The Irrigation Service Fees and Affordability After the Management Transfer: Empirical Evidence from Ban Vuen-Tonhen WUA in Savannakhet Province, Lao PDR

Arounyadeth Rasphone[1*], Fumio Osanami[1], and Takumi Kondo[1]

[1] Laboratory of Development Economics, Department of Agricultural Economic, Graduate School of Agriculture, Hokkaido University, Japan.

[*] Corresponding author: Laboratory of Development Economics, Department of Agricultural Economic, Graduate School of Agriculture, Hokkaido University, Sapporo City, Hokkaido 060-8589, Japan.
Phone: +81-11-706 2468, Fax: +81-11-706 4181, email: arounyadeth@yahoo.com.

Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006

Abstract

This study attempts to identify the cause of lowing rate of irrigation use fee's collection through the examination of the farmer affordability in paying the fee. The study chooses to investigate one of the nine pilot irrigation management transfer programs in the Lao PDR. The study scheme, Ban Vuen-Tonhen water user association, has earned remarkable reputation in outstanding operation and management, water distribution, and the fee collection. The irrigation service fee (ISF) affordable function and 45 degree plotting diagram are used in the analysis. The findings indicate that farmers, who cultivate rice only, have the least capacity to pay the fee. However, other farmers, who cultivate rice and cash crops or only cash-crop, are able to pay the fee and 11 times higher than current ISF charged. The study also confirms that ISF paid farmers actually line closely to the total average ISF. Finally, the role of commercialized farming has play a critical role in enhancing the payment and farmer affordability.

JEL classification: O13, Q15

Keywords: Laos; IMT; WUA, Irrigation service fee, Affordability.

1. Introduction

In the past few decades many governments have emphasized on the transferring of irrigation management, operation and maintenance of irrigation system to the private entity, or well known as water user association (WUA). Many studies in Vermillion (1997) have confirmed that the fee collection rates have risen up to 70 percents after the transferring. This high rate shares a common involvement of farmer organizations influencing the fee collection. However, recent study has shown that many countries that employed irrigation management transfer (IMT) policy have been facing the degradation of the system because the operation and maintenance (O&M) activities could not fully be compensated by activities of irrigators associations (Fujiie et al., 2005) because of the O&M has been shrinking. Main cause for such shrinking is the underinvestment in system maintenance, and lack of financial capacity and

viability (Svendsen, 1993; Bruns, 1998). As indicated in autonomous financing irrigation, farmer must bear both direct and indirect costs of O&M (Small and Carruthers, 1991), identifying the financial capacity of farmers is primarily essential. Incentives and suitable cropping pattern is also necessary for sustaining the operation of irrigation service. This study then aims to identify the affordable level of irrigation service fee to reflect the effectiveness of fee collection and the needs for new investment and maintenance. The analysis employs the affordable function to identify the affordable irrigation service fee (ISF).

The paper includes the discussion of ISF analytical function and type of data in section 2, then the history of irrigation of Ban Vuen-Tonhen Water User Association with its structure, ISF's structure and collection methods, characteristics of WUA, and irrigation water scheduling are briefly discussed in section 3. Section 4 then summarizes the results of analysis with discussions and follows by the conclusion in section 5.

2 Data and analytical method

In accessing the affordable irrigation service fee (ISF), cost-profit analysis alike is employed in the calculation and the definition of affordable ISF has been defined economically. Within this framework, the affordable ISF is defined as the irrigation's attributed net revenues after the water user fees, and the net revenues should be greater than in the absent of irrigation (Small and Carruthers, 1991).

The analysis will emphasize on the rural area of Laos because the primary purpose of irrigation development in Laos is to improve living standard of rural Lao. Therefore, the net land revenue generated in dry-season shall firstly be determined. The net revenues generated by using land in the dry-season in rural Laos can be assumed to be zero because the land is normally abandoned after wet-season's cultivation if irrigation system does not exist, but the use of farmland for animal grazing was not included in this analysis due to the average number of large livestock holding is less than 3. Thus, the irrigation service fee's affordable function could be:

$$\sum_{i=1}^{n} Y_i P_i - \sum_{i=1}^{n} (\sum_{k=1}^{m} W_k X_{ik}) - wa > 0 \qquad i = 1, 2, 3, \ldots n; \text{ and } k = 1,2,3, \ldots m \qquad (1)$$

where, Y_i = Output of crop $_i$; P_i = Price of crop $_i$ at farm gate; W_k = Price of input $_k$; X_{ik}= Quantity of input $_k$ for producing output $_i$; w = Rate of irrigation service fee; and a = ISF charged area.

Therefore, the affordable ISF of farmers can be defined if the left side of equation (1) is greater than zero. Otherwise, farmers will not be able to pay the ISF.

The data used in this analysis are mainly primary data from two surveys in December 2004 and September 2005. The data were used in conjunction with secondary data for the exchange rate during the 1990 to 2004 for Thai Baht to Lao Kips (ADB, 2005) in estimating the price of some inputs and depreciation cost of hand tractor. The prices of crops and other inputs were collected at the farm-gate prices. The labor data was estimated by per man-day, (8 hours per day per person), while the family labor opportunity cost was estimated by the numbers of working hour per activity per day per labor. In calculation of family labor cost, 3 children laborers of ages 10-14 are considered as an adult labor and the minimum current prices paid for hired labor are used in the analysis. The minimum daily charge of hired labor in paddy farming was used in analysis at 15 000 kips per one-man-day

The expenditures for production include fertilizers, pesticides, gasoline, tractor rental, seeds, hired labor, others materials and land rental. The straight-line method was used to estimate the tractor depreciation cost because of its simplicity and suitability in farm business analysis (Hopkins and Heady, 1995) with the economic life of 8 years or 96 months and 10 percent salvage value. On the revenues, the price of each crop sold to the middle-man in the village was used to multiply with the total quantity of production.

During the survey, the market of farmland property was limited and minimal as there were only five plots of land rented for the production and six plots were lent without any costs. The rental cost was also very low, with the average of 52 kips/m^2.

3 The overviews of Ban Vuen-Tonhen WUA

Ban[1] Vuen-Tonhen's irrigation scheme has been selected for the analysis because of its outstanding performance in management (ADB, 2000), long history in farmer managed irrigation, utilizing Mekong River's tributary and electric pumps to supply the water to command area, experience with severe floods and located distantly from the major city. The description of the study area is highlighted as following.

The study area is located approximately 80 kilometers from Savannakhet Province or 450 kilometers southern of Vientiane Municipality (Figure 1) with a population of more than 7 800 people. There are five administrative villages[2] in the study area. Prior to the construction of irrigation system in 1989, the study area had faced severe poverty and floods during the monsoon season. The study area is located next to Xe Bangfai River, which is one of the largest Mekong's tributaries. Therefore, in order to prevent flood and fight poverty, the construction of a multipurpose irrigation has been constructed and operated since 1990. The specific objectives were to increase the cropping area through intensive cultivation in dry-season paddy, and flood protection in monsoon season[3]. The initial survey and construction of the irrigation was mainly carried out the by state irrigation company, State Irrigation and Construction No.1, but the participation of farmers were minimized. The designated command area was 550 ha and was originally equipped with fixed headwork of two axial flow electric pumps at the capacity of 550 liters/sec/pump.

During 1990-92 all administrative activities, including water scheduling, the estimation of water fees and maintenance were managed by local state company, Savanh Development Company. Under such management, dry-season paddy was traditionally cultivated, while other crops were only cultivated in the river basin.

[1] Ban means village.
[2] These five villages are: Tonhen, Vuen-Nue, Vuen-Xay, Vuenxivilay and Vuen-Tai.
[3] Monsoon season begins in June-October, and the rest is dry season.

By 1993 the Sustainable Irrigation Agricultural Project (known as SIRAP) had rehabilitated the system and trained necessary skills of O&M to Ban Vuen-Tonhen Water User Association (WUA) as a part of transferal of participatory irrigation management (Souvannavong, 1994). The scheme was one of nine pilot schemes implemented under the IMT policy, which was fully transferred to Ban Vuen-Tonhen WUA in 1997. Since then the WUA has achieved its outstanding record by increasing the cultivated area up to 423 ha with 21 water user units (WUUs) in 1998/99. This achievement has been highlighted as one of very successful cases in sustaining irrigation management by farmer organization (ADB, 2000). However, the cultivated area and number of WUU have been decreased gradually in contrast with uncollected Irrigation Service Fee (ISF) and the average electricity costs. Indeed, the structure of ISF has also changed and the shares of the electricity cost have risen recently (Table 1). Also, since the transfer the pumps broke down three times in 00/01, 01/02 and 02/03 due to the fluctuated electricity. The fluctuation of electricity has then been recognized as another threat to the operational of irrigation in this area.

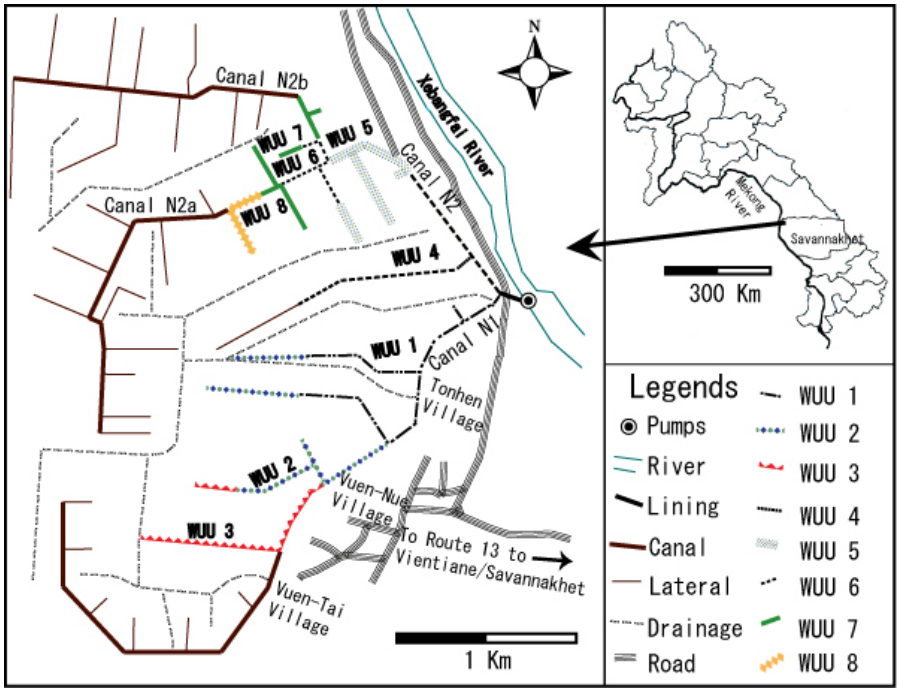

Figure 1. Map of Ban Vuen-Tonhen WUA location and irrigation canal layout with Water User Unit (WUU).

Source: Farm surveys, 2004 and 2005.

Table 1. Changes in irrigated area, irrigation service fee collection and fee's structure from 2000-2005

Year	Total irrigated area (ha)	Total irrigation service fees (million kips)	Electricity cost ('000kips per Kwh)	Average irrigation service fees (Kips per m^2)	Shares of Irrigation Service Fee (%)						
					Electricity cost	Saving fund	Lubricant cost	Dynamo repairing cost	Canal Maintenance Cost	Other costs	Total
00/01	353.55 [14]	57.20 (23.88)	13.77	16.18	42.15	2.11	3.49	14.22	34.68	3.35	100
01/02	285.27 [14]	69.76 (23.44)	29.00	24.45	56.26	28.69	1.95	4.31	3.90	4.90	100
02/03	270.01 [14]	157.31 (25.24)	20.92	58.26	42.19	45.15	2.65	3.77	2.73	3.52	100
03/04	237.25 [14]	79.77 (26.54)	48.70	33.62	80.65	17.85	1.50	NA	NA	NA	100
04/05*	100.92 [8]	47.42 (54.96)	49.67	46.99	85.39	12.78	1.83	NA	NA	NA	100

Source: Farm Surveys, 2004 and 2005.

Notes: 1) The figure in [ ] indicates the total number of Water User Unit (WUU) in the respective year.
2) The figure in ( ) indicates the percentage of uncollected irrigation service fee in the respective year.
3) * Indicates the latest update of ISF collected in September 2005.
4) NA is Not Available.

3.2 Water User Association's structure

The administrative structure of Ban Vuen-Tonhen WUA is one of the most common structures designed by the irrigation agency, consisting of a leading committee, advisory board, auditing board, administrative leaders, and head of water user unit (WUU). The committee members are elected every two years by all members, while the head of WUU is elected yearly. It is common to see chief or deputy chief of the villages (*Nai ban*[4]) leads the committee of the WUA. With the consensus of members, the committee and administrators will be posted in bookkeeping/finance and planning, agricultural advisory, irrigation technical advisory, gender issues counselor, machinery-man, and head of WUU. The roles of the committee board are to guide, monitor, look after the welfare of members, facilitate with local authorities and resolve the conflicts occurred. However, the roles of head WUU, machinery-man and the chief of WUA or bookkeeper are more critical in water allocation because they must witness and record the unit of electricity use for each provisional of irrigation water.

[4] *Nai ban* is the chief of the village, who is elected by villagers and has responsibility to look after the welfare of villagers.

The members of the WUA designate to the WUU that is the most suitable with the optima's water provisional capacity. The association mixes and shuffles head-tail farmers of each water channel in order to achieve such an optimal level. The members of WUU are free to choose the type of farming system, excluding tobacco because tobacco farming is contracted to tobacco factory. Therefore, there are four main types of farming found in WUA, including paddy, rice-cash crop, cash crop and tobacco farming systems (Table 2). Within the study area, the soil quality varies and results in differing demand on electricity use for pumping. As irrigation is a new challenge for farmers, many farmers are still used to the traditional cultivation that mean they practice subsistence farming as shown in table 3.

Table 2. Profiles of WUU by households, area, electricity consumed, farming system, payment status and percentage of subsistence farmer

	Total WUA					Total farm survey					
WUU No	No. House-holds	Cultivated area (ha)	Total electricity consumed (Kwh)	Productivity of electricity (m^2/Kwh)		Paddy farming	Rice-cash crop farming	Cash crop farming	Tobacco farming	All farming	% of subsistence farmer
1	39	22.83	88.55	2,579		2 (1)	8 (4)	0 (0)	0 (0)	10 (5)	70
2	38	20.59	110.00	1,872		2 (2)	4 (4)	0 (0)	0 (0)	6 (6)	78
3	47	16.70	173.15	964		8 (1)	5 (3)	0 (0)	0 (0)	13 (4)	72
4	27	16.41	130.73	1,255		6 (3)	4 (0)	0 (0)	0 (0)	10 (3)	52
5	29	13.46	152.58	882		3 (2)	9 (3)	1 (1)	0 (0)	13 (6)	55
6	39	4.50	49.70	906		0 (0)	4 (3)	6 (2)	0 (0)	10 (5)	54
7	46	3.63	45.15	804		0 (0)	0 (0)	10 (6)	0 (0)	10 (6)	23
8	3	2.79	58.70	475		0 (0)	0 (0)	0 (0)	2 (0)	2 (0)	0
Total	268	100.92	808.55	1,248		21 (9)	34 (17)	17 (9)	2 (0)	74 (35)	50

Source: Farm survey, 2005.

Note: Figures in brackets indicate the number of farmers that paid ISF.

3.2 ISF's structure and collection methods

In Ban Vuen-Tonhen WUA, the ISF includes all costs of operation and management, administration, maintenance cost (MC) and savings funds. This ISF is not the total cost recovery, but used to be designed to cover up to at least five percent of total capital cost for a period of 15 years. In calculating the ISF, electricity meter is used as the proxy in volumetric estimation, then multiplied with cultivated area with a markup of 30 percent for the main MC, and another 25 percent for savings funds and administration. There is no special incentive for farmers to pay the ISF, but farmers are normally obligated to pay within 30 days after the

announcement of charges. To collect the fee the head of WUU is solely responsible to collect the fee from the members, house to house, transferring to the bookkeeper or financial chief to deposit into the saving bank. Once the fee is collected, the bookkeeper will pay electricity costs and then announce the balance of bookkeeping to all members. Even though the financial penalty is expressed and addressed for late payers and non-paid farmers, the delay in ISF payment still occur because social and legal punishment are seldom practiced.

3.3 Characteristics of the WUA

The survey scheme has a special and unique character compared to other schemes, specifically, the cooperation among the villagers of all five villages, because these five villages were originally established through the expansion of population from Tonhen village. Therefore, villagers are intact, cohesive, and consolidated, which minimize the dispute on water distribution and water thievery. Instead, helping and assistance for poor farmers during the poor harvests are easily found. Also, in the study area community gatherings for collective activities are also common for both economical and spiritual works as occurred in rural areas in Laos as identified by Ireson (1995).

3.4 Irrigation water scheduling

The main objective of irrigation water distribution in Ban Vuen Tonhen WUA is to maximize the equity of water accessibility to all members. The water schedule and rotation have been designed with the consensus of all members and usually based on the plan made after the monsoon season. The summary of the irrigation water schedule is shown in figure 2 that highlights cropping patterns in dry-season, water schedule and paired-wise irrigation system.

Cropping pattern plays a major role in water scheduling in the study scheme, because regular irrigation schedule starts from the nursery of paddy and ends around ten days before the cultivation of paddy. The priority is high for the nursery, transplanting, then maturing periods of paddy farming. As the requirement of water for cash crops is lower than the paddy,

water provision to the cash-crops and tobacco farmers were fixed as demonstrated in figure 2 (WUU 6, 7 and 8). Furthermore, the condition of soil in WUU 3, 4 and 5 are mostly loamy-sandy, thus there were high demand for irrigation about 29, 33 and 30 times, respectively.

To optimize the provision of water, the plan of water schedule is designed to minimize the rotation cycle through a special irrigation water provisional system, called “paired-wise irrigation” system. The paired-wise irrigation (PWI) is a provisional of water to two WUUs on different main canals in the northern and southern parts of the system at the same time. The record of electricity used then will be made by head of WUUs, bookkeeper and machinery-man when one or both of WUUs has/have fulfilled their water demand. With such record, farmers can understand the proximity of their irrigation usage. However, in case of high water demand, the irrigators also allocate the period of irrigation into morning and afternoon session, and the afternoon session is mainly designated to farmers with cash-crops. Even though night irrigation has been practiced in the study area, such practicing has not been performed anymore because of the pump conditions and the fluctuated supply of electricity.

Furthermore, the rule of irrigation provisional between head and tail farmers were not specified, that allows the provisional is flexible, but under a condition that irrigation water must reach the end of scheduled channels before the intake can be performed. Therefore, tail farmers can receive the provision before head farmers. In addition, “on spot” ISF is also applied for farmers, who request irrigation on an irregular schedule or prior the beginning of cultivation period. The on spot fee is also practiced in the wet season when there is a rainfall shortage and the charge is at a premium of 59 kips/m^2/Kwh.

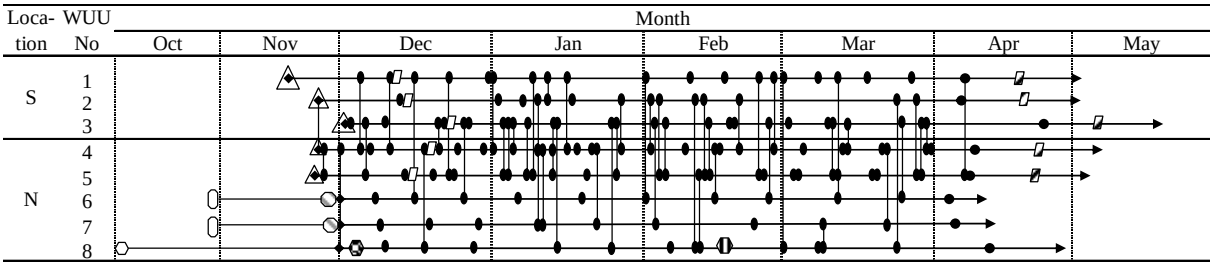

Figure 2. Cropping pattern, water schedule and "Paired-Wises Irrigation" by WUU in dry season

Source: Field Survey, 2005.

Notes: The started day of irrigation. The paired-wises irrigation (PCI).
The irrigated day. The last day of irrigation.
Rice sowing. Uprooting and transplanting. Beginning of rice harvesting.
Cash crop sowing/seeding. Cash crops transplanting.
(Cash crops include chilli, peanut, maize and spring onion).
Tobacco seeding. Tobacco transplanting. Beginning of tobacco havesting.
S and N indicate the location of main canal on Southern and Northern parts of the system, respectively.

4 Estimated results and discussions

The estimated results of the average production costs, revenues and profits by farming pattern are given in table 3. The table indicates that paddy farming is financially unattractive because of its negative revenue. However, the profits of rice-cash crops combined and cash-crop farmers are relatively high. The results reveal that the average total profit from combined rice-cash crop farmers is greater than alone cash-crop farmers due to the size of cultivated area. On the other hand, tobacco farmers generate the highest profit among all four type of farming system. However, the discussion of tobacco farming shall not be emphasized because tobacco farmers are contracted with a tobacco company (*Red A Brand* Cigarette Factory), who provides and purchases both input and production. Thus, the area of cultivation could not be further expanded without the permission from the company.

The estimates result of affordable ISF per farm is shown in table 4. The table highlights that excluding tobacco farmer, cash crop farmer has the highest capacity to pay for ISF at 853 kips/m^2, or at 6.4 times higher than rice-cash crop farmer. The table then indicates that rice farmers could not afford the ISF because of holding the negative affordable level at -88 kips/m^2, while both rice-cash crop and cash crop farmers hold higher affordable ratio compared to the total farming system at 1.3 and 5.7 times, respectively. Therefore, by combining with or diverting to high valued cropping system, the farmers will be able to

compensate required O&M costs after the transferring. The table further indicates that both cash crops and tobacco farmers are able to pay the ISF at about 11 times higher than the current charged, while paddy farmers are about 3 times lower than current charged.

Chili cultivation is one of the main sources of farmer revenues due to its high market demand in both Lao and Thai markets. Peanut is one of the options, which has been recently cultivated in this area, where the price is relatively high as the demand is increasing for supplying of peanut to the vegetable oil factory in Savannakhet Province. These two crops were selected by farmers due to its convenience in storing, transporting and high returns.

Table 3. Estimated average production costs, revenues and profits prior the charged of ISF by farming system in dry-season

Particulars	Paddy farming	Rice-cash crop farming	Cash crop farming	Tobacco farming	All farmings
B. Production costs (kips)					
1. Variable costs					
Fertilizers	574,048	733,563	143,000	4,400,000	666,594
Insecticides	857	4,700	0	1,890,000	54,264
Gasoline	98,452	216,086	0	545,000	149,095
Tractor rental	39,476	36,886	0	0	30,725
Seeds	110,893	168,470	0	0	109,652
Hired labor	188,095	33,030	0	3,262,500	156,284
Land rental cost	21,132	19,021	0	0	14,479
Packing matterial	6,000	22,424	0	15,000,000	417,108
Irrigation service fees	241,532	267,112	63,936	987,557	235,048
Total variable costs	1,280,485	1,501,291	206,936	26,085,057	1,833,248
2. Fixed cost					
Tractor DC	172,522	221,060	0	421,875	180,590
Family labor OC	966,071	1,285,214	225,000	1,372,500	992,365
Total fixed cost	1,138,594	1,506,274	225,000	1,794,375	1,172,955
D. Total production costs (B+C)	2,419,079	3,007,565	431,936	27,879,432	3,006,203
E. Revenue					
Paddy	2,234,286	2,768,686	0	0	1,943,568
Vegetable	0	22,714	0	0	11,042
Peanut	0	309,943	450,000	0	232,886
Chilly	0	1,284,429	980,000	0	722,230
Tobacco	0	0	0	39,500,000	1,097,222
Maize	0	45,714	0	0	24,444
F. Total revenue	2,234,286	4,431,486	1,430,000	39,500,000	4,031,391
G.Profit (F-D)*	-184,793	1,423,921	998,064	11,620,568	1,025,189

Source: Field survey, 2005.

Notes:1) * indicates that the profit estimation was not including the irrigation service fee.

2) Sample sizes are 21, 34, 17, 2 and 74 for paddy, rice-cash crop, cash crop, tobacco and all farmings, respectively.

3) Tractor depeciation cost (DC) was calculated by the straight-line method with the expected economic life of 8 years and 10% of salvage value.

4) The exchange rates from 1990 to 2004 was estimated from ADB online statistic data, 2005.

5) Exchange rate per 1U$ is 10,820 kips (December, 2005).

Table 4. Estimates of affordable ISF by farming systems

Particulars	Paddy farming	Rice-cash crop farming	Cash crop farming	Tobacco farming	All farmings
A. Profits per m^2 (kips)	-36	184	905	1,162	185
B. Land opportunity cost (kips)	52	52	52	52	52
C. Affordable ISF kips per m^2 (A-B)	-88	132	853	1,110	133
D. Current average ISF	49	50	75	97	68
E. Affordability ratio (C/D)	-1.8	2.7	11.4	11.4	2.0

Source: Field survey, 2005.

Note: Profit per m^2 (A) is derived from G/A of table 3.

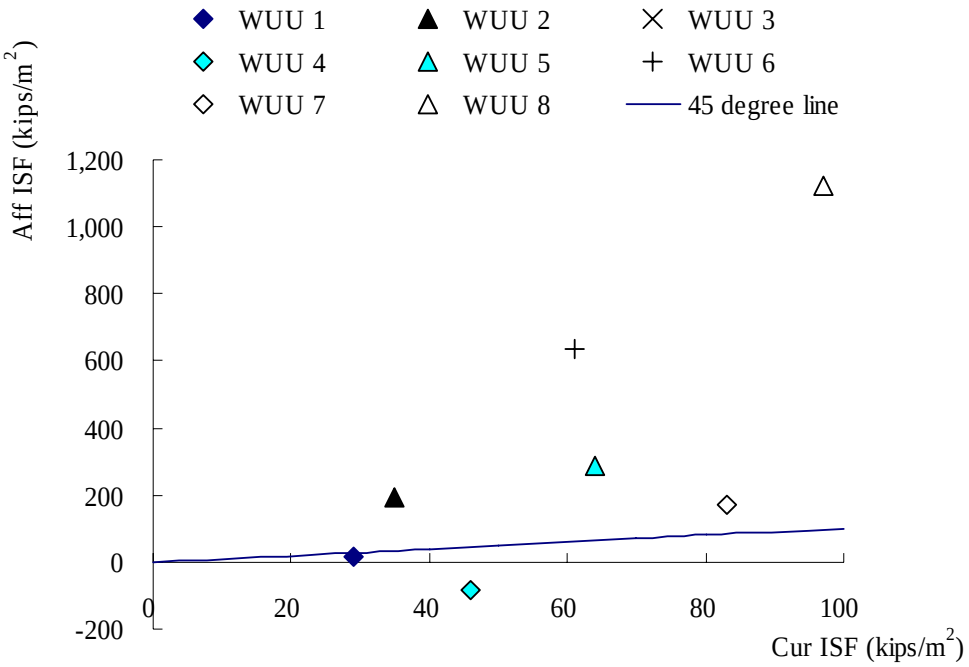

Figure 3. Aggregated level of affordable ISF by WUU

Source: Farm survey, 2005.

For further discussion, plot of aggregated affordable ISF and the aggregated current charged ISF of all Water User Units (WUUs) against the 45 degree line indicates that most of the WUUs are located above the 45 degree lines, which implies that they have the capacity to pay for current charges (Figure 3). However, the plot reveals that WUU 1 and WUU 4 are located under the line, which means that these users are facing difficulties in paying the ISF. The causes can be explained by not only the composition farming system, which rice farming is mainly practiced within WUU 4, but also the composition of subsistence farmers as indicated in table 2. However, the qualitative interviews reveal that even though members of

WUU 1 and 2, were mostly subsistence farmers, they partly subsidized the fee from livestock and off-farm revenues or holding large number of large livestock.

To reveal the cause of high rate of unpaid farmers, the estimation of t-ratio of affordable ISF and current charged ISF have been estimated (Table 5). The table shows that the ratio of affordable ISF over the current ISF is greater for those farmers who have paid the fee, specifically 5.4 times, while the ratio of non-paid farmers is -0.92. The t-ratio is significant at 1 percent level with the t-ratio result of 3.02. Therefore, the result indicates that affordable ISF have played a significant role in the payment of ISF. The table further indicates the role of market has also pay another significant role in paying ISF, because the t-ratio of percentage sold of product to market or the rate of graduating from subsistence farming is also significant at 10 percent level with the estimation of 1.92. Therefore encouraging farmers to divert or/and combine higher cash crop value with paddy, will increase farmer capacity to pay the fee as well as the chance of converting subsistence to commercialized farming, which will increase farmer's participation in operation and maintenance.

Table 5. Estimated ratio of affordable ISF and percentage of product sold to the market by payment status

Payment status	Sample size	Affordable ISF (kips/m^2) (A)	Current ISF (kips/m^2) (B)	Ratio A/B	% sold to market
Paid farmers	35	313.00	54.40	5.4	51.50
Non paid farmers	37	-36.3	55.57	-0.92	34.80
t-ratio				3.02*	1.92**

Source: Farm survey, 2005.

Notes:1) Two tobacco farmers are not included.

2) * and ** indicate significant at 1% and 10% levels, respectively.

Conclusion

The results of Ban Vuen-Tonhen studying have confirmed that the transferal of irrigation management will increase value of production through crop diversification. Also by diversifying and/or combining with higher crop value, farmers will be better off in paying irrigation user fees. Indeed, diverting to cash-crop farming has significantly diverted farmer from subsistence to commercialized production. Therefore with commercialized production,

farmers would have the access to information of markets and technology. Thus, the participation in paying ISF will also be enhanced. However, the ability to pay for irrigation fee is questionable if there is no diversification or guidance on converting paddy field into cash-cash cropping area or combining paddy with cash-crop farming. As current research is the first empirical study, more detail study should be further emphasized with the conjunction of local institutional analysis particularly, farmers attitudes, participation and the role of incentives.

References

ADB, 2000. Sustainable Development in Asia. Asian Development Bank, Manila.

ADB, 2005. Key Indicators 2005: Labor Markets in Asia: Promoting Full Productive, and Decent Employment, Asian Development Bank, Manila.

Bruns, B., 1999. Making Irrigators' Organizations Creditworthy. In: Abernethy, C., Heim, F., (Eds.), Irrigators' Organizations: Government Action Towards Effective Irrigators' Organizations with special reference to Lao PDR and Vietnam. Food and Agricultural Development Center, Deldafing, GER.

Fujiie, M., Hayami, Y., Kikuchi, M., 2005. The condition of collective action for local commons management: the case of irrigation in the Philippines. Agricultural Economics. 33, 179-189.

Hopkins, J.A, and Heady, E.O., 1955. Farm Records and Accounting. 4th Eds. Iowa State College Press. Ames. Iowa.

Ireson, W., 1995. Village Irrigation in Laos: Traditional Patterns of Common Property Resource Management. Society and Natural Resource. 8, 541-558.

Small, L., and Carruthers, I., 1991. Farmer-Financed Irrigation: The economics of Reform. Cambridge University Press, Cambridge, UK.

Souvannavong, O., 1994. Irrigation Management Transfer Issues in the Sustainable Irrigated Agriculture Project (SIRAP). Department of Irrigation's Workshop, Vientiane.

Svenden, M., 1993. The impact of financial autonomy on irrigation system performance in the Philippines. World Development. 21, 989-1005.

Vermillion, D., 1997. Impacts of Irrigation Management Transfer: A Review of the Evidence. International Irrigation Management Institute. Colombo.