The Intricacies of Water Pricing in the Red River Delta, Vietnam

Jean-Philippe Fontenelle and François Molle

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Jean-Philippe Fontenelle[1], François Molle[2]

1 Introduction

Many State-run large-scale irrigation schemes worldwide have long been financially supported by public funds. Because of financial squeeze and of the general trend to hand over the management of irrigation schemes to farmers, emphasis is often placed on cost-recovery and on the financial autonomy of these schemes. Water fees, in most countries, generally cover only a part of O&M costs and amount to a small percentage of the agricultural gross product, typically less than 10%. In some other countries, water supply is free and is considered as State subsidy. However, in situations where irrigation and drainage operations demand the use of pumping devices, operational costs are generally significantly higher, as they include the costs of energy, and water fees tend to be higher than the average. This is the case of the Red river delta (RRD), where thousands of pumps of all capacities are used in operations of water management.

The RRD is also well known for having one of the highest densities of rural populations in the world. Consequently, agricultural production is extremely intensive, cropping intensity is high and the proper management of water paramount in achieving sustainability and food security. The relationship between the State and the farming population has undergone drastic evolutions, from colonial times to the collectivist period and the recent liberalization. The question of the financing of irrigation must therefore be addressed as a particular aspect of a changing political economy, where the taxation system and the roles and responsibilities of the different actors are in constant redefinition.

The first part of this paper describes the political changes, which induced technical and institutional evolutions of the RRD water-control systems, as the organization of the operation and even the technological nature of water-control systems, were influenced by national political choices. The second section describes the management framework and the financial organization of the RRD water-control systems. In-depth studies conducted at local level allow a better understanding of the present situation.[3] Water management in the RRD appears to be strongly organized by the State into successive nested levels, from the central level of the Ministry of Agriculture to the local level of the cooperatives. This structure

[1] Groupe de Recherche et d' Echanges Technologiques (GRET), Paris. fontenelle@gret.org

[2] Senior researcher, International Water Management Institute, Colombo, Sri Lanka. f.molle@cgiar.com

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was challenged by the emergence of local pumping stations and water management practices, which superimposed themselves upon the officially existing structure. It is shown how the mismatch between administrative and hydraulic units adds to the complexity of the definition of both the financing and the management of hydraulic operations. The third and last section of the paper examines the financing of the different operators, the amount and the use of the water fees paid by farmers and questions the process of water management decentralization and privatization in the RRD.

2 The evolution of the RRD water-control systems

With a population of more than 75 million and a total area of 331,700 square kilometers, from which only one-third is covered by plains, Vietnam shows much concern about its food security. Vietnam is a hilly and mountainous country where fertile and crowded plains, notably the Mekong and Red River deltas, play a key role as the country's rice bowls. The RRD is the smaller and the more crowded of the two deltas, with a gross area of only 1.5 million hectares (4.5% of the total area of Vietnam) and a total population of 20 million (27% of the total population of Vietnam) (Le Ba Thao, 1997). The combination of these two characteristics leads to the world's highest density in the rural population of more than 1,300 inhabitants per square kilometer in some areas.

2.1 Water control before collectivization

The high population density of the RRD is not a new feature of the delta. It was already above 400 ha/km^2 at the beginning of this century (Dumont, 1935; Gourou, 1936). Actually, the RRD is an area of old human settlement which reclamation by paddy growers has been attested to date back more than 2,000 years (Sakurai, n.d.). This situation is most singular with regard to the unfavorable natural conditions faced by the population living in the RRD. Dangerous river floods and occasional typhoons followed by possible droughts are common during summer monsoons. During dry winter seasons, the main concern is accessing water to allow irrigated agriculture. To minimize the impact of these calamities, water control works, such as dike and canals construction, were initiated by imperial States more than 8 centuries ago (Chassigneux, 1912). Dikes protected the Vietnamese population from Red river floods during the monsoon. During the dry season, canals could receive water from the river (through pipes in the dikes) and channel it to paddy fields. To secure and intensify paddy agriculture, individual irrigation equipments such as water-lifting baskets and tripod scoops were introduced over seven centuries ago.

The imperial State took responsibility for the construction of dikes, water gates and main canals along river banks through the mobilization of local forced labor, leaving the responsibility of irrigation to Vietnamese villages (*lang xa*) (Fontenelle, 1998). With the French colonization, State investments in hydraulics increased dramatically with the improvement and completion of the RRD dikes, gates and the framework of main canals. Although the combined action of the Central State and farmer communities had already allowed the development of an intensive agriculture and a high density of population in the RRD, the situation of the farmers remained very uncertain due to the occurrence of droughts and floods, as well as the imposition of taxes and the burden of forced labor (Hémery and Brocheux, 1995). Drainage-wise, the constraint of water-gravity flow did not allow the drying up of land during the monsoon, when

the water level of the river was higher than in the surrounding paddy fields. Irrigation-wise, the constraint of manual water lifting hindered rice development during the dry season.

2.2 The centralized modernization of water control

The modernization of water control in the RRD began in the 1960s under the policy of agricultural collectivization and the setting up of cooperatives. The modernization of water control was assigned the strategic mission to facilitate the collectivization of agriculture. The combined effects of population mobilization during collective hydraulics works, such as canal digging, and the improvement of agricultural conditions were supposed to encourage the participation of the population in the new cooperative system (Yvon-Tran, 1994).

The State placed emphasis on mechanized drainage and irrigation. In 1962, 9.8 million man-days of labor were recorded against 2.3 million in 1959. In the Hung Yen province alone 4,000 kilometers of canals were dug at the end of 1963 (ibid.). In terms of direct investments from the State, more than 80% of the funds were dedicated to the improvement of water control. Large drainage and irrigation schemes were created with a comprehensive canal network from the primary to the tertiary level, channels giving access to rivers were dug and large-scale irrigation and drainage pumping stations were built. Between 1961 and 1965, more than 2,500 pumping stations were set up in the RRD (Vo Nhân Tri, 1967 quoted by Yvon-Tran, 1994). In 1966, 73% of the cultivated area of the RRD was equipped with a modern set of electric irrigation and drainage-pumping stations, which could supply and extract water mechanically without human labor (Le Thanh Khoi, 1978). These works, combined with the introduction of improved paddy varieties and chemical fertilizer, led to the further intensification of agriculture that, in turn, led to the expansion of double cropping of rice on all the RRD paddy land. But beyond the simple modernization of infrastructures, the way in which the Government of Vietnam intended to manage water supply was also changed. Water distribution was organized through the rotation of a strict irrigation-turn amongst all the cooperatives belonging to a single irrigation scheme. From a situation where local management at the village level prevailed, water management was given to State, provincial and district water services. Farmers were excluded from the water-distribution process (Fontenelle, 1999).

However, the improvement of food security in the RRD did not last long. Between 1960 and 1975, the increasing reluctance of the population toward collectivist economy and cooperatives, combined with the dysfunctioning of centralized management, appeared to reinforce the economic crisis (Kerkvliet, 1999). The situation worsened at the end of the 1970s when the government tried to sustain the collectivist economy through further heavy investments combined with a stronger centralization of production management. Drainage capacities were upgraded through the implementation of new pumping stations with high discharge capacity. Village cooperatives were aggregated into commune cooperatives. Districts became responsible for all production aspects, including the establishment of the crop calendar, choice of rice variety and the management of hydraulics. This policy failed dramatically and the very poor living conditions of farmers led to some starvation (Nguyen Duc Truyen, 1993). The food crisis faced by the RRD at the end of the 1970s was not the result of a lack of production capacity or funds, since water-control infrastructures had never been so developed in the past. This crisis appeared to be due to an excess of State interventionism, which undermined in particular the capacity of innovation of the farmers and

their interest in production. This was a political rather than a technical crisis (Tessier and Fontenelle, 2000).

2.3 Liberalization reforms and decentralization of water control

This situation lasted until the beginning of the 1980s when Vietnamese authorities recognized the failure of the "great socialist agriculture" and proposed, through the *Khoan 100* (directive 100), a new contract of production with farming households. This contract, which aimed to lease paddy land to households against a fixed contribution while the surplus of production was left to farmers, came in a context of economic crisis compounded by farmers' rejection of collectivism (Beresford, 1988; Kerkvliet, 1995). This resulted in a boom in agricultural production and encouraged farmers to claim full responsibility for agricultural production, including water supply. This aspiration could not be satisfied through the strict rotation of irrigation-turn, which prevailed on centrally managed schemes. First of all, individual land management created the need for a specific access to water for each small field leased to farmers, in contrast to the former organization of water supply on large collective plots (Mai Van Hai, 1999). Second, a strict organization leading to the establishment of a collectively fixed crop calendar did not allow diversification of crops and paddy varieties (Fontenelle and Tessier, 1997). The negative impact of this constraint was reinforced in the case of droughts or electricity cuts. In order to improve local irrigation conditions, farmers and cooperatives had to free themselves from their dependency on centralized irrigation systems. Farmers managed to deepen existing irrigation tertiary canals to store water for a few days after pumping and to get some flexibility in irrigation at the farm level (Dang The Phong and Fontenelle, 1995). Cooperatives implemented local pumping stations to get direct and autonomous access to water supply (Fontenelle and Tessier, 1997). These pumps were financed by revenues from cooperatives and subsidies from the State. Local pumping stations used the canal networks built by the State in the 1960s, and local irrigation schemes were therefore included in the old centralized irrigation perimeters.

The implementation of local pumping stations increased during the 1980s and took advantage of further political reforms initiated by the Government of Vietnam. In 1984, through the directive 112/HDBT, the central government slightly decreased its involvement in water management, partly by "privatizing" water-control services. A new actor, the Irrigation and Drainage Management Company (IDMC), was created in each *polder*.[4] The IDMCs are public companies owned by the State which were supposed to balance their accounts through the collection of a water fee paid by the cooperatives. Furthermore, the *Doi Moi* in 1986, which consisted in the abolition of subsidies and liberalization of production activities, the *Khoan 10* (directive 10) in 1988 and the Land Law in 1993, which governs the redistribution of land to farming households, created new conditions for water management and agriculture. Last, in 1996, the State issued a law on cooperatives aiming at improving their management in a way reminiscent of the 1984 reform of the IDMCs. Cooperatives were no more considered responsible for production and were supposed to provide a service to farmers, for which they could charge a fee.

[4] The RRD is divided into independent hydraulic units, which are fully diked and surrounded by arms of the river. These are called *polders* or *casiers,* in what follows.

The IDMCs were faced with rising electricity costs. Cooperatives were responsible for the collection of water fees, directly paid by farmers. On the other hand, agriculture became more diversified and intensive as farmers could decide their production activities on an individual basis. Farmers increased the number of paddy varieties they used, developed direct seedling and increased commercial crop production, especially during the winter season (Bach Trung Hung et al., 1999; Le Duc Thinh and Fontenelle, 1998). These production changes impacted on the water demand, both in terms of overall requirements and frequency of supply (Mai Van Hai, 1999). Such requirements were satisfied by cooperatives by increasing the number of local pumping stations in order to get more autonomy and flexibility in water supply. These stations now serve about half the irrigated area of the RRD. High population densities do not seem to jeopardize the food security of the RRD anymore, as agriculture now provides more than 300 kg of paddy per head per year (Dao The Tuan, 1998). Agriculture is very intensive and the RRD paddy production makes up 22 % of the whole Vietnamese paddy production. The RRD seems to successfully combine high population densities with intensive agriculture and strong water-control measures.

3 Institutional and financial framework of water management

This section is based on the example of the Bac Hung Hai (BHH) polder. It is the largest polder and the first in which hydraulic modernization was implemented at the end of the 1950s. With an extent of 210,000 hectares, 185,000 ha of which are inside the dykes, 126,000 ha cultivated and 100,000 ha irrigated, the BHH polder makes up 13% of the total area of the RDD. It encompasses 15 districts from 4 provinces: Hanoi province (1 district), Bac Ninh province (2), Hung Yen province (6) and Hai Duong province (6). In 1996, the number of pumping stations amounted to 1022, including 698 local stations.

3.1 National and provincial administrative levels

In 1995, the former Ministry of Water Resources, the Ministry of Agriculture and Food Industries, and the Ministry of Forestry were combined into a new Ministry of Agriculture and Rural Development (MARD). The Department of Water Resource (DWR) within the MARD is responsible for the planning, design, construction and funding of major projects, down to the 150-ha level. It fixes the rules for the calculation of the water fee according to the type of irrigation (gravity, one pumping operation or two pumping operations) and drainage (gravity and/or pumping).

The responsibility for managing existing public irrigation and drainage systems, and planning and executing smaller projects is delegated to the province under the leadership of the Provincial People's Committees (PPC). The PPCs provide policy advice and funds and oversee the work of technical services, set provincial water rates based on national guidelines, define subsidies for local water resources projects, and make investments in local infrastructure. Provinces have established provincial Water Resource Services (WRS) to take over these water-related responsibilities. There are 10 WRS involved in the water management of the RRD, since the delta area overlaps 10 provinces. WRS are line agencies of the provincial governments. Their duties are similar to those of the central DWR in terms of planning, design and construction, but are focused on smaller projects below 150 ha. Additionally, they shoulder the responsibility of the calculation of water fees paid by farmers. Water fees and their calculation were originally based on a national decree that the government cabinet promulgated in August 1984 (112

HDBT, 1984). The total water fee cannot exceed 8% of each province's average paddy yield for the last five consecutive seasons, for spring and summer seasons. The fee calculation is based on three subsidiary fees which account for paddy field irrigation, paddy nursery irrigation and paddy field drainage operating costs. The maximum value of the fee for these different services depends on whether water is supplied by gravity, or through one or two pumping operations: the irrigation fee, for example, includes a 'diversion' fee which is paid to the company in all cases (operation of the main system), a pumping fee if such operations are necessary, and a field-application fee. The diversity of situations leads to a great complexity in the calculation of the fees. Given the fact that the fee is expressed in kilos of paddy, even though farmers now pay in cash, the PPCs determine every year an official rate for one kilo of paddy in order to avoid the impact of price fluctuations in the paddy market.

3.2 IDMC at the polder level

In response to the national policy mandating privatization of various government departments and functions, provinces have established separate companies under the WRS to identify and design water-resource projects, to construct and repair civil works and to manage irrigation water. These Irrigation and Drainage Management Companies (IDMC) were established and registered as State companies after 1984. Most often, an IDMC has responsibility for all existing public irrigation in a primary hydraulic unit or polder. Several IDMCs can respond to the same WRS when the province encompasses more than one polder. Unlike DWR and WRS, the IDMC level is not based on an administrative division but on the polder division. There are 30 IDMCs in the delta, managed by 10 provincial WRS. In larger polders, which extend over more than one district-administrative unit, the IDMC is assisted by several sub-companies (IDMSC), one per district concerned.[5] In 1995, 29 IDMSCs were recorded in the RRD, including 14 in the BHH polder.[6] Each IDMC or IDMSC is structured based on irrigation groups, called *cum*, each being responsible for 1,000 hectares or so. Hydraulic *cum* work with cooperatives to manage water maintain facilities and collect the water fee. Hydraulic *cum* are responsible for irrigation operation and maintenance of schemes, from the pumping station to the primary canal. Overall, the mismatch between hydraulic units (polders, irrigation units) and administrative ones (province, districts, communes) generates a complex set of nested structures.

With the 1997 national Directive 56/CP, IDMCs (and IDMSCs) became companies of public utility. They were expected to cover the cost of water diversion, operation and maintenance of irrigation and drainage and depreciation through the collection of the water fee paid by the farmers. IDMCs do not control their income and are, in particular, not allowed to raise service fees or keep surplus funds, except for minimal maintenance. But, in case of climatic hazards, such as typhoons and droughts, state subsidies are supposed to be granted in order to compensate for extra drainage and field application costs and for the decline in water fee allowed in case of paddy losses. The implementation of the Directive 56/CP is the responsibility

[5] The distinction between IDMC and IDMSC will be made only when necessary. From a general point of view we will only refer to IDMC.

[6] The two districts of Bac Ninh Province have a joint IDMSC. This is why there are only 14 IDMSCs for 15 districts in the BHH polder.

of each PPC, which adapts the Directive to its own provincial situation and publishes provincial circulars on this issue.

Because of the size of the BHH polder, BHH IDMC constitutes a special case: before 1998, it was supervised by the Hai Hung provincial WRS;[7] nowadays, BHH IDMC is supervised by a System Management Council, constituted of representatives from the 4 provincial WRS, and chaired by the Director of the DWR-MARD. BHH IDMC is responsible for water diversion and transportation from the river through the dual-purpose central canal network on the whole BHH polder, and for the manipulation of most drainage facilities (pumping stations and gravity gates).

Table 1 shows the breakdown of revenues and expenditures of IDMC as dictated by the national regulation and its application in Hai Duong Province. Within the same BHH polder, the situation of each district depends on the province it belongs to: the IDMSCs from Hung Yen and Hai Duong provinces (equivalent to 85% of the BHH supplied area) pay on the basis of the effective supplied area (36 kg/ha for spring season and 24 kg/ha for summer season), while Hanoi and Bac Ninh IDMSCs pay a percentage of BHH IDMC annual expenditures equivalent to the share of area covered by each IDMSC (3% for Hanoi IDMSC and 12% for Bac Ninh IDMSC). Regarding State subsidies, Hai Duong provincial decision No. 283/QD-UB stipulates that altogether 136,000 kWh are annually needed to cover the electricity costs of drainage stations. When drainage needs are higher than this rate, subsidies are granted by the WRS province, and not any longer by the budget ministry, to the IDMC to compensate for the losses. Moreover, a permanent subsidy is given to the IDMC to decrease the cost of water to farmers. Finally, commercial activities include transport fees for boats using the primary canal network, and the repair fees for the main works directly achieved by the company. An analysis of the 1995-1999 period showed that, on average, diversion fees paid by IDMSCs amounted to 87% of the BHH IDMC annual revenue, while subsidies and commercial fees represented only 2% and 11%, respectively (Nguyen Thi Hong Loan, 2000). Expenditures are also specified in terms of percentage of the revenue. The larger share goes to maintenance work, while salaries plus social insurance costs have to remain approximately below 10%.

[7] The Hai Hung province was formerly composed of two provinces (Hai Duong and Hung Yen) but the 1997 reform, which led to the division of several provinces and districts in Vietnam, resulted in BHH overlapping with four provinces.

TABLE 1: ANNUAL REVENUES AND EXPENDITURES OF IDMCS AND IDMSCS IN HAI DUONG PROVINCE

		National regulation Circular 90/1997/TTLT/TC-NN	Hai Duong Provincial regulation Decision 1854/1998/QD-UB
Incomes	Water fee average level	From 3 to 8% of the yield Directive 112/HDBT (1984)	From 1.6 to 5.9% of the yield Decision 1132/QD-UB (1993)
	Public subsidies	Circular 90/1997/TTLT/TC-NN (1997) - when yield decrease > 30 % - when incomes < expenditures (from national budget) - when drainage cost > average ratio kWh/ha	Decision 283/QD-UB (1998) - when yield decrease > 30% - when incomes < expenditures (from provincial budget) - when drainage cost > average ratio kWh/ha - permanent subsidy to decrease water diversion cost to farmers
	Commercial activities	Directive 112/HDBT (1984)	Directive 112/HDBT (1984)
Expenditures	Gasoline and electricity	< 50%	Circular 16/DM-XN (1989)
	Salaries	< 8% of total expenditures Circular 06/NNPTNT (1998)	< 8% of total expenditures Circular 06/NNPTNT (1998)
	Social and medical insurance	19% of salaries Directive 112/HDBT (1984)	19% of salaries Directive 112/HDBT (1984)
	Diversion cost paid to BHH IDMC	Directive 112/HDBT (1984)	Decision 1132/QD-UB (1993)
	Depreciation of equipment	Decision 1062TC/QD/CSCT (1996)	Decision 1062TC/QD/CSCT (1996)
	Exceptional repairs	18 to 20% Decision 506TC/DTXD	16 to 19% Circular 06/TL (1990)
	Ordinary repairs	20 to 30% Decision 211/BNN (1988)	14 to 16% Circular 06/TL (1990)
	Water fee collection	2 to 3%	< 3%
	Management overheads	5 to 6%	< 5%

3.3 Cooperatives and farmer levels

Cooperatives[8] are the last formal level involved in irrigation. Cooperatives are collective bodies supposed to represent all the farmers who depend on their water supply. They are always managed by commune officials only, and access to membership (with corresponding rights) is restricted to some voluntary farmers only (members of the Party or of the Farmers Association). The relationship between cooperatives and IDMSCs, via a hydraulic *cum*, depends on the existence and the location of local pumping stations. Every year, each cooperative signs a service contract with a *cum* which acts on behalf of the district IDMSC. These contracts are established on a seasonal or annual basis by mutual agreement and signed

[8] Cooperatives are established at commune level or at village level. In the latter case, the village cooperatives depend from the economic development committee of the commune. In any case, cooperatives are closely linked to commune authorities.

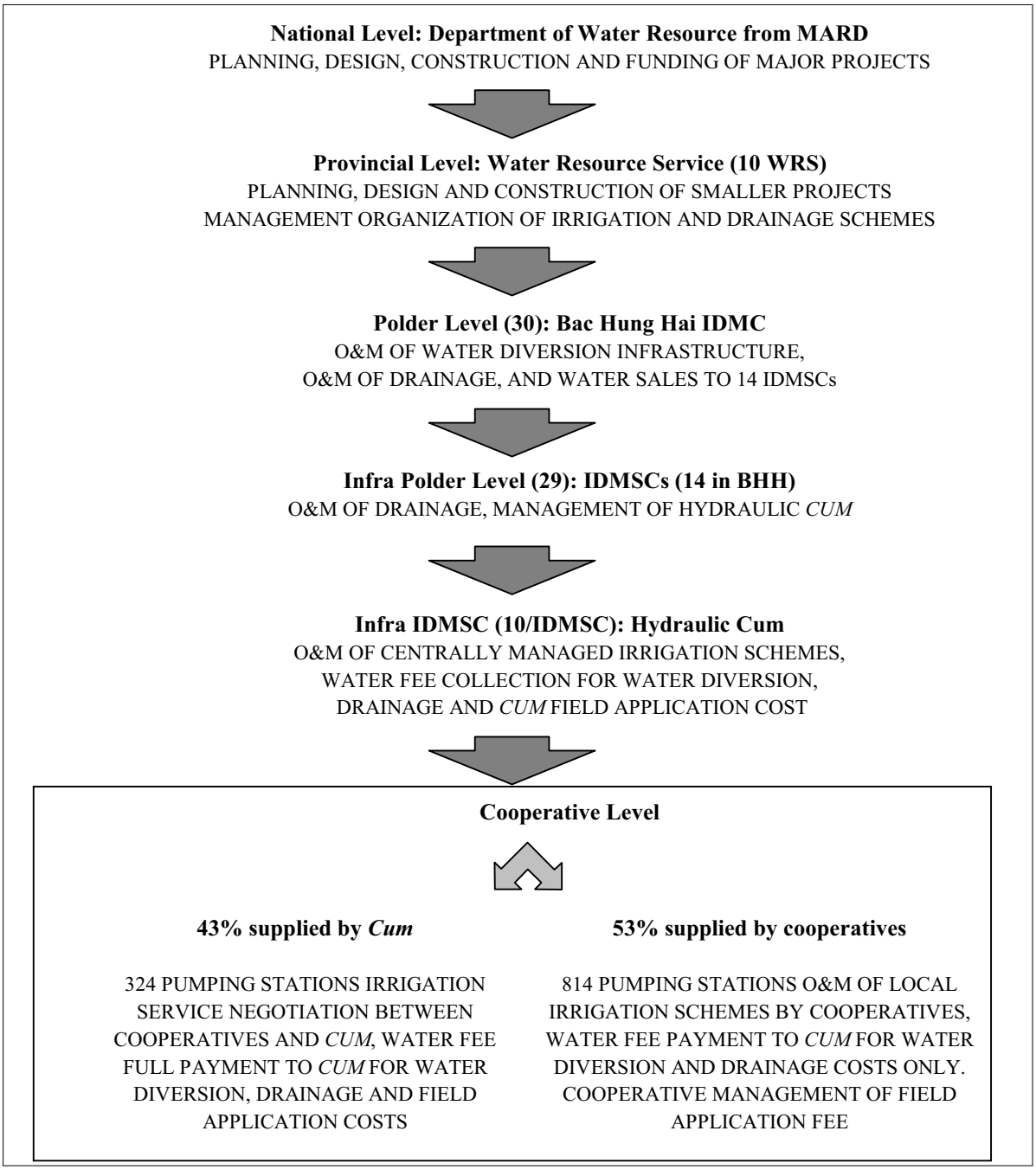
between each cooperative Director and the concerned *cum* Director. The contract quantifies the cooperative seasonal or annual water fee. For the spring season, the area cultivated by the cooperative is indicated and the supplier specified: water can be either provided by the *cum* or by a local pump of the cooperative itself. For the area supplied by the *cum*, more details are given: these include the kind of crop (rice, rice nursery, food crops or industrial crops), and the kind of irrigation, which is provided (direct gravity irrigation, single or double pumping, "hand lifted" irrigation). For each type of crop and irrigation, a water fee rate is given in kilos of paddy per hectare, based on provincial regulations. These rates are multiplied by the area of each type of crop and irrigation, and then aggregated. The sum gives the irrigation fee amount, including the water diversion costs, to be paid by the cooperative to the *cum*. For the summer season, an additional fee for drainage costs is calculated on the basis of the area cultivated by the cooperative. The date, the place and the nature of payment are specified too. Contracts vary with each cooperative water-supply situation as explained below:

- When there is no local pumping station, cooperatives are responsible for distribution of water and maintenance of irrigation canals, from secondary canals to quaternary canals. They collect a water fee from farmers equivalent to water diversion, drainage and field application costs. The totality of this fee is paid to the hydraulic *cum,* which supplies them with water.
- When there are local pumping stations built along one of the channels of the polder-hydraulic network, cooperatives have to operate and maintain their system from the pumping station down to the quaternary canals. They collect a fee from farmers as explained above but they do not pass the totality on to the *cum*. They only pay for water diversion and drainage costs and keep the irrigation fee (adjusted to incorporate the cooperatives costs) for themselves.
- When there are local pumping stations which withdraw water from primary (raised) irrigation canals supplied by a pumping station of the *cum*, cooperatives have to operate and maintain their local systems from the local pumping station to the quaternary canals. The field application fee is increased, since this part is kept by the cooperative, while the standard fees for diversion and drainage are paid to the *cum*.

Some cooperatives are fully independent while others still rely on centrally managed pumping stations for a percentage of their irrigated area, ranging from a few hectares to the full cooperative irrigated area. Combinations of two of these three cases can also be found within the same cooperative, as sub-areas may have different status (in such cases, the costs of supplying water to farmers differ but they are averaged in order to come up with a uniform fee per ha). In the BHH polder, there are only a few cases of double pumping and they are not recorded. The official figures are that 53% of the irrigated area is supplied by cooperative stations and 43% by IDMSCs.

Finally, every 6 months, farmers have to pay part of their annual individual water fee to the cooperative. The amount they pay reflects the situation of the cooperative regarding irrigation and drainage facilities. They all pay the same amount per unit of area, irrespective of the location of their plots. The water fee is paid together with other levies such as the land tax and several local taxes established by the commune (local roads maintenance, field surveillance, taxes on houses, gardens and ponds, solidarity tax, etc.). As a result, only a few farmers know the exact amount paid for the irrigation and drainage service (Fontenelle et Tessier, 1997).

Figure 1: Water management organizational framework in Bac Hung Hai polder



4 Water pricing and its intricacies

4.1 Overlapping rationalities

The implementation of local pumping-irrigation stations in the RRD led to the creation of a dual system where two kinds of irrigation stations with different technical characteristics supply fragments of the same original network. In the BHH unit there were 814 local stations in 1996 supplying 54,487 ha, and 324 centralized stations supplying 41,490 ha. The average size of local schemes (67 ha) is, therefore, half that of the centralized schemes (128 ha). In terms of discharge capacity, local pumping stations have a higher pumping capacity than originally centralized ones (see table 2). Their implementation cost per unit area is higher but, on the other hand, they provide several benefits to farmers (Fontenelle and Tessier, 1997; Mai Van Hai, 1999):

TABLE 2: COMPARISON OF IRRIGATION DURATION FOR LOCAL AND CENTRALIZED STATIONS

	Effective continuous flow	Land preparation Supply of 100 mm (night and day, 20 hours)	Rice season irrigation Supply of 30 mm (12 hours maximum per day)
Local station	7 l/s/ha	40 hours: 2 days	12 hours: 1 day
Centralized station	1.2 l/s/ha	231 hours: 11.5 days	69 hours: 6 days

- **Satisfaction of water requirements**. Technical surveys conducted on irrigation efficiency at scheme, plot and field levels in An Binh cooperative, in the district of Nam Thanh, showed that crop-water requirements were met. This contrasts with the former situation of centrally managed stations where downstream cooperatives could not access water in time (Bousquet et al., 1994; Dang The Phong and Fontenelle, 1995).
- **Flexibility/autonomy.** Field surveys have shown that farmers did not want to get water with an interval longer than 7 days. On local irrigation schemes, there is no more delay between the decision of pumping and the effective supply of water. During the rice-growing stage, the full supply of local irrigation schemes is achieved within a day. Farmers can now complete their land preparation within 2 days, instead of the earlier 11, which allows them more flexibility in terms of cropping patterns and choice of rice variety. The cooperatives' decisions to pump are triggered by the actual water status of canals and paddy fields and not based on a fixed pumping calendar. All farmers need water when a pumping operation is decided. Managers and users of local schemes are from the same village, or even from the same hamlet. They define their water supplies and rules amongst themselves, without IDMSC intervention. Localities commonly share irrigation benefits and constraints within their boundaries as it was before the agricultural collectivization of the 1960s.
- **Efficiency.** Local schemes are smaller than centrally managed schemes, below 100 hectares instead of 1,000 hectares or more.[9] Canals are shorter and less water is wasted compared with centrally managed schemes, which suffered from water losses and illegal water diversion (Bousquet et al., 1994;

[9] The original area of the centrally managed Van Giang scheme was 14,000 hectares.

Fontenelle, 1999). As a result, local stations pump less water per unit of irrigated area than central ones, as it can be seen from table 3.[10] Differences in water use are due, in part, to the fact that the local management is more efficient, but higher consumption rates of companies are also due to some illicit arrangements between cooperatives and staff of company pumping stations. In some instances, staffs of pumping stations sell water to cooperatives in order to increase their incomes. This artificially increases the record of the volume delivered per ha by the company pumping stations, while it decreases the official water consumption of the cooperatives that benefit from such arrangements.

TABLE 3: AVERAGE VOLUMES PUMPED PER HA DURING SPRING SEASON 1996[11]

	Land preparation m^3/ha	Rice season irrigation m^3/ha	Seasonal consumption m^3/ha
Local station	1,600	2,400	4,000
Centralized station	3,900	5,900	9,800

However, reasons for investing in local pumping stations are not only technical. Firstly, before the end of the 1980s, it was a way to obtain the electrification of a village (*thon*) or a commune (*xa*) (Do Hai Dang, 1999). Secondly, the establishment of a local pumping station in each village of a commune is sometimes the sign of political competition between influential persons ('*notables*') who all want to have a local station serving their village. Effective continuous flows of 5 l/s/ha may be technically acceptable but they sometimes reach 10 l/s/ha, which are clearly unnecessary as far as paddy cultivation is concerned. Beyond the mere technical question of crop water supply, local water management embodies local political struggles amongst commune and village leaders.

4.2 Costs to farmers

To assess the cost of water to farmers, six cooperatives were surveyed in two districts of the BHH unit. Two were fully responsible for their irrigation, two partly responsible and the last two were supplied by the central pumping stations of the company for all their irrigated area (see table 4). Results show that the calculation of the water fee can be based on actual costs paid by the cooperatives or on fixed rates chosen by each cooperative, when pumping stations are managed by cooperatives themselves. When the water supply to the cooperative depends on central stations, the water fee calculation is based on provincial regulations only.

Table 5 specifies the amount of water fees paid by farmers and shows significant differences between cooperatives. These can be due to the natural or hydraulic conditions of each cooperative, such as the necessity of double pumping in the Tan Lang commune. But differences should not appear within each type of water supply, as rates are based on the same provincial directives and national decrees. For instance,

[10] These values are based on two combined approaches. One consisted of the monitoring of date and duration of each pumping. The other consisted of power readings. In both cases they represent actual volumes pumped and do not represent billed amounts.

[11] Monitoring of 10 pumping stations in the Nam Thanh district, Hai Duong province.

single pumping fee ranges from 395 kg/ha to 473 kg/ha in the same province of Hai Duong, which is officially impossible. The highest levy was paid by farmers from the Tan Lang cooperatives, where all irrigated areas are supplied through two consecutive pumping operations. It amounted to 639 kg of paddy per hectare per year. The lowest fee was paid by farmers from the Hung Thai cooperative in which all types of water supply were cheaper than in other surveyed cooperatives. A single pumping operation by a local station costs farmers 464 kg of paddy per hectare per year in the Hung Thai cooperative, which is 28% cheaper than in the Tan Lang cooperative.

TABLE 4: IRRIGATION TYPE AND WATER FEE CALCULATION SYSTEM FOR 6 SURVEYED COOPERATIVES

Name of the cooperative	Scale	Number of pumping stations	% of the area supplied by local stations	District	Province	Basis of fee calculation
Tan Vinh	Village (since 1982)	2	100	Ninh Giang	Hai Duong	Cooperative effective expenditures (CEE)
Tan Lang	Commune	9	100	Gia Luong	Bac Ninh	Cooperative fixed rates (CFR)
Hung Thai	Commune	3	61	Ninh Giang	Hai Duong	Provincial fixed rates (PFR)
Dong Tam	Commune	3 (+4+12[12])	60[13]	Ninh Giang	Hai Duong	CEE for pumping and PFR for water diversion
Ngo Phan	Village (since 1992)	0	0	Gia Luong	Bac Ninh	Provincial fixed rates
Kim Thao	Village (since 1987)	0	0	Gia Luong	Bac Ninh	Provincial fixed rates

TABLE 5: WATER FEE PAID PER TYPE OF WATER SUPPLY (IN KG OF PADDY/HA/YEAR)

Name of cooperative	Type of access to water			Remarks
	Single pumping	Double pumping (IDMSC + Local)	Diversion by gravity	
Tan Vinh	619 (473+146)	---	324 (178+146)	(including 146 kg of extra fee for maintenance and new construction)
Tan Lang		639		
Hung Thai	464 (408+56)	345 (289+56)[14]	253 (197+56)	(including 56 kg of extra fee for maintenance and new construction)
Dong Tam	478 (395+83)	---	280 (197+83)	(including 83 kg of extra fee for maintenance and new construction)
Ngo Phan	475	475	475	
Kim Thao	586 (475+111)			(including 111 kg of extra fee for maintenance and new construction)

[12] There are 4 local collective diesel pumping stations and 12 individual petrol pumping stations for 28% of the total cooperative area.

[13] Including the 28% supplied by diesel and petrol pumps.

[14] In fact, in this cooperative there is only one pumping from the IDMSC. The second lift is achieved manually by farmers.

But beyond these differences, which are not so large (20% only for the previous example), the main differences are due to local extra water fees defined, collected and used by cooperatives to improve the quality of their service (extra costs for local maintenance) and to increase their involvement in irrigation (capitalizing for new investments in local stations). Extra fees, also referred to as 'exceptional levees', range from 56 kg/ha to 146 kg/ha and differences reach 62% between cooperatives.

This is a reflection of their autonomy. This also creates inequity among farmers who do not benefit from the same production conditions depending on the cooperative they belong to. But, compared with the annual production of paddy field (an average of 8 tons of paddy in two seasons, plus an additional crop in one-third of the area), water fees appear to be quite small. Even in the Tan Lang cooperative, they do not exceed 8% of the annual paddy production (not considering the benefit of the winter crop). Since in most areas of BHH water can be supplied by a single pumping operation, water fees paid by farmers in these cooperatives (including extra fees established by cooperatives), range from 5.8% to 7.7% of their annual paddy production, which is not considerable.

The point is that most farmers do not know any detail about the calculation of the water fee. This information is withheld by the village chief who is in charge of tax collection on behalf of the Commune People's Committee. Ambiguity also results from the complexity of the breakdown of the water fee, depending on local situation. Farmers only know how many kilos of equivalent paddy they have to pay at the end of each rice season, and even if they know the amount of the water fee they are not in a position to ascertain whether the extra fees collected are justified or not and what is their exact utilization. Sometimes, there is an ambiguity between irrigation services and the provision of electricity to households, which also allow some illicit gains to the company[15]. All this opacity is embedded in kinship and clientelist relationships and tends to engender mistrust in the villages. Altogether, the annual taxes paid by farmers are equal to 20% to 25% of the value of the annual paddy production (Bousquet et al., 1994). They include the water fee, but also the land tax and several other taxes (house, field watching, cooperative fund, construction of local roads, health, labor insurance, construction, crop damages, new economic zones, "duty" and police [*ibid.*]). More than an issue of taxation only, farmers' difficulties are due to the low economic return of paddy production. Production costs amount to 25% of the annual gross value of paddy production. Added to taxes, annual deduction reaches almost 50% of farmers' annual production of paddy.

4.3 The cooperatives: balanced but non-transparent accounts

The financial situation of the cooperatives surveyed was analyzed based on data communicated by the cooperatives themselves, except for Kim Thao village cooperative where information was not made available (table 6). On the basis of the available information, it appears that the breakdown of expenditures varies from one cooperative to another.

[15] The electricity for pumping (irrigation) is billed 30% cheaper than domestic electricity by the Company in charge of this service. The companies sometimes apply only the higher tariff to all types of consumption.

TABLE 6: ANNUAL AVERAGE EXPENDITURES AND BALANCE (YEARS 1998 AND 1999)

Name of Cooperative	Nb. of Staff	% Management Costs	% paid to IDMSC	% Electricity	% Repairs	% Invested	% Depreciation	% Annual Balance
Tan Vinh	9	9,7	30,1	11,5	18,7	30,0	0,0	7,3
Tan Lang*	27	9,3	29,1	44,4	17,2	0,0	0,0	?
Hung Thai	17	23,0	43,6	18,8	11,9	0,0	2,7	4,0
Dong Tam	32	29,9	50,0	12,5	7,6	0,0	0,0	2,5
Ngo Phan*	9	5,9	74,8	0,0	19,3	0,0	0,0	?

* Average on 1997, 1998 and 1999.

The number of staff is obviously larger in commune cooperatives than in village cooperatives but it seems that there is no economy of scale as the shares of management costs are higher in commune cooperatives than in village ones. With the information on hand it is difficult to interpret correlation between the shares of management cost and the degree of dependence on the Company. The amount paid to IDMSC is directly correlated to the percentage of area supplied by the central pumping stations, ranging from 30% (100% locally irrigated) to 75% (100% centrally irrigated) of total costs. On average, repairs amount to 15% of total expenditures and investment in new construction or savings for depreciation of the equipment are not frequent. Overall, and on the basis of the available values, cooperatives seem to balance their accounts, which is not the case of IDMCs and IDMSCs, as will be shown later. The main point about these values is that no justification is given for them. Cooperative managers do not present their accounts with more details than the data provided in this table. Moreover, in three of the surveyed cooperatives no information was provided on the amount of fees collected. Financial transparency is not the rule.

4.4 IDMC's finances

The analysis of annual fee recovery of BHH IDMC and four IDMSCs showed a cumulated deficit, which leads to an unbalanced annual situation for these organizations. Table 7 shows the situation encountered in four district IDMSCs, one from each province concerned with the BHH hydraulic unit, for four consecutive years. These included Ninh Giang IDMSC from the Hai Duong province, Chau Giang IDMSC from the Hung Yen province, Gia Lam IDMSC from the Hanoi province, and Gia Thuan IDMSC from the Bac Ninh province.

The water fee collected annually by each of these four IDMSCs never reached the expected income, but fee recovery from the cooperatives nevertheless exceeded 92%, which is quite remarkable[16]. However, the analysis of the annual effective expenditures compared to annual effective incomes (fee + subsidies +

[16] The reasons for defaulting are not clear. It is possible that cooperatives which receive poor services decide to withhold part of the fee. Since these figures come from the IDMSCs, it is also possible that the company has interest in showing a default rate. Interestingly, there is a recent move towards establishing contacts between the *cum* and the cooperatives which are not based on area but on real pumping hours and days. The gain, however, may not reach farmers as they are unaware of the nature of the contracts.

commercial activities) shows that the situation of the IDMSCs is really unbalanced, with expenditures exceeding incomes by 18% on average (table 7).

This situation is due to the incapacity or unwillingness of the provinces to provide subsidies to compensate for the loss, as dictated by the regulation. The consequence is that the IDMSCs studied are heavily indebted to BHH IDMC and electricity companies, as highlighted in table 8. On average, the cumulated debt of these companies exceeds 55 % of their annual income with important differences from one company to another. The status of each company is strongly correlated to the importance of the cumulated electricity debt rather than to BHH water-diversion fee, which amount is known by each IDMSC and does not vary much from one year to the next. This does not apply to electricity costs, which depend on annual rainfall and farmers' practices. Theses differences between incomes and expenditures show that the present regulation does not allow the financial equilibrium of the activities of companies without the provision of subsidies by the national or provincial levels, and the granting of loans by the banks.

TABLE 7: WATER FEE, INCOMES AND EXPENDITURES (IDMSC)

IDMSC	Year	Water Fee (in billion dong)			Incomes	Expenditures	
		Due	Collected	%	(in billion dong)	(in billion dong)	%
Ninh Giang (Hai Duong province)	1996	3.0	2.9	97	3.0	3.5	117
	1997	2.5	2.4	96	2.9	3.6	124
	1998	2.7	2.4	89	3.0	3.3	110
	1999	2.3	2.2	96	2.9	?	?
Chau Giang (Hung Yen province)	1995	2,4	2,4	99	2,6	2,7	104
	1996	2,6	2,4	92	2,6	3,1	119
	1997	2,1	2,1	98	2,2	2,6	118
	1998	2,8	2,7	96	2,8	3,3	118
	1999	2,5	2,5	97	2,7	3,2	119
Gia Lam (Hanoi province)	1995	2,5	2,2	88	2,5	3,0	120
	1996	3,2	3,0	94	3,0	3,6	120
	1997	3,2	2,8	88	2,8	4,3	154
	1998	3,1	2,6	84	3,3	4,3	130
	1999	3,9	3,2	82	3,7	4,1	111
Gia Thuan (Bac Ninh province)	1995	6,7	6,3	94	7,9	6,7	85
	1996	8,4	7,4	88	11,0	9,5	86
	1997	7,1	6,5	92	8,1	11,5	142
	1998	8,0	7,4	93	9,0	11,5	128
	1999	8,1	7,7	95	9,1	11	121

TABLE 8: CUMULATED DEBT OF FOUR IDMSCS (UP TO AND INCLUDING 1999)

	Ninh Giang (in million dong)	Chau Giang (in million dong)	Gia Lam (in million dong)	Gia Thuan (in million dong)
Electricity cost	116 (17%)	1,349 (58%)	1,126 (61%)	1,754 (41%)
BHH water diversion fee	444	968	697	1,975
Other (repairs, maintenance, etc.)	141	0	25	517
Total	701	2,317	1,848	4,246
Percentage of annual income	24	90	60	47

A similar analysis was done for BHH IDMC. Table 9 shows that for the 5 years studied the company could not collect the full water diversion fee due by the 14 IDMSCs. The situation is that IDMSCs do not pay their diversion fee to BBH IDMC as they should (80% at the most).

This financial imbalance has a direct impact on BHH IDMC activities. Every year, the company has to submit its activity plan to the authorities. Priority is given to operational activities to the detriment of maintenance and repairs. Financial resources cover priority costs, such as salaries for IDMC staff, electricity and petrol for stations operation, fees for water fee recovery and loan interests. Maintenance and repair activities depend on the annual collected income, on cash flows and loans made with public organizations (banks and public companies). Figures on main repairs show that differences between planned and achieved activities are very large every year (see table 10). Only in 2 years, 1996 and 1999, could the company mobilize enough funds to cover the cost of the planned repairs. This is because in 1996 BHH IDMC got a loan of 3.7 billion dong from the dredging public company and in 1999 it got a subsidy from the Ministry of Agriculture and Rural Development. This situation of deficient incomes weakens the capacity of the IDMC to meet its annual.

TABLE 9: COMPARISON BETWEEN DUE AND COLLECTED WATER DIVERSION FEE (IDMC)

Year	Water diversion fee due (in billion dong)	Water diversion fee collected (in billion dong)	%
1995	7.6	4.4	58
1996	8.4	6.7	80
1997	7.4	4.3	58
1998	11.1	6.1	55
1999	9.2	6.6	72

TABLE 10: COMPARISON BETWEEN PLANNED AND ACHIEVED MAIN REPAIRS (IDMC)

Year	Main repairs planned (in billion dong)	Main repairs achieved (in billion dong)	%
1995	3.7	1.6	43
1996	3.4	3.7	109
1997	3.2	1.5	47
1998	3.8	0.9	24
1999	2.9	3.2	110

4.5 Institutional contradictions and difficulties

This is a classical problem with irrigation schemes. From a functional point of view, the relevant unit is the hydraulic unit. But decisions on water management (and mostly about financial issues) are based on administrative decisions and on administrative units. This is the case with the IDMCs and IDMSCs, which are under control of the WRS of the province. Moreover, some IDMCs as in the BHH polder are under the control of more than one province. When water is provided to hydraulic units that span different provinces, the level of the fees and subsidies can be different for the same service. Actually, there are four different directives governing the level of the water fee paid by farmers living in the BHH unit, and policies on subsidies vary from one province to the rest. This situation leads to inequalities between farmers depending on the province they belong to, and not on the IDMC, which supplies them with irrigation water.

The level of fees is determined by PPCs, within a framework fixed by the State. They are based on a percentage of the yield, depending on the kind of water service that is provided. At national and even more at provincial levels, the determination of fees is based more on political considerations than on the economic analysis of water-service costs. For example, the level of fees did not follow the huge increase in the electricity costs, which occurred from 1986 to the beginning of the 1990s.

The companies have limited control on their income, which depends on the area actually irrigated and drained, and on the level of the fees. Even if they collect 100% of the fees, it is doubtful whether they can balance their costs. Officially, provincial subsidies are supposed to cover the differences between incomes and expenditures. Moreover, the reference for the fees is supposed to be the average yield for the past 5 years. But often, this reference has not been revised since 1984, even if real yields have dramatically increased. In addition, provincial WRS did not add a third irrigation fee for the winter season, even if some irrigation supply was required. Instead they decided that the cost of the third crop would be covered by subsidies as a political measure to promote intensification of agriculture. Considering the actual agricultural results (paddy yields and a third winter crop) of farmers, the effective water fee they pay to the companies is lower than the nominal official percentage (5.9% for Hai Duong).

The main items of operating costs of companies are electricity and maintenance, along with salaries. The electricity cost depends on the year but companies have to fulfill their duties even if they jeopardize their annual financial balances. They cannot stop drainage or irrigation when the electricity expenses are above the provisional budget. Companies do not control operational costs, which depend on annual weather conditions. Most company charges are defined and fixed by the administration. Decrees on water management specify how many people have to be employed for each kind of work. Depending on the power, a pumping unit must have a chief, a worker and, maybe, a third agent. Therefore, the number of people working for the company is broadly defined by the structure of the scheme. Some officials at the central level say that these norms are too high and that it is not necessary to have so many people. Salaries, social security contributions, etc., are also fixed by the administration. Even if they wanted to, companies could not significantly reduce the cost of labor. This cost, if we trust the official statistics, remains under 10% and is not as high as expected. Thus, companies cannot be assimilated to overstaffed agencies commonly found in the irrigation sector and reducing staff would only yield limited gains.

In such a situation, companies can only control their expenses by delaying or leaving the maintenance works unpaid. Moreover, for clientelist or political reasons, companies may employ more people than the number fixed by decrees. Knowing that they may have subsidies if they are unbalanced, companies do not have so much interest in showing a balanced budget. Most of the maintenance work is done by the companies themselves, or by public enterprises under contract without real competition, which may result in increased costs.

Due to the emergence of local pumping stations, IDMSCs now supply about 50% of the area they used to serve originally. Their incomes are based on the area supplied and have therefore significantly declined, despite the electricity bill having also decreased, because of the smaller area now irrigated. But electricity is only a part of the expenses, and the labor cost and other fixed costs have not decreased, because the number of people paid by companies is still the same. Moreover, the contract between companies and cooperatives is based on an estimate of the irrigated and drained areas, but companies are not able to accurately determine the effective area. Cooperatives tend to underestimate this area, to reduce the amount of fee to be paid to the companies, contributing to increasing the gap between IDMCs incomes and costs.

The evolution of the legal status of IDMCs has been a step in the restructuring of water management after de-collectivization. Compared with a full administrative management, it allows the specification of responsibilities. The attempt to oblige them with a balanced budget was a failure. The creation of the status of a “public interest company” means the State recognizes that it has to subsidize some costs. But the current status does not provide proper incentives to IDMCs to balance their operational costs, and may even prevent them from doing so.

5 Synthesis

The organizational and financial framework of water-control in the Red river delta presents a complex and confused image. The establishment of a water fee and of the IDMCs was linked to the de-collectivization policy, dated from the mid-1980s. From this time, the Vietnamese State has tried to combine two political goals. On the one hand, the liberalization of the economy meant that production costs would have to be covered by the producers themselves and, on the other, the struggle for national food security after more than 30 years of war and scarcity, led the State not to leave the full cost of hydraulic activity to farmers alone. Drainage cost recovery is not limited to farmers alone, since this service benefits the nonagricultural rural and urban population too. This also justifies the State covering part of the expenditures of the IDMCs, and the farmers and the State (central and provincial) shouldering cost recovery for irrigation and drainage.

With the 1990s, the decentralization policy, the organization of the water-control in the RRD became more complex. From the management point of view, part of the legislation-making capacity was transferred to the provincial level. From the technical point of view, the increasing involvement of cooperatives in irrigation and the development of local pumping stations has led to the effective redistribution of responsibilities between the IDMCs and the cooperatives. The resulting multiplication of circulars and rules for regulation at the central, provincial and communal levels created significant heterogeneity and inequalities in farm taxation. The water fees paid by farmers are different from one

cooperative to another. The calculation of income and expenditures of the IDMCs vary according to the province. This heterogeneity stems more from local political decisions than from the variety of hydraulic conditions faced by farmers, cooperatives and IDMCs.

The study also showed the benefits that can be drawn from decentralized and autonomous pumping stations, as opposed to centralized large-scale ones. The gains in flexibility and responsiveness to needs come at the cost of what might appear as pumping overcapacity, but they are significant enough to encourage the development of local stations, even if the costs/ha tend to be somewhat higher. This is particularly so when farmers are able to obtain public funds and do not pay directly for the investments in local pumping stations. The share of these investments paid by the communes varies with time and place[17]. Sometimes, the subsidies can be obtained from the State, but this is an obscure point in which personal networks of influence also play a role.

However, the fees paid by farmers encompass more than operating costs only, and they cannot assess their use. Part of the fees is dedicated to the satisfaction of their irrigation needs but the opacity of the management of cooperatives does not allow the farmers to estimate the adequacy of their payment with regard to the costs faced by cooperatives. This opacity is also allowed by the extraordinary diversity of situations regarding water control (irrigation and drainage may be achieved by gravity or through one or two pumping operations) combined with an institutional diversity (the operations can be ensured by the cooperative and/or the company), which makes the calculation of fees very complex. Moreover, local political practices prioritize heavy investments in hydraulic equipment and in other infrastructures, such as roads, which can create an unbearable burden to the farmers: the 1999 riots in the Thai Binh province were motivated by mismanagement of the fees, which were raised and used for building roads and for paying bribes or extra salaries to the local authorities instead of for irrigation services. One can object that the water fees paid by farmers are still very low in the RRD, but the facts that the official water fees have been increased by many unofficial subsidiary fees and taxes and the opacity of management do not motivate farmers to contribute to the cost-recovery of irrigation and drainage activities while generating mistrust.

The same opacity prevails regarding the management of IDMCs and IDMSCs. The companies do not have clear incentives to present balanced budgets, since provincial or State subsidies will finally cover their debts, and may be inclined to favor the satisfaction of their internal needs to the detriment of the quality of the hydraulic service. Actually, the permanent debt regarding the water diversion fee due to the IDMC and the electricity cost can be seen as a deliberate management policy: a transfer of the financial burden directly to the province, for the electricity, and to the State via the IDMC for the water diversion debt. This informal strategy was confirmed during interviews conducted with company officials during our research. In addition, the companies also transfer part of their costs to the cooperatives by eliciting unofficial payments to field staff aimed at ensuring diligence and timely service.

[17] Communes can use different local taxes or state subsidies to support such investments. In the late 1980s, for example, they used subsidies for agricultural input that were made unnecessary by the liberalization policy.

The crucial point, therefore, is to determine whether the financial imbalance is the result of poor management and significant improvements are possible, or whether real constraints such as rising electricity bills, straightjacketing official regulation, and declining service areas do not allow companies to fare better. In the latter case, the debts of companies can be seen as implicit State subsidies made necessary by the political decision to keep water charges under a certain level. Since the overall taxation of households was shown to be quite high, this concern might be a practical recognition that surplus extraction by the State cannot be increased, and an indication that farmers' contributions might, after all, exceed what they get from the State in return, a point that needs further investigation. The apparent low percentage of companies' income spent on staff salaries (around 10%) seems to indicate that administrative reforms might yield fewer gains than expected, but the extra payments made by farmers also show that these real costs might be higher than indicated.

The RRD example shows that water pricing is primarily geared towards ensuring financial stability. The closed nature of the Red river polders indicates that saving in pumping costs translates into financial gains but not into water savings at the macro level (in addition contracts between *cum* and companies are generally made on the basis of area and not of volume). In any event, localized water shortages are due to insufficient hydraulic capacity of secondary canals in the face of uncoordinated pumping operations, rather than to a lack of water at the polder level.

The point was made that water pricing is not a goal in itself and should be linked with a clear definition of responsibilities and transparent measures of management. The paper showed that without questioning the institutional framework of the hydraulic activities, the economic efficiency of the activity decreases due to financials losses at several levels. It was shown that the overall financing of irrigation and drainage gives way to complex financial flows between nested levels of power and responsibility (farmers/cooperatives/ companies and provinces/the state), and that the lack of transparence at all levels precluded the clear assessment of who pays for what. It also pointed to the fact that cooperative managers are generally administrative cadres, sometimes pursuing agendas beyond the scope of irrigation itself, just as company officials and district and provincial politicians. An institutional reform must question the distribution and share of responsibility in decision-making, and introduce higher transparency in financing. This, of course, is an issue that cannot be restricted to the water sector and pertains to the wider question of political change in Vietnam.

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