Making Irrigation Management Pro-Poor: Lessons from China and Vietnam

Eric Biltonen*, Doan Doan Tuan**, Jinxia Wang***

Introduction:

In recent years, attention has been increasingly focused on the role irrigation systems can have on poverty alleviation. Attention has shifted away from the provision of new infrastructure toward changes in management and institutional arrangements of existing irrigation systems. Particular focus has fallen on issues such as participatory management, water rights, and water charges. This paper examines preliminary findings from research being done for the ADB-funded *Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia* project being led by the International Water Management Institute (IWMI). The objective of the project is "to determine what can realistically be done to improve the returns to poor farmers in the low-productivity irrigated areas within the context of improving the overall performance and sustainability of the established irrigation schemes." The overall approach of the project is to make assessments of the poverty and irrigation situations in each country, determine linkages between poverty and irrigation, identify potential interventions, and then develop specific country action plans. This paper focuses on research being conducted in China and Vietnam. The purpose of the paper is to demonstrate the current state of 1) irrigation management in the case study areas, 2) awareness of poverty issues, and 3) identification of areas for poverty reduction efforts.

Background

China and Vietnam are two of six countries included in the *Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia* project.[1] During March and April of 2002, field visits were taken to China and Vietnam by a member of the IWMI research team.[2] The information gained during these trips is the foundation for this paper. China and Vietnam are characterized by significant proportions of their populations both living in poverty and working in agriculture. Both countries have widely developed irrigated

* Post-Doctoral Scientist, International Water Management Institute – Southeast Asia Regional Office. E-mail: e.biltonen@cgiar.org
** Deputy Director, Center for Irrigation and Water Supply Research, Vietnam Institute for Water Resources Research
*** Post-Doctoral Scientist, International Water Management Institute and Associate Professor, Center for Chinese Agricultural Policy, Chinese Academy of Sciences
[1] The six countries are Bangladesh, China, India, Indonesia, Pakistan, and Vietnam.
[2] In China, interviews were held in Ningxia Province with the Ningxia Irrigation Bureau, the Zhongning Water Conservancy Bureau, Qingtongxia Water Management Bureau, Nan Zhuang Village People's Committee. In Vietnam, interviews were held with Bac Ninh Province Department of Agricultural and Rural Development, the Thuan Thanh District Irrigation Enterprise, Thuan Thanh District People's Committee, the Gia Thuan Irrigation Company, the Nguyet Duc Commune People's Committee, Quang Tri Province Department of Agricultural and Rural Development, the Quang Tri Irrigation Company, and the Trieu Phong District People's Committee.

areas; however, often the irrigation infrastructure has fallen into poor condition compromising both the efficiency of irrigation performance and the livelihoods of the people who depend upon the irrigation service for their livelihoods. Additionally, there are various constraints on the management of the irrigation structure in effectively addressing these issues.

China has a population of over 1.2 billion people of which about 64 percent live in rural areas.[3] Agriculture accounts for 15.6 percent of GDP in 2000 and 50 percent of the employed labor force. In 1998, the western regions accounted for 50 percent of China's total poverty. This is an increase from 40 percent in 1989.

Vietnam has a population of over 76 million of which 58 million live in rural areas (General Statistical Office, 2001). Roughly 65 percent of people aged 13 and over were in employed in agriculture and forestry based activities (General Statistical Office, 2001). The proportion of population with agriculture as their main job is 75 percent in rural areas and 64 percent for females. Food accounts for 47 percent of total expenditures for Vietnam, while for farm households 41 percent of food comes from own production (General Statistical Office, 2000). The poverty rate for all of Vietnam is reported as 37 percent (General Statistical Office, 2000).

It can be seen from the above statistics that poverty is a significant problem in China and Vietnam despite dramatic improvements over the past ten years. There is a strong potential for irrigation to benefit poverty by increasing production, reducing food prices, and mitigating vulnerability to production fluctuations.

Poverty Situation

In 1986, China initiated a large-scale poverty reduction plan. The head organization spearheading poverty reduction plans is the Leading Group for Economic Development in Poor Areas. The Leading Group is an inter-ministerial agency established by the State Council. The Leading Group coordinates and facilitates poverty reduction programs issued by the government. Since the mid-1980s, the Government has issued a series of circulars calling for increased poverty alleviation efforts. The programs have focused on solving basic subsistence problems for farmers through provision and effective management of resources. The provision of credit to low-income farmers has also received amble attention over the years.

In China, poverty rates in the Weining and Qingtongxia Irrigation Systems appear low because of the low official poverty line. However, relative to the more developed coastal regions or the international poverty line, poverty rates can be quite high. In interviews with irrigation management officials, potential poverty incidence as related to irrigation was linked most significantly to production levels. However, in both the Weining and Qingtongxia Irrigation Systems, production levels are roughly even across the entire system. Any poor farmers in the irrigated area are reported to be unable to farm

[3] Statistics not cited in this report are from Irrigation and Poverty Profiles completed by each country as part of the project requirements.

effectively because of age or disability. A review of county level average farmer income shows that for average incomes, only one county is above the international poverty rate of US$ 1 per day. Contrary to hypothesized spatial patterns of poverty concentrations in the tail-ends, no discernible pattern seems to exist in the two systems, see Figure 1.

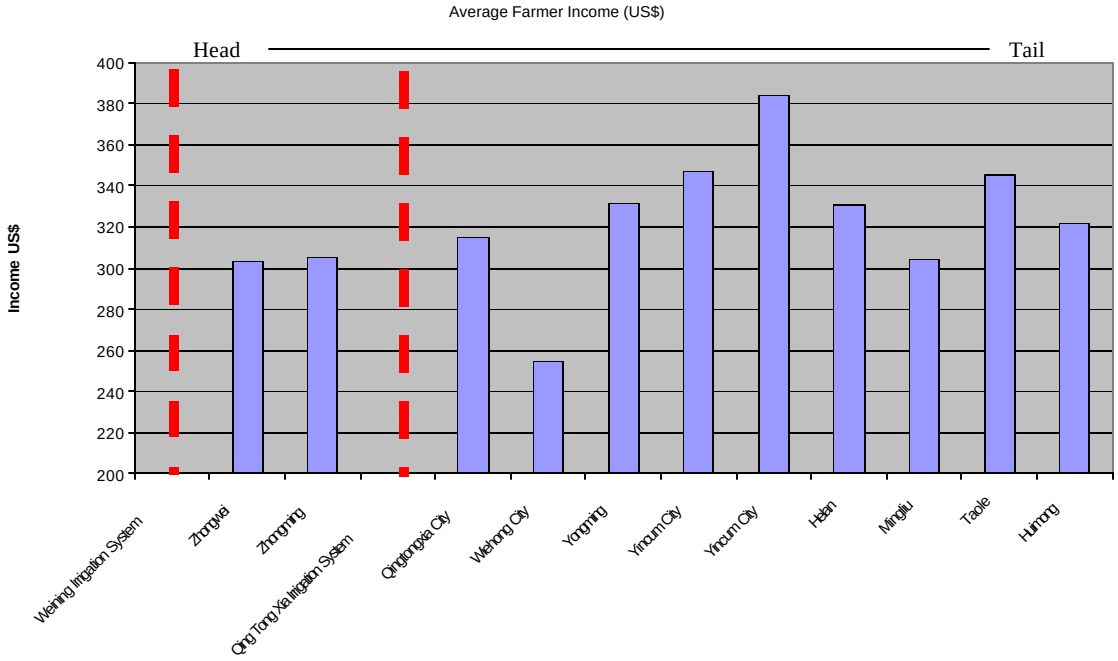

Figure 1. Average farmer incomes moving from head to tail end of Weining and Qingtongxia Irrigation Systems, China

In Vietnam, the majority of poverty reduction strategies originate with the central government. The most significant program is the Hunger Alleviation and Poverty Reduction Program which aims to reduce poverty levels in the rural area by increasing labor opportunities. For example, in Thuan Thanh District of Bac Ninh Province, the local People's Committee is attempting to create more jobs for farmers such as handicrafts and industry. Current efforts are aimed at increasing trade and improving marketing. Additionally, Thuan Thanh provides small loans to farmers. The improvement of infrastructure, such as water supply and transportation, was cited as a hindrance to economic development.

In Vietnam, causes of poverty ranged from lack of land, lack of off-farm employment opportunities, low farm yields, and inability to farm effectively due to age, accident, or lack of family labor. Poverty within the system possesses a strong spatial component, rising with distance from a pumping station.[4] Poverty in Bac Ninh Province is given as

[4] Spatial patterns of poverty along secondary canals in the Nam Duong Irrigation System are difficult to analyze because of the geographical dispersion of individual farms. Farms are an average of .25 hectares and divided among 7 plots. However, along the main canal the poverty situation demonstrate a clearer picture.

7.1 percent in 2000 according to Vietnamese standards and 44.7 percent as estimated by the World Bank (Baulch, 2000). Poverty tends to increase as distance increases from the intake pump and from Hanoi City, see Figure 2. An explanation for the jump in poverty after the mid-point Mon Quang pumping station is currently being investigated. The highest poverty rate reported here occurs in Van Ninh commune. Formerly, the area suffered from annual flooding caused by its poor drainage because of its low elevation level. In 2001, the area switched to growing fish in the rainy season and thus taking advantage of its topographic condition. It is felt that this will have a significant impact on poverty. However, no statistics were available at the time of this writing to support this. The raising of fish in this area uses water in naturally flooded areas, so no increase in water demand occurs. It was reported that water demand in the Nam Duong system is effectively met, but crop diversification is beginning to create water scarcities. Water scarcities are most prevalent in the tail end areas of the north canal before Mon Quang pumping station.

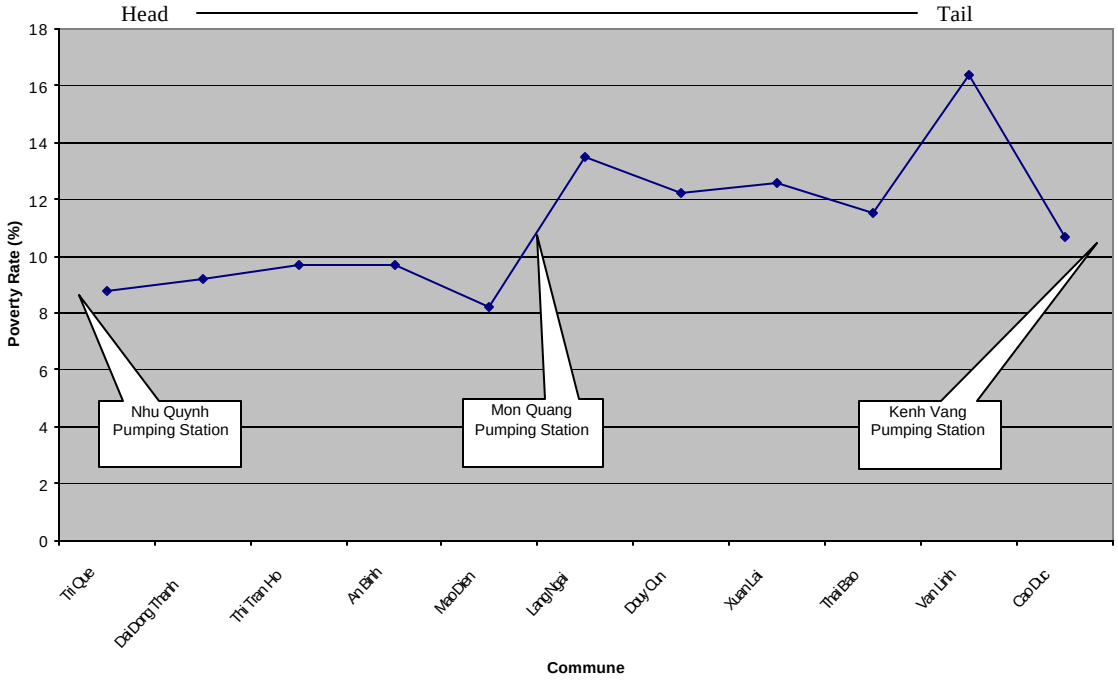

Figure 2. Poverty rates along the Nam Duong Irrigation System, Vietnam

Quang Tri Province has a poverty rate of 13.3 percent by Vietnamese Poverty Line standards and 54.5 percent as estimated by the World Bank (Baulch, 2000). In the Nam Thach Han Irrigation System, interviews were held with the local irrigation managers, Trieu Phong and Hai Lang district people's committees. The system comprises of a dam, run-off river intake, main canal and 6 secondary canals. The poverty rates of communes along secondary canals N1, N2, N3, N4 and N5 are shown in Table 1 and graphs of the five canals are shown in Annex 1. These clearly demonstrate an increasing poverty rate

as distance increases. The local irrigation managers related that water scarcity is most prevalent in the tail ends of these canals.

Table 1. Poverty rates along secondary canals in Nam Thach Han Irrigation System, Quang Tri, Vietnam

Secondary canals	Village	1998	2000
N1	Trieu Thanh	11.9	7.92
	Trieu Dong	12.3	6.22
	Trieu Long	14.6	9.3
	Trieu Hoa	10.6	6.62
	Trieu Dai	16.8	7.99
	Rieu Thuan	9.9	7.87
	Trieu Do	12.3	8.99
N2	Hai Phu	6.47	15.5
	Hai Thuong	9.17	11.8
	Hai Lam	16.26	16.4
N3	Trieu Son	15.1	6.14
	Trieu Trach	13.7	6.05
	Trieu Phuoc	15.9	11.39
N4	Hai Quy	16.16	16.3
	Hai Xuan	16.38	19.3
	Hai Vinh	22.91	18.8
	Hai Thien	18.17	14.1
	Hai Thanh	24.78	33.6
N6	Hai Ba	14.25	17.1
	Hai Que	16.51	20.3
	Hai Duong	24.78	33.6

Irrigation systems

In China, two irrigation systems are examined in this paper. These are the Weining and Qingtongxia Irrigation Systems in Ningxia Province. Both Irrigation Systems are located along the Yellow River and are primarily gravity flow systems, although small areas require pumps. The primary crops grown are wheat, paddy, and maize. The annual pattern for irrigation is in April, May, August, and October using water from the Yellow River. Increasing water scarcity has motivated the government to search for methods to use less water on more land. Primary methods for reducing water use are the use of economic incentives and increasing farmer awareness of the importance of saving water.

The Weining Irrigation System is a large scale irrigation system located upstream of the Qingtongxia Irrigation System along the Yellow River. Characteristics of the two systems include low productivity, low water use efficiency, and poor performance. The systems are publicly managed systems. They have had only limited experience with management innovations such as Water User Associations. Average farm size in the irrigation command area is 0.13 ha. Water fees are assessed and collected, but are inadequate at the current rate. Fees are set by the Provincial Water Resources Bureau.

The two irrigation systems in Vietnam are the Nam Duong (formerly Gia Thuan) Irrigation System in Bac Ninh Province and the Nam Thach Han Irrigation System in Quang Tri Province. Both irrigation systems are characterized by paddy as the main crop, inadequate funds, poor infrastructure, and poverty. The Nam Duong system irrigates approximately 16,000 ha. There are three main pumping stations: the Nhu Quynh station at the head, the Mon Quang pumping station at the middle, and the Kenh Vang pumping/drainage station at the tail. The Mon Quang pumping station is meant to supplement water from Nhu Quynh; however, water is drawn from the Duong River only in June and July. This was reported to save the local Irrigation Enterprise money by avoiding additional payments for pumping from the Nhu Quynh station. However, the poor condition of the canal beyond Mon Quang prevents them from pumping water in quantities that meet the canals designed capacity.

The Nam Thach Han irrigation system was built in 1978 and is located in Quang Tri Province in Central Vietnam. This irrigation system is the top priority item for the Provincial Government. Local officials stated that the irrigation system is important for water supply, flood protection, and environmental protection. The irrigated area is approximately 7,600 ha, while the design area is approximately 17,000 ha. About 2,000 ha of the design area fall in Hue Province. This area is not irrigated due to a lack of water. In the summer the irrigated area falls to 4,500 ha due to seasonal drought. Irrigation has had a significant impact on crop yields causing crop yields to rise from 1.2 – 1.8 tons per ha before construction to 4.5 – 5 tons per ha after construction. Additionally, this province is relatively remote and thus suffers from being a greater distance from potential markets.

The most serious problems for the Nam Thach Han system are a lack of water and flooding in the rainy season. Goals for the system officials include finding solutions for the water supply and for flooding. Currently, there are numerous river and sea dykes in place. However, harvesting is still completed by September due to the high probability of flooding. Management feels that improvements include the construction of more reservoirs, upgrading of canals, and improving various aspects of management. Management improvements include capacity building through education and through the provision of better equipment.

Management Structure

In general, the oversight of water resources is primarily by the Ministry of Water Resources, see Figure 3. Below the national level, further administrative divisions in

descending order are province, prefecture, county, township, and village. For irrigation, the highest level is the Irrigation District which manages an entire irrigation system. The Irrigation District is a department in the Provincial Water Resources Bureau. Secondary management divisions are termed Management Divisions. A secondary division may correspond with a secondary diversion of the canal system, but may also refer to divisions of the main canal where the length is long. Tertiary management divisions are referred to as Management Sections and quaternary divisions are referred to as Points. The irrigation management divisions do not rely on administrative divisions, but on the irrigation system design. The area which the irrigation system covers will determine the administrative level with which the Irrigation District level most closely coordinates.

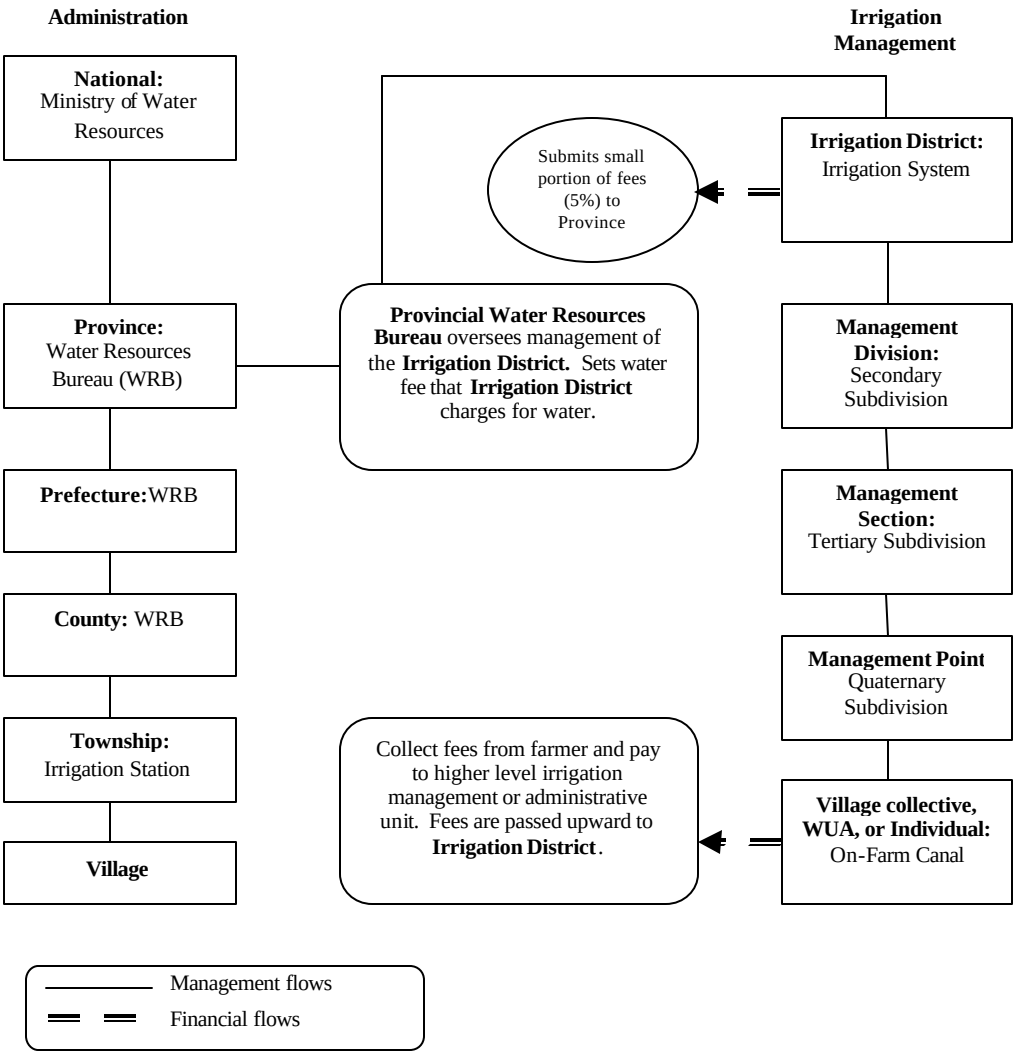

Figure 3. General Irrigation Management Structure in Ningxia Province, China

There is much cross communication and coordination in planning between the different administrative and irrigation management levels. However, the Irrigation District will rely most on the administrative level that best matches the irrigation system design. For example, the Weining Irrigation System is a smaller system lying almost entirely within Zhongning County. Therefore, the Irrigation District coordinates most closely with the Zhongning Water Resources Bureau for management of the irrigation system. Management responsibilities are further divided among 10 sub-county level management divisions, which are responsible for secondary canals. The County Water Resources Bureau is responsible for controlling water in the main canals and metering water down to the secondary canal level. Other responsibilities include monitoring the condition and safety of the main canals.

The Qingtongxia Irrigation System covers a much larger area, so the Irrigation District coordinates management in an inter-county manner. The Qingtongxia Irrigation System is divided into eleven Management Sections that are responsible for the main canals. In Qingtongxia, the Water Resources Bureau runs several additional companies to generate revenues. These private businesses included a reception house that generated 80,000 Yuan per year, a project company that deal with aspects of canal maintenance which nets a profit of 500,000 Yuan per year, rental of land to farmers (1,100 *mu*) which brought in 100,000 Yuan per year, and a technology service for other areas. The average salary of the staff was reported as 1,000 Yuan per month.

At the top of the irrigation management structure in Vietnam is the Irrigation Company, which oversees management for the entire irrigation system. Below them is the Irrigation Enterprise, which is a district level agency responsible for operating the pumping stations and secondary canals. Under the Enterprise, there are irrigation stations/sections. Within the irrigation station are the technical staff who communicate directly with the commune. Tertiary canals belong to the commune or village who are responsible for maintaining them. Each commune has a farm cooperative within which is an irrigation team. The irrigation team is responsible for communicating with the farmers and monitoring irrigation. The irrigation team is also responsible for all repairs that require less than 5 m^3 of soil. For repairs requiring more than 5 m^3 of soil, a request is submitted to the cooperative (this is true for some cooperatives in Thuan Thanh only). Currently, the cooperative has been separated from the commune. This has tended to lower the cooperative's salaries and level of responsibility. It has also made it more difficult to mobilize farmers to help with irrigation maintenance. The communication structure to transfer farmers' desired water demand is relatively bureaucratic. Before each cropping season, the farmer submits their irrigation plan to the irrigation station. The irrigation station submits a report to the irrigation enterprise, who submits a report to the irrigation company. The irrigation authority, based on demand, develops a water delivery schedule and informs the cooperatives via irrigation stations, see Figure 4.

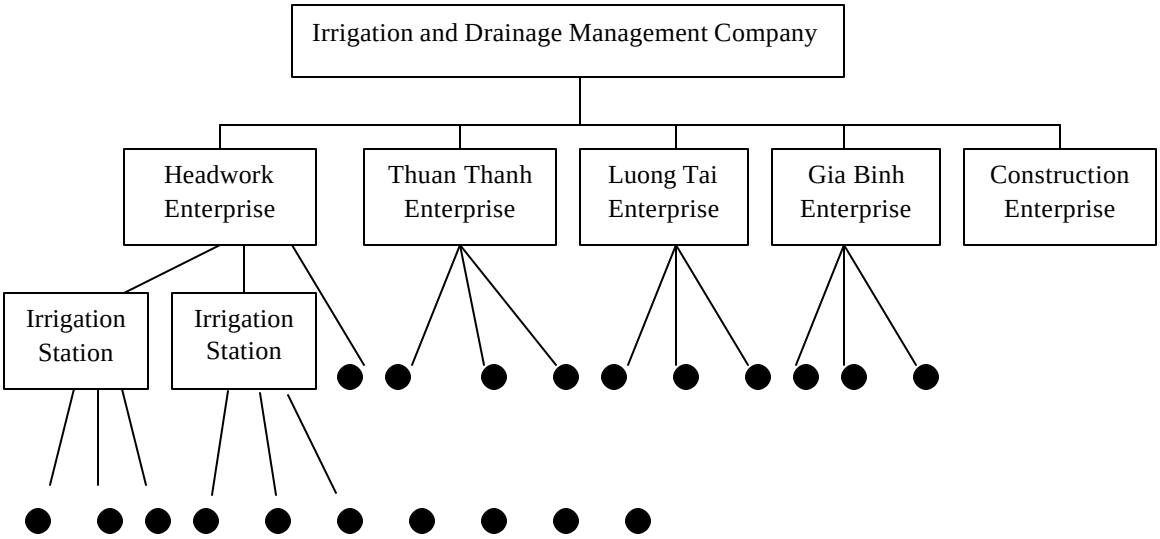

Figure 4. Management Structure of Nam Duong Irrigation System Note: One end arrow: Instructive relation. Two end arrow: Contract relation. Black dots represent irrigation stations and cooperatives.

The irrigation system in Quang Tri has a similar management structure except that there is no Irrigation Enterprise because there are no major pumping stations as Nam Thach Han is primarily a gravity system. Additionally, the Nam Thach Han is managed by canal rather than by district. In Quang Tri, the Irrigation Management Company has the responsibility for construction, water supply, and collection of the water fees. The Irrigation Management Company manages the whole system down to the secondary canals. Management of the tertiary canals is accomplished through coordination with the cooperatives and farmers. The Irrigation Management Company coordinates with the Commune People's Committees on issues of system protection, identification of damaged canals, and flood prevention.

In Nam Thach Han, farmers participate in irrigation management by working with the cooperatives. Each year the irrigation company holds a meeting with the farmers. At this meeting the irrigation company gives the farmers guidelines on how to use and save water. The irrigation company prepares planning and schedule for irrigation and then informs the farmer. The schedule and plan depends on water demand, water supply, and the construction situation. An official with the Irrigation Company stated that the highest priority component was the water demand. Every week there is a meeting between the Cooperative Irrigation Team and the Irrigation Company. Because of a lack of automatic monitoring equipment, the Irrigation Staff conducts daily monitoring of the irrigation system when irrigation is taking place.

Management Problems

In China, water allocations are determined by the Ningxia Water Conservancy Bureau. Allocations are based on planned cropping patterns of the farmers. For example, a farmer

will grow one *mu* of wheat is entitled to 700 m^3 of water delivered to the township or county level. In the case of water scarcity, all areas will share in the scarcity to some degree. However, priority is given to delivering water to high-yield production areas. In general, a rotational method is used where tail-end sections of the irrigation system are irrigated first. Subsequent irrigations then move back toward the head of the canal. During the regular rotations, farmers may have conflicts based on timing of irrigations. At the village level, the conflict is reported to the Water User Association for resolution.

The Qingtongxia Water Management Bureau stated that problems facing the irrigation system include the degraded condition of the canals, a lack of funds, and lack of awareness among farmers for the need to save water. The current effort is to get farmers to view water as a commodity. The lack of funds is caused by an inadequate water fee. Another problem involved the accuracy of the water meters. In dealing with non-payment of water fees, if several farms along a canal do not pay their water fees, then water in the canal is cutoff. Other farmers using water from the canal will then exert pressure of the non-paying farmers to pay the fees. Options for the non-paying farmers included taking loans to pay the fees.

Another problem for water management at the village level is that the village staff receive no salary for water management duties above their salary for normal leadership duties. A WUA can vote to keep part of the fees for salaries. However, the village collective cannot do this. Instead, they have the option to contract management of a canal to a private individual. However, in general, it was stated in interviews in Nan Zhuang Village that individuals generally cannot manage the canals well, which makes it difficult to collect the contract fees.

In Vietnam, both irrigation systems experience a lack of funds which was cited as a serious hindrance to better irrigation maintenance. The general belief was that improved management must be tied to improved infrastructure. Infrastructure improvements for the Nam Duong included canal lining and upgrading of the pump stations. Because of low salaries, irrigation staff had to look elsewhere to supplement their incomes, which distracted them from effectively doing their jobs. An evaluation system of staff performance is in place, but it was reported that it was not effective for motivating staff. Water shortages in the Nam Duong System were widely attributed to poor infrastructure. Another management problem is that the irrigation management is charged for electricity in a time period that is out of line with when irrigation fees are collected from the farmers.

Management for the Nam Thach Han system was stated as very good despite the lack of water. A problem facing the system is that a lack of equipment prevents the engineers from knowing the exact parameters of the irrigation system (e.g. the quantity of water being delivered). Another problem is that the Irrigation Management Company is set up as a public company. This was described as being in between a private company and a government agency. They lack the management strengths of both and therefore must use "soft" policy approaches. The Irrigation Company must provide irrigation service to the farmers as a public good. However, they cannot utilize private sector strategies to gain

profits or exclude non-payers. They also cannot resort to strong enforcement policies of government agencies, such as arrests or fines.

Water use is monitored in the summer by the technical staff of the irrigation station. This is accomplished by visual inspection of farm plots. If over-watering is observed a warning is given to the farmer. If continued over-watering is observed, then the Irrigation Company may cut off water in the canal. This creates hardship on all farmers, who will then exert pressure on the offending farmer to curtail their water use. No discussion was given as to the extent of this pressure, but it was related that police are sometimes called in to join in the monitoring. Summer monitoring creates additional costs for the irrigation company at a time when the irrigated area is reduced which reduces water fees collected.

In times of water scarcity, an attempt is made to irrigate all areas as equally as possible. Any areas that do not receive water are areas where it is impossible to irrigate. There is no plan for reducing irrigated areas. The irrigation company related that originally they had the idea to reduce the irrigated area to guarantee enough water for some portion of the system. However, both the cooperative and the farmers want water spread as evenly as possible. The idea is to hope for a late season rain to save the crop. This method was translated as "we all die together."

Management Innovations

In Ningxia Province of China, there are two relatively new approaches for managing irrigation water deliveries to the farm level. These are Water User Associations and contracting with private individuals. Water User Associations have been formed since 2000. They were promoted as a solution to wide-scale wastage of water. Farmers in a locality first vote to form an association. Then the farmer association will hold a meeting and elect a single person to manage a section of the sub-canal. This person must promise to provide good service and to save water. Farmers make requests for water from the Irrigation Management Section.

In the WUA, a farmer will be chosen to manage a canal. Farmers along the canal will annually pay the water user association 2 Yuan per *mu* to pay for the worker. The Water User Association organizes farmers for maintenance of their canal. Each farmer is required to contribute 3.5 days per *mu* per year for these efforts. Any materials required for the maintenance is funded by the township or village. This amount is included in the water fee. For large projects, however, the Province will cover any labor costs.

The second alternative is to contract management responsibility for a sub-canal to a private person. The person is responsible for irrigating the entire area of his canal. Water fees are established based on projected water demand and collected by the individual. However, payment by the managing individual is not determined or due until after the season. Therefore, if water use can be kept under the contracted level, then the manager can keep the excess fees. In this way, previously collected fees above what he is charged are kept as profits. In this way, an incentive is given for the managing person to give

good service to the farmers and to encourage the manager to use less water. If service delivery is bad, then farmers are less likely to pay the water fee.

In Vietnam, since the late 1980s, economic renovation has been implemented in the agricultural sector. There is an ongoing process to decentralize resources management. The land has been allocated to individual farmers for long-term use. For water resources, methods for effective management are a main goal. It is a difficult process, but two major modes for on-farm water management are in place. In the areas of water shortage and limited off-farm income opportunities, water resources are managed by commune People's Committee - farmer cooperative - village/hamlet. In the areas with sufficient water and opportunities for off-farm income, water is managed by commune People's Committee - service cooperative - village/hamlet. The difference between the two is that farmer cooperatives are comprised entirely of farmers and service cooperatives are comprised of only ten persons responsible for service supply. In both models, the role of traditional village/hamlet is increasing.

Water Fees

Water fees in Ningxia Province of China are set by the Provincial Water Resources Bureau at 0.012 Yuan per m^3 up to the projected level of demand and 0.017 Yuan per m^3 for deliveries in excess of projected demand. Projected demand is based on land area and crop choice. This is also the method used to assess water use, and thus the water fee, at the farm level. However, water is delivered to the tertiary level volumetrically based on actual measurements. The amount of water at the lower price is generally insufficient, so it becomes necessary to request additional water. Increased revenues from the higher price are then used for salaries and small maintenance.

The farmer faces a two-part water fee, which is the sum of the cost of water used plus a fixed fee for the canal manager or repairs. In Nan Zhuang Village, the fee was 0.012 per m^3 of water plus 2 Yuan per *mu* annually for labor cost of the canal manager. Collection of fees from the farmers is done by the village collective, Water Users Association, or a private manager. Collection success rates of 95 - 99 percent were reported. Of the total fees collected by the Qingtongxia Irrigation District, about 5 percent is returned to the Province, while 95 percent stays within the Irrigation District. Priority uses for collected fees in Ningxia are first for staff salaries and second for canal repairs.

The Qingtongxia Irrigation District stated that the current fee was too low. They offered an estimate of 0.022 Yuan per m^3 as a fair price for water considering the costs of delivery. However, it was also felt that a higher fee would be harder to collect as fewer farmers could afford the higher level. In Qingtongxia, it was reported that fees can be difficult to collect as fees are due at the time of irrigation. In response, some poorer farmers must delay payment. If a farmer is too poor to pay, then another government department, the People's Government Department, will make the payment for the poor farmer.

In Vietnam the water fee is decided by the local People's Provincial Committee based on the water fee framework set by the Central Government. Water fees are based on the crop grown, the land area, and the quality of service. Interviews with the Thuan Thanh Irrigation Enterprise indicated that there is a 95% successful collection rate. First priority use for the collected fees is to pay for electricity and the second priority is to pay salaries. The third priority use of collected fees is for maintenance and operations. Electricity claims 36% of collected fees, while salaries claim 44% and operations and maintenance 20%. Irrigation fees brought in about VND 7 billion per year versus an annual budget of about VND 12 billion annually.

Thuan Thanh Irrigation Enterprise officials noted a concern that increased crop diversification would increase the difficulty of collecting fees in the future. This would be caused by relatively poorer service to due the diversified crops' increase water demands. An additional difficulty for collecting fees is that in response to the growing role of traditional villages and hamlets, each commune will have four to five cooperatives (village/hamlet scale) versus one cooperative per commune now. This creates an environment where there is little incentive for the leader to make sure fees are collected. In order to hold more authority in getting farmers to pay, it was believed by several officials that the Irrigation Enterprise would need to hold more political power. Currently, irrigation is provided unconditionally as a public service.

In the Nam Thach Han Irrigation System, collected fees are currently adequate to cover only 50 % of expenses. However, it was felt by the local Department of Agricultural and Rural Development that the water fee could not be raised because the farmers would refuse to pay. Priorities for fee allocation are first to Irrigation Company salaries, second electricity, third small maintenance issues, fourth flood prevention, and fifth, research and study. In Nam Thach Han, the allocation of collected fees is 26 – 27% for staff salaries, 5 – 7% electricity, 17% for small maintenance jobs, 3 – 5% for flood prevention and research, and 40% for large scale maintenance. The Ministry of Agriculture and Rural Development called for 25% to be spent on small maintenance, but it was stated that a shortage of funds constrained that amount to 17%.

Currently, expenditures by the Irrigation Company are based on the projected value of crop output per hectare. Before the season, an estimate is made of the revenue amount from the water fees. If production yields are above estimates, then output prices are driven lower resulting in collected fees lower than projected. Additional constraints to collection of fees include areas where it is difficult to irrigation or pumps are required for irrigation.

Direction for improvement of irrigation management performance

The reviews of the irrigation systems, water fees, and poverty assessments yield several interesting insights. In discussing the problems of the irrigation system, interviewees were asked for their opinions on a solution and for the potential for improved irrigation to alleviate poverty. The general response regarding poverty alleviation was that the impact would be solely on maintaining or improving crop yields. Emphasis seemed to be placed

on the importance of maintenance and improved management in reducing the vulnerability of the poor to downside risks, rather than on large potential upside benefits.

However, in Vietnam, an official with the Trieu Phong District People's Committee was asked his opinion on further reducing poverty through irrigation. The official related that there are many avenues for improvement and that they are interrelated. These solutions included improved production yields, expansion of production area, crop diversification, improved irrigation method, improved education of farmer for increased adoption of modern technology, and building of staff capacity so that staff can more effectively make and implement plans.

In both of the countries, stronger emphasis and understanding was placed by the interviewees on improved water use efficiency rather than on poverty reduction. For instance, in China the Provincial Water Resources Bureau stated that the current high priority goal of the irrigation system is to irrigate more land with less water. The system makes uses of new irrigation research and techniques popularized by Nanjing University. Related efforts include increasing the production of rice and reducing expenditures of farmers. An example was given for rice production, where output was raised an average of 23 kg/mu, while decreasing expenditures by 5 Yuan per mu. The reduction in expenditure was derived primarily from decreased water and manure use.

To increase water use efficiency, Ningxia government efforts are aimed at raising awareness among farmers of the need to conserve water. Methods used to accomplish this task include the use of water fees as an economic incentive. Another method has come through the establishment of farmers' associations. The farmer association supervises the use of water and collects water fees. An interesting point is that the farmer association also informs the farmers about how the collected fees are used. The farmer association leaders are paid a small amount for their work, but most money goes to the Irrigation Section.

Most problems were reported to be tied to a lack of adequate funds. The head of a county Water Resources Bureau was asked for solution for solving these irrigation problems. He outlined a financing scheme were the National Government would fund investments in the main canal, the Provincial Government would fund lower division canals, and farmers would pay for and fix canals going to the fields. This official was of the opinion that "the money is there" and that the solution is simply a matter of adjusting the current allocation. However, raising water fees was not given as an option as it was believe that the farmers would have greater difficulty paying the increased fees.

In Vietnam, the various stakeholders were asked for their ideas on how to improve or solve the deficiencies. The common response in Vietnam was given as a general increase in funds and budgets. However, when asked for how this could be brought about, few had any idea. Most seem willing to wait for the central government to hand down the answer. In both irrigation systems, it was reported that the raising of fees would be met with resistance.

A more intriguing answer came from the Vice-Minister for the Thanh Thuan People' Committee who stated that strengthening management and information sharing among irrigation staff would improve the performance of irrigation. Canals are often damaged by farmers breaking holes in the sides to water their fields. Improved information sharing and greater awareness of the wide-spread impacts of an improved (or degraded) system could reduce damage caused by farmers because, ultimately management depends upon infrastructure. Additionally, farmers who understand the system are more likely to comply with its policies. This view was also expressed during the interviews at Nam Thach Han.

One suggestion for improved management offered by the Irrigation Enterprise involved the absorption of the Irrigation Enterprise into the District Government. This would increase the political power of irrigation management and make them more able to enforce irrigation management policies. However, this viewpoint was from the enterprise director who may want more power; from the system point of view it is doubtful that better performance would result. Other possibilities include a restructuring of the electricity payment schedule for the Nam Duong Irrigation System. If electricity payments where adjusted to coincide with the collection of water fees, it would allow the system to more fully utilize the pumping stations. This would better coincide with the Irrigation Company's ability to pay.

Finally, an interesting situation was discussed in Nguyet Duc Commune in the Nam Duong Irrigation System. In recent time, some farmers have adopted the cultivation of mushrooms, which raises their income. While the commune leader stated a desire to extend the model, he noted that most farmers in the commune are satisfied with their current standard of living and do not interested in raising their standard of living.

In recent years, the local government has encouraged the farmers to diversify their crops from the traditional paddy cropping patter. The current cropping pattern is for low lands to cultivate fish, mid-lands: paddy, and high-lands: cereal and corn. Additional crop diversification has also occurred placing additional demands for water on the irrigation system. It was reported by local authorities that the increased demands from crop diversification have outstripped the design capacity of the Nam Duong Irrigation System. A common problem for all irrigation systems in Vietnam was trouble gaining access to local markets. This was the result of both distance and the lack of suitable road infrastructure.

Conclusion

The previous discussion highlights some important lessons for future research into the poverty alleviation impacts of irrigation. Within the irrigation management community, while there is an awareness of poverty, poverty itself is still largely viewed as a production/income issue. The multidimensional nature of poverty is not addressed. There does seem to be support of a relationship between poverty and water scarcity caused by poor irrigation performance.

Inadequate funding was often stated as a constraint to better management. Funding impacts both infrastructure maintenance efforts and management salaries. In achieving financial self-sufficiency, there seems to be a reluctance to raise water fees out of a concern for farmers' ability (and willingness) to pay the fee. Moreover, it is recognized that unless adequate fees are obtained, poor service will result. Poor service will in turn decrease the willingness and ability of farmers' to pay the fees. Most interviewees maintained the idea that funding would eventually come from a higher level government agency. A strong question to be examined here is the ability of farmers to pay fees in relation to the financial needs of the management. Additionally, the ability of management to make effective use of collective fees is important.

To try to increase the willingness of farmers to pay fees, the sharing of information between management and farmers was recognized, particularly evident in Vietnam. Regular communication with farmers created a more transparent management system, which fostered farmer compliance. Particularly important seemed to be discussions between farmers and management on the specific use of collected water fees and problems facing management. Another method for encouraging farmer compliance with payment of fees was the use of social pressure. Non-payment by one farmer resulted in all farmers being cut off from canal water. This presents a rather interesting area for future research especially in terms of its extent of occurrence and its impact.

Finally, there was the widely held belief that better management and better infrastructure go together. If the canals are badly damaged, then better management cannot be effective. In addressing the management problem, there are trends toward the decentralization of management responsibilities. Unfortunately, there is a lingering centralized pull on collected fees. All of the above issues are relevant to the potential poverty reduction impacts from improved irrigation management and need to be examined carefully. This will help in efforts to reform irrigation management to yield the maximum poverty alleviation benefits possible.

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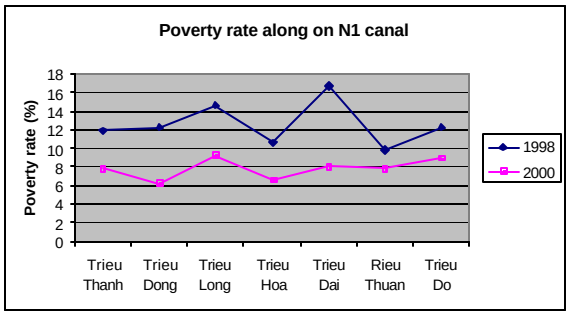
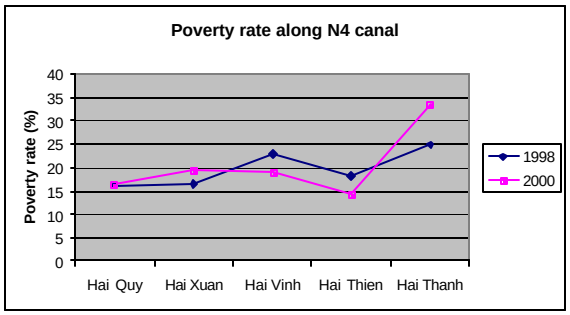
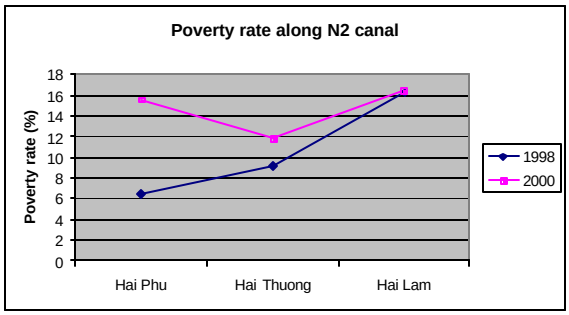
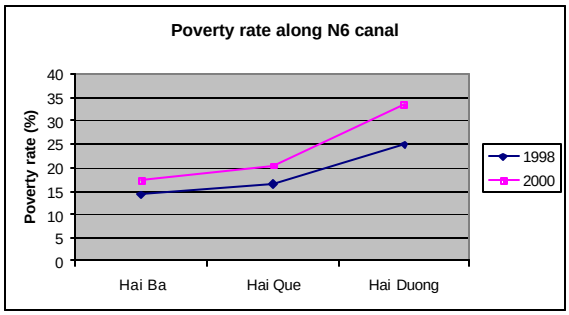
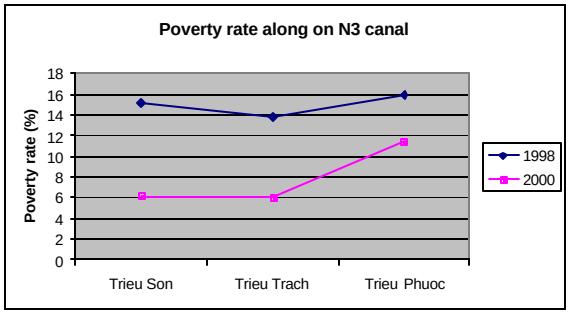
Annex 1. Poverty rates along the secondary canals in Nam Thach Han Irrigation System, Quang Tri, Vietnam











Note: For canals N1 and N3, which is in Trieu Phong district, the poverty rate was evaluated based on the old poverty line of 70,000 VND/capita/month for both years. For N4 and N6, in Hai Lang district, the poverty rate for 2000 was based on the poverty line of 100,000 VND/capita/month. This explains the shift in poverty in 2000 compared to 1998 in N4 and N6 canals.