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Vietnam Red River Delta Irrigation Management: Incomplete Recognition of Local Institutional Innovations

With the de-collectivisation of agriculture in Vietnam in the 1980s, emerging farming households in the Red River Delta became directly involved in agriculture. New water service requirements emerged from de-collectivisation. Former irrigation and drainage management companies (IDMC) lowered their involvement in irrigation activities to the benefit of cooperatives that developed local irrigation capacities. How extensive was this evolution? Has this technical evolution had impact on the institutional framework of the activity? To what extent are farming households involved in decision making? Prepared as part of a World Bank/Wageningen Agricultural University study on innovations for irrigation management, this report analyses the history of these changes and explains the process that took place.

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SCIENTIFIC DIRECTORATE

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Abstract

What kind of institutional frameworks allow efficient and sustainable water management in irrigation? International debates on water and irrigation management put the emphasis on the limitations to public management and suggest that management turn-over and farmer management are more efficient. However, farmers' management has its limits in large schemes and farmers are not always willing to take on such responsibilities. This paper proposes an analysis of the evolutions in the Red River Delta (RRD) water control system's institutional framework in north Vietnam. This case has a very original trajectory, with a dramatic change toward grassroots water management for irrigation, whereas State Hydraulic Companies still manage drainage. Without any state policy, local pumping stations now supply more than 50% of the RRD irrigated area. This situation is quite efficient in terms of water management. There have also been some legal evolutions, in which Hydraulic Companies sign contracts with local pumping stations.

In the 1960s, the Vietnamese government invested heavily in hydraulics, building large schemes with full water control in the RRD. At that time, agriculture was fully collectivized. These state-managed polders allowed double cropping, but collectivization and highly centralized water management led to a production crisis at the end of the 1970s. With the de-collectivization of agriculture in the 1980s, emerging farming households became directly involved in paying for agricultural costs and also acceded to larger autonomy in production choices. New water service requirements emerged from de-collectivization. At the primary hydraulic unit level, irrigation and drainage management companies (IDMCs) were designed to operate and maintain irrigation schemes. They were financed by water fees paid by farmers. At local level, small pumping stations managed by local management organizations (cooperatives or other) developed quite spontaneously in order to overcome centrally managed schemes' weaknesses and to facilitate farmers' crop diversification.

A new division of responsibilities occurred progressively in practice in terms of management and finances, which made quite good water service possible for farmers. However, the formal institutional framework does not take this into account yet. Local pumping stations are still only ambiguously recognized by the State and by IDMCs, who do not seem to understand the importance of the changes. At present, it seems that the institutional evolution is not yet complete, and that there are still sizeable problems regarding IDMCs' economic balance, ambiguity as to local management organizations' functions (they act both as water supply enterprises and water users' collective representatives), and the clarification of duties and responsibilities between IDMCs and local management organizations.

I. GOALS

Vietnam Red River Delta is characterized by high population density rates of more than 1000 inhabitants per square kilometer, heavy agricultural intensity with almost three crops a year, and huge water control infrastructures with hundreds of kilometers of dykes individualizing delta land into primary hydraulic units, of irrigation and drainage pumping stations scattered along thousands of kilometers of irrigation canals.

Within the framework of agriculture collectivization and cooperatives implementation, heavy investment was initiated in the water control system at the end of the 1950s. Within the 25 following years, a full mechanized irrigation and drainage supply network was provided to agricultural purpose through the settlement of large irrigation and drainage schemes in each RRD primary hydraulic unit. Each irrigation scheme of more than a thousand hectares was supplied by a single pumping station, lifting water from large ditches into a complete network of gravity canals. All RRD paddy fields were collectivized and leveled into collective plots connected to a tertiary canal. Water control at each level was centrally managed by authorities.

With 1980s agriculture de-collectivization, emerging farming households got directly involved in agriculture costs payment and acceded to larger autonomy in production choices as well. New water service requirements emerged from de-collectivization. At primary hydraulic unit level, irrigation and drainage management companies (IDMC) were designed to operate and maintain irrigation schemes. They were financed by a water fee paid by farmers. At local[1] level, small pumping stations managed by cooperatives developed in order to overcome centrally managed schemes' weaknesses and to facilitate farmers' crop diversification. Local pumping stations materialized new irrigation schemes included in IDMCs managed schemes but independent from them in terms of water supply and management.

Local pumping stations development emphasis increased at the end of the 1980s. It led to the situation that about 50% of RRD irrigated area is now supplied by cooperatives and does not depend from IDMCs anymore. But more than an autonomy in water supply only, cooperatives acceded to new responsibilities through local pumping stations development which were previously assumed by IDMCs only. A new division in responsibility occurred progressively in terms of management and finances, but the formal institutional framework does not take it into account yet. Comprehensive surveys and national administration policy still focus on IDMCs primary tasks and weaknesses without analyzing cooperative direct and strong involvement in water supply for irrigation.

The objective of this paper is to study the evolution of RRD irrigation and drainage management system. In order to start the discussion, an historical overview is needed. This will be presented in the first part of this report. Then, a description of RRD current hydraulic equipment, organizational framework, financing system and legal national context will be provided in the second part of this document. This presentation will be highlighted by a detailed description of Bac Hung Hai (BHH) unit, the largest of RRD 30 primary hydraulic

[1] Local is opposed to central. This is valid for province, district, commune, village or household levels.

units[2]. Finally, key issues on local institutional innovations will be discussed in a third chapter through two specific analyses focused on IDMCs and cooperatives.

II. RRD AGRICULTURE AND WATER CONTROL COMBINED EVOLUTION

1. The Pre-Collectivist Time

1.1 RRD Natural Conditions

With more than 75 million inhabitants and 331,700 square kilometers total area, from which one third only is covered by plains, Vietnam shows much concern about its food security. Vietnam is a hilly and mountainous country in which fertile and crowded plains, mainly Mekong and Red River deltas, play a key role as country rice bowls.

The RRD is the smallest and the most crowded of the two deltas, with a gross area of 1.5 million hectares only (4.5% of Vietnam total area), and a total population of 20 million inhabitants (27% of Vietnam total population) (Le Ba Thao, 1997). The combination of these two characteristics leads to the world' highest rural population densities of more than 1,300 inhabitants per square kilometer in some areas.

RRD high population densities do not constitute a new parameter. They were already above 400 at the beginning of this century (Dumont, 1935; Gourou, 1936). Actually, the RRD is an old human settlement area, attested to be reclaimed by paddy growing farmers for more than 2,000 years (Sakurai, n.d.). This situation is most singular regarding unfavorable natural conditions faced by the population living in the RRD. Dangerous river floods, and casual typhoons followed by possible droughts are common during summer monsoons. During dry winter seasons, the main concern is water accessibility to allow irrigated agriculture.

1.2 Former Regimes Water Control Policy

To minimize the impact of these calamities, water control works, such as dyke and canal construction, were undertaken by Vietnamese imperial regime more than 8 centuries ago (Chassigneux, 1912). At the end of the 19th Century, Red River banks, from the entrance of the delta downstream to the sea, were protected by a complete range of dykes. They protected Vietnamese population from Red River floods during monsoon. Canals provided water to paddy fields, from river gates through dykes, during summer droughts and winter dry season. Farmers were using irrigation tools such as water lifting basket and tripod scoop, introduced for more than 7 centuries from the neighboring China (*ibid*.). Water management was under village responsibility. Rules and regulation on individuals water access and maintenance of collective reservoirs were stipulated in the village customary law (Fontenelle, 1999). Imperial policy was incomplete at the beginning of the 20th Century when French troops arrived in Hanoi. Unequipped and unprotected areas along Red River tributaries were still subject to floods and droughts.

[2] This description is based on "DELTAS" INCO-DC research project primary results. This project is implemented by GRET (Paris) and VASI (Hanoi). It is funded by the European Union (DG XII).

Infrastructures implementation rationalized and intensified under French colonial management during the first half of the 20th Century (Vézin, 1992). From the late 1940s, 377,000 hectares of irrigated land were implemented, all RRD rivers were embedded within a complete network of earth dykes, along which several gates allowed water transit. This network of dykes individualized 30 hydraulic primary hydraulic units, independent each to another in terms of water control (see figure 1). However, RRD agriculture was still facing many difficulties due to the constraint of water gravity flow. Occurrence of droughts and floods was high, causing recurrent food shortages, the impact of which was first reinforced by colonialism's high tax pressure combined with an evident lack of agriculture policy toward farmers (Hémery and Brocheux, 1995). In terms of average amount of paddy per head and per year, the data gathered by Henri in the early 1930s gives a figure of 260 kg only (Henry, 1932).

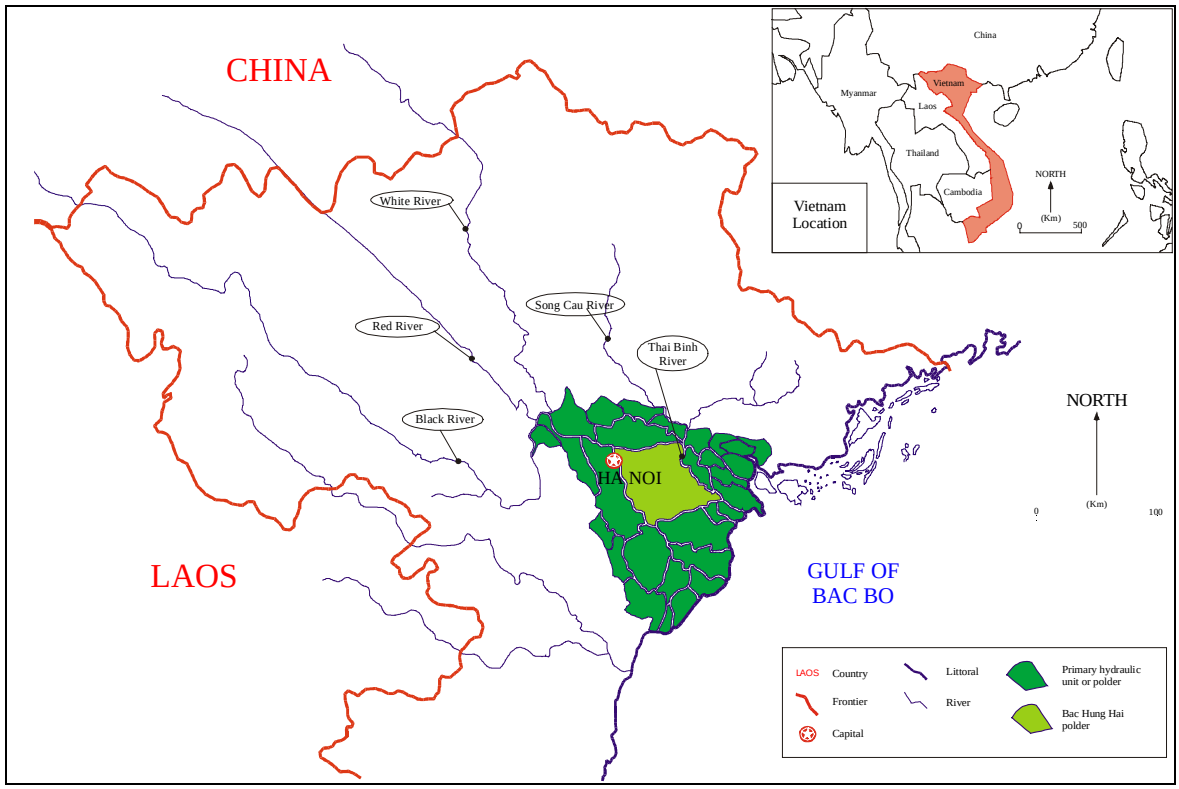

Figure 1: Red River Delta Location and Composition (source: Fontenelle)

Farmers' situation worsened during the 1940s up to the climax of winter 1944-1945 starvation. This crisis led to the death of almost 2 million farmers in the RRD. This was due to structural causes such as repetitive climatic casualties, combined with a constant and fast population growth rate. It was also due to conjectural causes such as Japanese army rice compulsory levies, combined with French colonial agricultural policy pressing for industrial crops cultivation in order to handle war shortages (Nguyen The Anh, 1985; Van Tao and Furuta Moto, 1995).

2. Vietnam Collectivization of the Economy

2.1 RRD Water Control and Agriculture Modernization Policy

This situation changed at the end of the 1950s when the newly born North Vietnamese State initiated the policy of agriculture collectivization. RRD water control modernization began under the political framework of agriculture collectivization and cooperative settlement. More than a technical improvement only, it was a complete change of mentality, from village "backward feudalism" to modernity and rationality, through the use of experience gathered in "advanced science and technology" (The constitutions of Vietnam, 1995). Agriculture collectivization and water control were considered as tightly linked, one could not been implemented without the other (Duong Binh, 1973). Water control modernization was assigned the strategic mission to facilitate agriculture collectivization. The combined effects of population mobilization during hydraulic collective works such as canal digging, and the improvement of agriculture conditions were supposed to upgrade population participation to new cooperatives (Vo Nhân Tri, 1967 quoted by Yvon-Tran, 1994).

From the beginning of the 1960s to the end of the 1970s a huge amount of work was undertaken. In comparison with 1959, 2.3 million man-days, 9.8 million man-days were recorded in 1962 (*ibid*.). More than 80% of state direct investments were dedicated to water control improvement. Large drainage and irrigation schemes were created with a full canal network from primary to tertiary levels, channels giving access to rivers were dug, large scale irrigation and drainage pumping stations were built. Between 1961 and 1965, more than 2,500 pumping stations were built in the RRD (*ibid*.). In 1966, 73% of RRD cultivated area was equipped with a modern set of electric irrigation and drainage pumping stations, which could supply and evacuate water mechanically without human labor (Le Thanh Khoi, 1978). These works combined with the introduction of improved paddy varieties and chemical fertilizer, during the Green Revolution, led to agriculture intensification and the cultivation of two crops a year on all RRD paddy land.

2.2 Collectivization Policy Failure

But more than a simple modernization of infrastructures, changes occurred in the way Vietnamese government intended to manage water supply. Water distribution was organized through the rotation of a rigid irrigation-turn amongst each cooperative belonging to an irrigation scheme (Bousquet *et al*., 1994). From a local management at village level, water management was given to state, provincial and district water control services. Farmers were absent from the water distribution process (*ibid*.).

However, RRD food security improvement did not last long. Between 1960 and 1975, the average of paddy per head and per year decreased from 315 to 220 kg (De Vienne, 1994). Several causes were identified by authorities, as national American war effort and high population growth rate (Nguyen Duc Nhuan, 1987). But beside all these reasons, increasing population reluctance toward collectivized economy and production cooperatives, combined with centralized management dysfunction, appeared to reinforce the economic crisis (Yvon-Tran, 1994; Kerkvliet, 1999). This situation worsened at the end of the 1970s when the government tried to secure 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 crop calendar establishment, rice variety choice and full hydraulic management.

This policy failed, and the very low living conditions of farmers led to some starvation (Nguyen Duc Truyen, 1993). The average of paddy was below 1940s figures, with only 220 kg per head and per year in 1980[3]. RRD faced a food crisis at the end of the 1970s. But this is not the result of a lack of policy nor a lack of funds, as in colonial times. Water control equipment had never been this strong in the past. This crisis appeared due to an excess of state interventionism which cut innovation capacities of farmers. More than a technically based crisis, this was a political crisis (Tessier and Fontenelle, 2000).

3. Economical Liberalization Reforms

This situation lasted until the beginning of the 1980s when Vietnamese authorities recognized the failure of "great socialist agriculture" and proposed through the *Khoan 100* (directive 100) a new contract of production with farming households. This contract aimed to lease paddy land to households for a fixed contribution with excess yields to be kept by farmers. It gave back to farmers "the right to decide the use of their labor and the return of their labor" (Dao The Tuan, 1995). It boomed agricultural production and mobilized farmers to claim for the full responsibility in agricultural production, including water supply. This claim could not be satisfied through the organization of a strict irrigation-turn rotation which prevailed on centrally managed schemes. First of all, land individual management created the need for a specific access to water of each small field leased to farmers. These conditions were different from 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 crop and paddy varieties diversification (Fontenelle and Tessier, 1997). The negative impact of this constraint was reinforced in case of droughts or electricity cut. In order to improve local irrigation conditions, farmers and cooperatives had to cut their irrigation dependency from centralized systems. Farmers managed to deepen existing irrigation tertiary canals in order to store water for a few days after pumping and to get some flexibility in irrigation at on-farm level (Dang The Phong and Fontenelle, 1995). Cooperatives implemented local pumping stations in order to get direct autonomy in water supply (Fontenelle and Tessier, 1997). These pumps were financed by cooperatives' revenues and state subsidies. Local pumping stations used canal networks built by state in the 1960s and local irrigation schemes are included into centralized irrigation perimeters.

The implementation of local pumping stations increased during the 1980s and took benefit from further political reforms initiated by Vietnamese government. In 1984, through the directive 112/HDBT, the central government slightly decreased its commitment in water management, by partly "privatizing" water control services. A new actor, the Irrigation and Drainage Management Company (IDMC), was created in each primary hydraulic unit. These IDMCs, which are public companies owned by the State, were supposed to balance their accounts through the collection of a water fee, paid by cooperatives.

Furthermore, the *Doi Moi* in 1986, which consisted in the abolition of subsidies and liberalization of production activities and cost, and the *Khoan 10* (directive 10) in 1988, which

[3] His situation was even worse taking into consideration that rice and wheat imports increased regularly between 1975 and 1979 (Beresford, 1988).

consisted in land redistribution to farming households, created new conditions for water management and agriculture. On the one hand, electricity cost increased rapidly which was difficult to face by IDMCs. Cooperatives had to organized water fee collection, 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, they 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 were of some impact on the water demand, both in terms of overall requirements and supply frequency (Mai Van Hai, 1999). They have been satisfied by cooperatives which increased local pumping stations number in order to get more water supply autonomy. Moreover, local schemes cooperative management takes more account of farmers demands and is more flexible than former centralized schemes management (*ibid*.). They now count for about half of the RRD irrigated area and have some impact on water management as it will be explained in the coming chapter.

III. RRD CURRENT WATER MANAGEMENT

1. Hydraulic Equipment

1.1 Primary Hydraulic Units Water Control Equipment

The RRD, divided into 30 primary hydraulic units, has 907,000 hectares of arable land, from which 824,000 are cultivated (Binnie *et al*., 1995). The average unit size is 25,000 hectares, from 5,000 for the smallest to 200,000 for the largest ones. The large majority of this area, 734,000 hectares, is integrated within irrigated schemes managed by IDMCs.

Each primary unit hydraulic infrastructure is based on the same technical model. The intake is often one water gate only. It is located upstream and connected to the river flow in order to create the source of water to the unit. The flow is allocated to irrigated areas through a main canal network. This network, which mixes artificial and natural channels, has an elevation below field elevation. When the unit is too large, one to several control gates are built along main canals in order to create several independent reaches. The outlet is located at the end of the canal network, downstream along the river that allows gravity flow due to the elevation gradient. The outlet can be made of one to several water gates (see Figure 2).

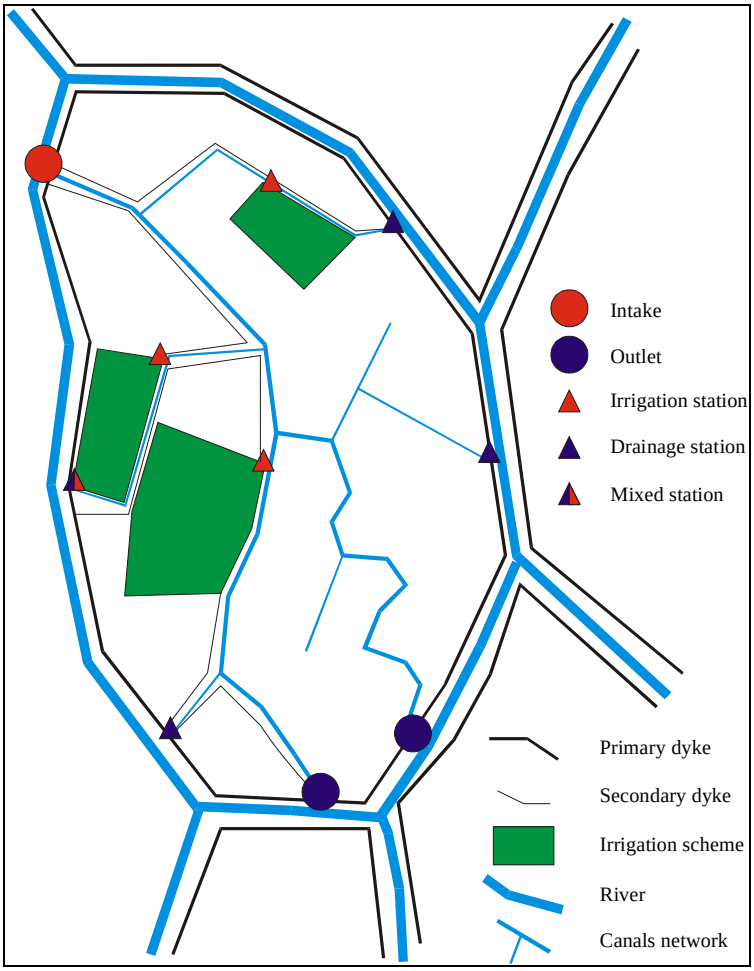

Figure 2: RRD Hydraulic Infrastructure Framework (Fontenelle *et al.*, 2000)

During summer monsoons, which is the North Vietnamese rainy season, the main canal network acts as a ditch which collects the surface runoff water of the rice fields. The intake is closed in order to prevent high river flow from getting into the unit. The main canal network excess flow is drained by gravity through the outlet, or by drainage pumping stations built along the dyke, on unit sides (see figure 3). Apart from the monsoon, during winter and spring seasons, the intake gate is opened. The main canal network acts as a reservoir besides conveying water from the intake to the irrigated areas (see Figure 4).

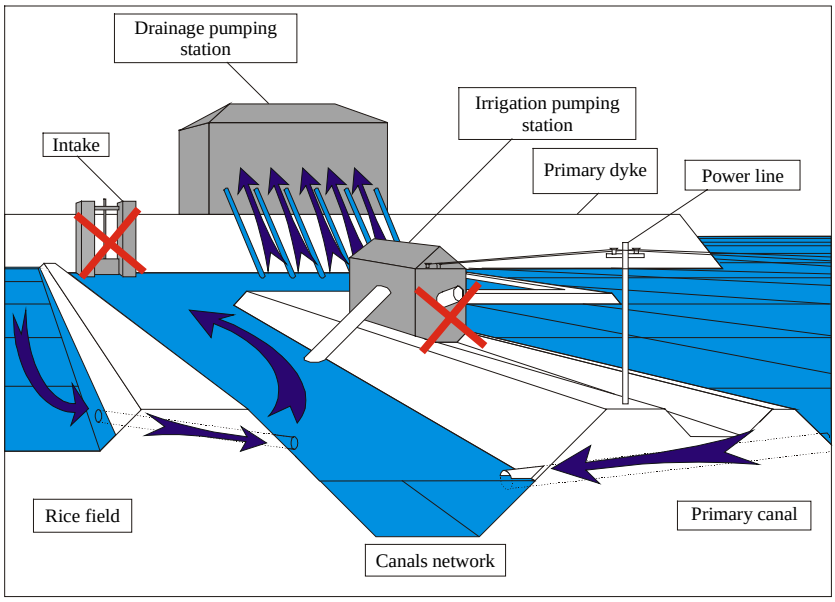

Figure 3: Drainage During the Rainy Season (Fontenelle *et al.*, 2000)

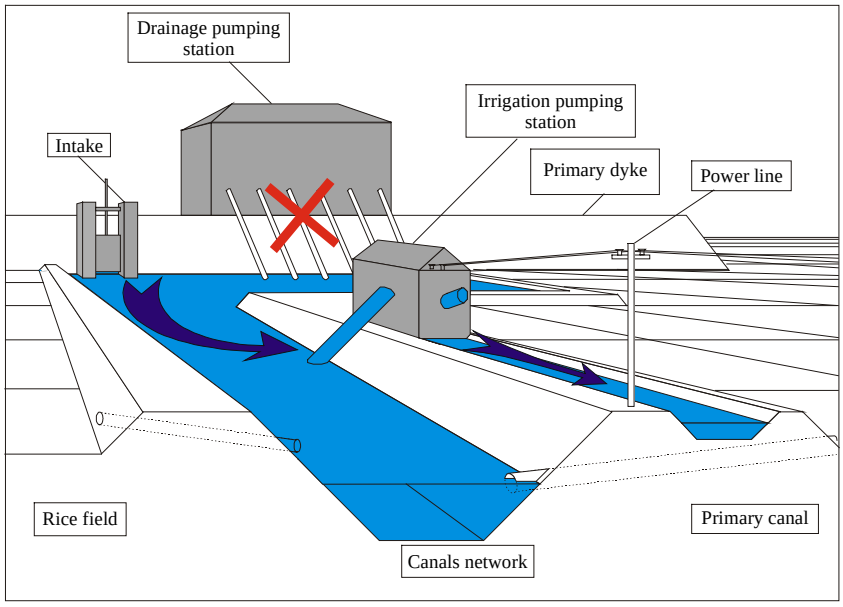

Figure 4: Irrigation During the Dry Season (Fontenelle *et al.*, 2000)

Due to the main canals' low elevation, rice fields are seldom supplied by direct gravity flow. According to authors, pumping from stations built along the main canal network is required for 70 to 80% of the RRD irrigated area (Binnie *et al.*, 1995; Nguyen Thanh Nga, 1999). But, construction of irrigation and drainage systems is not uniform and complete. The canals do not meet the design criteria (Tran Sy Vinh and Dao Trong Tu, 1998). Only 47% of the primary hydraulic units areas supposed to be irrigated by pumping are actually supplied, which is due

to infrastructure mediocrity and management weaknesses (Nguyen Thanh Nga, 1999). According to Mark Svendsen, other types of irrigation supply 38% of the RRD irrigated area. These types which are private, local (at commune and village levels) or directly achieved by farmers by on-farm manual lift, compensate infrastructure and management primary hydraulic unit weaknesses (Svendsen, 1995).

1.2 BHH Irrigation Pumping Capacities

To get a detailed vision of RRD irrigation pumping capacities, a close-up on a specific primary hydraulic unit is needed. Bac Hung Hai (BHH) unit was chosen. It is the largest unit and the first in which hydraulics modernization was implemented at the end of the 1950s (see figure 1). 210,000 hectares in size, with 185,000 ha inside the dykes, 126,000 ha cultivated and 100,000 ha irrigated, BHH is equivalent to 13% of the RRD total area. It encompasses 15 districts from 4 provinces: Hanoi province (1), Bac Ninh province (2), Hung Yen province (6) and Hai Duong province (6). An Irrigation and Drainage Management Company (IDMC) manages the BHH unit water control system. It is assisted by 14 subsidiary companies (IDMSCs), established on the basis of district administrative boundaries (except one IDMSC for the two districts of Bac Ninh province). Surveys conducted in BHH unit record a total number of 1,138 irrigation stations, 324 of which are managed by IDMCs, while 814 depend on the cooperatives. Within an irrigated area of 100,000 hectares, 53% are supplied by cooperative stations and 43% only by IDMSC stations (see table 2). In some districts IDMSCs are providing less than one third of their designed command area.

District	IDMSC (in ha)	Cooperative (in ha)	Total (in ha)	% IDMSC	% Cooperative
Gia Lam[4]	1,665	132	1,892	88	7
Thuan Thanh	4,312	1,761	6,073	71	29
Gia Loc	3,796	3,367	7,163	53	47
Chau Giang	4,934	2,129	9,675	51	22
An Thi	3,238	3,651	6,889	47	53
My Van	5,391	6,094	11,719	46	52
Tien Lu	2,061	2,733	4,794	43	57
Thanh Mien	2,642	4,499	7,141	37	63
Kim Dong	1,547	2,749	4,296	36	64
Cam Giang	1,877	3,338	5,215	36	64
Gia Luong	3,282	6,094	9,376	35	65
Phu Cu	1,671	3,244	4,915	34	66
Binh Giang	1,492	4,245	5,737	26	74
Tu Ky	1,949	5,196	8,119	24	64
Ninh Giang	1,633	5,255	7,101	23	74
Total BHH	**41,490**	**54,487**	**100,105**	**43[5]**	**53[6]**

Table 2: District Area Supplied by IDMSCs and Cooperatives in Spring 1996 (Source: DELTAS Project)

[4] Cooperatives outside BHH unit are not taken into account.

[5] Percentages do not add up to 100 for reasons of lack of data.

[6] *Idem* note 5.

A detailed survey conducted in each cooperative of Chau Giang district listed a total number of 62 local irrigation pumping stations instead of the 28 officially recorded by Chau Giang IDMSC (see Chart 1). This development process started at the beginning of the 1960s, twenty years before agriculture de-collectivization, with the implementation of a dozen of local stations in areas which were not properly supplied by the Van Giang centrally managed scheme. Their number remained more or less stable until the end of the 1970s, before to increase dramatically at the beginning of the 1980s. Within 11 years only, they tripled, from 18 stations in 1983 to 55 in 1993.

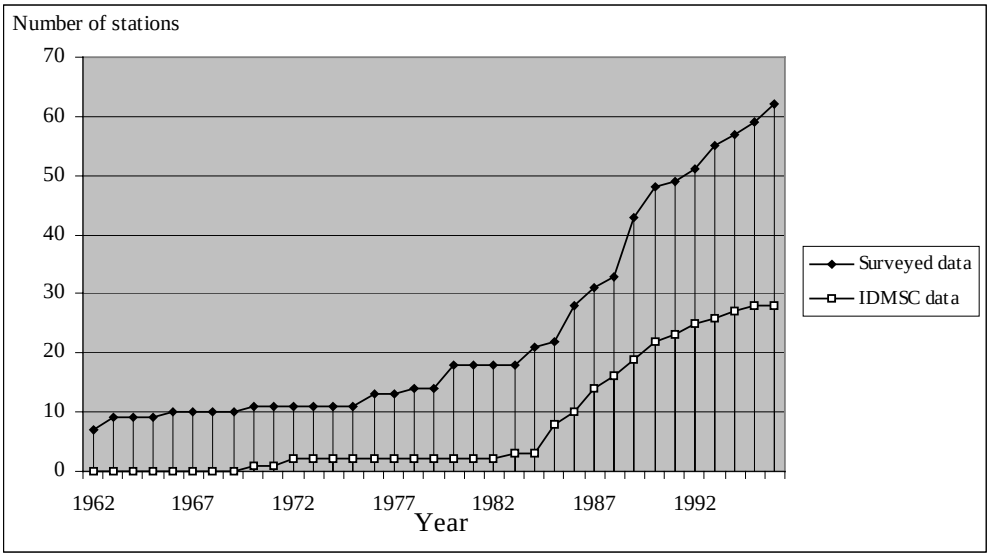

Chart 1: Local Pumping Stations Implementation in Van Giang Irrigation Scheme (Source: DELTAS Project)

The spatial representation of local schemes development inside Van Giang centralized scheme shows that perimeters were first created at the tail of the perimeter but not only (see Figure 6).

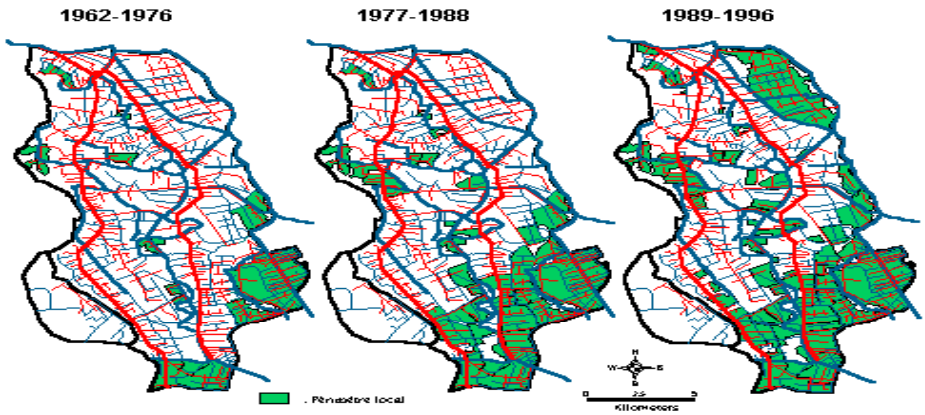

Figure 6: Evolution of local scheme implementation inside Van Giang centralized perimeter (Source: DELTAS Project)

Some local perimeters were also created at the head of Van Giang perimeter, especially during the 1980s. It shows that other reasons different from technical reasons like water scarcity only, mobilized cooperatives to create local perimeters. But the common characteristic shared by all local schemes is that they are always located near a drainage canal. Actually, local stations pump water from drainage canals connected to Bac Hung Hai main canal network. These canals which collect monsoon runoff are never dry. Local perimeters are independent from Van Giang irrigation scheme and do not count on water conveyed in Van Giang primary canals.

Instead of 2,129 hectares presented in table 2, surveyed data give an estimated area managed by cooperatives of 3,196 hectares in Chau Giang. This example reinforces figures presented in table 2 which were based on official IDMSC records only. Although local pumping stations development is rather impressive, figures in table 2 are underestimated. There are currently more than 700 local pumping stations in BHH unit. Other references gathered in Nam Thanh and Nam Ha primary hydraulic units, account for a similar situation in several areas of RRD (Fontenelle, 1999; Yasuyuki *et al*., 1999).

1.3 Local Pumping Stations' Characteristics

The first improvement farmers and managers got from the implementation of local pumping stations is irrigation operation flexibility (Fontenelle and Tessier, 1997; Mai Van Hai, 1999). In terms of discharge capacity, local pumping stations have a higher pumping capacity than centralized ones originally had (see Table 3).

	Continuous fictive flow	**Land preparation** Supply of 100 mm (night and day, 20 hours)	**Rice season irrigation** Supply of 30 mm (12 hours max. 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

Table 3: Comparison of Irrigation Duration for Local and Centralized Stations of BHH Primary hydraulic unit (Source: DELTAS Project)

On the basis of conducted field surveys results, it appears that farmers do not want to get water on the basis of an irrigation interval of 7 days anymore. 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 11 before, which allows them more flexibility in terms of cropping patterns and rice variety choices. Moreover, in many cases tertiary irrigation canals are deepened. They are used as ditches in drainage period and reservoirs in irrigation time from which farmers lift water with local baskets (Fontenelle, 1999). Due to the very low percolation rate in the reservoirs, it allows farmers to come whenever they want between two pumpings (Dang The Phong and Fontenelle, 1995).

The second improvement concerns the technical efficiency of local irrigation schemes. Their efficiency is better than centralized schemes as they do not suffer from water distribution

rigidity, electricity cut, IDMSC employees sloppiness combined with farmers unwillingness to follow rigid irrigation-turn rotations:

- ▷ Technical surveys conducted on irrigation efficiency at scheme, plot and field levels in An Binh cooperative, district of Nam Thanh, conclude to crop water requirements satisfaction. This situation is different from the former one with centrally managed stations when downstream cooperatives could not access to water on time (Bousquet *et al.*, 1994; Dang The Phong and Fontenelle, 1995).
- ▷ Cooperatives pumping decision depends from technical reasons such as canal and paddy fields droughts and not from a fixed pumping calendar. Everyone needs water when a pumping is decided (*ibid*.).
- ▷ Local schemes are smaller than centrally managed schemes, below 100 hectares instead of 1,000 hectares or more[7]. Canals are shorter and there is no waste of water as compared to centrally managed schemes which suffered from water losses and illegal water capture (Bousquet *et al.*, 1994; Fontenelle, 1999).

One can oppose that irrigation equipment density is higher today than it was during collectivization time. On the on hand this has a cost in terms of initial investment. But on the other hand local stations pump less water per irrigated area unit than centralized ones, as can be seen on Table 4[8]. Differences in water use are due in part to the fact the local management is more effective, due to profit sharing arrangements with staff, and for another part that IDMSC staff has no incentive to save water because it does not share in any profits and therefore engages in a rent seeking business of its own, selling water under the table to cooperatives.

	Land Preparation **M3/ha**	**Rice Season Irrigation** **m3/ha**	**Season Consumption** **m3/ha**
Local Station	1,600	2,400	4,000
Centralized Station	3,900	5,900	9,800

Table 4: Average Pumped Volumes During Spring Season 1996[9]
(Source: DELTAS Project)

The third improvement concerns autonomy in decision making acquired by localities. Reasons of getting a local pumping stations were not all technical. Firstly, before the end of the 1980s, it was the way to get villages (*thon*) or communes (*xa*) electrification (Do Hai Dang, 1999). Secondly, establishment of a local pumping station in each village of a commune is sometimes the sign of local political life. Continuous fictive flows of 5 l/s/ha have a technical meaning but they sometimes reach 10 l/s/ha which is not needed as far as paddy cultivation is concerned. More than a strict technical question of crop water supply, local water

[7] Van Giang centrally managed scheme was originally 14000 hectares wide.

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

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

management crystallizes local political struggle amongst commune and village leaders (*ibid*.). Lastly, nowadays each commune or village decides its pumping schedule alone, whereas it had to respect an irrigation calendar in former centralized scheme it belonged to. The constraint of having farmers and local managers respect regulations on water supply frequency and duration, is less frequent. Local schemes managers and users are from the same village, even the same hamlet. They decide their water supplies and rules amongst themselves, without IDMSC intervention. Localities commonly share irrigation benefits and constraints within their boundaries as it was before 1960s agriculture collectivization.

2. Organizational Framework

2.1 National and Provincial Administrative Levels

In 1995, a major reorganization of water and water related ministries took place. The former Ministry of Water Resources, Ministry of Agriculture and Food Industries, and Ministry of Forestry was combined into a new Ministry of Agriculture and Rural Development (MARD). The Department of Water Resource (DWR) within the MARD, is responsible for 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 or two pumpings) and drainage (gravity and/or pumping).

Responsibility for managing existing public irrigation and drainage systems, planning and executing smaller projects, is delegated to the province under the leadership of the Provincial Peoples Committee (PPC). The PPC provides policy advice, funds and oversees the work of a specialized service, sets provincial water rates based on national guidelines, decides on subsidies for local water resource projects, and makes investments in local infrastructure. Provinces have established provincial Water Resource Services (WRS) to hold these water-related responsibilities. WRS are line agencies of the provincial government. Their duties are similar to central level tasks in terms of planning, design and construction, but are focused on smaller projects below 150 ha. Additionally, they have to organize irrigation and drainage scheme management, and to fix the water fee base within their jurisdiction. There are 10 WRS involved in RRD water management as RRD territory encompasses 10 provincial boundaries.

2.2 IDMC Primary Hydraulic Unit Level

In response to the national policy mandating privatization of various government departments and functions, provinces have established separate companies under the WRS to design and investigate 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 at the end of the 1980s. Companies are headed by a director who is assisted by a deputy. Under him are usually 3 or 4 departments for finance, administration, planning, and technical activities. In practice, the director reports to the head of the WRS or to the PPC through the WRS. An IDMC most often has responsibility for all existing public irrigation in a primary hydraulic unit. Several IDMCs can depend on the same province WRS when provincial boundaries encompass more than one unit. Unlike DWR and WRS, IDMC level is not based on an administrative division but on the primary hydraulic unit division, RRD hydraulic division. There are 30 IDMCs in the delta, managed by 10 provincial WRS. On larger primary hydraulic units which embrace more than one district

administrative unit, such as BHH unit, the IDMC is assisted by several sub-companies (IDMSC), one per concerned district. In 1995, 29 IDMSCs were recorded in RRD with 14 included in BHH unit.

Before 1999 BHH IDMC was supervised by Hai Hung provincial WRS[10]. Nowadays, BHH IDMC is supervised by a System Management Council, constituted of representatives from the 4 provinces WRS, and chaired by the DWR Director from MARD. BHH IDMC is responsible for water derivation and transportation from the river through the dual-purpose canal central network on the whole BHH perimeter, and for most of drainage facilities manipulation (pumping stations and gravity gates). IDMSCs buy water from BHH IDMC, and pay with water fee revenues. They are responsible for irrigation, and for drainage to some extent. Each IDMSC has an associated set of about ten irrigation groups, or *cum*, each being responsible for 1,000 hectares or so. Hydraulic *cum*, in turn, work with cooperatives to manage water, maintain facilities and collect the water fee. Hydraulic *cum* are responsible for centrally managed irrigation schemes operation and maintenance, from the pumping station to the primary canal included.

2.3 Cooperative Level

Cooperatives are the last formal level involved in irrigation. Relationship between cooperatives and IDMSCs, via hydraulic *cum*, depends on the existence and the location of local pumping stations. Every year each cooperative signs a service contract with the *cum* upon areas to irrigate and drain, and upon the amount of water fees to be paid. Contracts depend from each cooperative water supply situation as explained below:

- When there is no local pumping station, cooperatives are responsible for water distribution and irrigation canal maintenance, from secondary canals to quaternary canals included. They collect a water fee from farmers equivalent to water derivation, 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 build along a dual-purpose canal connected to the primary hydraulic unit intake, cooperatives have to operate and maintain their system from the pumping station down to the quaternary canals included. They collect a fee from farmers as explained above but they do not pay the totality to the *cum*. They only pay for water derivation and drainage costs and keep the irrigation part for themselves.
- When there are local pumping stations build along primary canals after the *cum* pumping stations, cooperatives have to operate and maintain their local systems from the local pumping station to the quaternary canals included. They collect a fee increased of local field application costs, they keep this part for themselves and pay the standard fee to the *cum*.

The combination of these three cases depends on cooperatives. Some are fully independent where 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. In BHH unit, there are only few cases of double pumping and they are not recorded. The official figures are

[10] Hai Hung province was constituted of the two provinces of Hai Duong and Hung Yen until 1997 administrative reform. This reform led to the division of several provinces and districts in Vietnam.

that 53% of the irrigated area are supplied by cooperative stations and 43% by IDMSCs (See Figure 7).

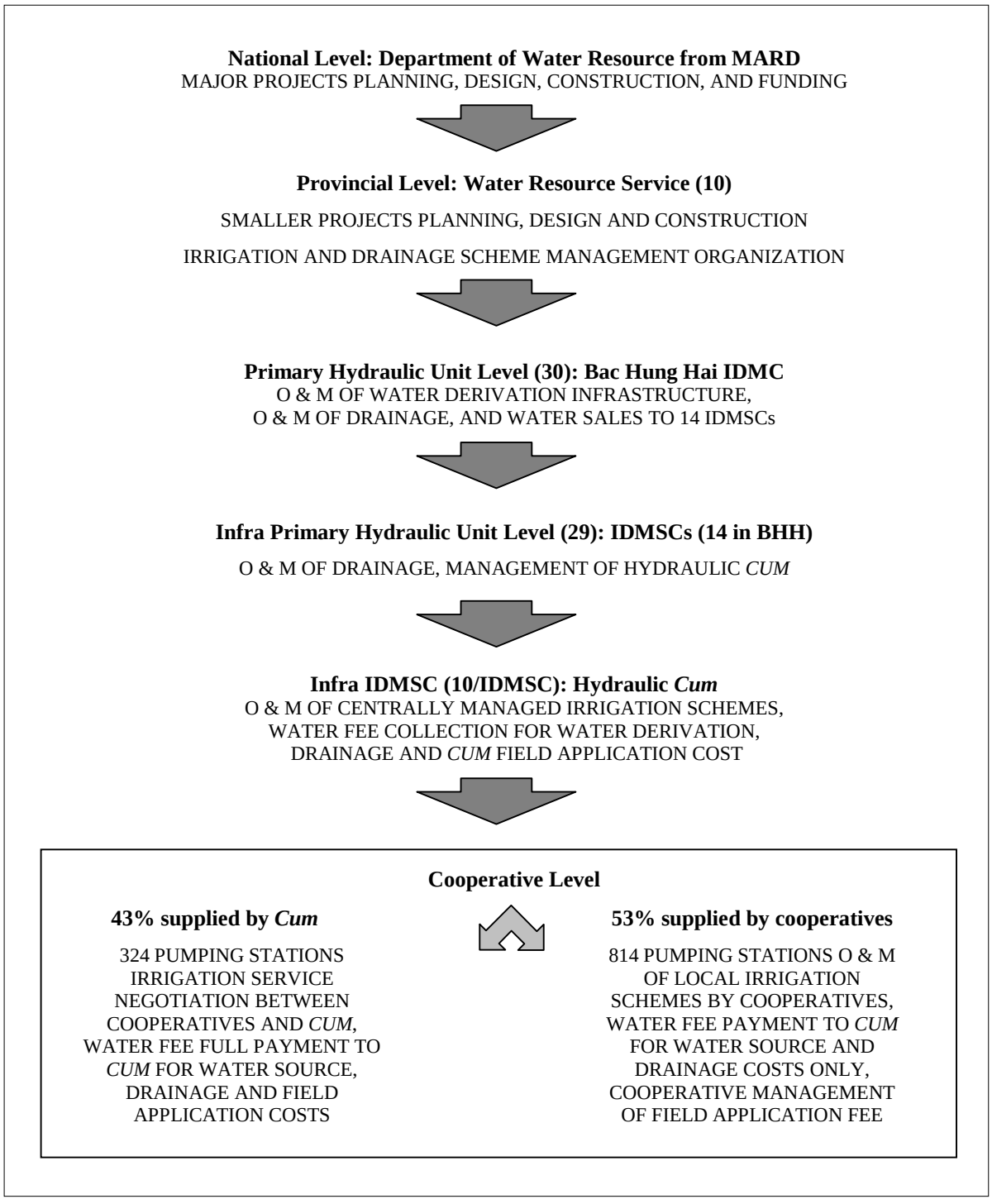

Figure 6: Bac Hung Hai Unit Water Management Organizational Framework (Source: DELTAS Project)

3. Financial Organization

3.1 Finances of IDMCs

The Government funds most major infrastructure, but IDMCs are expected to cover their water derivation, irrigation and drainage operation, maintenance and depreciation costs through the collection of a water fee paid by farmers. Water fees and their calculation are originally based on a national decree that the government cabinet promulgated in August 1984 (112 HDBT, 1984). This decree specifies that all organizations and individuals benefiting from irrigation, drainage and other hydraulic public services, have to pay a water fee to hydraulic companies. The Province Water Resource Services shoulder the responsibility for water fee calculation. But, on the basis of this decree the water fee rate cannot exceed 8% of each province's average paddy yield for the last five consecutive seasons, for spring and summer seasons. In theory, charges are based on the average cost of providing a service, which is supposedly easy to determine, transparent and understood by consumers. In practice, charges are not calculated on the actual costs of delivering water and in the irrigation sector, rates are based on national water consumption of particular crops (Svendsen, 1995). This maximum rate is estimated for both electric irrigation and electric drainage services. Other kinds of field application and/or drainage and winter season hydraulic costs if any, have lower water fee rates. Given the fact that the fee is expressed in kilos of paddy, even if farmers now pay in cash, the PPC decides every year an official rate for one kilo of paddy (See Table 5). This is done in order to avoid speculation due to paddy market price fluctuations. In Bac Hung Hai, the fact that there are 4 provinces involved creates 4 different water fees, as average yields and fixed paddy prices can be different in each province. This creates inequity amongst farmers from BHH unit living in different provinces.

No.	Type	Rate
1	Paddy field irrigation (in kg/ha)	
	Centralized pumping station	112.5
	Double pumping (1 centralized followed by 1 local pumping)	91.5
	Water derivation	42
2	Paddy nursery irrigation (in kg/ha)	
	Centralized pumping station	81
	Water derivation	21
3	Paddy field drainage (in kg/ha)	80
4	Price of paddy (in dong[11]/kg)	1450

Table 5: Hai Duong Province Irrigation and Drainage Rates in 1999 (Source: DELTAS Project)

[11] 14,000 dong = 1 US$ in 1999.

IDMCs do not control their incomes and are not allowed to raise service fees or retain surplus funds except to minimally maintain or repair facilities. Instead, the PPC can review water tariffs proposed by the companies, on the basis of social and political considerations (*ibid*.). While cost recovery and financial sustainability are the official policy, they have not been achieved and many agencies are unable to finance their operation and maintenance costs (Vietnam Water Resources Sector review, 1996). State aims to make the IDMCs self-sufficient, but IDMCs are still significantly dependent on, and controlled by, Government agencies (Sandoz, 1995). For instance, BHH IDMC water derivation costs are paid by each IDMSC and account for 85 to 90% of its annual expenditures. Other costs are covered by state subsidies and its commercial activities. Actually, IDMSCs from Hung Yen and Hai Duong provinces (equivalent to 85% of 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), where Hanoi and Bac Ninh IDMSCs pay on the basis of a percentage of BHH IDMC annual expenditures equivalent to each IDMSC covered area (3% for Hanoi IDMSC and 12% for Bac Ninh IDMSC). This creates inequity amongst IDMSCs regarding water derivation costs. This inconsistency is due to the fact that until 1999 BHH IDMC was accountable to Hai Hung province. Although some reform did take place after the 1997 administrative reform which divided provinces, institutions at the level of state companies regarding water fee payment did not change yet. Concerning the payment of the water derivation fee by IDMSCs, it seems that they have difficulties to achieve it properly as their official annual average debt during the last five years ranges between 20 and 45% of the scheduled revenue. This debt is covered by state subsidies.

Unlike BHH IDMC, IDMSCs have to cover all their costs with the water fee collected at farmers level. Only in case of climatic casualties such as typhoons and droughts, some subsidies can be awarded from provincial WRS to IDMSCs, in order to compensate extra drainage and field application IDMSCs costs and farmers water fee official decrease due to paddy losses. All cooperatives sign service contracts with a *cum* on behalf of their district IDMSC. These contracts established on seasonal or annual basis by mutual agreement, are signed between each cooperative Director and the concerned *cum* Director. Contract objective is to quantify the cooperative seasonal or annual water fee amount. For spring season, the cooperative cultivated area is specified with details on supplier identity. Water can be either provided by the *cum* or by the cooperative itself. For the area supplied by the *cum*, more details are given. The first one is the kind of crop which is irrigated: rice, rice nursery, food crops or industrial crops. The second one is the kind of irrigation which is provided: direct gravity irrigation, single or double pumping, “hand lifted” irrigation. For each type of crop and irrigation, there is a water fee rate in kilo of paddy per hectare, which is based on Province regulations (see Table 5). This rate is multiplied by the area of each type of crop and irrigation, and then aggregated. This sum gives the irrigation fee amount, including the water derivation costs, to be paid by the cooperative to the *cum*. For summer season, an additional fee for drainage costs is calculated on the basis of cooperative summer season cultivated area. The date, the place and the nature of payment are specified too.

The average cooperatives debt for 4 studied IDMSCs is equal to less than 10% only of the planned water fee amount as stipulated in contracts. Cooperatives did have difficulties paying their fee at the end of the 1980s but this situation has improved a lot since then. This is partly due to the fact that nowadays and despite some contradictory opinions presented at central level, farmers pay their fees in a very large majority.

3.2 Water Fee Payment at Cooperative Level

Every six months farmers have to pay an individual water fee which is collected by the cooperative. The water fee level in each cooperative depends on water derivation, drainage and field application costs and paddy prices rates fixed by each province WRS. It varies also from one cooperative to another on the basis of natural and hydraulic conditions, and on the percentage of irrigation locally assumed by cooperatives. Water can be directly supplied, or drained out, by gravity. Irrigation and drainage can be mechanized. Water can enter from the quaternary canal into farmers fields directly by gravity or it may need a manual lift with a scoop handled by farmers. Irrigation can require one to two successive pumpings. Water can be supplied by a local or a centrally managed pumping station. During the spring season, the water fee amount mainly depends on irrigation activity due to crops water needs. During summer season, the water fee amount mainly depends on drainage activity due to excess rainfall and electric drainage pumping stations high operating costs. There can be some field application costs too, due to the occurrence of drought periods during summer season.

But at last, the water fee paid by farmers depends from cooperatives own policy regarding water management. Six cooperatives were surveyed in two districts of BHH unit. Two were fully responsible of their irrigation, two partly responsible and the last two were supplied by centrally managed pumping stations for all their irrigated area (See Table 6). These figures show that water fee calculation can be based on effective costs paid by the cooperatives when they manage their water supply. This system is not possible for cooperatives supplied by centrally managed pumping stations.

Cooperative Name	Scale	Number of Pumping Stations	% Local/IDMSC	District	Province	Fee Calculation Basis
Tan Vinh	Village (since 1982, 1/5 villages)	2	100	Ninh Giang	Hai Duong	Cooperative effective expenditures (CEE)
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 pumpings and PFR for water derivation
Ngo Phan	Village (since 1992, 1/5 villages)	0	0	Gia Luong	Bac Ninh	PFR
Tan Lang	Commune	9	100	Gia Luong	Bac Ninh	Cooperative fixed rates (CFR)
Kim Thao	Village (since 1987, 1/6 villages)	0	0	Gia Luong	Bac Ninh	PFR

Table 6: Irrigation Type and Water Fee Calculation System for 6 Surveyed Cooperatives (Source: DELTAS Project)

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

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

Table 7 details water fee amounts paid by farmers. The main information from this table is that there are big differences between cooperatives. Actually, water fee amounts vary from one cooperative to another. Differences can be based on each cooperative natural or hydraulic conditions, double pumping in Tan Lang for instance. 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, single pumping fee ranges from 395 kg/ha to 473 kg/ha in the same province of Hai Duong, which is in theory impossible. But more than these differences which are not so important, 20% only for the previous example, main differences are due to local extra water fees decided, collected and used by cooperatives in order to improve the quality of their service (it covers maintenance extra costs) and to increase their implication in irrigation (it covers new investments in local stations). Extra fees ranges from 56 kg/ha to 146 kg/ha and differences reach 62% amongst cooperatives.

Total annual water fee paid by farmers depends from each cooperative to another. The highest levy is paid by farmers from Tan Lang cooperatives where all irrigated areas are supplied by two consecutive pumpings. It is equal to 639 kg of paddy per hectare and per year. The lowest fee is paid by farmers from Hung Thai cooperative in which all types of water supply are cheaper than other surveyed cooperatives. A single pumping by a local station costs farmers 464 kg of paddy per hectare and per year in Hung Thai cooperative, which is 28% cheaper than in Tan Lang cooperative.

Cooperative Name	Single Pumping	Double Pumping (IDMSC + Local)	Water Derivation	Remarks
Tan Vinh	619 (473+146)	---	324 (178+146)	(including 146 kg of extra fee for maintenance and new construction)
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	
Tan Lang		639		
Kim Thao	586 (475+111)			(including 111 kg of extra fee for maintenance and new construction)

Table 7: Water Fee Paid per Type of Water Supply (in kg of paddy/ha/year) (Source: DELTAS Project)

The fact that water fee varies in such proportions from a cooperative to another is the sign of their autonomy. It creates inequity amongst farmers which do not benefit from the same production conditions depending from the cooperative they belong to. But, compared to paddy field annual production which is equal to an average of 8 tons of paddy in two seasons, plus an additional crop on one third of the area, water fee appears to be quite small. Even in Tan Lang cooperative, it does not exceed 8% of annual paddy production (without counting the benefit of the winter crop). Knowing that most of water supplies in BHH need a single pumping only,

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

and including extra fee decided by cooperatives, water fees paid by farmers in these cooperatives, range from 5.8 to 7.7% of their annual paddy production, which is not a great deal.

The issue is that most of farmers do not know any details about water fee calculation. This information is held by the village chief who is in charge of taxes collection on behalf of the Commune Peoples Committee (CPC). Farmers only know how many kilos of equivalent paddy they have to pay at the end of each rice season. It is equal to 20 to 25% of paddy annual production value (Bousquet *et al*.; 1994). Actually, the amount they pay combines water fee, land tax and several other taxes (house, field watching, cooperative fund, local roads construction, 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. Operational charges are equal to 25% of paddy production annual value. Added to taxes, annual deduction reaches almost 50% of farmers paddy annual production.

Regarding surveyed cooperatives financial situation, figures could not be collected for Kim Thao village cooperative (See Table 8). On the basis of the available information, it appears that all expenditures depend from a cooperative to another.

Cooperative Name	Staff	% Management Cost	% 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
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[15]	9	5,9	74,8	0,0	19,3	0,0	0,0	?
Tan Lang[16]	27	9,3	29,1	44,4	17,2	0,0	0,0	?
Kim Thao	?	?	?	?	?	??	??	?

Table 8: Annual Average Expenditures and Balance (years 1998 and 1999) (Source: DELTAS Project)

Staff number is obviously larger in commune cooperatives than in village cooperatives but it seems that there is no economy of scale as the weight of management costs is higher in commune cooperatives than in village cooperatives. Amount paid to IDMSC is directly correlated to the percentage of area supplied by a centrally managed pumping station, ranging from 30% (100% locally irrigated) to 75% (100% centrally irrigated) of total costs. In average, repairs count for 15% of total expenditures and investment in new construction or savings for depreciation of the equipment are not frequent. At last, and on the basis of the few available figures, cooperatives seem to balance their accounts, which is different from IDMCs and IDMSCs respective situations. The main issue on these figures is that there is no justification given on each line. Cooperative managers do not present their accounts with more details than

[15] Average on 1997, 1998 and 1999.

[16] *Idem* note 15.

the data provided in this table. Moreover, in three of the surveyed cooperatives no information was provided on collected water fee amount. Financial transparency is not better at cooperative than at IDMC level.

4. Legal Framework

4.1 1990s Water Management Institutional Reforms

The issue on resource management became more and more important as Vietnam went through a process of de-collectivization of agriculture, moving toward a market economic system from 1986. In his 1994 State of the Nation speech to the National Assembly, former Prime Minister Vo Van Kiet indicated that the nation had largely accomplished its goal of economic liberalization and should turn to institutional reform (Svendsen, 1995). New policies and laws affecting resource development were enacted, such as laws on the environment, land, forests, minerals, and also promotion of foreign investments, Civil Code and evolving policies of decentralized government administration. In 1993 the implementation of a new land law guarantied farmers the use of land during 20 years for annual crops land and 50 years for perennial crops. But unlike land or forests fast responsibility transfer to farming households, water resource management was maintained under public authorities direct leadership. From 1986 to 1995, the draft water law went through 14 revisions and the law is still not enacted yet. The government instead opted for necessary regulation in the forms of decrees (UNDP, 1996). From 1994 to 1998 included, 10 orders, decrees, circulars or directives were enacted by Vietnam central government on hydraulic infrastructures management.

The first order on protection and conservation of hydraulic works was enacted by National Assembly on August 1994. It stipulates that “water users” are individuals and organizations who are legally exploiting and using water resources. They can either provide water supply services from hydraulic works or enjoy services provided by IDMCs. Concerned services are irrigation, drainage, works improvement, electricity supply, fisheries, navigation, tourism, scientific studies, domestic and industrial use (Bui Kim Dong and Nguyen Thi Hong Loan, 1999). Water users using and exploiting water potentials should be granted licenses of water exploitation and utilization by competent authorities. In return, water users have the responsibility to timely pay water taxes, fees and charges as stipulated. They must contribute with labor and/or payment for the costs for prevention and protection as stipulated by decree (*ibid*.). Provinces and Cities People’s Committees under central administration issue and revoke licenses of exploitation, using water resources, permits of discharging waste water, wastes into water resources as prescribed by the government and designated by the Ministry of Agriculture and Rural Development. IDMCs are public companies which balance their budgets through the collection of water and commercial fees. State can provide subsidies in case of natural disasters, main repairs and investments. IDMCs are directly accountable to central government. Bonus and sanctions are based on state general regulations. This order was complemented by several implementing decrees: decree 98/CP in 1995, 50/CP and 56/CP in 1996, 14/LDTBXH-TT in 1997.

The main decree defining IDMCs management was enacted in 1998. Decree 06/1998/TT-BNN-TCCB defines national regulations on organization and operation of IDMCs. It specifies that an IDMCs are companies of “public utility”. They are not supposed to make profit from their activities and have to balance their budget. State will finance operation losses and investment cost. In case of deficit of water fee payment from water users, relevant authorities

(central, provincial and district) will manage this issue. Three types of IDMCs are considered: inter-provincial and provincial (same type), inter-district, and district IDMCs. For each type, details on operation execution and responsibilities, on staff organization (number and salaries) are given. Regulations are very clear and depend from the administrative type of the IDMC and on the hydraulic works (gates, pumping stations size, etc.) to be managed.

4.2 1996 Law on Cooperatives

Cooperatives which played an important role in RRD water management evolution, faced increasing difficulties at the end of the 1980s. On the basis of our field studies, three main types of local water management organizations could be found in 1996 in RRD (Dang The Phong and Fontenelle, 1999):

- ▷ These organizations could be former production communal cooperatives.
- ▷ It could be private service experiments from the Commune People's Committee, at both village and commune levels, either specialized in water supply service or non-specialized in selling agricultural inputs, water and electricity.
- ▷ It could be less formalized groups managed at village level by village chief.

In order to secure water management at commune and village levels, and to avoid the emergence of uncontrolled local dynamics which could weaken agricultural production, government launched in 1996 a Law on cooperatives. This law aimed to reform old collectivist bodies into collective efficient service organizations opened to market economy. It stipulates that a cooperative is an independent economic organization created on voluntary basis by workers having common needs and interests (*Loi sur les coopératives*, 1996). From January 1997, the progressive implementation of the Law on cooperatives allowed local water management existing organizations to get a single formal status. It is not completed yet in the whole RRD. The size of the service cooperative is decided at commune and village levels. For instance, the six cooperatives presented previously in this paper, are all transformed in new service cooperatives. Three are village cooperatives and three are commune cooperatives.

The main points of the law were that:

- ▷ A service cooperative is an artificial person, profit oriented, with balanced budgets and a bank account;
- ▷ Profit sharing should respect cooperative members interests and cooperative development;
- ▷ It is organized on a democratic and worker management basis;
- ▷ It can decide on its own of the services to supply and of the type of internal organization to adopt;
- ▷ It needs to be registered (with a commercial license) and is accountable to local authorities (commune, district, province);
- ▷ It is capitalized by a group of shareholders (minimum 7), also called founder members, who owns the assets of the cooperative (buildings, electric transformers, pumps, canals, etc.);
- ▷ It is managed by a cooperative board and a director which are elected by cooperative members directly or by a congress of members representatives if there are more than 100 members.

State policy toward cooperatives is willing to protect their interest and legal rights, to facilitate their development through adequate measures, in order they progressively get their autonomy in production and services. In return cooperatives constitute a tool that state uses to fight poverty and economic differentiation amongst cooperatives members. State helps cooperatives to develop in order they facilitate Vietnam broad development and planning.

IV. INCOMPLETE INSTITUTIONAL REFORM

Despite numerous institutional changes presented previously, Vietnam water management organization still presents important institutional weaknesses which are mainly based on the way reforms were undertaken. Definitions of rules can be either too vague or too rigid due to the top-down approach which prevailed at that time. They did not take into account informal institutional arrangements which took place at cooperative level and can to some extend reinforce negative side effects. This issue will be highlighted through the analysis of the reforms of two important actors of RRD water management: the cooperatives and the IDMCs.

1. The Definition Gap of Service Cooperatives

1.1 Cooperatives Lack of Accountability

To Local Administration

On the one hand, the law on cooperatives did not change so many things in term of farmers collective management. Cooperatives workers and managers are always the former collectivist production cooperatives staffs. Actually, former production cooperative staffs got the opportunity to become founder members of these new organizations via authorities (commune, district and province) approval. They were supposed to buy shares which provided them legitimacy to own and manage all cooperatives assets (buildings, pumps, electricity lines, canals,…). But, in many cooperatives, shares do not exist or are very small (5$/founder member). Moreover, due to the fact that farmers exceed 100 in all cooperatives, there is always a congress of members, first level of farmers representation. In many cases farmers representatives are chosen by commune and village authorities on the basis of Vietnam Communist Party and Mass Associations (Farmers, Youth, Women,…) memberships. This is the sign of Vietnam authorities hesitation not to say reluctance, to liberalize their position toward organization of production at local level. The consequence of this political control is that there is no formalized regulation procedure feasible. Control should be assumed by an independent authority but the overlap between politico-administrative bodies (CPC and VCP) and production collective management organizations (cooperatives) does not allow this control at commune level. This situation results in lack of cooperatives effective accountability to the administration in charge.

Moreover, the fact that cooperatives strong involvement in irrigation water supply, through the development of local pumping stations, is not formally acknowledged by Vietnam authorities, reinforces the lack of cooperatives accountability. Although cooperatives pay correctly their fee to IDMSCs, contracts do not give an estimate of the water fee paid by farmers. They only correspond to the annual fee each cooperative has to pay to the *cum*, and cooperative field

application costs are not mentioned. Actually, drainage costs are still calculated on the basis of cooperatives summer cultivated area, as it was officially stipulated in 1984 national decree. This is no more the case for field application costs due to the fact that irrigation activity is more and more directly assumed by cooperatives. Consequently, cooperatives stopped to pay their water fee as a whole like they did before. They managed to pay for the exact service provided by the *cum* only. They keep some of the irrigation fee proportionally to the irrigated area they supply. This is the result of a local agreement and not the consequence of 1990s decrees which did not take cooperative increasing involvement in irrigation into account. Contracts contents signed between *cum* and cooperatives changed through a negotiation process which did not involve neither central nor provincial or district authorities. These contracts formalize a commercial agreement but they do not include any formal requirements concerning service and finances quality monitoring from the authorities point of view.

To Cooperatives Members

On the other hand, there is a major difference between former and present cooperative forms. Nowadays service cooperatives managers are entitled to make profit by selling water to farmers. They have to balance their budgets and do not hesitate to increase the water fee in order to achieve this goal. They justify their decision by the necessity to maintain and increase cooperative water supply capacities. Cooperative management activities are specialized functions which can justify that farmers are not directly active in water management. But the issue is to question the way farmers control and influence water management. It appears that no clear regulation is fixed yet. In much cases there is no backup about water fee use given to farmers. Transparency is never the rule except in some village cooperatives where budget and fee amount can be effectively decided in farmers assembly. Water local management symbolizes community autonomy in decision-making but also provides some pragmatic financial power due to the water fee. In this context, state regulation is missing and transparency is hardly in place. The only way to maintain some equity is the active involvement of Vietnam Communist Party (VCP) commune and village cells (Do Hai Dang, 1999). But it is also one weakness of this system as explained above.

The consequence of this lack of transparency is to concentrate power in the hands of a minority. It can lead to side effects such as fraudulent dealing with cooperative assets, when the original idea was to avoid mismanagement. Social studies conducted at village level on the issue of local water management governance, show that cooperatives management quality depends more from managers personal skills and seriousness than from active farmers control (*Ibid*.). Due to the possibility of making profit from cooperatives management, the lack of cooperatives accountability to the administration, combined with the low transparency regarding farmers information on water fee calculation and cooperatives annual accounts, increase the risk of mismanagement. Up to now there is no cooperatives service quality and rigor assessment feasible. This weakness argues for the establishment of new regulations asking for transparent budgets and detailed accounts.

1.2 Ambiguity in Cooperatives Functions

Several issues or inconsistencies appear in 1990s passed decrees. First of all water user terminology concerns both users or exploiters of the water resource, which may create difficulties in terms of water rights definition and regulation as their interest may often be opposed. Then, more emphasis is given to economical aspect of water selling and buying, and nothing much is said about legal aspect of conflict settlement and regulation. At last, there can

be a possible paradox in Vietnamese state policy of promoting water management privatization while trying to reinforce production cooperatives as a planning and social tools.

Water Users Definition Issue

With 1988 *khoan 10*, farmers became involved *de facto* in the hydraulic process as new water users. Yet, the formal affirmation of farmers participation in the agricultural production process did not lead to their participation in the water management process. On the contrary, from the formal point of view, cooperatives have secured their position as collective water users, when they signed hydraulic contracts with IDMSCs. From the finances, management and equipment points of view, they act in an informal way, as intermediate organizations between individual water consumers, farmers, and IDMSCs. Moreover, they are involved as water supply service organizations in competition with IDMSCs.

The first comment about water users definition given in the draft water law is that the word user encompasses a double meaning. In Vietnamese authorities mind, a user can use water to its own benefit or supply water to the benefit of someone else. It can be individuals or collective organizations. It can be private or public. A cooperative "can either provide water supply services from hydraulic works or enjoy services provided by IDMCs"(UNDP, 1996). This terminological confusion is the exact formalization of the existing confusion concerning cooperatives and farmers respective duties.

The second comment is that the way water users can benefit from water rights, through the establishment of licenses, seems to be more relevant to organizations, such as cooperatives, than individual farmers. Province and city authorities can hardly succeed in providing licenses to all farmers of their jurisdiction. Therefore, the idea of creating users associations under state leadership is mainly addressed to cooperatives as they are organized under the strict guidance of Vietnamese authorities and already have a social mandate of farmers representation.

The third and last comment relates to the economic nature of water resource management. It seems that more than a question of responsibility transfer, present water management decentralization is a cost transfer concern. Actually, approved decrees specify that water users can be granted a license of using water by concerned authorities in return for water taxes, fees and charges payment. Existing contracts signed between IDMCs and cooperatives can be analyzed as the granting of cooperatives by IDMCs on behalf of province authorities, of a commercial license to use water resource in an agricultural purpose. Moreover, the law on cooperatives enacted in 1996, promotes cooperative evolution towards the establishment of cooperatives of service which sell water to farmers and make profit out of it. Furthermore, these new cooperatives must be capitalized by shareholders who manage these so-called "cooperatives" as private service companies. More emphasis is given to the financial aspect of the reform, when field surveys show that management issues mainly follow from regulation weaknesses.

For all these reasons, water management decentralization which led to IDMSCs pragmatic recognition of cooperatives partnership in irrigation, is not achieved. First of all cooperatives involvement in irrigation is not formally established at provincial and central levels. Contract contents changed without any formal statement on this evolution so that a kind of public regulation or control could be achieved. Secondly, these contracts which should be users service contract in the aim of Vietnamese State, are only the sign of a commercial understanding on financial resources sharing between two water supply services competing organizations. They do not give any details of the cooperatives specific costs and revenues. At

last, cooperatives informal new dual mandate of representing farmers and selling water, does not secure farmers interests as they are not formally considered as final water users, with rights to be respected, but only as crop producers buying a service.

Reforming Farmers Representation in Local Water Management

Farmer involvement is a strong foundation stone on which improved institutions can be built. During collectivist period, former agriculture production cooperatives have performed local-level resource development, conveyance, repair and maintenance, resource mobilization, and conflict resolution functions with respect to irrigation, in addition to their agricultural production functions. Moreover, farmers strong experience of and willingness in irrigation management gathered previously to agriculture collectivization, played a major role in the reinforcement of cooperatives present involvement in irrigation water supply (Fontenelle and Tessier, 1997). From the point of view of local stations development, one of the most important consequence appears to be the individualization of local irrigation schemes for about 50% of RRD. These local perimeters are independent from the old large perimeters, because local stations are getting water directly from zones which are not linked to IDMSC stations activity anymore. In terms of social appraisal of this process, this evolution is the result of farmers dismissal of a centralized agriculture management and of their willingness to get some autonomy in decision-making (*ibid*.). Nowadays, cooperatives fulfill in several cases the same duty as IDMSCs. The physical independence in resource access and the autonomy in decision-making put cooperatives and IDMSCs in a direct competition for water supplying service market gain. Yet, if farmers opposition to former collectivist organization of production is commonly shared, their formal involvement in local irrigation systems control is not acquired and still relies on village and commune socio-political conditions (Do Hai Dang, 1999).

Regarding cooperatives, the main issue concerns the duality of their function. Being a water supplier to farmers and a water user on behalf of farmers can lead cooperatives managers to favor one function more than the other. Until now Vietnamese Government satisfies international donors comments regarding national economy privatization by creating service organizations such as service cooperatives. In term of management transfer and population participation, some stress is put on cooperatives representation mandate, which satisfies donors too. The official policy follows the dialectic that cooperatives as water users can either provide or use water. In this context, and with respect to new cooperatives weaknesses presented previously, the coming challenge appears to be the reinforcement of local irrigation as it shows promising results both in terms of technical and social efficiency, until cooperatives structures are able to open themselves to a real farmers participation. Such a participation could be to enlarge effective farmers participation, through the creation of operational monitoring tools which results would be discussed on general assembly. This institutional reform would aim to balance private activity interests of cooperatives managers with collective production interest of farmers.

Until now, formal water management broad policy does not mention farmers rights as water final users. They are considered as water consumers only. They have to pay the fee but the monopoly characteristic of both cooperatives and IDMCs does not allow farmers to negotiate and to discuss water supply prices. As water users, they should be able to pay water a fair price to suppliers, whoever they are. They should be able to control the activity of the organization which provide them with a service. For the time being formal institutions do not fit the conditions to fulfill these rights. In-depth studies conducted in BHH unit show that

current institutional arrangements are unfavorable to farmers interests with unclear water fee charges and impenetrable financial management. They can sometimes present some willingness of equity and transparency especially when management is restricted to village level. But existing fair local institutions respecting farmers interests, are mainly due to the social cohesion of the community, to the personal strictness of water managers and to the close monitoring of local VCP cells. Administration from local to central levels is never formally involved in this process. The coming challenge for RRD water management institutions is to place these local arrangement in the policy agenda of Vietnamese Government more than to keep stress technical and financial aspects only.

2. The Contradictions in IDMCs' Status

National decrees provide a legal framework to IDMCs and IDMSCs. It defines their mandate, rules and regulations. Since 1998, the new status of « public interest company » allows these Companies to have public subsidies and recognizes that water service is not a simple commercial service which can easily balance its costs. But IDMSCs and even more IDMC are still heavily unbalanced. For one part, this seems due to some institutional contradictions in their status.

2.1 Partial Similarity Between Hydraulic and Administrative Units

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) depend from administrative decisions, and on administrative units. These is the case for the governance of IDMCs (which are under control of the WRS of the Province) and IDMSCs (under control of the district), and for the calculation of the water fee. Vietnamese authorities have tried to improve the similarity between both kinds of units, creating two new IDMSCs when the administrative unit (province or district) is divided in 1997. But it is not always possible to have a complete similarity. Some IDMCs, like in BHH unit, are under control of more than one province. When they provide water to hydraulic units that are in different provinces, the level of the fees can be different for a same service.

2.2 How to Balance a Budget when You Control Neither the Costs Nor the Income

It seems interesting to look at the financial position of the IDMCs. We have seen that, even if local cooperatives pay most of the fees, IDMSCs are quite unbalanced, because provinces do not pay the subsidies they should pay. And these unbalanced IDMSCs pay only a part of their fees to the IDMC, which is much more unbalanced.

But it seems that a part of the companies deficit comes from some institutional contradictions in their position. They are supposed to be balanced, with subsidies for primary infrastructures maintenance and in cases of bad yields (to balance the reduction of fees). But companies do not control most part of their budget.

The Level of Income is Decided by Politico-Administrative Bodies

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 much more at provincial levels, the determination of fees is more based on

political considerations than on the economic analysis of water service costs. For example, the level of fees did not follow the huge increase of the electricity cost:

- The companies do not control their incomes, which depends on the area actually irrigated and drained, and on the level of fees. Even if they collect 100% of the fees, it is not sure that it can balance their costs.
- 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. Moreover, provincial WRS do not add a third irrigation fee for the winter season, even if it uses a lot of water. So, compared with actual farmers agricultural results (paddy yields and a third winter crop), the water fee they actually pay is lower than the official given percentage.

Companies Can Control Only a Small Part of Their Costs

Electricity and salaries are the main expenses, along with maintenance:

- The electricity cost depends on the year but companies have to provide a good service. They cannot stop drainage or irrigation when the electricity expenses are above the provisional budget. Companies do not control operational costs, which depends on annual weather conditions.
- Most of the companies fixed charges are defined by the State. Decrees on water management say precisely how much people have to be employed for each kind of work: depending on the power, a pumping unit must have a chief, a worker, maybe a third one. So, the number of people working for the company is broadly fixed by the structure of the scheme. Some officials at MARD level say that these norms are too high and that it is not necessary to have so many people. Salaries, social security contributions,… are also fixed by the state. Even if they wanted to, companies could not reduce significantly the cost of labor.

In such a situation, it is only on maintenance that companies can control their expenses. Reduction of maintenance is frequent, and debt toward enterprises which have done the works also. Moreover, for clientelist or political reasons, companies may employ more people than the amount fixed by decrees. Knowing that they may have subsidies if they are unbalanced, companies do not have so much interest to show a balanced budget. Most of the maintenance work is done by the companies themselves, or by public enterprises under contract without real competition, which can allow to overestimate the costs.

2.3 The Structure and Rules of the Companies Are Not Adapted to the New Situation

Due to the emergence of local pumping stations, IDMSCs now supply about 50% of the former irrigated area. Their incomes have significantly decreased, because the percentage of the fee they get depends on the kind of water service provided by the company. The electricity cost decreased, because a smaller area is now irrigated. But electricity is only a part of the expenses, and the labor cost did not decrease, because the number of people paid by companies are 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 know precisely the real area.

Cooperatives tend to underestimate this area, to reduce the amount of fee to paid to the companies, contributing to increase the gap between IDMCs incomes and costs.

The evolution of IDMCs legal status has been a step in the restructuring of water management after de-collectivization. Compared with a full administrative management, it allows to precise the responsibilities. The attempt to give them an obligation of balanced budget was a failure. The creation of the status of « public interest company » means that the state recognizes that it has to subsidize some costs, mainly for primary infrastructures and new works. But the current status does not provide IDMCs proper incentives to balance their operational costs. It may even forbid them to do so. Their structural deficit is even stronger with the emergence of local stations, since they have not reduced their staff in accordance with the decrease of their irrigation activity.

V. CONCLUSION

De-collectivization of Vietnam agriculture facilitated and brought about the emergence of institutional innovations in water management for more than 15 years. From an informal point of view, the multiplication of local pumping stations reached the level that today about 50% of RRD irrigated area is supplied by cooperatives and not by public bodies anymore. Local pumping stations development individualized local irrigation schemes which are managed in an autonomous and flexible ways by cooperatives, apart from IDMCs activities. From a formal point of view, the situation changed a lot within these 15 years too. Primary hydraulic unit water management came under the responsibility of specialized organizations, the IDMCs. These companies remain under public governance but have to balance their accounts with the collection of a water fee paid by farmers and collected by cooperatives. Furthermore, Vietnam government worked on the promulgation of a comprehensive law and application decrees on water resource management, in an attempt to define each actor position and duty within Vietnam water management framework.

The issue is that state was not able to combine flexibility with accountability. On the contrary, Vietnam state, such as other southeast Asian states, is a so-called “weak strong state” (McCarthy, 2000). It combines strong broad policies establishment, which do not formally allow any flexibility, but is not effectively able to monitor their implementation at local level. Accountability tools are not effective which in return maintains informal arrangements and flexibility out of state control. From the informal point of view, local arrangements which led to the development of local schemes managed by cooperatives, express farmers and cooperatives willingness and capacity to adopt more flexibility in management. The side effect of this evolution was to decrease the transparency of these new systems, which were not formally recognized by authorities. No work on their accountability could be achieved yet. From the formal point of view, state put stress on IDMCs formal accountability without giving them the minimum flexibility required by such services companies. Central formal control and planning froze IDMCs capacity to adjust to pragmatic informal evolution of water management. They reacted in developing informal arrangements in order to overcome formal constraints and to create some operational flexibility.

Present RRD water management challenge is to create a formal room for water management flexibility. This can be achieved through the formal acknowledgement of local irrigation

development. This acknowledgement would lead to the necessary implementation of an assessment of local irrigation management diversity. Indeed, formal flexibility is feasible if accountability is effective. This means to open cooperatives to transparent management rules and to make them accountable not only to the administration but also to farmers in order to guarantee the quality of their service. Actual political control on cooperatives does not allow this assessment as administration can not control itself and farmers are not entitled to do it either. The first step to improve irrigation water management is then to decrease political control on cooperatives.

Such an evolution would improve RRD water management as far as farmers participation is reinforced and cooperative social and collective mandate is respected. Actually state policy tries to make cooperatives respect this statement but has no effective tool to do so. Personal interest of local leaders interferes with their political mandate which does not help to clarify local water management. Political spheres of activity overlap production spheres of activity and farmers representatives in the cooperative congress, have difficulties to act effectively on cooperative internal management. State could instead grant farmers with water users' rights so that they can play an effective role in local water management service control.

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