

LESSONS FROM INVENTORY PREPARATION OF IRRIGATION SYSTEMS OF BUDHI RAPTI RIVER, CHITWAN, NEPAL¹

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INTRODUCTION

Irrigation can contribute to agricultural production if it is properly integrated into an agricultural development package. Realizing this vital role of water in increased potential production, the Department of Irrigation, Hydrology and Meteorology (DIHM), His Majesty's Government of Nepal (HMGN), has begun to design and construct irrigation systems in different parts of the country.

The Chitwan Irrigation Project (CIP) is a huge irrigation undertaking which started in 1974 with a loan for US\$ 19.5 millions signed by the Asian Development Bank (ADB) and HMGN. The project comprises three schemes covering an estimated area of 12,000 hectares (ha). Big projects like this have been criticized for not being able to ensure timely, reliable, and adequate supplies of irrigation water, and have been blamed for not being able to reduce the farmers' production risks.

In addition to the CIP, there are many farmer-developed and managed irrigation systems operating in the Chitwan valley. The farmers' efforts have been very encouraging. In the Chitwan valley alone, the estimated total irrigated land is 17,530 ha (WECS 1985), of which a substantial area is under farmer-managed irrigation systems.

Wherever there is a farmer-managed irrigation system, there needs to be effective management to assure the timely delivery of water to the farmers' fields to meet the crop water requirements. However, the lack of technical knowledge and resource constraints such as limited finances or lack of construction materials, or natural occurrences such as changes in river course, are some of the major problems associated with the operation and maintenance of such systems. Limited outside assistance to improve these systems has a tremendous potential for increasing agricultural production in the valley.

The Farm Irrigation and Water Utilization Division (FIWUD) of the Department of Agriculture (DOA) is working in the District to provide assistance to farmer-managed irrigation systems in order to improve water utilization. Eight irrigation projects covering a total command area of 640 ha

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are presently (February 1987) under improvement in the East Chitwan valley with FIWUD assistance (FIWUD office, Hetauda). The Ministry of Panchayat and Local Development (MPLD) also provides financial and technical support to local small-scale irrigation systems for effective operation of the systems.

In bringing about modifications in the existing systems or in planning a new system, a thorough knowledge of the existing systems and the extent of water utilization is needed. The Water and Energy Commission Secretariat (WECS 1985) has carried out a water resource inventory of the Chitwan District. A feasibility study of the East Rapti Irrigation Project (DIHM/ADB/Nippon Koei Co. Ltd. 1986) has included a comprehensive list of both government as well as farmer-built irrigation systems. However, these reports were incomplete. It was therefore considered appropriate to prepare a complete resource inventory of the irrigation systems from the Budhi Rapti river. Such an inventory is expected to develop a picture of the numbers, sizes, and types of systems in terms of the physical structures that exist for conveying, distributing, and draining water. The inventory also proposes to survey the social structure that exists for determining rules and regulations for allocating water, for repair and maintenance of the physical structures, and for resolving conflicts over water matters. It is also expected to identify the present farming systems along with possible modifications within the command area of some of the new or rehabilitated systems. Further, the study is visualized to generate lessons for future directives on issues such as the operation and maintenance of the irrigation systems in general.

BACKGROUND

The Chitwan District is located at the southwestern corner of the Central Development Region, between longitudes 85 degrees 55 minutes to 85 degrees 35 minutes east and latitudes 27 degrees 21 minutes to 27 degrees 46 minutes north and covers an area of 2,510 square kilometers (km^2). About three-fourths of the total area of the District is flat to almost-flat plain with high agricultural potential and is known by the name of the Chitwan valley. The valley floor was formed mainly by detrital depositions from the lower slopes of the enclosing Mahabharat Lekh in the north and northeast and Chure range in the south. The average altitude of the valley is about 244 meters (m) above mean sea level.

Physiography, Natural Drainage and the Soil

The Chitwan valley is made of terraces of various ages created by the Narayani and Rapti River systems. The valley is divided into an eastern area and a western area by the Khageri river, a tributary of the Rapti running from north to south in the valley. The area south of the Rapti river is called Madi valley.

The principal features seen today in the East Chitwan valley are the alluvial plains dissected into a mosaic of land types by the action of the tributaries of the Rapti and Narayani river systems. The general slope of the valley floor is south and southwest with many streams flowing into the valley from the Mahabharat Lekh. Most of these are either ephemeral in character or the volume of water declines heavily during the dry season. The section of land north of the East-West Highway usually suffers from the shortage of water. Physiographically depressed areas with poorly drained to swampy floor beds are also occasionally encountered. Perennial rivers like the Manahari and Lothar flow from the eastern boundary of the valley and become the part of

the Rapti River which again flows from the northeast to southwest and ultimately loses itself in the Narayani river system.

The Dhongre Khola originates from the Lothar river and the Budhi Rapti river from springs in the jungle of Kuchkuche which is being rapidly deforested. Both of these rivers flow from east to west parallel to the Rapti river and are perennial in nature. Unlike the Nerayani river, the Rapti and its tributaries flow at levels almost equal to the average level of the valley floor and, as such, have large flood plains. The water from these streams is utilized for irrigation. The Narayani river flows at a lower level than the average level of the valley floor.

The soils of most of the valley are young without much differentiation into horizons. However, the soils developed on the old terraces have weakly to moderately well-developed horizons. Most uplands and well-drained khet (paddy) lands have an acidic reaction (pH ranging from 4.2 to 7.0). Soils deposited on depressed areas and where drainage is impeded are alkaline (pH >8.5). Generally the soils developed on the terraces of the Rapti river and its tributaries tend to be alkaline. Sandy loam and loam are the most dominant textural classes of the surface soil with a few patches of sandy clay loam and silty clay loam as well. East Chitwan valley soils tend to be heavier in texture than those of the west. A relatively high content of organic matter (1.1 to 6.8 percent, with an average of 2.8 percent) reflects the recent agricultural history of the valley (Khatri-Chhetri 1982). With proper management and adequate inputs including irrigation water, the soils of the Chitwan valley can be highly productive.

Agro-climatic Conditions and Agricultural Development in the Valley

In the early fifties the valley was inhabited by Tharus and Darais (ethnic groups of Nepal) whose settlements were scattered. After the introduction of the resettlement program in the mid-fifties, settlers came into the valley from various parts of the country. The new settlers were more willing to adapt new technologies and hence were more advanced and cooperative. As a consequence, intensive agriculture including livestock raising and plantation crops are practiced in the valley and it is the area with the most potential for producing surplus food grains, oil-seeds, fruits, and animal products in the country. Various agricultural agencies located at different parts of the valley have given impetus to its agricultural development.

The agro-climatic conditions of the valley are most favorable to the tropical and sub-tropical crops and fruits. The major crops grown are rice, maize, mustard, and wheat. Other crops are also grown but on a small scale. Rice followed by wheat or spring maize is a common rotation in lowlands. Wherever water is available double crops of rice are grown. In the uplands maize-mustard is the favored rotation. Maize after maize is also grown. Seasonal vegetables and fruits such as banana, pineapples, guava, mango, and litchi are commonly grown in the valley.

The following is a summary of the meteorological features at Rampur, which can be generalized to the valley. The hottest months are April, May, and June when the average maximum temperature rises to 35 degrees Celsius (°C), with extremes as high as 42°C. The winter temperature goes down as low as 7°C, during December and January. Over 75 percent of the annual rainfall (average annual = 2,000 millimeters) falls during June through September. July and August are the wettest months. Heavy dew is seen during winter months

but its contribution to the water requirements of the wheat crop is negligible (Sharma, et al. 1984).

June through September appear to be the water surplus months. The major crops of this season are monsoon paddy and summer maize. If the crops cannot be planted on time due to the erratic nature of rainfall regarding the arrival, amount, and the number of rainy days in each monsoon, the productivity declines. If rainfall is not regular in early June, water stress may adversely affect the paddy nursery beds. Similarly, the early-sown summer maize crops are severely affected by drought. However, the late-sown crop usually does better.

October through May are water deficit months. The major crops grown during these months are: mustard, winter maize, wheat, spring maize, and spring paddy. The winter and spring showers are also erratic with respect to time and amount. If there is no rainfall during February and March the wheat crop is seriously affected. The spring maize crop is a complete failure if it is affected by drought at the tasselling stage. Observations of the partial or complete failure of spring maize due to drought are numerous in the valley. Similarly, there has been evidence of reduced yields of mustard and winter maize due to drought. The spring paddy is commonly grown in the valley where there is dependable irrigation. It is therefore clear that the value of water in the valley for agricultural production lies in its timely availability.

METHODOLOGY

The inventory data collection methodology was divided into two parts: the preparation for the field survey and the field work.

Preparation for the field survey

Preparation for the field survey required the collection of information about the area with reference to agricultural land-use, geology, and soil geomorphology. In order to understand the area and the mapping of the drainage pattern, the previously published works of WECS (1985) and DIHM/ADB/Nippon Koei Co. Ltd. (1986) were carefully reviewed. The agro-meteorological information helped to visualize the need for irrigation water in the area.

Preparation of questionnaire. To collect sufficient factual and reliable information about the farmer-managed irrigation systems, an inventory checklist and questionnaire were prepared. The questionnaire was designed to probe for a brief historical background of the system, characteristics and performance of the physical systems and the farmers' organizations, and agricultural services and production.

The base-map. An appropriate base-map with details including the river systems, villages, village to village footpaths, panchayat boundaries, plantations, and other physical features of the area was needed. A topographical map (1:25,000 scale) of the District prepared by the Survey Department, Topographical Survey, HMGN was used as the base-map.

Field work

With the help of the information collected from secondary sources, field visits were planned to conduct interviews with key informants and observations

of the irrigation systems. The study group consisted of an interdisciplinary team with backgrounds in agronomy and soil science, agricultural engineering, agricultural economics, and agricultural extension.

Interview. The questionnaire was designed to elicit detailed information on selected topics. The key informants selected included members of the local water users' organization (i.e. members of the Kulo Samiti), village leaders, and local farmers.

The information was used to provide background information on the systems and was also used to investigate problem areas in the community and in the operation and maintenance of the irrigation system. The data gathered from key informants were checked and cross-checked with other key informants. At the same time the minute books of the canal committees were used to verify the data wherever possible.

Observation of the irrigation system. Field observations of each and every system were done either before or after the interviews. The field observations included the inspection of the source and the intake points, the head-works and types of diversion structures, the network of canal systems, and measurements of the cross-section of the main canal to evaluate its carrying capacity. The devices used for distributing water among lower order canals and into the field were also noted.

After the completion of the field work the information was compiled by the authors. No statistical analysis was involved.

RESULTS AND CONCLUSIONS

Irrigation Systems of the Budhi Rapti River

The Budhi Rapti river originates from springs in Kuchkuche forest in the southeastern Chitwan valley and has a perennial flow of water. The river meanders in the southern part of the East Chitwan valley almost parallel to the main Rapti river. The total length of the river is about 4.5 km and there are 11 independent farmer-managed irrigation systems with a year-round irrigation command of over 1,800 bighas (1,200 ha). Due to the recharging capability of the Budhi Rapti river there has been no complaint of water shortage. The Budhi river is called an Amrit Khola, or "life-saving river" in the area. All irrigation systems from the Budhi Rapti are gravity systems, run-off-the-river diversion types. The systems are simple, indigenous, labor-intensive, and have temporary diversion structures.

A sketch of the river course and the irrigation systems follows (Figure. 1) so that the relationship between the systems is apparent at a glance. Arrows indicate the direction of flows and the number of each system corresponds with the names given in Appendix 1.

Some of the systems are very old. Chronologically, the systems are arranged as Kathar (over 100 years), Tin-Mauje (1915), Janakpur (1920), Kapiya (1948), Jiwanpur (1952), Kusuna Gathauli (1957), Kharkhutte lower (1957), Kharkhutte upper (1961), Khairgahari (1967), Sathi-Bighe (1984), and Budhi Rapti Community Irrigation Project (1984).

Figure 1. Map of the Budhi Rapti irrigation systems.

Since their construction, the performance of the systems has been excellent, although frequent problems of recurrent supply interruptions due to flood damages of diversions, washing away of canal reaches and branches, and subsidence of canals due to undercutting, were reported. Even with such difficult situations the farmers have demonstrated their capability to operate and maintain the systems.

One of the most important considerations for the excellent performance of the systems might be due to the ownership feelings among farmers. The farmers have participated in all aspects from construction to the various repair and maintenance aspects of the irrigation systems. The systems have been crude and need intensive maintenance and management for their operation. Therefore, farmers have developed a mechanism to take care of the operation and the maintenance of the system which is based on need and problem resolution. This has played a crucial role in getting farmers to cohere and work together. It has ultimately led to the formation of management committees, locally called Kulo Samitis.

Kulo Samiti. The Kulo Samitis have been most effective in creating favorable impacts on water utilization. They have been very efficient in the operation and maintenance of the system, water allocation, and conflict resolution. The reason for such excellent performance of the Kulo Samiti is perhaps due to its leadership, which is accountable to the water users. If the responsibility fails to be fulfilled, the water users change the incumbent in the next annual meeting of the general body.

Another important feature of the Kulo Samiti is that its activity is kept away from the local power-politics and hence it is regarded as impartial. Farmers of the command area are of the opinion that once the irrigation water management is brought under or influenced by the local power-politics its effectiveness diminishes. For example, the Kulo Samiti formed at Kharkhutte lower irrigation system under the ward chairman in 1980 could not function. Since then the system is working effectively under the leadership of Mr. Rudra Bahadur Dhakal, one of the farmers of the system. One common disadvantage of the farmer-managed irrigation systems is that it is labor-intensive and has limited resources which prevent it from reaping the full potential of the project.

Agriculture

The agricultural productivity achieved in the command area of the Budhi Rapti irrigation systems is tremendous. Triple cropping is practiced with cropping intensities of 300 percent. The crop yields, common varieties used, and estimated area under major crops are shown in Table 1.

Liberal application of farmyard manure and compost is done by the farmers. The use of chemical fertilizers is an increasing trend. However, its use is limited to a few crops only. Rice, maize, wheat, and mustard are the major crops receiving chemical fertilizers. The doses applied were usually half of the recommended doses. Chemical fertilizers and improved seeds are available from local cooperatives. Information regarding the use of chemical fertilizers and improved seeds was obtained from innovative farmers and junior technical assistants and junior technicians of the District Agriculture Office.

Table 1. Estimated crop yields, common varieties and estimated area under major crop.

Crop (by varieties)	Ha cultivated	Yields metric tons/ha	Months grown
Paddy			
a) Main season (Mansuli)	960	3.0-5.0	June-Oct
b) Spring season (CH-45)	600	4.0-6.0	Feb-June
Maize			
a) Summer season (Rampur yellow, Khumal yellow)	---	2.0-3.0	May-Aug
b) Spring season (Arun-2)	300	2.0-2.5	Mar-June
c) Winter season	240	----	Oct-Feb
Wheat (UP-262, RR-21)	480	2.5-3.0	Nov-May
Grain legumes (Khesari, Lentil, etc)	---	0.5-0.8	----
Mustard (Chitwan local)	240	0.6-1.0	Sept-Jan

LESSONS TO LEARN

Based on the findings of the study on farmer-managed irrigation systems from the Budhi Rapti river the following conclusions can be drawn:

Methodology

Good base-maps. A large-scale, detailed base-map is essential to allow ample room for clear drawings of the canal systems. Without such a map it becomes difficult to clearly trace the command boundary of the irrigation system or the canal head-work and its network of canals in relation to the river system.

If air photos of the study area are available, mapping might be easier on them because they show topography, pattern of land-use and other features that can be easily correlated with the existing irrigation network. Results can be re-plotted on the base-map, area by area, as the work continues.

Well-designed questionnaires. Clear, precise, and concise questionnaires must be carefully designed. The arrangement of the questions should progress from general to specific. Such an ordering may add to the quality of the answers as well as increase the respondents' cooperation. Also, it is sometimes very easy to miss some of the most important information. Pre-testing of questionnaires may reduce such dangers.

Field Checks. Field checks are essential. If careful field checks are done mistakes such as "transposition of the direction of canal taking water out of the river" which appeared in WECS (1985) would have been corrected. Similarly, the order of the irrigation systems along the river course could be arranged as per the real situation of the river system. Further, it may decrease the danger of omitting the small systems altogether.

On the Performance of the System

Ownership feeling. One of the most important considerations for the farmer-managed irrigation systems to perform effectively is the feeling of ownership among its members. The farmers own the system. They work for it and get the water for their crops and themselves in return. They consider that the system is the hope for their well-being and prosperity. They operate and maintain the system so that the water supply is available as and when it is needed to meet the crop water requirements. They give examples of the government-owned systems such as Khageri where the water supply is not synchronized with the critical periods of crop water requirements.

Effective organization. The Kulo Samitis of the farmer-managed irrigation systems have excellent performance in terms of water allocation, conflict management, organization, and management of the resources for repair and maintenance of the systems. Leader farmers with a high commitment to work are selected to serve in the Kulo Samiti. The Kulo Samiti is kept away from the local power politics and thus its decisions become unbiased and acceptable to all the water users. Because it serves the needs of the farmers and helps them to resolve their problems, it receives the strong support of the users.

External assistance. Farmers have done their utmost to bring water to their fields. The operation and maintenance cost of these farmer-managed systems is usually high, and improvement in physical systems is generally needed. Because the farmers have limited resources not all aspects of irrigation system improvements can be borne by them. Therefore, there is ample opportunity to improve and expand the irrigation systems at relatively low cost. In some of the systems only lining with concrete at critical canal reaches may improve water distribution considerably. The FWUD approach of assisting farmers appears to be effective. FWUD projects are implemented on a cost-sharing basis and it demands the farmers' participation at all stages of development. This type of involvement makes farmers feel that the project is theirs, which is the most important aspect to be considered.

Kuchkuche forest needs conservation. The Budhi Rapti river originates from springs in the Kuchkuche forest which is being rapidly deforested and encroached upon. If this continues, there is a grave danger of not only drying up the source of the Budhi Rapti river but also it is likely that the main Rapti river may branch into the Budhi Rapti river and damage the whole system, endangering the lives and property of the settlers there.

ISSUES TO BE ADDRESSED

A comparative study of the systems constructed with external assistance and those with farmers' endeavour might be very useful to evaluate the needs for external assistance in the farmer-managed irrigation systems of the area. Operation and management, resource mobilization patterns, and water use efficiency are some aspects that should be examined.

The post-operational changes in cropping pattern, cropping intensity, socio-economic status, and management rules and policy are relevant issues which need to be studied in order to obtain information critical to the evaluation of the systems' productivity.

In order to develop and manage irrigation systems, a number of issues were raised in a seminar on "Water Management Issues" organized jointly by MOA/APROSC/ADC in 1983. The issues raised and presented in the proceedings of the seminar need to be addressed as well.

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System name: Kusuna Gathauli Map symbol: 1.1
 Type of Headworks: Temporary diversion structure at Kuchkuche forest
 Length of main canal: 2 km with 9 branches
 Villages served: Kusuna and Gathali of Kather Village Panchayat and Ward No, 9 of Bhandara Village Panchayat.
 Command area: 160 bigha³ (107.2 ha)
 Water user organization: Five-member Kulo Samiti
 Remarks: The system was first constructed in 1957 and rehabilitated in 1975 after flood damage. The Water Users Organization (WUO) of Gathauli and Ward No. 9 of Bhandara assisted in the repairs. The system is desilted twice a year due to the high silt load from the main Rapti River which is mixed with this system from Janakalyan Ka Kulo.

System name: Kharkhutte Upper System Map symbol: 1.2
 Type of headworks: Temporary diversion structure at Kuchkuche forest
 Length of main canal: 8 km with 9 branches
 Villages served: Ward No. 7 of Kathar Village Panchayat
 Command area: 181 bigha (121.27 ha)
 Water user organization: Nine-member Kulo Samiti responsible for all operation and management (O&M) of the system.
 Remarks: The system was first constructed in 1961 and had a command area of 32 bigha. It was expanded in 1967 to 62 bigha with grant assistance of Rs 7,000 from the Local Development Office. In 1975 it was damaged by flood and rehabilitated in the same year. The FIWUD-constructed Janakalyan Ka Kulo from the main Rapti river mixes with this system since 1985 and covers an additional 70 bighas, consisting of three sections each 50 m long. There are unstable and critically vulnerable points at the canal dikes which need continuous repair and maintenance.

System name: Kathar Irrigation System Map symbol: 1.3
 Type of headworks: Temporary diversion structure at Kuchkuche forest
 Length of main canal: 2 branch canals; ends at Budhi Rapti for drainage
 Villages served: Wards No. 2 and 5 of Kathar Village Panchayat
 Command area: 95 bigha (63.65 ha)
 Water user organization: Nine-member Kulo Samiti which is responsible for all O&M of the system.
 Remarks: More than 100 years old.

System name: Khairghari Irrigation system Map symbol: 1.4
 Type of headworks: Temporary diversion structure at Kuchkuche forest
 Length of main canal: 1 km main canal; irrigation is direct from main canal
 Villages served: Ward No. 3 of Kathar Village Panchayat
 Command area: 11 bigha (7.37 ha)
 Water user organization: No formal WUO. Being a small system, all the farmers gather and resolve problems as and when there is need.
 Remarks: First constructed in 1967. In 1972 the intake point was moved 200 m upstream from the common intake point with Kharkhutte lower system.

³Bigha is a local unit of land measurement. One bigha equals 0.67 hectares.

System name: Kharkhutte Lower System Map symbol: 1.5
Type of headworks: Temporary diversion structure at Kuchkuche forest with a gabion-type structure since 1980.
Length of main canal: 2 km main canal delivering 150 liters/sec, and 5 branches. The tailend of the canal drains to Gaida Ghole.
Villages served: Ward No. 7 of Kathar Village Panchayat
Command area: 150 bighas (100.5 ha)
Water user organization: No formal WUO. Rudra Bdr. Dhaka, a local farmer, is mobilizing the users for the O&M of the system.
Remarks: First constructed in 1957. In 1975 the diversion was washed away in a flood. Major rehabilitation with a gabion diversion structure and canal dikes was completed in 1980 with grant assistance of Rs 7,000 from the Local Development Office.

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System name: Jiwanpur Irrigation System Map symbol: 1.6
Type of headworks: Temporary diversion structure near Budgaon village
Length of main canal: 4 km main canal delivering 200 liters/sec; 11 branches
Villages served: Ward No. 5 of Kathar Village Panchayat
Command area: 56 Bighas (37.52 ha)
Water user organization: Five-member WUO supervises O&M of the system
Remarks: First constructed in 1952. In 1975 a semi-permanent gabion-type diversion structure was built with grant assistance of Rs 7,000 from the Local Development Office, but it was later washed away.

System name: Janakpur Irrigation System Map symbol: 1.7
Type of headworks: Permanent structure gated with a head regulator
Length of main canal: 3.78 km main canal delivering 200 liters/sec; 10 branches
Villages served: Bhatihani, Sattisal, Gorkhela, Dharampur, Janakpur Kumroj of Kumroj Village Panchayat
Command area: 283 bighas (189.61 ha)
Water user organization: A formal Kulo Samiti looks after the O&M of the system.
Remarks: First constructed in 1920, having a command area of 278 bigha. Rehabilitated in 1985 and the command area was increased to 283.

System name: Kapiya Irrigation System Map symbol: 1.8
Type of headworks: Temporary diversion structure
Length of main canal: 3 km main canal with 4 branches
Villages served: Kapiya village Ward No. 8 of Kumroj Village Panchayat
Command area: 113 bighas (75.71 ha)
Water user organization: Nine-member Kulo Samiti responsible for O&M
Remarks: First constructed in 1948. In 1960 a masonry flume was constructed over the main canal of the Kumroj-Dharampur-Sishani Irrigation System with Rs 5,000 from the Local Development Office. Recently a new concrete flume was constructed by the Small Farmer Development Project/CARE, Nepal (SFDP/CARE) over the canal of Naya Simalghari Sathi-Bighe Irrigation system to guide the tailend branch to the Kapiya system.

System name: Tin-Mauja Kulo Map symbol: 1.9
Type of headworks: Gabion-type diversion
Length of main canal: 2 km main canal delivering 400 liters/sec; 3 sub-systems
Villages served: Kumroj, Dharampur, and Sishani of Kumroj Village Panchayat
Command area: 183 bighas (122.61 ha)
Water user organization: Three WUO, one for each sub-system
Remarks: First constructed in 1915. Water is equally distributed among the sub-systems through proportional weirs. There has been no change in the canal alignment since the system was first constructed.

System name: Naya Simalghari Sathi-Bighe Map symbol: 1.10
Type of headworks: Permanent diversion structure, overflow type; gated weir and nearly 50 km lined approach canal with gated head regulator
Length of main canal: 2 km main canal delivering 400 liters/sec; 5 branches
Villages served: Jholiya and Sishani villages of Kumroj Village Panchayat
Command area: 60 bighas (40.2 ha)
Water user organization: 13-member Kulo Nirman Samiti may be converted into a WUO after completion of construction work.
Remarks: Construction work first started in 1984 with the technical assistance of SFDP/CARE, Nepal. Estimated completion date was April 1987. Budget: 1984, SFDP loan = Rs 30,000. 1986, SFDP loan = Rs 16,200. A second SFDP loan = Rs 85,000. Grant assistance from CARE, Nepal: 1,000 bags of cement, 300 kg steel rods, 500 kg gabion wire. Labor contribution of the farmers = 6,600 man-days.

System name: Budhi Rapti Community Irrigation Map symbol: 1.11
Project
Type of headworks: Gated weir. Reinforced concrete diversion. Gated head regulator at the intake point.
Length of main canal: 5.85 km main canal delivering 800 liters/sec with 10 branches. Earthen canal network. Reinforced concrete cross-drainage works. Main canal drains into the Budhi Rapti.
Villages served: Ward numbers 1, 2, 3, 4, and 7 of Kumroj Village Panchayat
Command area: 585 bighas (391.95 ha)
Water user organization:
Remarks: Construction work first started in 1984 with an estimated completion date of April 1987. Budget: Estimated cost = Rs 1,496,000, of which Rs 449,000 is a SFDP loan and Rs 748,000 grant assistance from CARE, Nepal. Labor contribution from the farmers amounted to Rs 2,299,000.

TOTAL COMMAND AREA OF ALL THE SYSTEMS: 1,817 bighas (1,217.39 ha)