Main System Management under Participatory Management Program Experiences from Sirsiya Dudhaura Irrigation System

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1. Introduction

1.1 System Description

Sirsiya Dudhaura Irrigation System (SDIS) is composed of two overlapping irrigation systems namely: Sirsiya Irrigation System (SIS), fed by the perennial Sirsiya river, and Dudhaura Irrigation System (DIS) fed by Dudhaura river and by the spring fed Kathoh Khola, having almost no dry season discharge.

The system is located in the Terai plain of Bara and Parsa districts, Central Development Region of Nepal. It lies between longitudes of 84° 53' 45" E to 54° 58' 32" E and latitudes of 27° 01' 05" N to 27° 05' 45" N.

The system was constructed in 1957, and has a gross command area of 2050 ha in which 1400 ha comes under SIS and 650 ha under DIS. The net irrigable area, as per hydrological boundary map is 1616 ha. Some patches in the command area (approx. 16%) get irrigation from Deep Tube Wells (DTW) that are operated by Narayani Zone Irrigation Development Project (NZIDP) Birganj.

SDIS has altogether 13 km of long main canals, totaling 6 km of Sirsiya main canal having 3 branch canals with 7 km of Dudhaura main canal having 4 branch canals. The whole command area has been hydrologically divided into 14 irrigation blocks.

The rainfall pattern in SDIS, from 1971 to 1982, indicates that 80 percent of the total annual rainfall (1500 mm) occurs during the monsoon. In the winter it varies from 6 mm to 25 mm.

Paddy followed by wheat is the major cropping pattern, but in some areas farmers grow pulses, maize, and oilseed crops after paddy. In some areas, with assured water supply farmers grow early paddy as the 3rd crop. Sugarcane is also grown in some patches.

A baseline study made in August 1988 shows that the average land holding size in the command area is 1.47 ha and the average size of land farmed is 2.06 ha. Land to man ratio was 0.16 ha/person and the average family size was 9 persons/family. The percentage of land holdings and sizes found in the command area are as follows: 62.8% : 1.0 ha, 13.1% : 1 - 2.6 ha, and 24.1% : 2.6 ha.

SDIS is being managed by the District Irrigation Office (DIO). The DIO has hired one assistant engineer, one overseer, one Association Organizer, and seven dhalpas to manage the system.

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1.2 Purpose of the Paper

The management of an irrigation system has a direct effect on the systems' performance, affecting total production in the command area. The objectives of a participatory program in irrigation system management are to improve system management, improve performance levels, minimize managerial activities, and the cost of O&M through problem sharing with the beneficiaries. The procedure for applying a participatory approach in the context of Nepal is a learn by doing technique. This approach was applied in the joint management program of SDIS. Their field experiment was expected to provide insight into many seen and unseen problems, and find field based solutions. The lessons learned will be used in other irrigation systems. The aim of this paper is to reflect on the procedures used and the lessons learned in SDIS, so as to understand the differences and strengths of the participatory approach in other agency managed systems.

2. Operation and Maintenance Procedures

2.1 Operation

a) Cropping schedule

Paddy rice is the staple crop grown in the command area. The other crops grown and their approximate area include: wheat (45%), lentils (21%), maize and sugarcane (8%), oil seeds, and pulses like vetch (khesari), green gram, linseed, and others (14.5%). Early paddy is grown in some areas as a third crop. During winter some area (11.5%) is kept fallow. The cropping pattern followed in the command area are:

- Paddy-Paddy-Wheat/Lentil
- Paddy-Wheat-Fallow
- Paddy-Pulse+Oilseed
- Paddy-Green gram/Maize
- Sugarcane

During joint management efforts through the Irrigation Management Project (IMP), farmers were encouraged to make crop plans to simplify operational plan development and to maximize the use of limited water during winter. Farmers of different blocks were asked to hold meetings to make crop plans prior to the cropping periods. The agency staff helped them prepare their crop plans. Determining factors that affected the above process were: adequacy and reliability of water, availability of improved crop varieties, fertilizers, other agricultural inputs like tools and machinery, labor, credit, and customs.

The agency tried to control water distribution through operation schedules. For agricultural inputs, Parwanipur Agriculture Center (PAC), and Input Corporation (AIC) were contacted for help. PAC was also requested to launch agri-extension programs like minikit (seed program) and farmers field trails. Credit programs from ADB/N did not materialized because of farmers lack of interest. Agricultural customs and traditions were expected to be self-evolutionary. Farmers of individual blocks felt that serious efforts in this regard were needed to come up with crop plans.

b) Water allocation

The earlier irrigation water delivery system in SDIS was based on a "might is right" principle, and attempted to be made systematic and technical through IMP programs. The sequential steps required for water allocation are as follows:

- The Agency adopted a process of allocating irrigation water in the requested branch on the basis of written requests from the individual beneficiaries.
- After some months the agency started entertaining only those water demands that were recommended by members of their respective Water Users' Group (WUG).
- Afterwards, the agency encouraged the beneficiaries to put collective water demands through WUG.
- The agency acquainted WUG presidents with the practical difficulties in the above process, and aided them in formulating rotational schedules based on number of days per water proportion of an individual WUG's demand.
- To limit exaggerated water demands, the WUG presidents (i.e. Water Users' Association members) fixed the rotational schedule based on area to be served.
- When the amount of water that different blocks were to receive was understood, WUGs were taught how to share irrigation water proportionately within the required time frame.
- The process was supported by many related activities, integrating other irrigation management activities with the institutional development process.

The fishery unit located within the campus of Parwanipur Agriculture Farm, which used to receive water from SDIS, was also asked to comply with the above approaches as another beneficiary.

This approach allowed the beneficiaries to share the available irrigation water in an equitable manner over a defined time period. This lead to the adoption of a better operational plan through user involvement. Two major factors that influenced the above allocation process were: the availability of irrigation water supply throughout the year, and a vague understanding about the impacts of equitable water sharing practices.

Water availability at the source used to play vital role during early paddy before the start of monsoon and rabi (dry) season. Water discharges at the source were very low and unpredictable because of the number of Farmers Managed Irrigation Schemes (FMIS), about 15 in DIS and 5 in SIS, in the upstream.

The amount of available water left the agency and WUA with preparation of rotational water delivery schedules based on the time proportions of available discharge. Generally, the schedules used to be in weeks, but during

critical periods in days and even in hours, as agreed upon in WUA monthly meetings. Emergency meetings were sometimes called.

The operation schedule was limited to the branch canal levels. Within the branch canals and/or rotational blocks down to farm level, the water distribution process was mutually decided on by the beneficiaries. Water allocation, as set up by the Agency to the different branch canals, had to be fulfilled with the help of Dhalpas.

c) Use of rainfall and drainage water

The system was previously designed for supplementary irrigation during paddy. Now, with the growing demand for food production and diversification of crops grown through modern agricultural practices, the water demand is increasing continuously. To supplement the increased demand the beneficiaries use Shingara drain and local ponds, filled during the rainy season. The head reach farmers of Dhudhaura System (Bahera and Baluwa blocks) construct their brush dam in the Sirsiya river upstream. A number of inlet structures have been built along the canal system to acquire surplus runoff in the command area. The additional water, obtained by rainfall or drainage, was never taken into account in the water schedule. It provides flexibility when adjusting the tight schedule during critical periods.

d) Water adequacy

Both river sources have sufficient discharge during Kharif, the normal monsoon season. The system is able to adequately serve the whole command area. But during early paddy and rabi the users were forced to live with water scarcity. This constraint was over come to a great extent through rotational water scheduling. In rabi the users only choice was to share the water deficit equitably. This used to be one of the reasons for conflict among tail-enders. SDIS having weir type diversion structures, doesn't have the ability to store water. Users were motivated to stick to the water distribution schedule. The head-enders always tried to influence the rest for getting more water than allocated.

e) Maintenance

Under the participatory program, in order to establish joint a management process, IMP carried out a whole package of Essential Structural Improvement (ESI) works, so that the system could be brought up to the level to fulfill the joint management objectives besides the regular maintenance works. Regular maintenance work carried out by the agency were: desilting and canal cleaning, reshaping, oiling of gates and equipments for water control. While launching the participatory program, ESI was one of the major complementary activities along with the institutional development works. These ESI works were to be completed with maximum participation of farmers/farmer groups.

f) Planning

The program implementation steps were:

- identification of key-farmers,
- briefing the about the ESI program and its objectives,

- system walk-through by the team comprising the key-farmers, agency persons responsible for O&M, IMP personnel, USAID representative, Technical Assistant (TA) team,
- identification of ESI needs,
- tentative cost estimating,
- adhoc water users groups formulation,
- screening of ESI needs to limit the cost,
- identifying the users' contribution in ESI works, and
- formal agreement between adhoc committees and the agency on final ESI plan.

g) Execution

- prioritizing the listed ESI works,
- preparation of a construction schedule with WUA, and
- construction.

The users' share of ESI works were to be completed through local resource mobilization in parallel with the works to be carried out by the agency. The users' share of works were labor intensive like desilting, canal cleaning, field channel construction, carrying hume pipes, GI wire boxes, and reinforcement. For works to be done by the agency, the users were involved at various stages of construction, like site finalization, lay out fixation, design modification, and construction supervision.

To increase WUGs participation in ESI works and to generate funds for their organization, some of the agencies works were awarded as contracts to the farmers/farmer groups recommended by respective WUGs.

The works allotted were less labor intensive. The farmer-contractors were required to deposit 10 percent of the billed amount in the WUG's fund. Professional contractors were called for technically sophisticated works.

h) Effects of Differed Maintenance

Because of conventional bureaucratic procedures in the agency for allotting and releasing O&M funds, and for processing the construction work activities, maintenance was a slow process. A new approach like participatory program in irrigation, requiring extensive interaction with the farmers, further delayed the maintenance. The maintenance schedule delays interfered with the operational schedule. This resulted in difficulty in achieving coordination between farmers' works and agency's works, causing increased cost for maintenance, and deterioration in the system's function status. There was dissatisfaction among both the users and the agency people.

After completion of a major portion of ESI works, the regular maintenance activities also had to be carried out in close coordination with WUA/WUGs. As per the mutually agreed upon joint management approach at SDIS, the beneficiaries were responsible for carrying out regular maintenance works

down the main canals. The head works and the main canal were the responsibility of the agency.

The users carried out the regular maintenance works on their field channels collectively, mobilizing local resources. Prior to the IMP efforts these works were being carried out by needy individual farmers on irregular basis.

Regular maintenance of field channels by the users led to:

- easy water distribution at the farm level,
- generated the habit of doing group works among the users,
- minimized conflict,
- minimized field channel water losses,
- increased serviceability of the canals, and
- developed feelings of ownership.

Maintenance of the branch canals by farmers' contribution did not take shape. The main reasons for this failure were: a lack of insufficient resources within the beneficiaries, previous practices of maintaining the branch canals by the agency, insufficient institutional strength to mobilize people.

Maintenance of the main canals and headworks was carried out by the agency. Prioritization of needed works and preparation of implementation plans were done in consultation with WUA.

Effects of water user groups participation in maintenance: In order to accomplish the physical improvement works, the WUGs were involved under a joint management endeavor. In this regard the objectives were:

- to make the users acquainted with various maintenance techniques,
- to take out some portion (10% of billed amount) of the profits from the construction contracts to be a means of generating O&M funds in their WUGs, and
- to develop the confidence of the WUGs in the management activities of the systems.

The farmers were opposed to taking the profits. They thought it to be a source of generating money, which adversely affected the joint management program. Involvement of the beneficiaries in the quality control of construction works gave rise to an undesirable "empowered" feeling, hindering progress and differing maintenance.

Roles, responsibilities and rights of agency staff and WUGs in O&M activities for the main system: The roles and responsibilities of agency staff for:

i) **Operation**

- Acquisition of water from the river source.
- Assisting WUA in preparation of water distribution schedule.
- Allocation of water to different branch canals as scheduled.
- Monitoring water delivery schedule.

- Applying safety measures to protect the irrigation system against natural calamities.

ii) **Maintenance**

- Inventory of maintenance needs for head works and canal system.
- Design and estimation of the needed maintenance works
- Setting priorities for works with WUA
- Make budgetary arrangements
- Prepare construction schedules
- Construction with the involvement of users
- Oiling and greasing of mechanical water controlling structures.

Additional agency responsibilities were to provide technical assistance to WUA/WUGs when needed, perform and administrative and financial activities related to O&M, and watercess (water charge) realization in the system were also the part of agencies responsibilities.

i) Roles and responsibilities of water user groups

i) **Operation**

- Prepare crop plans
- Forward water demands
- Formulate a water delivery schedule for water allocation and distribution
- Prepare a water crisis management plan
- Assist the agency in monitoring the operational schedule
- Resole water related conflicts.

ii) **Maintenance**

- Identify maintenance needs in the system with the agency
- Provide necessary inputs in design considerations
- Assist agency in prioritizing maintenance requirements
- Resource mobilization for repairing farm structures and field channels
- Assist in implementation of maintenance plan
- Assist in quality control of maintenance work

The WUG also helped assess the watercess and its realization, hold meetings regularly at WUG and WUA levels, and manage WUA funds.

3. Impact of Main System Management during the Participatory Program

3.1 Water Allocation and Distribution

Through IMP efforts considerable changes were brought about in water allocation and distribution. Users came to take care the responsibility of water distribution on farm level, increasing water use efficiency. The agency could focus more on water allocation at the branch level. The farmers, through WUA, were in the position to formulate and follow rotational water delivery schedules, leading to more equitable distribution. This was verified by the analysis of water related conflicts. The users used to be concerned about water rights problems in the upstream of the source rivers and showed strong initiative to negotiate with the upstream farmers and settle upon some water sharing principles.

The farmers report that water conflicts have been minimized when rules and sanctions are enforced for "out-of-turn water use".

3.2 Productivity

The system was previously designed for 2050 ha, but the actual irrigated area had decreased considerably over time. Implementation of the participatory program brought the net irrigable cropped area to a maximum level of 2203 ha. (considering the two major crops-paddy and wheat). Water cess records from 1985 to 1990 showed that there had been a fall in the cropping area from 1713 ha in 1985 to 1243 ha in 1987, which increased again to 2203 ha during 1990. The cropping intensity has not increased considerably, but the farmers have shifted from wheat to other high value crops. The introduction of high yielding crop varieties, fertilizers, and pesticides has changed the yield pattern of different crops. For example, the yield rate of wheat has gone up to 1.5 tons/ha and the yield of paddy has gone from 2.5 to 3.0 mt/ha. Some farmers have reported rice yields up to 7 ton a hectares. This indicates that there has been a considerable increase in production.

4. Conclusions

4.1 Problems and Issues Encountered

Some of the problems and issues encountered during the joint management efforts are given below:

a) Unpredictable river discharge, because of upstream water users, made it complex to prepare a reliable operational schedule that is accepted by the users.

b) Prompt agricultural support services were important in order to prepare viable crop plans, which leads to the development of more practical operational schedules.

c) Involvement of users in the maintenance works required flexibility in the bureaucratic procedures, as well as long time frame, in order to accomplish targeted jobs.

d) WUGs funds, generated through contracts awarded to the beneficiaries, could not be maintained in absence of other ways of generating funds and could not be utilized in constructive ways either.

e) Realization of watercess could never become effective.

f) Launching a joint management program through IMP was perceived as a wave that came with the support of IMP resources and slacked down with its withdrawal. Local agencies responsible for system management do not have sufficient resources to compete with this approach.

g) Specific sanctions required for monitoring institutional development processes were lacking. The constitution of the WUA was not in a position to assist in this regard.

h) Urban proximity also affected the strength of WUA. Many of the users had dual professions; agriculture as well as business or factory jobs in the nearby town of Birganj.

4.2 Lessons Learned

In observing the IMP exercise of joint management at SDIS the following lessons can be stipulated:

a) The agency must do a great deal of exercise in predicting availability of water in the source throughout the year.

b) Water rights for sharing water from other basins is a crucial matter on which the reliability of the source river depends.

c) Agriculture support services need to be integrated with irrigation management plans.

d) Extending the involvement of the farmers in construction activities should be well understood.

e) Fund generation and utilization procedures in WUG need to be monitored very closely.

f) Watercess realization process needs intensive co-operation and involvement of WUA.

g) Joint management program can be led more effectively if carried out through the local agency office over a longer time span.

h) Institution development process is required to progress in compliance with the management efforts. Fixing rigid targets in establishing the management practices may not be a constructive approach.

4.3 Recommendations

The followings recommendations are being made for improving main system management procedures with participatory management;

a) The agency must demonstrate the capability to allocate water to different parts of the canal system in a reliable manner.

b) The agency should assist the WUA to overcome water right problems in the source river.

c) The agency should assess the availability of water in the source round the year.

d) Agriculture support services should be provided in co-ordination with crop planning and system operation activities.

e) Farmers' involvement in the construction procedures should be well defined in detail.

f) A monitoring process of WUGs' funds should be formulated.

g) Watercess realization process should be channelized through WUA.

h) Agency should not make tight schedules for joint management action plans.

i) Socio-institutional aspects should be given due considerations in formulating joint management plans.

j) Orientation and training programs related to joint management activities should be prepared on site specific basis.

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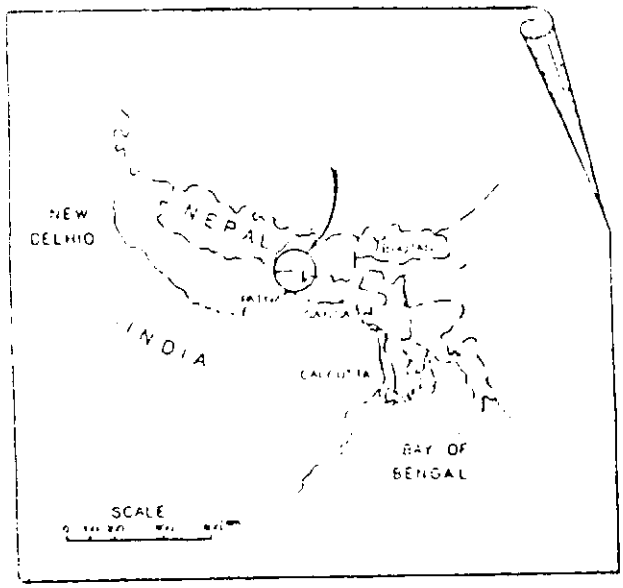

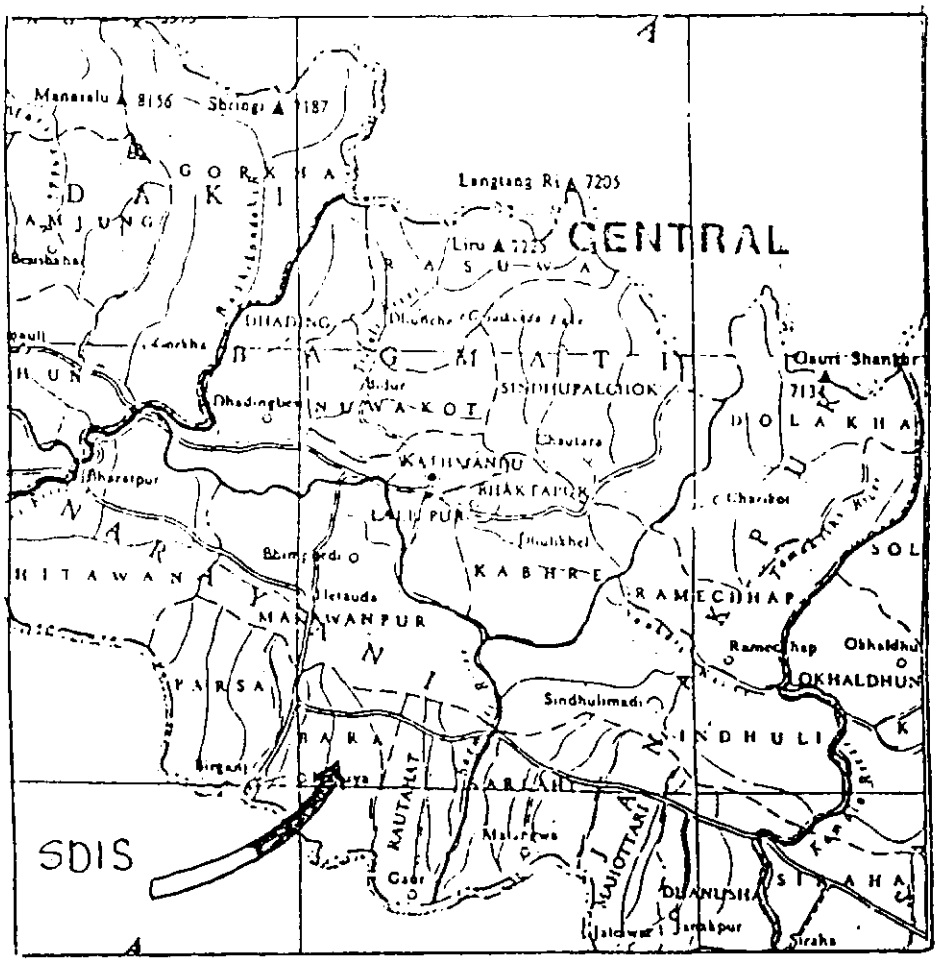

Figure 1: Location of Sirsia-Dudhaura Irrigation System

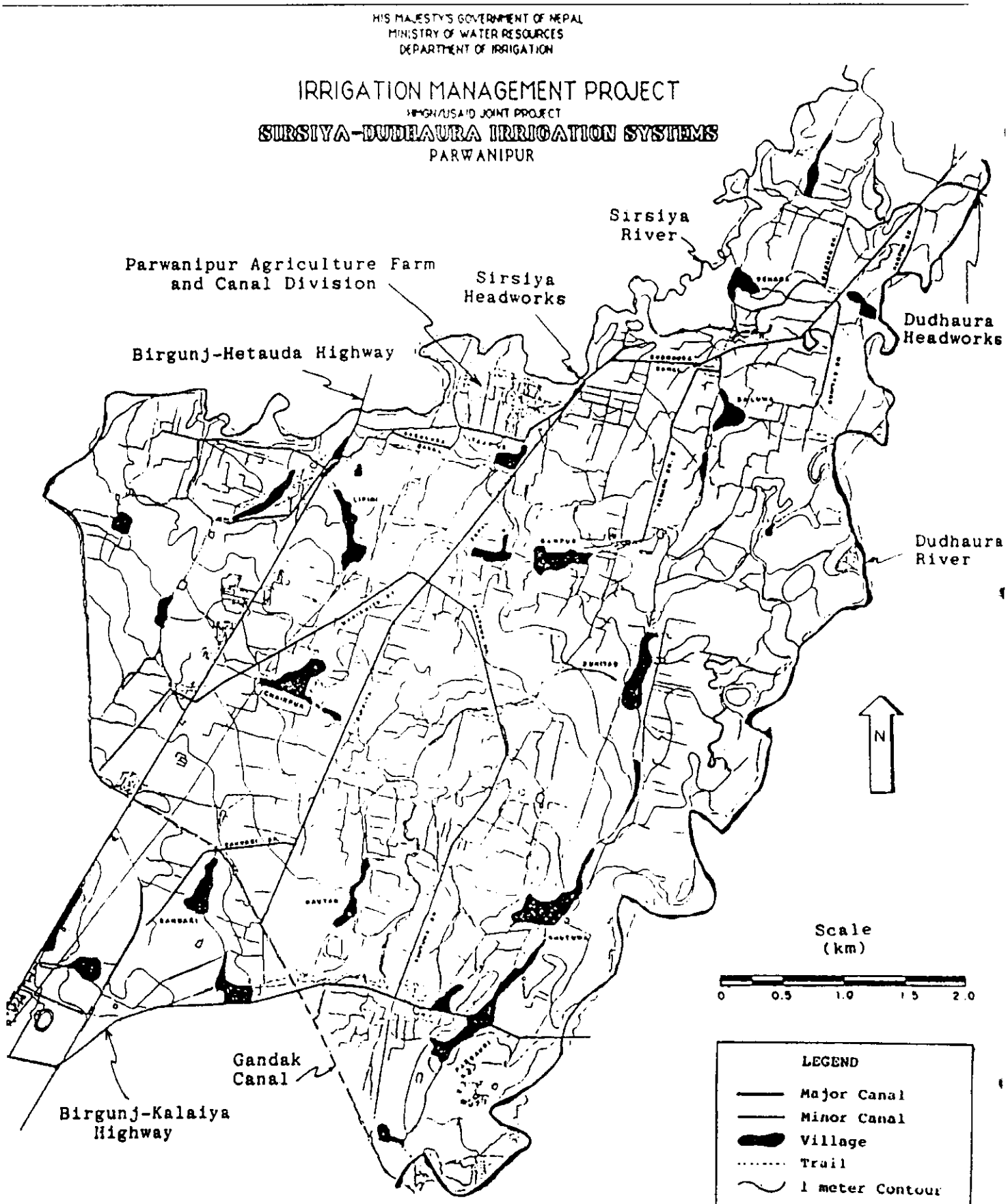

Figure 2: Command Area of SDIS