

Development of Effective Water-Management Institutions: The Case of the Upper Pampanga River Basin, Philippines

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Introduction

The Upper Pampanga River Basin (UPRB) is one of the biggest river basins in the Philippines and is located in Central Luzon, Philippines (figure 1). The estimated total area is 420,000 hectares, covering several cities, and 25 municipalities in the provinces of Nueva Ecija, Pampanga and Bulacan. Nueva Ecija occupies the biggest portion of the river basin.

The basin provides abundant water resources for a large population, growing industries, and agricultural production in a vast fertile rice land in the Central Luzon region. While the current water resources are still abundant, there is concern whether they will be able sustain the water requirements of the growing population. There is an urgent need to protect and manage the basin for the future generation. This is an enormous task, and the absence of a coordinating body to effect an overall water management necessitates the creation of the UPRB coordinating council.

This paper highlights the resources within the UPRB and the reforms needed to effectively manage the river basin. The next section profiles physical systems, socioeconomic conditions and stakeholders in the basin. The subsequent sections discuss the major water-management issues, institutional reforms and future plans. The creation of the Upper Pampanga River Basin Coordinating Council (UPRBCC) is the focal point of this paper. It is envisioned that the council could be an effective institution to develop and sustain the water resources of the basin.

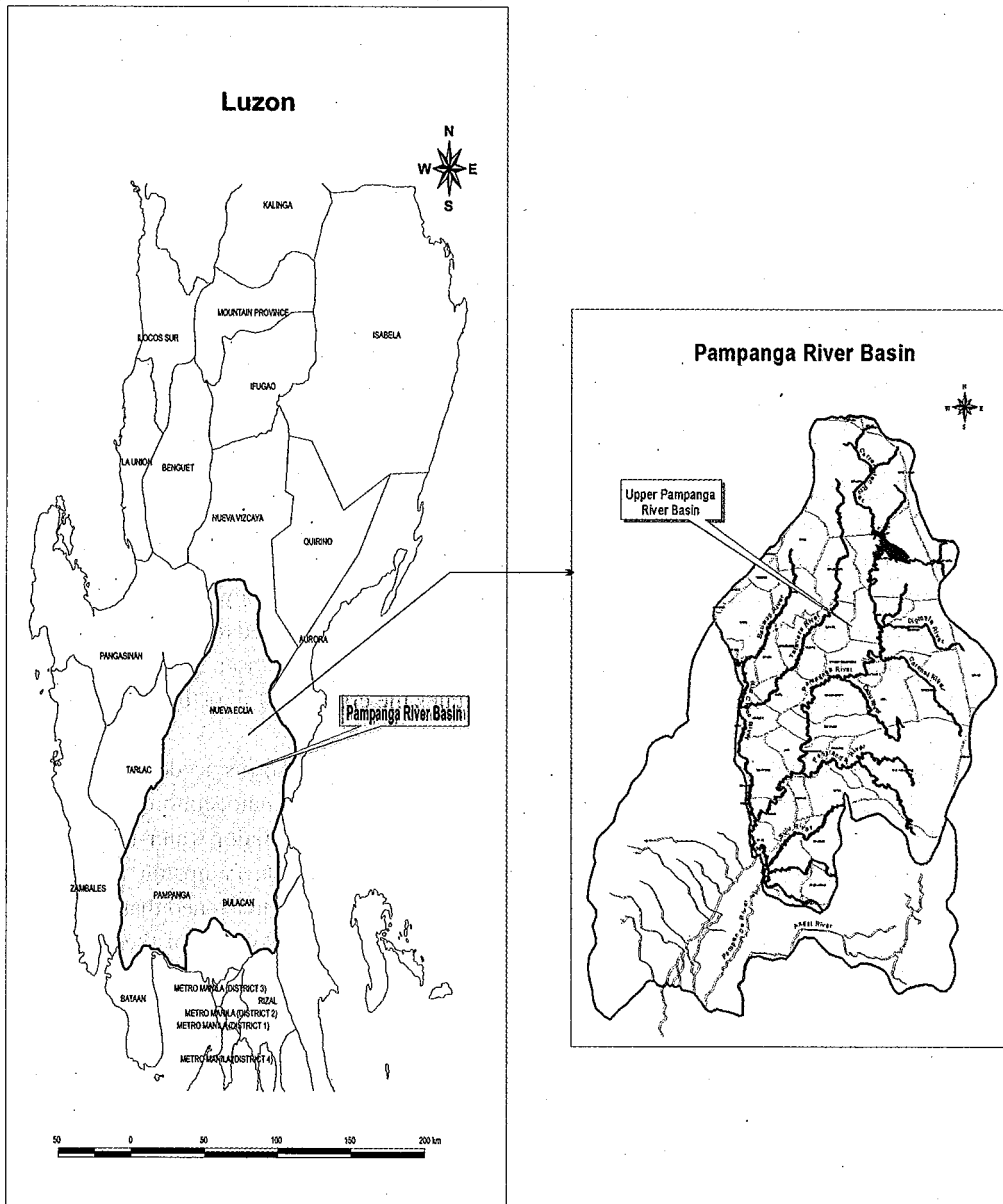
Profile of the Basin

Physical System and Water Resources

The UPRB has two distinct seasons. The wet season is from May to November and the dry season from December to April. The average rainfall is 1,900 mm for a normal year and 1,100 mm for a dry year. Rainfall during the rainy season is brought about by the southwest monsoon, accompanied by an average of 22 tropical depressions during this part of the year.

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Figure 1. Location of the Upper Pampanga River Basin.



The physical system of the basin consists of the Pantabangan reservoir, river system, diversion dams, and irrigation channel networks that supply water for irrigation and fisheries, and for municipal, industrial and other requirements. The major river tributaries are the Awilan, Digmala, and Coronel rivers in the upper reaches of the Pampanga river and the Talavera and Peñaranda rivers, as shown in figure 2. Within the UPRB is the Upper Pampanga River Integrated Irrigation System (UPRIIS), which became fully operational in 1975, mainly for irrigation. UPRIIS is one of the biggest national irrigation systems in the Philippines. Its total service area is 102,532 hectares, about 24 percent of the whole basin, as shown in figure 3. Communal irrigation systems (CIS) provide irrigation to about 2,500 hectares of rice and diversified croplands. Individually operated 4-inch shallow well pumps also contribute to the overall irrigated areas in the UPRB. As many as 1,571 units of shallow well pumps and engine sets with an average discharge of 9 liters per second (lps) were installed from 1997 to 1998; each one capable of irrigating 10–20 hectares. Additional physical infrastructure is being constructed by the Casecan Multipurpose Irrigation and Power Project (CMIPP). This project is expected to irrigate 35,000 hectares of agricultural land and provide hydroelectric power of 150 MW. The irrigation component of the project consists of 64 km of a super diversion canal and 611 km of laterals and sub-laterals, together with water-control structures and irrigation facilities

Water in the basin is also utilized for hydropower, a plant that produces 150 MW of electricity, and is reused for irrigation. The basic profile of the basin is shown in table 1.

Socioeconomic Conditions

The UPRB is relatively large in terms of population, land area and coverage. In 1995, the population within the basin's administrative boundary was 1.58 million. The population growth rate is 2.86 percent per year, which is very high by international standards and higher than the country's (2.3) and the region's (2.12) growth rates. Population in the basin is projected to reach 2.1 million in 2005. Population density was 341/ha in 1995, an increase of 45 persons/km² in a span of 5 years. The proportion of the population highly dependent on the household for survival (0 to 19-year-olds and over-65-year-olds) is relatively large at 50 percent. Urban population was 36 percent in 1990, 13 percent higher than the 1980 level, and it is expected to increase because of the growing importance of the nonagriculture sector and migration in the domestic economy.

The river basin is primarily agricultural. Figure 4 shows the land cover in the basin. Agriculture is the major source of employment and income, particularly in Nueva Ecija which is considered to be the major rice-producing province in the country. The labor force in agriculture in Nueva Ecija is 57 percent while that in Bulacan and Pampanga it is 30 percent in each. Farming households constitute about 50 percent of the total households. In addition to crop production, poultry, livestock and pigs are raised. Light industries such as feed mills, rice mills, ice plants, and cold storage for onions contribute to the basin's economy. Commercial establishments abound in population centers within the basin, especially in first-class municipalities like Santa Rosa, Gapan and San Miguel, and in cities like Cabanatuan and San Jose. However, commercialization of agricultural and nonagricultural activities in the basin has given rise to environmental pollution.

Figure 2. Rivers in the UPRB.

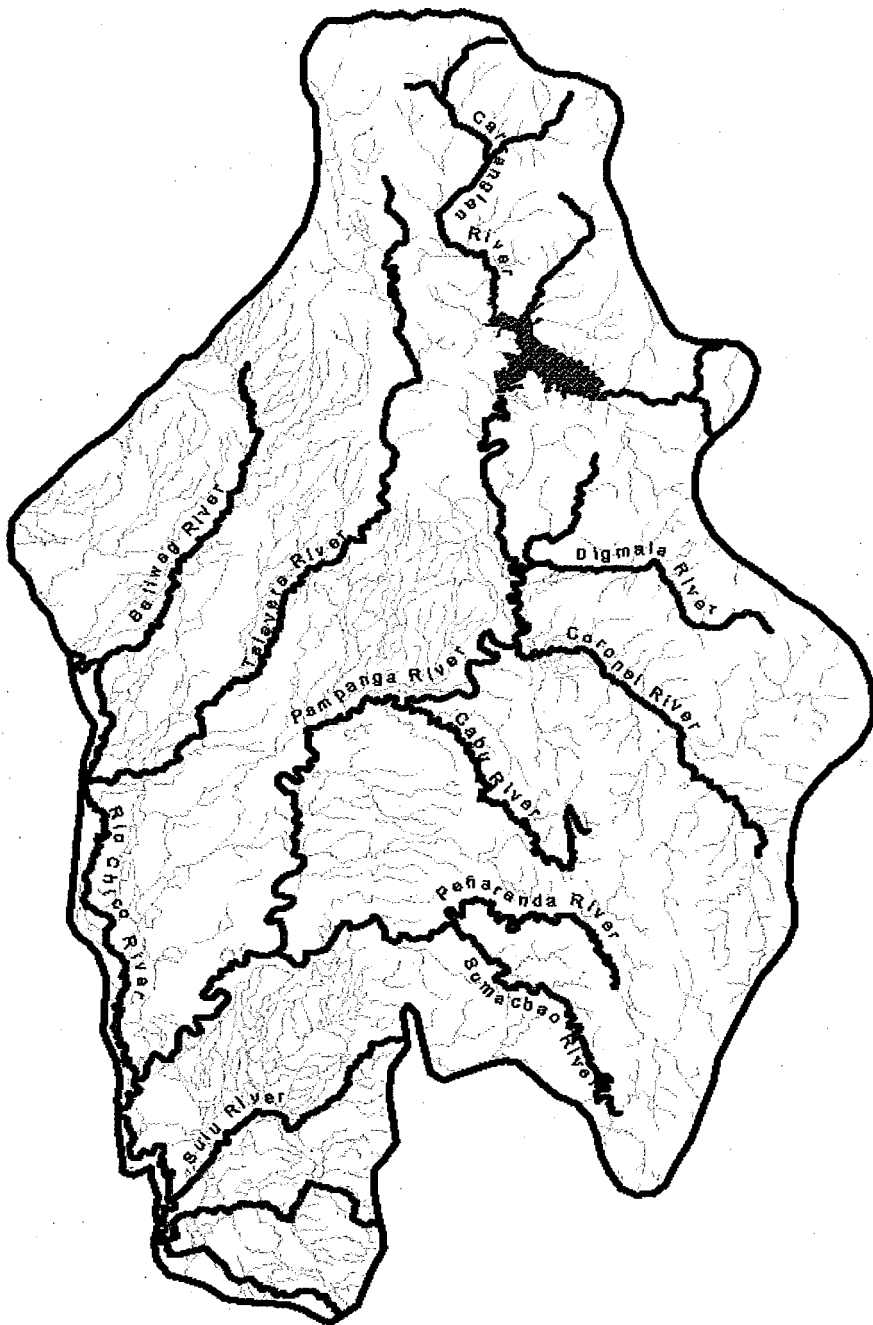


Figure 3. UPRIIS districts and communal irrigation systems within the UPRB.

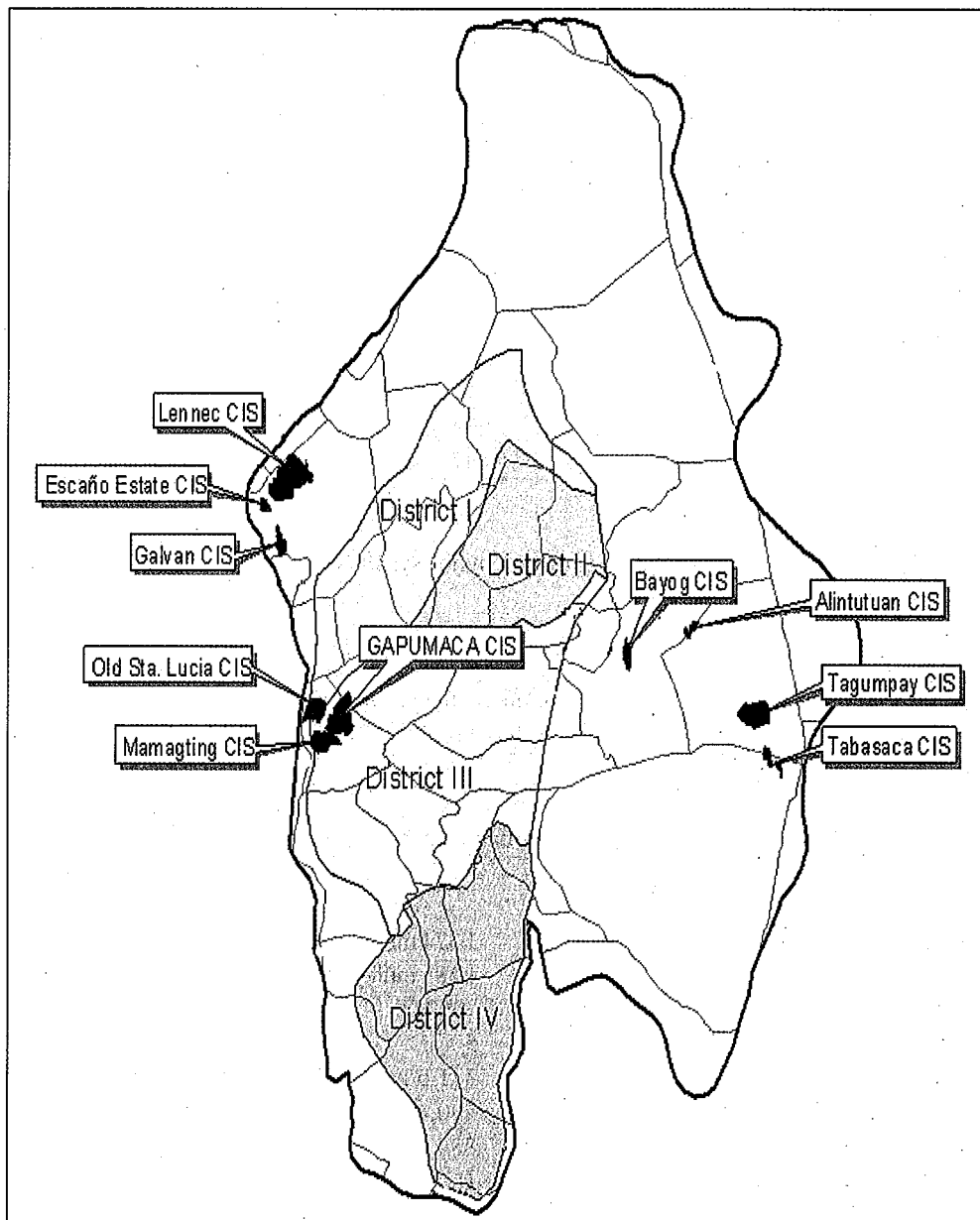


Table 1. Basic profile of the UPRB.

| <i>1. Basin Characteristics</i> | | | | |
|---|--|-----------------------|--------------------------|----------------------|
| General Information | | | | |
| Geographical area | 4,200 km ² | | | |
| Location | N14° 45' to N16° 10'; E 120° 20' to E 121°15' | | | |
| Physiographic features | Plains 90%; Mountainous 10% | | | |
| <i>Average rainfall</i> | | | | |
| Normal year | 1,900 mm | | | |
| Dry year | 1,100 mm | | | |
| Agro-climatic information (average for 1989–1999) | | | | |
| Location | Total rainfall | Total evaporation | Average temperature (°C) | Average humidity (%) |
| Central Luzon State | | | | |
| University | 1,994 | 1,904 | 28 | 75 |
| Cabanatuan City | 1,754 | 1,847 | 28 | 81 |
| <i>2. Facilities/Assets</i> | | | | |
| No. of irrigation schemes (surface irrigation) | 4 major systems | | | |
| No. of hydropower plants | 1 | | | |
| No. of rainfall stations | 2 | | | |
| No. of pan evaporation stations | 2 | | | |
| Large reservoir | 1 (2,996 million m ³)—Irrigation, hydropower, industry | | | |
| Shallow wells | 1,571—Deep wells 11 | | | |
| <i>3. Urban Centers</i> | | | | |
| No. of urban centers | 4 | Area of urban centers | 807 km ² | |
| <i>4. Socioeconomic Data</i> | | | | |
| Total population | 1.374 million | | (1990) | |
| | 1.583 million | | (1995) | |
| No. of households | 308,347 | | (1995) | |
| Average household size | 5 | | | |
| Population density | 341 p/km | | (1995) | |
| Maximum population in the urban sector | 490,425 | | (1990) | |
| Maximum population in the rural sector | 884,470 | | (1990) | |
| Ratio of urban: rural population | 1:1.8 | | | |
| Per capita land area | 0.006 km ² | | (1995) | |
| Households with piped water | 28% of total | | | |
| Number of IAs (under NIS) | 365 | | | |
| Number of IA members (under NIS) | 61,880 | | | |

5. Land Use and Agriculture

| | |
|----------------------|---------------------------------|
| Cultivated area | 254,490 ha |
| Urban land area | 67,365 ha |
| Irrigated area | 200,987 ha |
| Average Landholdings | 1.4 ha–3.0 ha |
| Major farm crops | rice, onion, garlic, vegetables |
| Cropping intensity | 120% (1998) 154% (1999) |

Sources: NCSO 1990, 1995; PAGASA 1990–1999; BAS 1999.

In Nueva Ecija, the average farm size has continued to decrease from 3.47 hectares in 1971 to 1.78 hectares in 1991. Similar trends were reported in Pampanga and Bulacan due to fragmentation and land conversion. If these activities continue, food supply in the basin will be a problem unless efforts are made to increase productivity per unit area.

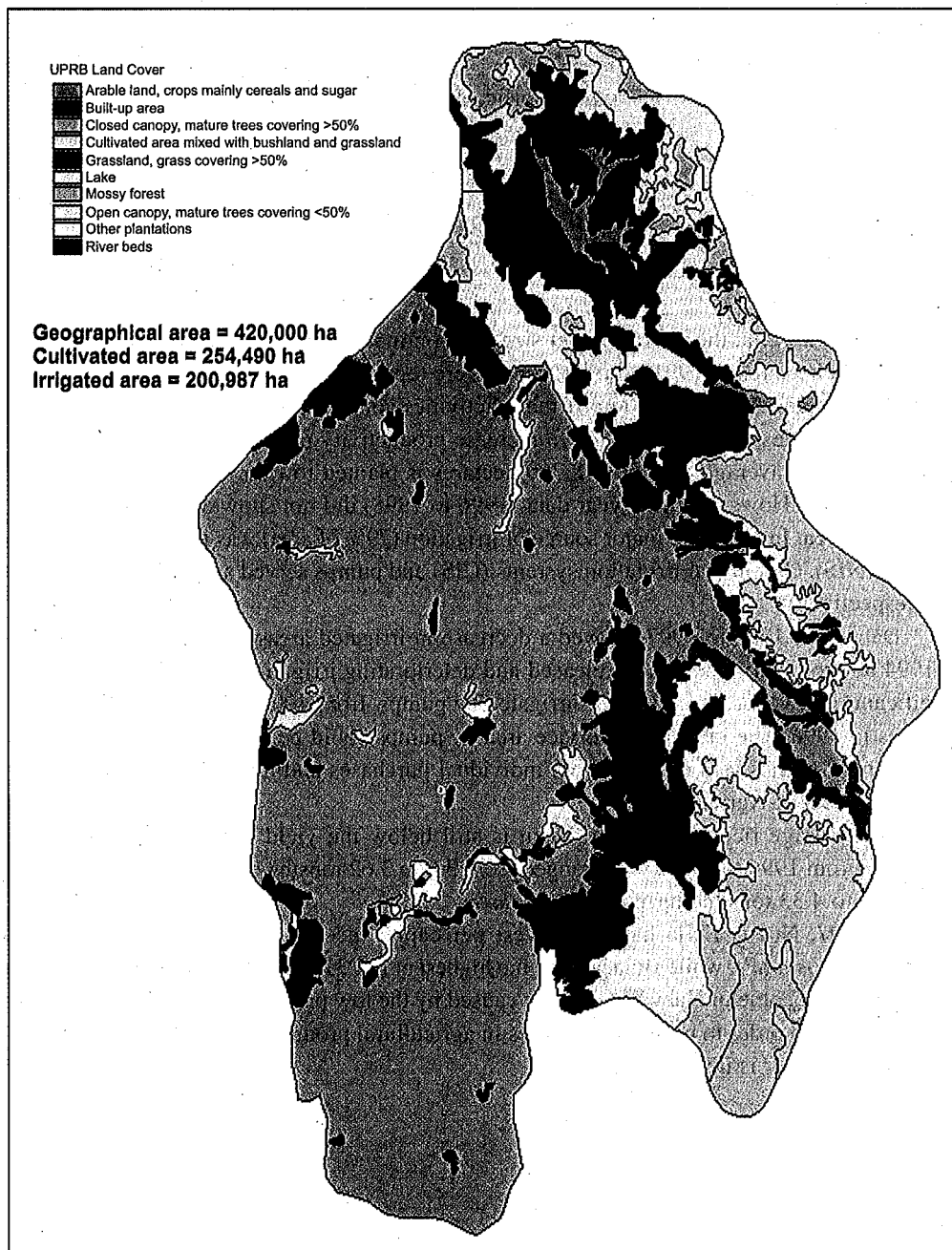
An annual average area of 218,710 hectares is planted to rice, 92 percent of which is irrigated paddy. However, the 3-year data (1996 to 1998) did not show a significant increase in irrigated area. In 1997, the major source of irrigation (79% of area) was the national irrigation systems (NIS). Communal irrigation systems (CIS) and pumps served smaller areas (12% and 9%, respectively).

Data from 1992 to 1997 showed a decrease in irrigated areas by NIS in 1993 and CIS in 1994 due to insufficient water released and deteriorating irrigation facilities. In contrast, a significant increase occurred in areas irrigated by pumps, from 400 hectares in 1992 to 10,000 hectares in 1996. The increase in service area by pumps could be attributed to an increase in ownership of pumps as a result of both individual purchases and the distribution program of the Department of Agriculture.

The average rice yield in the basin is still below the yield potential of modern rice varieties. From 1996 to 1999, yield ranged from 3.0 to 3.62 tons/ha during the wet season and from 3.73 to 4.33 tons/ha during the dry season.

In 1997, Nueva Ecija had the lowest per capita income of PhP 20,959 (US\$1=40 Philippine pesos, PhP), while Bulacan had the highest at PhP31,343. The low household income and per capita income in Nueva Ecija were caused by the low productivity and low farm prices in agriculture. In order to promote increases in agricultural productivity, efficient use of labor, fertilizer and water is important.

Figure 4. UPRB land-cover map.



Stakeholders in UPRB

Considering that agriculture is the primary source of employment and income within the UPRB, the National Irrigation Administration-Upper Pampanga River Integrated Irrigation System (NIA-UPRIIS) and its thousands of farmer beneficiaries who are mostly members of the irrigators associations (IAs) are considered the major stakeholders of water from the UPRB. As of December 31, 1999, altogether 365 IAs in the whole of NIA-UPRIIS had been recorded, with a membership of 61,880.

Most of these IAs are registered with the Securities and Exchange Commission (SEC) and currently hold contracts with NIA. They share in the management of operation and maintenance (O&M) of the irrigation systems. O&M contracts are of three types. Type I involves a canal maintenance contract. For this, an IA receives an incentive of PhP 400 for every kilometer or a total of PhP 1,400/month for a 3.5-km earth canal or a 7- km lined canal. In Type II contracts, the IA participates in system operation, and in the campaign and collection of the irrigation service fee (ISF) within its area of jurisdiction. An IA receives an incentive, based on the collection efficiency. Type III involves the transfer of O&M of a system, or part thereof, to the IA, which amortizes the direct chargeable investment cost to NIA without interest for a period not to exceed 50 years.

The objective of “shared management or participatory irrigation management” is to encourage active involvement of the associations in the O&M of the NIS. However, results of a recently concluded study that reviewed the cost-recovery mechanism for the NIS, including the NIA-UPRIIS revealed that “the NIA-IA partnership in practice is asymmetrical and that NIA controls the technical expertise and subsidizes maintenance and improvements in the canals that are being operated and maintained by the farmers (Shepley et al. 2000). In other words, the “paid” maintenance and ISF collection contracts do not provide enough accountability and incentives to the IA, and inhibit the farmers’ capability for sustained O&M of the irrigation system.

Several government agencies are tasked with the administration of water in the basin. Their interests and functions are administrative and regulatory in nature. These agencies are the National Power Corporation (NPC), Department of Environment and Natural Resources (DENR), Bureau of Soil and Water Management (BSWM), Philippine Atmospheric Geophysical, Astronomical Service Administration (PAGASA), Local Water Utilities Administration (LWUA), National Electrification Administration (NEA), Bureau of Fisheries and Aquatic Resources (BFAR), and Department of Public Works and Highways (DPWH). Despite the presence of these agencies within the basin, it is still beset with problems and issues such as siltation of waterways, land conversion, water pollution, and lack of a coordinating body to promote effective water-resources management in the basin.

Major Issues Related to Water Management

The study identified five major issues related to water management in the basin, and formulated recommendations for action to address these issues.

1. Water in the UPRB, particularly within the NIA-UPRIIS service areas, has been found to be closely tied to agriculture, high population-growth rates, population density, and an increasing rate of urbanization. This close linkage has raised the need for cooperation among the various agencies and interest groups within the basin. A multi-sectoral committee or core group should be formed, composed of representatives from the NIA, DENR, local government units (LGU), the NPC, local water districts, local communities, and other interest groups. This group will be responsible for reviewing and integrating plans and projects or in developing an institutional framework that will define how the various stakeholders of the UPRB can collaborate and operate in an integrated manner. This integration is imperative because, at present, there is an apparent lack of effective mechanisms for coordination among agencies within the basin that are concerned with water management.
2. Water accounting is crucial for planning and managing water resources. However, it is extremely difficult to do water accounting within the UPRB because of the lack of trained personnel responsible for obtaining the needed information. This is aggravated by inadequate or nonfunctional staff gauges and other measuring devices in strategic locations within the basin.
3. Within the UPRB, the problem of deteriorating water quality arises due to increases in population and urban activities. Household wastes, as well as wastes of micro-industries, especially in more urbanized areas in the basin, have started to create problems. Solid wastes are being thrown in irrigation canals, disregarding municipal ordinances intended to control the degradation of surface-water quality. If these municipal ordinances and other rules and regulations for the protection of water quality are not strictly enforced, water pollution within the UPRB will become an increasingly severe problem in the future.
4. Micro-level analysis of the crop production in the UPRB shows that the predominant cropping pattern is rice-rice. This cropping pattern requires a large volume of irrigation water that is drawn heavily from the main canal of the NIA-UPRIIS. Rice fields are flooded with water, starting from land preparation until 2 weeks before harvesting.

Efforts have been exerted to teach farmers water management in rice culture for minimizing waste of water. In the past, training on rice production and proper water management at the farm level was conducted by NIA and other government and nongovernment agencies. However, farmers continued their conventional practices, indicating that the training had been unsuccessful in attaining the objective of increased water efficiency at the farm level.

5. Traditionally, NIA has been tasked with irrigation development in the country. Over the years however, amendments in the original charter of NIA have been made, primarily by virtue of Presidential Directive (PD) No. 552 issued in 1974. The PD later paved the way for NIA to implement the shared management or participatory approach for irrigation management of O&M in the irrigation system. In the NIA-UPRIIS service areas, the first IA was organized in 1975. It was only in the mid-80s that the proliferation of IAs began. Through the years, the IA proved to be potent partners of the NIA-UPRIIS as they performed their roles and responsibilities pursuant to their O&M contracts with NIA. Of late, however, the functionality of the IA within the NIA-UPRIIS has shown a downward trend, as shown in the results of the functionality survey conducted during the last 4 years. Nonfunctional IAs increased from 57 percent to 84 percent in 1999.

NIA has indicated a willingness to consider transferring to the IA full or partial authority and responsibility for operating and managing the NIS in the service areas smaller than 3,000 hectares. This impending transfer necessitates that IA's management capability be enhanced to prepare them for the responsibility of operating and maintaining the irrigation system.

Institutional Reform

The problems identified and vital issues highlighted above relating to the physical facilities, water accounting, socioeconomic condition, and system performance within the UPRB were the basis for the institutional reforms that the research team is pursuing:

1. Institutional collaboration for effective water management.
2. Strengthening and enhancing the IA's capability for irrigation system O&M.
3. Adoption of operational mechanisms for water accounting and valuation.
4. Advocacy for use of proper water-management technologies.
5. Strict enforcement of existing policies and regulations to protect water quality.

Several actions have been undertaken to support the establishment and operationalization of the Upper Pampanga River Basin Coordinating Council (UPRBCC), as described below.

Consultative meeting. A consultative meeting was held at Central Luzon State University, on November 27, 2001 attended by 22 representatives of the various stakeholders who were initially identified to constitute the UPRBCC. The Provincial Governor of Nueva Ecija chairs the council, since Nueva Ecija constitutes the biggest portion of the basin. The terms of reference or the roles and responsibilities of each of the stakeholders were identified and included as an integral part of a concept paper.

Declaration of commitment. A Declaration of Commitment was signed by the initial members of the Council at the Office of the Provincial Governor of Nueva Ecija on January 18, 2002. This activity signaled the formal operationalization of the UPRBCC.

Organizational meetings. To date, two organizational meetings were conducted, the first on April 2 and the second on May 7, 2002. The organizational structure of the council was finalized as shown in figure 5. Development plans of each of the various stakeholders were presented in order to identify activities to be undertaken by the council. Among the priority activities initially identified by the council are:

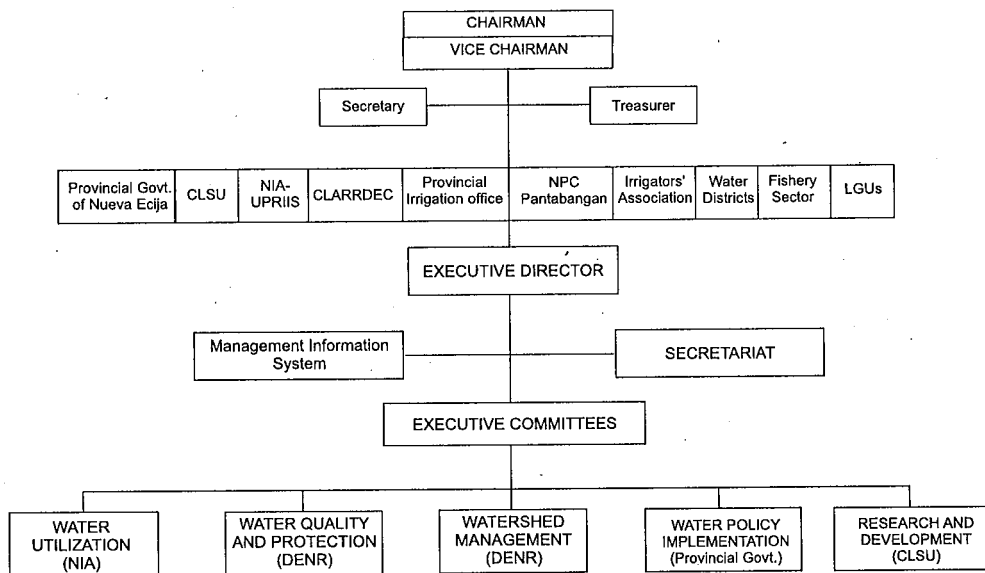
1. Advocating effective and efficient water management
2. Supporting the anti-water-pollution campaign of the local government units
3. Developing a UPRB database
4. Watershed management
5. Monitoring water quality
6. Strengthening IAs
7. Research and development

Strengthening the IA and NIA capabilities for O&M. A benchmark survey on selected Banaang Pag-asa IA officials and members was conducted to obtain information that could serve as the basis for strengthening the association. The information obtained from this survey was over and above that gathered during the initial phase of the project.

Among the salient initial findings are the following:

- Only 15 percent of the respondents claimed that regular meetings of the IA are held once every season (wet/dry). Such meetings are usually attended by the IA officials and some NIA-UPRIIS field personnel.
- Matters discussed during the IA's most recent meeting dealt with the irrigation management transfer (IMT), schedule of water release from the Pantabangan dam, and ISF collection.
- Most of the respondents have not attended any general assembly meeting; nor have they attended meetings of their Turn-Out Service Group (TSAG). The most notable reasons they mentioned were a) inaccessibility of the venue of the meeting, and b) lack of interest, as they believe that no tangible output would be achieved.
- Most farmers were unaware that the IA exists. They also do not know their officials, for no formal election had been held in the past several years. The present set of officials had been holding on to their positions for many years now.

Figure 5. UPRBCC organizational structure.



- Very few farmer-respondents (21%) disclosed that they had paid their ISF for the last wet season. Low yield and income were cited as the major reasons for non-payment of their ISF accounts.
- Most farmers signified their willingness to pay the ISF, provided that the main and lateral canals are rehabilitated and farm-to-market roads are constructed.

Inspection of infrastructure. A visual inspection of irrigation facilities within the area was conducted on September 27, 2001 to provide a more in-depth evaluation of the physical facilities. Results showed poor maintenance of irrigation facilities. The flow of water is obstructed by the presence of weeds, trees and debris along the lateral.

Meetings with the IA officials and members. In its desire to strengthen the capability of the IA officials and members, the research team conducted several meetings with the Banaag ng Pagasa IA Board of Directors (BOD) and different TSAG chairmen and members. Two BOD meetings were conducted on August 28 and November 28, 2001. Some of the salient matters discussed during the meetings were:

- Orientation of the board about NIA's IMT program and the CLSU-NIA-IWMI-funded research project.
- New elections for President, Vice President and Treasurer.

- The problem regarding the poor condition of the farm-to-market road was presented and discussed. A resolution was prepared requesting the Provincial Government to help in the repair/construction of this farm-to-market road. The resolution was favorably acted upon by the Governor and the Provincial Engineer, through the endorsement of the research team.

Meetings with TSAGs. As of February 27, 2002, separate meetings with ten TSAGs had already been held by the research team. Table 2 shows some of the details of the meetings with the different TSAGs. A general assembly/meeting was set for May 22–23, 2002.

Other activities. Field visits involving the BOD/TSAG officials were carried out on December 13, 2001 to expose the farmers to the different income-generating projects of the CLSU.

National Workshop. On April 16–17, a national workshop was conducted at CLSU. It was attended by 59 participants from various state colleges and universities in Luzon, Visayas and Mindanao. Other participants were representatives from NIA, DENR and LGUs. The national workshop focused on the following:

1. Introduction of the basin approach of assessing and managing water resources.
2. Report of the diagnostic study conducted in UPRB.
3. Workshop to:
 - provide comments on the applicability of the basin approach in other basins.
 - ongoing and planned activities in other river basins.

Future Plans

1. Continue with the operationalization of the UPRBCC, and ensure that the various plans and programs of the council are be pursued.
2. Undertake programs that will further enhance and strengthen institutional capability and improve the agricultural productivity of the Banaag ng Pag-asa IA.
3. Follow up and coordinate the finalization of the proposal developed by participants of the national workshop about the development of effective water-management institutions in other river basins of the country and submit the same to funding agencies for possible funding.

Table 2. Information discussed during the TSAG meetings, Banaag ng Pag-asa IA.

| Date | Place | Matters taken up | Attendance (%) |
|----------|---------------------------|--|----------------|
| 09/12/01 | Pamaldan, Cabanatuan City | Objective of strengthening the organization Need to rehabilitate the 4–5 km farm-to-market road not included in first resolution made and approved by the Governor Problem in their mini dam Rehabilitation of canal Schedule of the next meeting Agenda for the next meeting | 36 |
| 09/14/01 | Rajal Norte, Sta. Rosa | NIA's IMT program and the CLSU-IWMI research project Strengthening of IA for effective water management Problem of heavily silted farm ditches | 24 |
| 09/19/01 | San Pablo Matanda, Aliaga | NIA's IMT program and role in providing irrigation service and the CLSU-NIA-IWMI-funded research project Strengthening of IA Need to rehabilitate the farm-to-market road Schedule of the next meeting Agenda for the next meeting | 37 |
| 09/20/01 | San Pablo Bata, Aliaga | NIA's IMT program and role in providing irrigation service and the CLSU-NIA-IWMI-funded research to strengthen IA Need to rehabilitate the mini dam or "prtil" Presence of illegal turn-outs Desilting of lateral AM3 President G.M. Arroyo's program | 36 |
| 09/27/01 | Pamaldan, Cabanatuan City | Review of the minutes of the previous meeting (September 12, 2001) NIA's IMT program, constitution and bylaws Identification and presentation of officials Resolution requesting for the repair of the farm-to-market road Schedule of the regular meeting | 64 |

Continued

Table 2. Continued.

| Date of meeting | Place of meeting | Matters taken up | Attendance (%) |
|-----------------|------------------------------|---|----------------|
| 09/28/01 | San Pablo Bata, Aliagathe | NIA's IMT program and role in providing irrigation service and the CLSU-NIA-IWMI-funded research CLSU as a government institution of higher education and a center for generation/development and promotion of technology Strengthening the IA ISF collection problems President Arroyo's program | 100 |
| 10/12/01 | Cinco-cinco, Cabanatuan City | NIA's IMT program and CLSU-NIA-IWMI-funded research CLSU as a government institution for students and center for technology promotion Strengthening the IA Problems on water management and distribution | 27 |
| 10/23/01 | Rajal Norte, Sta. Rosa | NIA's IMT program and CLSU-NIA-IWMI-funded research Strengthening of the IA Illegal turn-outs Rehabilitation of only one lateral Desilting of lateral AM3 ISF payment and collection problems | 50 |

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