\_ times, how many days per time? \_\_\_\_\_ days/time

Summer crop \_\_\_\_\_ times, how many days per time? \_\_\_\_\_ days/time

3.6 In your opinion, do water users conform to regulations/rules on water distribution and protection of irrigation works?

1. ☐ Very good      3. ☐ Not really good      5. ☐ No idea  
2. ☐ Good      4. ☐ Rarely

3.7 Are there any dispute(s) when getting water? 1. ☐ Yes      2. ☐ No

If yes, why .....

3.8 Who solve(s) that dispute(s)? 1. ☐ Famers      2. ☐ Cooperatives  
3. ☐ Commune authority      4. ☐ Other

**D. Maintenance** (weeding, canal dredging, canal maintenance, etc.)

3.9 Are you satisfied with structural conditions of irrigation works?

1. ☐ Very satisfied      3. ☐ Satisfied      5. ☐ No idea  
2. ☐ Satisfied a bit      4. ☐ Unsatisfied

3.10. Are you involved in planning process of yearly maintenance?

.....  
.....

3.11 When is maintenance taken place during the year?

.....  
.....

3.12 How is maintenance performed? Who direct(s) this task? Who perform(s) this task?

.....  
.....

3.13 Are annual O&M activities for whole scheme (main canals, secondary canals, tertiary ones, etc) good? If yes, at which point(s)? If no, at which point(s)? Why not good?

.....  
.....

3.14 What should be done to have better O&M / to overcome the above constraints?

.....  
.....

**E. Service quality**

3.15 Is irrigation water distributed timely?      1. ☐ Yes      2. ☐ No

if not, why? .....

3.16 Is amount of irrigation water sufficient?      1. ☐ Yes      2. ☐ No

if not, why? .....

3.17 Is irrigation water polluted?      1. ☐ Yes      2. ☐ No

if yes, why? .....

3.18 Are you satisfied with current O&M activities of irrigation works?

1. ☐ Quite pleasant      3. ☐ Pleasant      5. ☐ No idea  
2. ☐ Rather pleasant      4. ☐ Unpleasant

3. 19 Are you satisfied with the feedbacks of water management staff to requirement of water users?

1. ☐ Quite pleasant      3. ☐ Pleasant      5. ☐ No idea  
2. ☐ Rather pleasant      4. ☐ Not pleasant

3.20 Drought area in 2007

Spring crop: \_\_\_\_\_ sao, causes: \_\_\_\_\_

Summer crop: \_\_\_\_\_ sao, causes: \_\_\_\_\_

**E. Trainings**

3.21 Have you attended in any training courses on O&M, and FM (from 1994 until now) ?

1. ☐ Yes      2. ☐ No

1. If yes, please tell us about the training topics and how many times

Topic: .....time(s);

Topic: .....time(s);

2. Participating in workshops?      1. ☐ Yes      2. ☐ No

## PART IV. GENDER ISSUES

Who participates in following activities? (Mark a cross at (X) for your answer)

Activities	Male	Female	Both
1. <b>Household activities:</b> cooking, washing, children care, cleaning, etc.			
2. <b>Agricultural production:</b>			
- Seeding and planting, ploughing,			
- Getting water in the fields			
- Maintening canals			
- Spraying herbicides/ chemicals			
- Harvesting			
3. <b>Getting domestic water</b>			
4. <b>Sanitation</b>			
5. <b>Social activities:</b> meeting, training, field visits, etc.			
6. <b>Make decision in the family</b>			

## PART V. INCOME AND EXPENDITURE IN 2007

### 5.1. Income

Details	Amount (VND)
I. Agricultural production (planting, forest products)	
II. Animal husbandry	
III. Aquaculture	
IV. Minerals	
IV. Others (temporary jobs, small business....)	
<b>Total</b>	

### 5.2. Expenditure

Details	Amount (VND)
I. Food, clothes, medicine, electricity, water	
II. Children's studying	
III. Agriculture	
IV. Animal husbandry	
V. Aquaculture	
IV. Others (travelling, weddings, funerals, shopping)	
<b>Total</b>	

**Do you have any recommendations for the Agricultural Cooperatives to provide better services?**

.....



## Part VI. REPLACEMENT OF TYPES OF TRADITIONAL CROPS(\*)

6.1 At present, what crops are grown by you for your family's income? Fill in the below table with detailed information:

Current crops	Soil/land types	Area (sao )		Income per capita per sao? per season? (dong)	Where do you sell your products?	Who provide(s) technical supports?	Who provide(s) varieties/seeds?	Are they suitable with type of soil/land?	Are they suitable with local climate?	Is irrigation required?	Where are water sources from?	Is there any difficulty with current crops?
		Present	Planned									
Crop .....												
Crop .....												
Crop .....												

6.2 Do you plan to grow other crop(s) for increasing family's income? Why? Fill in the below table with detailed information:

Expected Plants	Soil/land types	Estimated area (sao)?	How much does it cost for growing on one sao?	Who provide(s) technical supports?	Who provide(s) varieties?	Where will you sell products?	Do you know numbers of households also plan to grow this type of crop?	Why do you plan to grow that plant?
Crop .....								
Crop .....								

(\*) Note: If the space in this page is not enough, please add in the other side of the page..

**Interviewee**

(Sign and write full name)

**Interviewer**

(Sign and write full name)

## DATA COLLECTION OF HOP TIEN COMMUNE

**Table 1. Population – Labor in 2007**

Hamlet	Number of household		Population		Number of labor		Labor structure (%)		
	Total	Ethnic group	Total	Male	Total	Male	Agro-forestry	Aquaculture	Other sectors
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

**Table 2. Education level of people living and working at the hamlet**

Hamlet	Graduate and/or Post graduate	College, Vocational high school	High school	Secondary school	Elementary school	Illiterates
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

**Table 3 : Socio-economics situation**

Hamlet	Income per capita (kg of rice/head)		Number of poor household (*)		Number of household having tractor	Number of household having grinder	Number of household having refrigerator	Number of HH having T.V	Number of HH having motorbike
	1999	2007	1999	2007	2007	2007	2007	2007	2007
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

(\*) Based on the criteria for poor households of Ministry of Labor, Invalids, and Social Affairs.

**Table 4. Infrastructure Cơ sở hạ tầng**

Hamlet	Number of household using electricity	Number of household having built house	Number of household having telephone	Number of household using domestic water from sources:			
				Pipe	Well	Pond	Reservoir
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							

- Length of concrete roads (km):

- Number of schools :
- Canals::
- Number of clinic stations:

**Table 5. Land use in last years**

Or.	Type of land	1999	2000	2007
	GROSS AREA			
I	AGRICULTURAL LAND			
1.1	Agriculture production land			
1.1.1	Annual plants land			
1.1.1.1	Rice land			
1.1.1.2	Grass land for breeding			
1.1.1.3	Other annual plant land			
1.1.2	Perennial plant land			
1.2	Forestry land			
1.3	Aquaculture land			
1.4	Other purposes			
II	NON-AGRICULTURAL LAND			
2.1	Housing land			
2.2	Specialized land			
2.3	Other non-agricultural land			
III	UNUSED LAND			

**Table 6. Agricultural production – Area of some main crop plants (ha)**

Item	Cultivation area (ha) (**)					Irrigated area (ha)(*)				
	1999	2000	2005	2006	2007	1999	2000	2005	2006	2007
Winter-spring rice crop										
Summer-autumn rice crop										
Maize										
Tea										
Fruit trees										
Total										

(\*) Irrigated area from Cap Ke reservoir

(\*\*) Note: If cultivated area is different with irrigated area, what are the reasons?

.....

.....

**Table 7. Yield of some main crops (100 kg/ha)**

Item	Average yield					Yield on irrigated area				
	1999	2000	2005	2006	2007	1999	2000	2005	2006	2007
Winter-spring rice										
Summer-autumn rice										
Maize										
...										
Tea										
Fruit tress										
Total										

**Table 8. Aquaculture - Area (ha)**

Item	1999	2000	2005	2006	2007
Within reservoir surface					
Lake/pond					
Total					

**Table 9 : Aquaculture – Production (100 kg) (Tạ)**

Item	1999	2000	2005	2006	2007
Within reservoir surface					
Lake/pond					
Total					

**Table 10. Husbandry**Unit : *Animal*

Item	2005	2006	2007
Buffalo			
Cow/ox			
Pig			
Poultry			
...			

If collecting data on agricultural production of the 5 hamlets/villages irrigated from Cap Ke reservoir, table 6 and 7 must be used again.

**Hamlet 1 .....**

**Table 6. Agricultural production – Area of some main crops (ha)**

Item	Cultivation area (ha)(**)					Irrigated area (ha)(*)				
	1999	2000	2005	2006	2007	1999	2000	2005	2006	2007
Winter-spring rice crop										
Summer-autumn rice crop										
Maize										
...										
Tea										
Fruit trees										
Total										

(\*) *Irrigated area from Cap Ke reservoir*

(\*\*) *Note: If cultivated area is different with irrigated area, what are the reasons?*

.....

.....

**Table 7. Yield of some main crops (100 kg/ha)**

Item	Average yield					Yield on irrigated area				
	1999	2000	2005	2006	2007	1999	2000	2005	2006	2007
Winter-spring rice										
Summer-autumn rice										
Maize										
...										
Tea										
Fruit tress										
Total										

## Annex 4. WATER QUALITY STANDARDS of VIET NAM - TCVN 5942 - 1995

No.	Parameter	Unit	Allowable value	
			Class A	Class B
1	pH	-	6 to 8,5	5,5 to 9
2	BOD5 (20oC)	mg/l	< 4	< 25
3	COD	mg/l	>10	>35
4	Dissolved Oxygen	mg/l	$\geq 6$	$\geq 2$
5	Total suspended solid	mg/l	20	80
6	Arsenic	mg/l	0,05	0,1
7	Bari	mg/l	1	4
8	Cadmium	mg/l	0,01	0,02
9	Lead	mg/l	0,05	0,1
10	Chromium (VI)	mg/l	0,05	0,05
11	Chromium (III)	mg/l	0,1	1
12	Copper	mg/l	0,1	1
13	Zinc	mg/l	1	2
14	Manganese	mg/l	0,1	0,8
15	Nickel	mg/l	0,1	1
16	Iron	mg/l	1	2
17	Mercury	mg/l	0,001	0,002
18	Tin	mg/l	1	2
19	Ammonia	mg/l	0,05	1
20	Fluoride	mg/l	1	1,5
21	Nitrate	mg/l	10	15
22	Nitrite	mg/l	0,01	0,05
23	Cyanide	mg/l	0,01	0,05
24	Phenol (total)	mg/l	0,001	0,02
25	Lubricants, greases	mg/l	no	0,3
26	Detergents	mg/l	0,5	0,5
27	Coliform	MPN/100ml	5000	10000
28	Total pesticides (excluding DDT)	mg/l	0,15	0,15
29	DDT	mg/l	0,01	0,01
30	Total alpha unit of activity ( $\alpha$ )	Bq/l	0,1	0,1
31	Total beta unit of activity $\beta$	Bq/l	1,0	1,0

*Note: Class A is used for domestic water uses after having a treatment as regulated  
Class B is used for other purposes*



## **Annex 5. GUIDELINE ON IMPLEMENTATION OF PARTICIPATORY IRRIGATION MANAGEMENT**

**(PIM)**

### **PART I**

#### **INTRODUCTION OF PARTICIPATORY IRRIGATION MANAGEMENT (PIM)**

This part is organized with 3 main contents: (1) PIM concept, (2) Some essential conditions to ensure PIM sustainability, (3) Key principles of PIM

#### **I. PIM CONCEPT**

PIM definition (a shortly written form of Participatory Irrigation Management) has been introduced into Vietnam for round 10 years. PIM represents the participation of farmers in all aspects and tiers in irrigation management. Such aspects include planning, designing, constructing, O&M, financing, and related policies. Such tiers are on-farm canals, tertiary canal, secondary canal, main canal, scheme, and sector.

The above concept implies the ideality with largest participation. Nonetheless, the participation depends on factors like national development, people awareness, even actual condition of different areas. As such, to apply PIM into irrigation management, the most importance is to base on specific conditions at local, governmental policy framework, authority awareness to draw out proper orientation.

#### **II. SOME ESSENTIAL CONDITIONS TO ENSURE PIM SUSTAINABILITY<sup>1</sup>**

1. Suitable and effective policies that are timely promulgated;
2. Consideration of local government, sector leaders for PIM implementation at local level;
3. Roles of key staff and their correct understanding about PIM;
4. Roles of IDMC in forms of water user cooperatives under their control;
5. Clearly understanding the benefit of monitoring and evaluation generally and in PIM particular as well as technical requirements for PIM monitoring and evaluation taken in Vietnam at present.
6. Capacity of monitoring and evaluation at grass-root level;
7. Fundamental budget paid for cost of training, guidance, and implementation of monitoring and evaluation.

#### **III. KEY PRINCIPLES OF PIM**

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<sup>1</sup> For reference, please see report “Research result, evaluation PIM models available in Vietnam” of CTSWRD-PIM and Oxfam (GB), Hanoi, July 2005.

There are 4 principles applied in PIM development process.

### **1. Participation**

The rights of knowing, discussing, showing viewpoints, participating in decision-making, and monitoring process must be ensured for stakeholders in project activities. Stakeholders are provincial Department of Agriculture & Rural Development, Project management Unit (if any), IDMC, village/commune authorities, and WUs.

Stakeholders are included in process of actual state evaluation, demand specification, appropriate solution suggestion and selection, WUO development, and monitoring & evaluation of WUO activities.

Such forms as conferences, interviews, and weekly news at villages, communes are mainly used in this principle.

Participatory levels of beneficiaries:

1. Information sharing: use simple and effective means of communication at local regions to communicate via conferences, meetings.
2. Reference: gather viewpoints from meetings, fieldtrips...
3. Evaluating: level of participation and benefit
4. Together planning identifying roles in conferences/ meetings; solutions for contradiction/disputes/conflicts and difficulties, agreement, review all process are initiated via meetings.
5. Cooperation: build the connection between stakeholders, draw out principles of all sides for cooperation in implementation.
6. Empowerment: improve capacity of WUOs, transfer and manage it self, stakeholders facilitate new WUOs.

### **2. Democracy**

Responsibilities of stakeholders are clearly defined in process of WUO development.

- Authority: plays as state governance agency to orient, monitor, and evaluate the process of WUO development and operation, guide on legal documents when required.
- Water user: their tasks are to manage and operate on-farm works system, directly participate in WUO and in decision-making process related to O&M operation.
- IDMC: is responsible for assessing demand, providing suitable training and technical monitoring, and ensuring the quality of services to WUO.

### **3. Transparency**

- Process of capacity building and development of WUO should be understood clearly by stakeholders. They have chances to participate in discussion at conferences, meetings, surveys, and mass media to maximize participation of stakeholders, especially WUs.
- Meetings' results are announced and broadcasted via mass media.

- Basic financial information of IDMC/ WUO should be shared at acceptable level with purpose of providing WUs the IDMC/WUO income and expense data, gradually to improve WUs awareness in water use.
- Interaction/relations between service supplier and WUs about service quality and solutions is increased to advance I&D management.

#### **4. Sustainability**

A WUO is sustainable only when its activity does not depend on external financial support. This can only be achieved when:

- Users really comprehend their values and benefits in that organization;
- Users really comprehend the necessity of cooperation in water distribution;
- Users themselves decide types of WUO in accordance with local situation and particularities.
- Ways of organization should be easy to apply, and minimize cost for users.
- It is necessary for local authorities to monitor and facilitate process of WUO founding and developing, at least within 3-6 years after starting operation.
- IDMC is responsible for technical monitoring, providing sufficient O&M training periodically, at least within 3 years after starting operation.

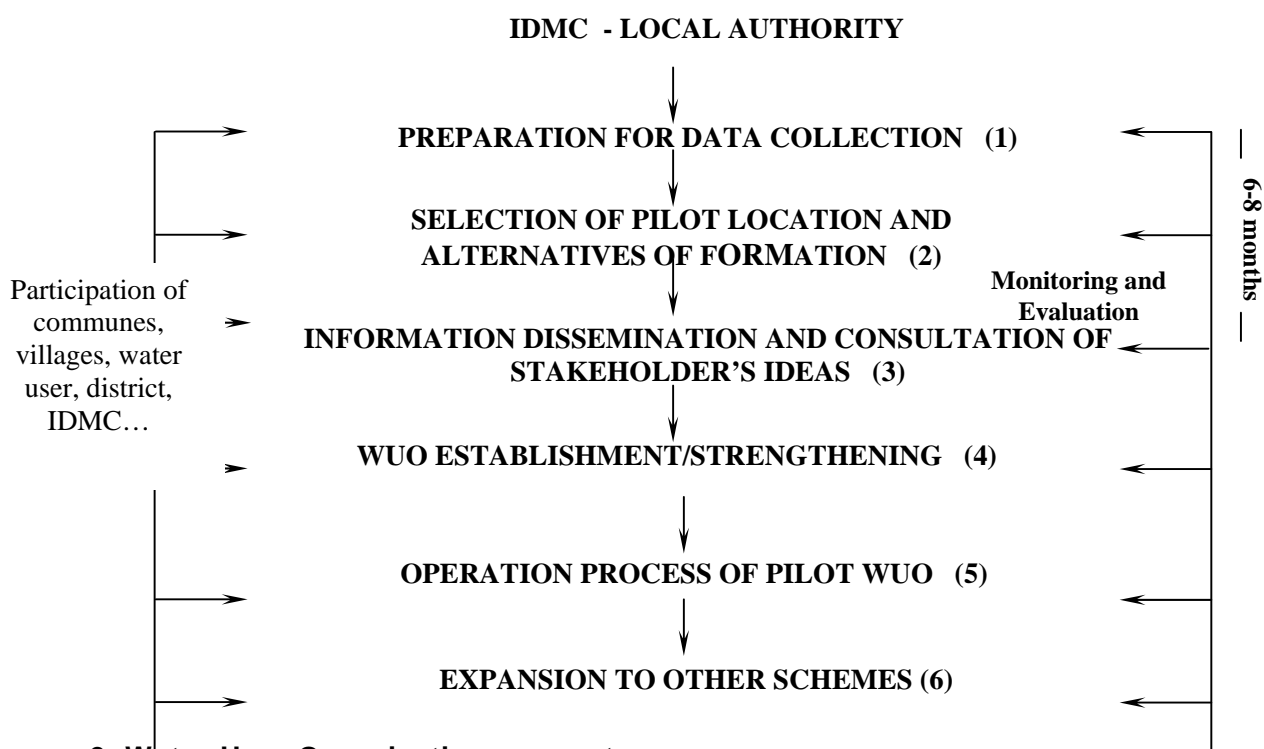
## PART II

### INTRODUCTION OF ESTABLISHMENT AND STRENGTHENING WATER USER ORGANIZATION (WUO)

This part is organized with 2 main contents: (1) General regulations to WUO, (2) Stages of WUO establishment/strengthening with 4 stages included.

#### I. GENERAL REGULATIONS OF WUO

##### 1. General process :



##### 2. Water User Organization concept

WUO as the cooperation from water users benefited from irrigation systems is responsible for exploitation and protection of irrigation scheme serving for production, domestic use in a specific area.

##### 3. Objectives of establishment/strengthening and development of WUO are to<sup>3</sup>:

- Ensure irrigation schemes, especially at commune, village level to be fully managed, maintained and repaired aiming to protect and have good efficiencies of irrigation schemes.
- Ensure the consistent closed management; well operate “a bridge function” between States owned enterprises operating and exploiting

<sup>2</sup> Ordinance on Exploitation and Protection of Hydraulic works

<sup>3</sup> Circular 75/2004/TT-BNN

irrigation systems or IDMCs and related services to assist farmers in using efficiently water.

#### **4. Principles of organization<sup>3</sup>**

- Works, irrigation systems serving within a village, commune or inter-commune shall be managed by an organization.
- WUO is established on the basis of volunteer and mutual benefit; formation procedures, organizational mechanism, management and operation of WUO shall follow the existing laws and charter, regulations of this organization.
- Farmers who use water for irrigation or drainage from different irrigation schemes at the same time should have a right to participate in various WUOs
- The management and operation by WUO shall ensure the systematic characteristics of irrigation schemes, not depend on administrative boundaries, WUOs should be under the state management of local authorities, the technical management and guide of specialized agencies (District's Department of Agriculture and Rural Development, IDMCs). Scale and form of WUO shall be diversified and suitable with specific situation of structures, management level, and farmer's knowledge and satisfy requirements of local people.
- For the existing WUOs, it is necessary to consider in detail each WUO for strengthening and development plan on the basis of the existing organizations. This is to facilitate the operation and improve the effectiveness of these WUOs.
- WUOs shall operate under regulations or charter approved by their congress or meeting; financial management shall be based on the autonomous, democratic and transparent principles in accordance with the current regulations of the financial sector. WUOs shall be authorized fully legal eligibility, have their own bank account and office.
- In addition to irrigation and drainage services, WUOs shall be entitled to carry out other services under the regulation of existing laws.

#### **5. Scale and form of the organization<sup>3</sup>**

##### ***a. WUOs managing independent irrigation schemes***

- For irrigation schemes serving a village, inter-village, commune and inter-commune (outside irrigation systems managed by IDMCs), it is required to establish an organization responsible for management, operation irrigation schemes according to appropriate forms.
- For WUOs managing a village or inter-village scale irrigation schemes, their regulation or charter for WUOs' operations shall be approved by Chairman of Commune People's Committee (CPC). For WUOs managing commune or inter-commune scale irrigation schemes, their regulation or

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<sup>3</sup> Circular 75/2004/TT-BNN

charter for operations shall be approved by Chairman of District's People Committee (DPC).

- In case of WUOs are water management groups under Agricultural Cooperative, its organization, functions, tasks, charter shall be stipulated by Cooperative's charter in accordance with the Law on Cooperatives.

***b. WUOs managing structures in irrigation schemes managed by IDMCs***

- For small-scale or less complicated structures serving for a small area in irrigation systems managed by IDMCs, the management of these structures shall be decentralized to WUOs based on specific situations in each locality.
  - Scale and organization form of these WUOs shall be stipulated in detail as the following:
    - + For structures, canals serving within a village, inter-villages or commune, these shall be managed by WUOs established in respective scales (according to administrative boundaries) or by a form of water management group under Agricultural Cooperative.
    - + For structure, canals serving for more 2 communes, these shall be managed by WUOs established at inter-commune canal scale without following the administrative boundaries. The most suitable organization form in this case is Water User Cooperative or Water User Association.
- The Chairman of DPC shall decide these WUOs and approve their regulations or charter.

**6. Activities of the WUO**

- WUO management activities
- Operational activities to ensure water distributed timely and in equality between water-users to have sustainable and effective irrigation schemes' performance.
- Maintenance activities of irrigation drainage structures to keep operation process as original design.
- Additional activities relating to beneficiaries' production and life.

**II. STAGES AND ACTIVITIES OF WUO ESTABLISHMENT/ STRENGTHENING**

To establish/strengthen a WUO the following 4 stages must be entirely put into practice. Followings are detailed contents of implementing stages:

**1. Stage 1: Need assessment**

This stage consists of 3 activities: (1) Data collection; (2) Assessment of situation and needs for a WUO; (3) Reporting.

***1. 1. Data collection***

This activity helps to make a systematic examination in local-level with aspects of organization, maintenance, irrigation and drainage management and an evaluation of its weakness and strengths as result.

Following factors must be concerned in evaluation process.

Data collection activity includes desk study and on-field assessment:

*\* Desk study :*

- Collect data and research document, decisions issued by the provincial and district offices and related to irrigation management;
- Investigate and assess decentralized administration of irrigation company/irrigation enterprise;
- Learn about relationship between irrigation management company and irrigation management organization at local level (documents of contract, acceptance, training, etc.)
- Collect overall data of currently applied model of irrigation management at local level ( scale, managerial extent and type, framework of organization, quantity);
- Assess the present status by using questionnaires or holding village meeting
- Analyze and assess participatory irrigation management based on collected data and information.

*\* On-field assessment:*

- Select location for on-field assessment.

## **1. 2. Assessment of existing situation and needs for WUO**

There are various measures for assessment, such as questionnaire, village meeting. Different measure has different advantages. With questionnaire, assessment can be widely done, but accuracy of assessment depends on interviewees and their cooperation. Village meeting help to get multi-aspect information which is discussed and agreed in the meeting, information, thus is found more diversity and accuracy.

**\* Assessment of existing situation and needs**

To establish/strengthen WUO must be based on analysis of strength, weakness collected from on-field assessment, in actual irrigation management of water user groups. Assessment of existing situation can be implemented by using the following ways:

**• Select some representative villages to hold meeting**

The representative here is referred to irrigation system. Select one canal typical for the system (with medium irrigation scale and having common features of the system), after that select 3 villages located at the head, middle, and tail of the canal to organize meeting.

**a. Purpose:**

To discuss on relationship between irrigation team, IDMC, local authority as well as issues related to farmers' irrigation and drainage.

**b. Content:**

- Operation of irrigation and drainage system

- Maintenance and repair
  - Records and financial management
  - Cropping seasons.
- c. **Members:** about 35 representatives from IDMC, hamlet, commune officers in charge of irrigation and transportation, village leaders, party committee secretary, village irrigation team, women union, extension unit, water user group;
- d. **Time:** 1 day
- e. **Methodology:** open discussion and consensus creation.
- f. **Expected outputs:**  
Consensus on discussion results

- **Select some villages to interview with questionnaire:** *Number of interviewees is limited*

*After getting information collected by using 1 of the 2 above-mentioned methods, prepare report on assessment of existing situation of irrigation management at local level, which consists of:*

- Purpose of assessment of existing situation ;
- Time and locations of meeting/interviews to be organized;
- Existing situation of irrigation management at local level;
- Strengths, weaknesses and causes of these weaknesses;
- What are solutions for overcoming these weaknesses? (*strengthen capacity or establish new WUO*);
- Schedule, content, purpose, and participants of the next meeting which will be held for considering and approving alternative of WUO establishment/strengthening.

### **1.3. Reporting**

Completion report will be delivered to leaders of village, commune, company, village cluster, and district (vice-chairman in charge of agriculture) for their feedback on assessment of existing situation of irrigation management as well as solutions for weakness (if available). This will be done before the meeting for stakeholders' agreement.

## **2. Stage 2: Establishment/strengthening and development of WUO**

This stage consists of 8 steps as follows: (1) Hold the meetings for discussion on alternative for WUO establishment and strengthening, (2) Hold the meetings for discussion and decision about location selection for pilot WUO, (3) Carry out field survey in the selected location, (4) Formulate and implement propagation campaign, (5) Hold inter-village meetings, (6) Hold village meetings, (7) Establish Water user association, WUO Founder Board



and hold member conference, (8) Prepare documents of irrigation management transfer for WUO. WUO Establishment is implemented through 8 steps, the step 2,3,4,7 are not necessarily carried out to WUO strengthening.

According Circular 75/2004/TT-BNN and Decree 151/2007/NĐ-CP, for WUO within village, inter-village it is not necessary to have a stamp; all transactions will be implemented by representative of WUO and certified by CPC. For WUO within commune, inter-commune it is not necessary to have a stamp; all transactions will be implemented by representative of WUO and certified by DPC.

Contents of these activities are concretized as follows:

### ***2.1. Hold the meetings for discussion on alternative of WUO establishment/strengthening***

#### ***a. Purpose:***

- To consent to assessment on results, strengths, weakness that need to be overcome and requirements for improvement;
- To make agreement and commitment among stakeholders on decided alternative for WUO.

#### ***b. Content:***

- Summarization of the existing model;
- Strengths/weaknesses of the existing WUO and demand of the water users;
- Reasons for WUO establishment/strengthening in current situations;
- Advantages, constraints in implementation of each alternative in current conditions;
- Challenges and benefits of water users to each alternative;

#### ***c. Participants:*** about 30 representatives from: DARD, (Vice-director, PIU), DPC (Vice chairman in charge of agriculture), staff of agriculture division, legislation division), IDMC (company's leaders, leader of water management division, head of irrigation station/cluster related), communes (leaders in charge of agriculture, staff in charge of irrigation and transportation, party committee secretary, farmer association leader, women union leader), villages (leader, party committee secretary, head of irrigation team), provincial consultant.

#### ***d. Time frame:*** 1 day

#### ***e. Responsibility:*** provincial consultant (PIM consultant).

#### ***f. Methodology:*** open discussion and consensus creation.

#### ***g. Expected outputs:***

Consensus in assessment results, selection of alternative for improvement.

## **2.2. Hold the meeting for discussion and decision about location selection of pilot WUO**

### **a. Purpose:**

- Ensure that provincial and district authorities understand the purpose, conception, and process of pilot WUO establishment/strengthening and monitoring.
- Mobilize provincial assistance for pilot WUO establishment, strengthening and monitoring.

### **b. Content :**

- Introduction of methodology; purpose of pilot WUO establishment/strengthening
- Results of the previous meeting;
- Discussion about organizational structure propose of pilot WUO and the steps of pilot WUO establishment.
- Creation of an initial discussion about legal document applied in the province that are necessitated for establishing a pilot WUO and transferring irrigation schemes to it.

### **c. Participants:** about 15 representatives from PPC Vice chairman, DARD, DPC, IDMC, commune leaders of the area having pumping station selected, provincial consultant.

### **d. Time frame:** 1/2 day

### **e. Responsibility:** provincial consultant (PIM consultants)

### **f. Methodology:** open discussion

### **g. Expected outputs:**

- Achieved consensus among representatives in the selection of pilot WUO
- Possibility of assistance from the province for establishing and monitoring pilot WUO.

## **2.3. Hold on-site survey to the select location for WUO establishment**

### **a. Purpose:**

Identify strengths/weaknesses of the WUGs during O&M

### **b. Content :**

- Basically, carrying out survey canal system using questionnaires applied in data collection stage for diagnosing participation/how participatory
- Describing actual M&O given to the secondary, tertiary canals managed by village WUs.

### **c. Participants:** Commune leaders, staff in charge of transportation and irrigation, heads of village, member of irrigation team, farmer's representative.

### **d. Time frame:** 1 day

### **e. Responsibility:** provincial consultants (consultants of PIM and O&M)

### **f. Methodology:**

Taken pictures and collected information will be structured in table to be used in the next meetings (*special attention to M&O of the head, middle and tail of canals*).

**g. Expected outputs:**

- Supplemented actual information/data on canal management;
- Consolidated stockholders' consensus of cooperation necessitated in M &O of irrigation schemes.

**2.4. Formulate and implement information dissemination campaign**

**a. Purpose:**

- Increase awareness of local people about pilot WUO establishment.
- Mobilize, as much as possible, local people's concerns and assistance for participation in the process.

**b. Content:**

- Formulating an implementation plan for information dissemination campaign of WUO
- Carrying out that plan.

**c. Participants:** Household representatives in the selected area.

**d. Time frame:** to closing day of the program

**e. Responsibility:** provincial consultants (PIM consultant) with assistance of leaders of village cluster, commune/villages.

**f. Methodology:**

Compiling news letters and broadcasting on the proposed activities of WUO establishment. The contents should be succinct (1-2 A4 pages) and broadcasted twice week during the program implementation. This news letters have to be updated at every completion of every step in WUO establishment process (for instant, after each meeting, achieved outputs and agreed plan for next activities will be informed)

**g. Expected outputs:**

- By media, local community in the selected area is entirely informed about process of pilot WUO establishment.
- Local people and authority are gradually created with awareness and concern as well as ability for monitoring the process of pilot WUO establishment

**2.5. Hold inter-village meetings**

**a. Purpose: share information about WUO among commune leaders and representatives of the village organizations.**

**b. Content:**

Information to be shared:

- Typical organization structure of WUO
- Benefit and contribution rate of WUs when involving in WUO
- Principles of WUO establishment and development
- Analysis of WUO establishment alternatives by village boundary
- Data of the secondary canal
- Suggestion on election principles, duties of the foundation board.
- Plan set for the coming time.

**c. Participants:** Commune leader in charge of irrigation, commune officer in charge of irrigation and transportation, heads and secretaries of villages, representatives of women union, farmer association, irrigation team, and military and civil administrative unit.

**d. Time frame:** 1/2 days

**e. Responsibility:** Provincial consultants (PIM) with assistance of leaders of village cluster, commune/village.

**f. Methodology:**

Posters are used to present and illustrate every step, after that open discussion is practiced for getting representative's ideas and consensus.

**g. Expected outputs:**

- Clear understanding of the principles of WUO establishment/strengthening
- Clear understanding of the alternative decided for establishing/strengthen WUO of the selected canal system.
- Agreement on the plan for election of WUO council members.

## **2.6. Hold the village meetings**

**a. Purpose:** Share information about WUO to local people and elect village representatives of water user association.

**b. Content:** Information to be shared:

- Outputs of the previous meetings
- Benefit and challenge of the WUs
- Alternatives for WUO establishment/consolidation
- Principles for WUO establishment/consolidation and development
- Duty, function of WU association
- Plan set for the coming time.

**c. Participants:** about 35-40 persons, they are heads, deputy head and secretary of villages, representatives of woman union, farmer association, irrigation team, administrative unit, WU association, managers in charge of canals of cluster/irrigation station, canal system, and provincial consultants.

**d. Time frame:** 1/2 days

**e. Responsibility:** Provincial consultants (PIM) with assistance of leaders of village cluster, commune/village.

f. Methodology:

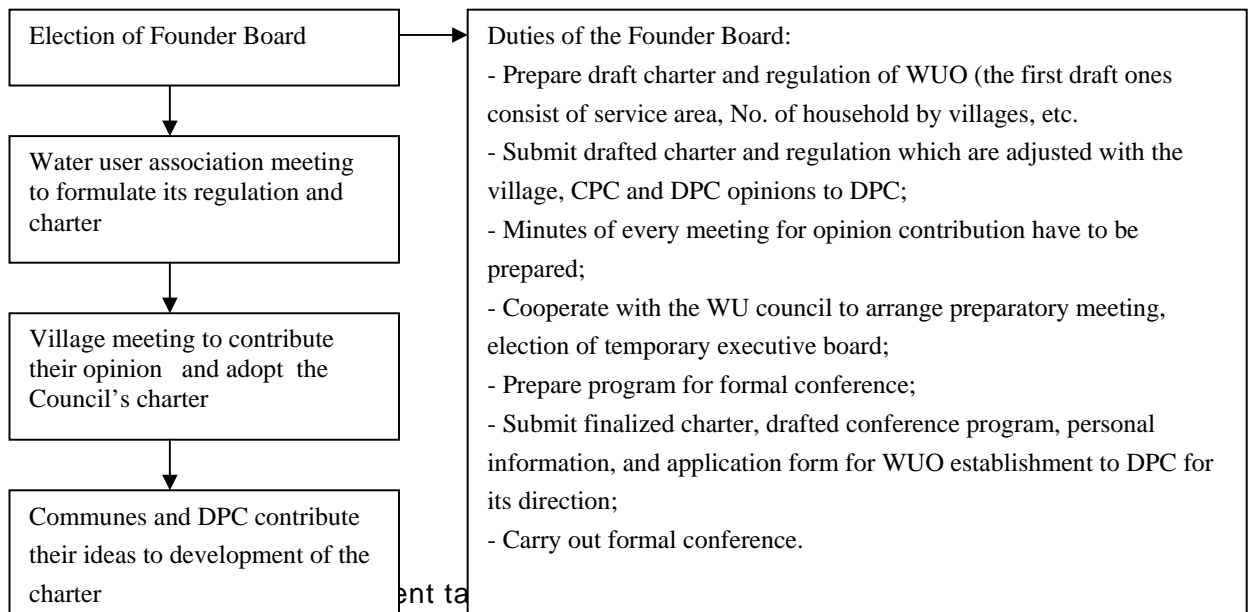
Posters are used to present and illustrate every step, after that open discussion is practiced for getting representative's ideas and consensus.

g. *Expected outputs:* Representatives actively support WUO establishment/consolidation and development

## **2.7. Establish Water user association and WUO Founder Board and hold meetings**

### **a. Water user association and WUO Founder Board**

In village meetings, Water user association is established. The council will elect Founder Board.



*\* It should be noted that after approved by DPC, the charter could be changed to be suitable with actual operations of WUO, but these changes have to follow the process of being consulted and adopted by the villages and WU association.*

### **b. Formal meeting**

Document to be prepared:

- Conference agenda,
- Charter of WUO
- Minute of preparatory meeting;
- Lists of WU council memberships and members of WUO management board;
- Submission letter to be submitted to DPC
- Resolution of the meeting

- c. *After formal meeting finished*, based on the minute and resolution of the meeting, DPC will issue a decision to approve WUO and official letter to guide communes in cooperation with WUO.

## **2.8. Formulate official documents for irrigation management right transfer to WUO**

★ **Principles:** The development of official documents for transferring management right of canal system or small-scale pump station to WUO will be implemented after WUO was officially established; this process possibly needs from 6 months to 1 year for completion and follows the principles of agreement between WUO and Irrigation Management Company.

This transfer will consist of responsibilities, obligations and interests of two parties of service provider and user.

### **a. Purpose:**

An official document for transferring management right of irrigation works is prepared to hand over the State management from Irrigation Management Company to WUO.

### **b. Content:**

- Identify the company's responsibilities for transfer process
  - Identify the WUO's responsibilities for transfer process and use of facilities/works in canal system.
  - Develop map (or layouts) of canal system, facilities available in canal system, this task is done in refer to the administrative boundaries of villages, communes irrigated by the canal system to be transferred.
  - List facilities in the canal system, which are registered with legal authorization, location, status and value of these facilities.
- + All parties' signatures of Company, communes, and WUO with DPC's witness.

### **c. Time frame:** at least from 6 months to 1 year

### **d. Participants :** Irrigation Company and WUO

### **e. Responsibility:** provincial consultant team, company, and DPC.

### **f. Outputs:**

The management right transfer is agreed and consensus in a written official documents by irrigation management company, WUO, related communes and these documents are certified by DPC.

## **3. Stage 3: Technical assistance**

This stage is practiced in both cases of WUO establishment and strengthening. It provides WUO with the skills of (1) WUO management

activities; (2) Irrigation management (3) Financial management; and (4) Monitoring and evaluation.

**3.1. WUO management activities**

- Work out the operation activities for each season, each year;
- Formulate the plans for water use and distribution by season and year;
- Evaluate WUO activities by season and year.

**3. 2. Irrigation management activities**

- Repair, maintain, and upgrade the scheme,
- Operate and distribute water,
- Examine environment inside and surround irrigation scheme.

**3. 3. Financial management activities**

- Financial transparency must be regularly carried out and written in the charter, regulation. Transparency of financial issues is not only to ensure budget for O&M but also to create confidence of WUs and favorable conditions for irrigation fee.
- Financial management
  - Inform irrigation fee calculated for every crop and collection plan,
  - Administer irrigation fee, revenue-expenditure of every activity.
  - State transparent financial issues of every crop (revenue, expenditure, etc.),
  - Mobilize capital and labor contribution.

➤ **Discussion on rate of irrigation fee:**

*a. Purpose:*

To provide for WUs what irrigation fee collection is used for, then farmers will be voluntary in contributing irrigation fee and monitoring financial activities.

*b. Content*

- Prepare expenditure plan based on the needs of repair, upgrading, O&M and on available data of the previous year expenditures.
- Calculate distribution rate and type.

*c. Participants:*

- Those persons participating in the irrigation system survey;
  - If number of WUs is from 30-40 persons, all of them are invited in discussion (at least, 1/3 are women);
  - If the number is more than 40 persons, representatives of every irrigation area are invited (at least, 1/3 are women);
- Way of discussion: all of given ideas are noted in the white board for discussion and vote.

For example: result of discussion on expenditures

*d. Timeframe: ½ day*

*e. Responsibility: consultant team, WUO*

*f. Expected outputs:*

- Agreement about necessary expenses;

- Decision of distribution rate per irrigated sao or hectare

#### **4. Stage 4: Monitoring, evaluation and adjust of activities**

This stage needs to be implemented when WUO has been operating for 1 main irrigation crop, at least. Evaluation is carried out to consider whether WUO's operation has met its goal or not and to adjust unsuitable things if any. Main activities of this stage are (1) Monitoring activities of WUO, (2) evaluation, and (3) Discussion and adjustment.

##### **4. 1. Monitoring of WUO's activities**

Monitoring activities of WUO consists of :

- Monitoring irrigation system operation and irrigation water distribution to the fields;
- Monitoring scheme maintenance and repair;
- Monitoring revenue, expenditure, and financial management
- Additionally, the Management Board is able to decide extra monitoring on any activities, if necessary

##### **4.2 Evaluation of WUO's activities**

- Implementation of seasonal/yearly plan;
- Activities of maintenance and repair. Technical status of facilities in irrigation system;
- Operation for water distribution in irrigation system and every household's irrigated area;
- Revenue, expenditure and financial management;
- Water source, environment, and social concerns;
- Activities of WUO management;
- Role of local people when participating in activities
- Role of local government when functioning its state management and intervention;
- Main constraints in term of organization, institution, policy, right and obligation of participating people.

##### **4.3 Discussion for adjustment**

Meeting to report on results of evaluation of WUO's activities (based on contents to decide member of the meeting).



# STAGES AND CONTENTS OF WUO ESTABLISHMENT/ STRENGTHENING

<b>WUO ESTABLISHMENT</b>	<b>WUO STRENGTHENING</b>
<b>Stage 1: Need assessment</b>	<b>Stage 1: Need assessment</b>
1. Data collection	1. Data collection
2. Assessment of existing situation and needs for a new WUO	2. Assessment of existing situation and needs for a new WUO
3. Reporting	3. Reporting
<b>Stage 2: Establishment/strengthening and development of WUO</b>	<b>Stage 2: Establishment/strengthening and development of WUO</b>
1. Hold the meetings for discussion on type of WUO establishment/ strengthening	1. Hold the meetings for discussion on type of WUO establishment/ strengthening
2. Hold the meeting for discussion and decision about selected location for pilot WUO	2. Hold inter-village meetings
3. Hold on-site survey to the select location for WUO establishment	3. Hold the village meetings
4. Formulate and implement information and dissemination campaign	4. Formulate official documents for transferring the management right of irrigation structures to WUO
5. Hold inter-village meetings	<b>Stage 3: Technical assistance</b>
6. Hold the village meetings	1. WUO management activities
7. Establish Water user association and WUO Founder Board and hold	2. Irrigation management activities
8. Formulate official documents for transferring the management right of irrigation structures to WUO	3. Financial management activities
<b>Stage 3: Technical assistance</b>	<b>Stage 4: Monitoring, evaluation and adjustment of activities</b>
1. WUO management activities	1. Monitoring of WUO's activities
2. Irrigation management activities	2. Evaluation of WUO's activities
3. Financial management activities	3. Discussion for adjustment
<b>Stage 4: Monitoring, evaluation and adjustment of activities</b>	
1. Monitoring of WUO's activities	
2. Evaluation of WUO's activities	
3. Discussion for adjustment	

## **Annex 6.**

### **MINUTES OF WORKSHOP ON REPORTING OUTPUTS OF A CASE STUDY ON**

#### **Impact of Participatory Irrigation Management (PIM) on Local Communities and Environment in Hop Tien Commune, Dong Hy District, Thai Nguyen Province**

- 1. Date:** 24 May 2008
- 2. Venue:** Dong Hy District People Committee, Dong Hy District, Thai Nguyen Province
- 3. Objectives of the workshop:**
  - To report results of the case study carried out in Hop Tien Commune, Dong Hy District, Thai Nguyen Province, Vietnam.
  - To exchange and share experience and obtain comments and contributions from participants to finalise the draft final report.
- 4. Participants:** (see the list of participants below)
  - Department of Water Resources (MARD/DWR), Thai Nguyen DARD, Thai Nguyen Irrigation and Drainage Management Company (IDMC), Dong Hy District People Committee (DPC), Hop Tien Communal People Committee (CPC), Hop Tien Communal Farmer Association, Cap Ke Water User Organisation (WUO), Hop Tien Communal Woman Union (List of participants is attached below) and the study team.
- 5. Contents:**

Following issues were presented and discussed at the workshop:

  - Reporting results of the case study:
    - General introduction
      - Purposes of the case study
      - General information of the studied area and specifications of Cap Ke dam, Cap Ke Reservoir, and canal system.
      - Management of the Cap Ke Reservoir and canal system
    - Studied approach:
      - Participatory Diagnostic Survey method (PDS)
      - Participatory Rural Appraisal (PRA)
    - Socio-economic situation:
      - Demography
      - Education
      - Public health
      - Labour and jobs
      - Revenues

- Expenditures
  - Housing and assets
  - Agricultural production
- Assessment of water resources
- Impacts on environment
- Crop diversification
- Impact of forest
- PIM issues
  - PIM development in Vietnam
  - PIM development in Hop Tien Commune
- Recommendations of stakeholders and the study team

## **6. Agreements and recommendations:**

- Participants have agreed that the studied results have truly reflected socio-economic situation and irrigation management of the studied area.
- The supports for improving irrigation management and structures of the Cap Ke Scheme are very necessary and strengthening capacity of the Hop Tien WUO is needed.
- The case study assessed a small scheme as Cap Ke helps MARD/DWR in formulating policies on irrigation management transfer and water services fee at macro level.
- MARD/DWR will create favourable conditions for Hop Tien Commune to solve problems in irrigation management meeting demands of agricultural production.
- Participants have agreed that recommendations and proposals made by the study team are appropriate and technically feasible and suitable with directions of local authority.
- Thai Nguyen DARD and Dong Hy DPC have supported the improvement of Cap Ke Scheme. Participants were informed that the intake of the Cap Ke Scheme will be rebuilt in June 2008 by local fund.
- Thai Nguyen IDMC will actively cooperate with relevant agencies studying proposals made by the study team in more details to maximise irrigated area of Hop Tien Commune.
- By the end of 2008, Thai Nguyen IDMC will consider delegating the management of Cap Ke Reservoir to Cap Ke WUO as recommended by the study team.
- Dong Hy DPC and Hop Tien CPC would like to request IUCN providing funds to heighten the spillway and dam up to 0.5 m to increase irrigated area and line 800 m of canal at the tail section to Cao Phong (from Mr. Hong's house to Cau Go area of Cao Phong – N1 Canal)
- Dong Hy DPC and Hop Tien CPC will jointly prepare an official letter stating their concerns and recommended follow-up actions to send to IUCN and MARD.

- The study team will correct some data, such as the number of malaria infected patients and rate of illiteracy, when finalizing the draft final report.

## **7. Detailed Discussions and contributions in the workshop (for reference)**

### **1. President of Hop Tien commune People's committee**

- Rate of illiteracy (700 people) mainly are from old ages group, all younger people come to school.
- Price of tea: 3,500 – 10,000 VND/kg: is average price
- If having enough irrigation water, times of pruning is as stated in the report (but not exceed 12 times per year)
  - Assisting the commune in upgrading Cap Ke reservoir is very necessary and meets the demand of local authority in improving living standard and regional environment.

### **2. Dong Hy district People's Committee (Commune Agriculture Office)**

- Completely agree with research report of consultants, which is very specific and appropriate
- Recommendations mentioned in the reports are so feasible. Rice production can never be separated from peasants, so tea and forest growing, and poultry breeding is reasonable.
- Recommendation regarding capacity building for irrigation team is very necessary because of the fact that local authority faces troubles when managing irrigation teams, which results in irrigation water loss.
- Propose DWR paying more care to other localities at Dong Hy district in building canal schemes from other reservoirs.

### **3. Thai Nguyen IDMC**

- Highly appreciate research result of consultants
- Technical issues are practical. Thai Nguyen IDMC will actively cooperate and do research for following activities to maximize irrigation area of Hop Tien commune.
- Sluices under dams at small reservoirs in Thai Nguyen are all terraced, water leaking that make lots of water loss. The Thai Nguyen IDMC is investing to replace this type of works with other valves. There is a decision of Thai Nguyen IDMC to repair sluices within Cap Ke reservoir in June 2006.
- Transferring management of Cap Ke reservoir to local authority: The IDMC is having plan of review and assessment on irrigation management decentralization. There have been 3 times of decentralization in Thai Nguyen province, which happened before 2003, from 2003 – 2005, and after 2006. After each time of decentralization, the more management tasks are assigned to local authorities. This time, province DARD plans to manage the main canals only, the left will be under management by localities. The management decentralization will include financial matters also. As such, recommendation of transferring Cap Ke reservoir management to commune is reasonable.

### **4. Dong Hy District (Tran Quyet Thang - Vice chairman of district People's Council)**

- Study report is sufficient with includes many socio-economic fields, not just irrigation.
- Words used in some fields like rate of illiteracy, number of people getting malaria should be corrected.
- Mentioned proposals are practical.
- More new reservoirs should be built up to ensure agricultural production, and forest growing. Local irrigations works should be transferred to and managed by local communities.

- The commune authority will prepare official proposals to organizations with support of province DARD.
5. Hop Tien commune (Mr. Hien-Farmers' union)
    - There are conflicts (small) when taking irrigation water
    - It is necessary to strengthen water use cooperatives in way as commune people's committee directs, cooperatives directly manage.
    - 2 more kilometers should be lengthened at the end of canal to Huu Nghi.
  6. Mr Hanh (District Statistic Office)
    - The actual area of tea is much more than data showed in annual statistics 2005
    - Agree with data stated in the research
  7. Explanation of Mr. Dat: The data from commune statistics are official, data from households are reference.
  8. Mr. Hung (Cao Phong village)
    - Lining more 800 metre of canal to Cao Phong village (N1 canal- from Mr. Hong to Cau Go of Cao Phong.
  9. Mr. Thang – DWR director (Closing the workshop)
    - MARD are preparing macro policies, but they should be practical, especially management of IDMCs, WSF, etc.
    - Local opinion of transferring management of irrigation works to local authority. Budget of water sector is limited, thus it requires to have cooperation with various organizations.
    - Water sector has not come up with the quick development of production structure.
    - Upgrading irrigation works, especially small scale works (from projection, building, and then exploitation management) is necessary.
    - Responsibilities should be clarified to each section to increase distribution of stakeholders.
    - DWR will create good conditions for Hop Tien commune to have technical management of small scale irrigation works.
    - The study result is effective for macro direction of MARD.

# LIST OF PARTICIPANTS PARTICIPATED IN THE 24 MAY 2008 WORKSHOP

No.	Name	Position	Organization
	<b>DWR</b>		
1	Vu Van Thang	Director	DWR - MARD
2	Pham Quoc Hung	Vice head section	DWR - MARD
3	Hoang Anh Tuan	Vice head section	DWR - MARD
4	Nguyen Hong Khanh	Vice head section	DWR - MARD
5	Le Van Chinh	Officer	DWR - MARD
6	Nguyen Hong Vu	Officer	DWR - MARD
7	Nguyen Van Hung	Officer	DWR - MARD
	<b>Thai Nguyen DARD</b>		
8	Do Van Long	Water resources officer	Dong Hy District Agriculture Division
9	Dinh Khac Tinh	Vice director	Thai Nguyen DARD
10	Phi Ngoc Lam	Director	Thai Nguyen IDMC
	<b>Dong Hy DPC</b>		
11	Dang Van Thanh	Irrigation and Transportation Officer/ Water and Sanitation Officer	Hop Tien Commune
12	Le Van Tho	Hamlet leader	Huu Nghi hamlet
13	Trieu Vien Phuc	Chairman	Hop Tien Cooperative
14	Tran Quyet Thang	Vice chairman	Hop Tien CPC
15	Trieu Sinh Kim	Hamlet leader	Mo Sat hamlet

No.	Name	Position	Organization
16	Nguyen Thanh Phuong	Manager	Dong Hy District Agriculture Division
17	Duong Van Lanh	Vice chairman	Dong Hy District CPC
18	Ban Phuc Thanh	Party Committee Secretary	Hop Tien Commune
19	Pham Viet Cuong	Officer	Dong Hy irrigation Station
20	Nguyen Van Nghi	Header	Head of Dong Hy Irrigation Station
21	Ha Huy Thuy	Chief of the Secretary	Dong Hy District
22	Nguyen Huu Hien	Vice chairman of the WUO/Chairman of Farmer Association/WUO Accountant	Hop Tien Commune
23	Ma Thi Uyen	Officer	Dong Hy District Agriculture Division
24	Nguyen Van Hung	Vice chairman	Dong Hy District Farmer Union
25	Nguyen Thi Cam	Chairwoman	Hop Tien Commune
26	Vu Thi Que	Vice chairwoman	Hop Tien Cooperative
27	Luu Duc Hanh	Chairman	Dong Hy District Statistics Division
28	Nguyen Manh Ha	Officer	Dong Hy DPC
29	Nguyen Thi Hoa	Officer	Dong Hy DPC
30	Nguyen Thi Thu Trang	Officer	Dong Hy DPC
31	Nguyen Van Hung	Hamlet leader	Cao Phong hamlet
32	Duong Phuc Thuan	Hamlet leader	Bai Bong hamlet

