Proceedings of the National Workshop on Participatory Management in Agency-managed Irrigation Systems in Nepal

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Foreword

Farmer participation is central to the new irrigation policy of the Department of Irrigation. The efforts in organizing farmers to participate in the operation and maintenance of DOI managed irrigation systems should be strengthened. The Department of Irrigation has undertaken programs to make farmer participation a reality. The Action Plan on Participatory Management was the start of these efforts. The new irrigation policy further exhorts the Department of Irrigation staff and encourages the farmers to actively participate in managing the irrigation systems initially in joint management arrangement and ultimately full management transfer or turnover.

This national workshop on participatory management proceedings is a timely publication to illustrate the efforts being undertaken by the Department of Irrigation and other institutions. These efforts are in organizing and strengthening water users groups and organizations and also assisting DOI staff in making farmer participation more effective in operating and maintaining irrigation systems. This publication also exemplifies the partnership between the Department of Irrigation and the farmers towards irrigation development. For the first time in the history of the Department, representative farmers from several DOI-managed irrigation systems wrote workshop papers, presented and discussed them in a national workshop, attended by donors, researchers and other agencies.

This initial effort to fully acknowledge the full participation of the farmers not only in the operation and maintenance of irrigation systems but also in activities such as this workshop is an embodiment of what is called for in the new irrigation policy.

The papers and discussions as presented in this proceedings will be useful not only to irrigation professionals but also other development oriented professionals that consider the farmers or users of resources as partners in development. This proceedings publication should be the start of the documentation of the participation of farmers in national workshops as indications of their real participation in irrigation development. More and more activities should be undertaken to enable farmers to fully participate as partners of government in development.

This proceedings and the workshop would not have been made possible without the concerted efforts of the staff from the Irrigation Management and Water Utilization Division (IMWUD) and the International Irrigation Management Institute (IIMI) Nepal Field Operations. The Office of the Agricultural and Rural Development of the USAID Mission to Nepal should be commended for supporting this activity. The participation of the staff from other agencies (ILO/SPWP, ILC/ISSP, ISP, UNDP, IOE, IAAS, AsDB, CRT) and other divisions of DOI that made the workshop successful is also acknowledged. The last but not the least are the farmers from Sirsia Dudhaura, Mahakali Irrigation Project, Banganga Irrigation System, Pithuwa Irrigation System and Handetar Irrigation System, to whom this proceedings should be dedicated to, for making farmer participation a reality.

Shiva Raj Pant
Director General
Department of Irrigation

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The support of the Agriculture and Rural Development Office (ARD) of the United States Agency for International Development (USAID) Mission to Nepal is gratefully acknowledged. This acknowledgment is expressed for supporting the Department of Irrigation (DOI) and International Irrigation Management Institute (IIMI) collaborative project in Banganga Irrigation System, the National Workshop on Participatory Management in Agency-managed Irrigation Systems and for the publication of the proceedings for this workshop.

The contribution from the Irrigation Management and Water Utilization Division (IMWUD), the Research and Training Branch (RTB) and System Management Branch (SMB) staff are acknowledged in making the effort to write papers and solicit farmers participation from Sirsia Dhudhaura Irrigation System. The consultants from ISSP/WB

are to be given credit for their efforts in writing papers and getting the farmers to write on their experiences with the Mahakali Irrigation Project.

The Department of Irrigation (DOI) staff from the central office in Panipokhari, Central and Western Regional Irrigation Directorates, Mahakali Irrigation Project, national and international consultants, donors (UNDP, AsDB) Institute of Engineering and Institute of Agriculture and Animal Sciences, Department of Agriculture and the press, the Rising Nepal and the Independent are thanked for participating in the workshop.

The honorable Secretary of the Ministry of Water Resources, Mr. Gauri Nath Rimal, is also acknowledged for graciously delivering the speech on behalf of HMG/N for supporting the workshop.

The assistance of Ms. Karen Conniff for the initial editorial work on the workshop papers is hereby acknowledged together with the work of Ms. Doreen Sakya of SPINS International Inc., for the final editorial work, layout and printing of this proceedings.

The hard work of Messrs. Durga K.C. and Mahtrika Bhattarai (IIMI-Nepal field staff) for inspiring the farmers from Banganga Irrigation System to write papers and participate in the workshop. The assistance from the IIMI-Nepal office staff are also noted for preparing the materials for the workshop.

To the participating farmers from the Sirsia Dudhaura, Mahakali, Banganga, Handetar, Pithuwa, and Chandra Nahar our profound gratitude for making the workshop a real participatory one and hopefully the benefits of the workshop and this proceedings will lead to making participatory management a reality not only in these irrigation systems but in all other systems as well.

Shiva Raj Pant, Director General, DOI
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and
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Keynote Address

by **Gauri Nath Rimal**
Secretary
Ministry of Water Resources

Ladies and Gentlemen,

Firstly, I wish to thank the Department of Irrigation and International Irrigation Management Institute, the organisers of this National Workshop on Participatory Management in Agency-managed Irrigation System in Nepal, for allowing me to say a few words.

While it has only been for the last 40 years that irrigation facilities have been set up in an organised manner by government effort, the history of small irrigation projects built by local farmers in Nepal goes back to more than 400 odd years. Many experts who have worked in this country feel that these indigenous projects are exemplary and they impart lessons other countries can learn from.

The fact that the Nepalese farmers have survived by their age-old methods of farm irrigation shows that their knowledge and skills cannot be undermined. These traditional practices, on the contrary, need to be blended with modern day techniques, creating efficient answers to present-day requirements. It is important that the farmers be concerned about the government's work during the last 40 years and that the government be aware of the achievements of individual efforts in the last 400 years, because to derive maximum benefits from irrigation, the users have to participate in the operation and maintenance of the facilities. This can happen only when both parties are aware of each other's work.

The need for the farmers and the technicians to sit together to discuss plans and projects of mutual benefit cannot be over-emphasised, particularly at a time when complaints regarding government-run irrigation projects are rife. Working together not only facilitates problem-solving but also helps in attaining common goals. I am glad that this seminar will overview the work of the past and chart a course of action for the future. This kind of discussion is vital for meeting the challenges of establishing more pragmatic management of our irrigation systems. Our plans and projects will prove futile if the local farmers do not benefit or if the agricultural produce and productivity do not increase. As this seminar is going to discuss ways and mean of Joint Management of the Operations and Maintenance of irrigation systems, I assure you that the ministry will strive to implement your suggestions and conclusions.

Lastly, I wish success to all the governmental organizations, international organizations and farmers, all of whom are involved in the development of irrigation facilities in Nepal.

Thank you.

Formation of Water Users' Association in Sirsia-Dudhaura Irrigation System

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Formation of Water Users' Association in Sirsia Dudhaura Irrigation System

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1. Introduction

1.1 System Description

Sirsia-Dudhaura Irrigation System (SDIS) in Bara district was built in 1957. Dudhaura main canal crosses Sirsia main canal 6 km down stream near Sirsia Headworks. The net command area of SDIS, based on hydrological boundaries developed later by the Irrigation Management Project, is 1616 ha. The total command area is fed by two canal systems: Dudhaura system with 7 km main canal covering 566 ha and Sirsia system with 8 km main canal covering 1050 ha. In both systems there are thirteen branch canals and 110 field channels. Permanent diversion weirs were built across Sirsia river and Dudhaura river to divert water into the command area.

There are seven villages Nautan, Tajpur, Mushahari, Rampur, Chainpur, and Bahuwari that occupy the majority of the command area. Yadab Shah (Teli) and Muslim groups are the majority, and Brahmins and Chettris are the minority groups. Nearly half of the farmers are land holders and others are divided into renting in and renting out groups. Many farmers have office jobs in addition to agriculture.

Rice, wheat, and maize are the main cereal crops of SDIS. The total number of beneficiaries is about 3,500. The average land holding size ranges from 0.5 ha to 10 ha.

A diagnosis study conducted by DOI/USAID in 1985 reported that the overall performance of the system is as follows:

a) Sirsia-Dudhaura Irrigation System is government owned but operated by the farmers on a might is right basis.

b) Inequity of water distribution existed. Farmers of Mushahari and Chainpur (head reach) received more water than the farmers of Nautan and Bahuwari (tail-end). The average flow rate varied from 0.3 lps/ha to 0.1 lps/ha. at the field gate.

c) Water supply was unreliable due to canal losses. Main and branch canal losses were 7 percent. Loses were 29 and 40 percent per kilometer length of the main and the branch canal, respectively.

d) Field channels were not cleaned leaving tail reach farmers without water for their crops.

e) More water related conflicts occurred in the system.

These features of the SDIS resulted in a demand for an effective water user's organization (WUO).

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In 1985, the Irrigation Management Project financed by HMG/USAID selected this system to execute water management activities through the formation of water user organizations.

The procedures adopted to form the WUO were successful. The WUO that was formed accomplished many works such as:

a) Cleaning of all tertiary canals.

b) Water in the tertiary canal was distributed by the WUO.

c) Essential structure development works were undertaken by the WUO.

d) New varieties of crops were grown by the farmers.

e) The last part of the branch canal was repaired and maintained by WUO mobilizing heavy equipment.

2. Formation Process Of Water Users' Organization And Its Activities

Two approaches - ad hoc and ideal were followed to form the water users organization.

2.1 The Ad hoc WUO (based on village boundary)

The whole command area was divided into twelve blocks based on village committee wards as follows:

	Village	Area (ha)	Canal
1.	Nautan 1,2	104	Nautan
2.	Nautan 3,4,7	60	Nautan
3.	Bahuwari 1-9	110	Bahuwari
4.	Khutuwa 1-4	116	Khutuwa
5.	Khutuwa 5-9	120	Khutuwa
6.	Rampur 5-9	110	Rampur
7.	Buniyad 3-9	99	Dudhaura
8.	Rampur 3,4	118	Buniyad, Bhaluwa
9.	Lipani 1-4	124	Sirsiya
10.	Lippani Mal 1-7	126	Marlaya
11.	Buniyad 1-3	90	Musauri, Tajpur, Rampur
12.	Lippani Mal 8,9	138	Marlaya, Sripur
	Total	1315	

Twelve association organizers (AO) were deputed to organize the Toli. The AOs gathered farmer profiles. Each toli formed consisted of one president, one vice president, one secretary, one treasurer, and 8-10 members. They were selected by a simple majority of the village people. Although this committee cleaned and participated in construction works for some months, it could not become effectively functional due to following reasons:

a) Farmers did not know their outlets and canals.

b) No one felt responsible for cleaning a service area where two village people owned land in such area.

c) No one knew the shared or allocated quantity of water in his field outlet.

d) The biggest land owner became the committee chairman.

These short comings of the village level organization resulted in the formation of a hydrological boundary based organization for the command area.

2.2 Ideal WUO (based on hydrological boundary)

Key procedures followed while establishing WUO were as follows: a)Deciding the level of organization; b) Formation of WUO; c) Development of constitution; and d) Registration of WUO.

a) Deciding the level of organization

Engineers and a sociologist finalized the three tiers of organization in SDIS. The basis for this was taken from the level of water control to be exercised by the farmers during low flow periods in the system.

b) Formation of WUO

The following steps were taken while forming the WUO is SDIS:

i) **Mapping**

- On a cadastral map of 1:5000 scale, a 50 ha area block was delineated in each branch canal. It was called the sub-toli map. Here the field channels were clearly drawn.
- A toli-map was prepared on the same scale of cadastral map.

ii) **Election or selection of officials of sub-toli**

- AOs were sent to the farmers, a few days earlier to form sub-tolis in the 50 ha block.
- An IMP team comprising a sociologist, engineer, and overseer) went to the field. The objectives and methods used in forming a sub-toli was explained to the farmers.
- During the selection process, all users in the 50 ha block gathered and selected 5-7 members from the beneficiaries. The members were requested to select one chairman and one secretary.
- All were agreed to and signed by all the members.

iii) **Election or selection of toli executives**

- The chairmen of the sub-toli become the ex-officio members of the toli committee. These chairman select a toli chairman, and a secretary. One field overseer was made a member of each toli for technical guidance.

iv) **Finally the Sangh (WUA) was formed.**

- In Sangh all chairmen were made ex-officio members. These members were requested to choose or elect the chairman and secretary of the Sangha.
- At present there exists 31 sub-tolis, 13 tolis and one Sangh (Association) in SDIS.

v) **Membership criteria**

- Land owner or tenant water users over 16 years age within command area could join the organization.
- A guardian will be the member, instead of such member who is below 16 years.
- Mentally and physically unfit persons can not be members.
- Government officials cannot be members.
- Owners of construction companies can not be members.

vi) **Data needs for WUA formation**

- Cadastral map to find land area of water users and land owners list.
- Hydrological boundary map for whole command area and also toli and up-toli boundary map.
- Length and number of field channels/canals.
- Water users list.

vii) **Method of data collection**

- Cadastral maps were obtained at the land revenue office along with a land owner's list.
- Hydrological boundary maps with toli and up-toli boundaries fixed were made in consultation with farmers.
- Length and number of field channels were measured from maps and observations made in command area.
- A water user list was prepared with the help of hydrological boundary maps, cadastral map, and land owner certificates in consultation with the beneficiaries.

viii) **Activities of WUAs**

Presently, the WUA works in the following manner within the command area:

- It conducts monthly meetings for water management activities such as: water acquisition, allocation, and distribution.
- Conflict management works are undertaken at each level of organization.

- The WUA consults the agency staff for a seasonal water schedule. The schedule is communicated to the farmers.
- The association appoints a representative for joint operation of main canal control gates.
- The association makes the necessary arrangement for water if any toli does not receive it.
- The association gets the users to clean the field channel and tertiary canal.
- The association makes arrangement for toli fund utilization in case an emergency arises.
- The association provides new field channels to individual farmers.

c) Roles and responsibilities, rights and sanctions

The roles and responsibilities for all the executives of WUO is defined in the constitution. The WUO constitution consists of seven chapters defining the words, objectives, membership criteria, different layers of organization, roles and responsibilities of all level officials, financial management and others.

The Sangh (WUA) performs two types of activities: i) service activities; ii) functional activities through its Toli and Sub-toli.

i) **Service activities**

- It acts as a coordinator between or among tolis.
- It keeps the accounts, decides the source of income for canal maintenance, and controls expenditures.
- Decentralization of the Sangh authority to the lower level of organization.
- It fills the vacancy post of Sangha officials from among the members.

ii) Functional activities

- Arranges timely field channel construction, maintenance, and operation.
- Makes right of way for field construction.
- Resolves water related conflicts brought by Toli. Acts as final decision making body for allocating and distributing water.
- Schedules water different types of crops.
- Helps the agency protect the main and branch canals, and Toli and Sub-toli for field structures.

3. Impact of WUAs on Irrigation Activities during the Participatory Program

a) Farmers followed the operation schedule. Conflicts over water distribution were reduced considerably.

b) Farmers cleaned the field channel, and tertiary canals, increasing on farm efficiency by 20 percent.

c) Farmers developed a knowledge about irrigation management activities through training. Then they manage the available water more efficiently.

d) Farmers got surety of water through rotational schedules. The irrigated paddy area was increased from 900 ha to 1400 ha.

4. Conclusion

4.1 Problems and Issues Encountered

a) Due to existing culture of SDIS management farmers, they did not believe that project utilization could be possible through organizing farmers.

b) Accurate land holding data could not be obtained due to frequent land fragmentation and ownership transfer.

c) The command area map was not clear for all field channels and tertiary canals. A field irrigation map had to be made by going to the field.

d) The village based organization could not operate canal cleaning and other works smoothly. Communication with the farmers was difficult.

e) Often selection of real farmer representation in the water user group was difficult due to influential local groups.

f) There were several places in the Sub-toli area, where the farmer owned his land. A solution was found to make him a member on his own preference.

g) Part time members involved in the WUA and Toli gave attention to WUA, toli functions, and decision making programs.

h) Vague program results and lack of clear utilization techniques for WUA, frequently prolonged fruitless discussion with the farmers.

i) The WUA did not function smoothly unless a constitution was developed. The officials complained of not having any rights and authority to exercise over Toli and Sub-toli.

4.2 Lessons Learned

a) A peer training program (farmer to farmer training organized by Irrigation Management Centre (IMC) 1987) was effective in changing attitudes and developing confidence among farmers.

b) A real problem and problematic situation of SDIS and the clear incentives to farmer after solving the problem, was necessary to motivate them to be organized.

c) The village based organization can be a temporary solution for channel cleaning, but not for canal operation on a long term basis.

d) Formation of WUO and mobilization of farmers should not be thought of as a minor job of AO. It should be thought of as an integral part of the program.

e) The registration work of WUA renewed the officials spirit and strength to move forward in expressing their decisions and thoughts with the agency.

f) The constitution worked as a binding material for all the sub-toli and Toli functions. The organization accomplished all its activities based on the provisions made in the constitution.

g) Meetings and gathering should be planned when the farmers have less field work. Flip-charts and field maps are very effective means of communication with farmers.

4.3 Suggestions and Recommendations

a) WUO formed based on village units, can be a quick and short term solution for canal maintenance. But for water distribution and allocation purposes this organization is ineffective.

b) Hydrologically based WUO is effective in canal maintenance and water control activities. Each farmer knows his outlet and canal.

c) If the irrigation project does not have an explicit layout of canal networks, an ad hoc WUO would serve the purpose temporarily. WUO without a constitution and adequate training are normally not capable of handling the incoming problems of water management.

d) A strategy of minimum voters for electing WUA is always safer and more sustainable.

e) The minimum area for sub-Toli organizations is 50 ha.

f) The WUA must have equal say and awareness of land operation and maintenance for sustaining the working spirit developed in WUO.

g) A clear incentive for being organized for irrigation related problems has to be produced within the farmers community in order to attract them towards the program.

Formation of Water Users' Organization in Nepal: A Case Of Mahakali Irrigation Project

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1. Introduction

1.1 System Description

The Mahakali Irrigation Project (MIP) is located in Kanchanpur district, far-Western Region of Nepal. Its Stage I command area is bordered in the west by the Mahakali River and in the east by the Choudhar River. Construction of civil works were completed in 1987/88 with credit assistance from IDA. Construction included a main canal with a capacity of 1000 cusecs and the distributory system that contains secondary (branch) canals and tertiary canals. The system irrigates a net command area of 4800 ha. Stage I is divided into two water delivery areas.

Area I: An individual tertiary commands approximately 40 ha and the number of field outlets varies from 3 to 6.

Area II: An individual tertiary commands 30 ha and each tertiary has 7 field outlets.

The system is supplied with water from the Sarada Barrage constructed on Mahakali River in 1928 as per the water sharing agreement made between His Majesty's Government of Nepal and the Government of British India in 1920.

The population of MIP area is largely of migrants, most are from the far-western hills. Many of these migrants have been in the area less than three generations. This mixed population also includes, Nepalese migrants from Burma, and Tharus, early settlers of the area. There are two types of Tharus each with different cultures. Dangora Tharus from the Dang area and the Rana Tharus from other parts. Major ethnic groups in the area are Chettri/Thakuri (46%) and Brahmin (29%). Tarus make up 11% of the population constituting the historically indigenous ethnic group.

The project is trying to establish a water user management system with Tharus and migrant hill farmers. Many are unfamiliar with irrigation. They lack cooperative labor patterns, and social institutions.

Flux of recent migrants in the area has brought almost 200 ha. of untitled land under the irrigation command. The average farm size per household is 1.45 ha and 38% of the total area is being held by the 14% of the farmers.

1.2 Purpose of the Paper

The procedures used by MIP in forming Water User Organizations (WUO), institutionalizing farmer participation, involving farmers from the beginning of the canal alignment has contributed to management. The inter-related levels of Water User

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2 *Team Leader, ISSP/WB.*

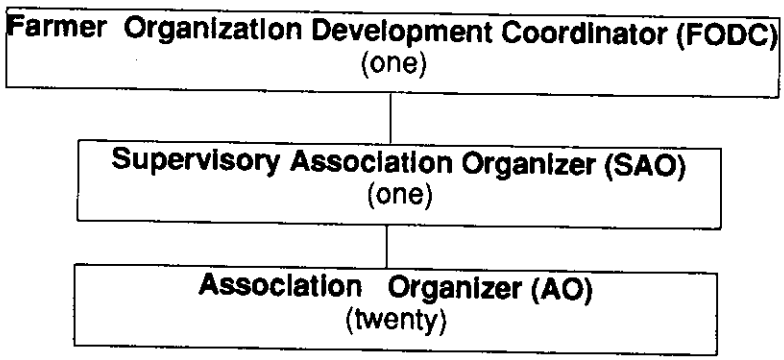
Organizations and the involvement of farmers through WUO has facilitated water delivery and management. The procedures developed in MIP hopefully, can be replicated in other large scale irrigation systems currently administered by a public irrigation agency.

2. Process for Forming Water User Organizations and its Activities

MIP failed in its first attempt to establish a WUO during 1987/88. An Agriculture Impact Study carried out in 1989 revealed that more than 90% of farmers were not aware that Water User Groups had been formed in their area. This first effort was carried out by the Agriculture Pilot Farm with support from field level extension staff. From this first attempt it was learned that farmers required purposeful organizing works. Out of the existing problems, and from establishment of inter-relationships between WUO with the agency, support was developed for joint system management.

2.1 Procedures

Once an understanding was reached at the credit negotiations with IDA for farmer organization work under Mahakali Stage II, the project established a Farmer Organization Division to start its second effort in farmer organization with the following manpower in the Stage I area:



At the beginning of 1989, MIP hired one FODC, one SAO, and thirteen AOs on contract service. The AOs received pre-job training giving them skills and knowledge specific to the area where they worked. A "coordinating committee" was established consisting of project manager, FODC, Agriculture Farm Chief, O&M Division Chief, and Design Division Chief. One prime activity of this committee was to give the farmer organization a role in all possible project activities and review the progress on weekly basis.

A strategy was developed to spread AOs on individual tertiaries throughout the area, maintaining their presence in the farmer community and maximizing the project's knowledge of farmers in the area. At the beginning AOs were assigned to work on a single tertiary, spreading their work to neighboring tertiaries as work progressed and their experience increased. Completed tertiaries would serve as demonstrations for neighboring farmers, contributing to farmer training as organizing efforts accelerated.

The AOs would help settle disputes or handle other problems on the canals after the organization process was complete. The AOs would continue to work in the adjoining tertiaries, continuing to maintain relations with farmers in the area.

In March 1989, AOs were assigned to ten tertiaries (300 ha). They established themselves in the field, then went on building a rapport with the users while documenting information related to the relationship between the irrigation system and the user.

2.2 Identification of Issues

Farmers were not fully aware of their own chak boundaries and were trying to draw water from the wrong field outlet. Some farmers were unable to connect to tertiaries because they could not get permission from the upstream farmers. Other farmers were unwilling to dig or maintain field channels, preferring to get their water by cutting or inserting pipes into the closest channels. Farmers did not blame their neighbors for misappropriation of water and breaching canal system. Their attitude, when the program started, was that because they paid a water charge it was the duty of the project to construct, maintain, protect, and deliver water to each field. Improper and untimely tertiary cleaning by the MIP contributed to water scarcity at the tail of the tertiary. AOs were taught how to respond to farmers under these constraints, and how to solve or minimize such constraints through joint system management by water users organization and the agency.

2.3 Organizing Process

Organization began at the individual outlets with the formation of individual water user groups (WUGs). Farmers were encouraged to participate. On an average, more than 90% of the households were represented at each WUG formation meeting. Leaders from all outlets were present at the tertiary committee formation.

Once the tertiary committees were formed, they organized a joint walk-through for agency and tertiary committee members. An engineer, overseer, field staff of O&M Division, and Extension staff from the Agriculture Farm participated in the walk-through.

The walk-through helped educate the farmer representatives on system protection, operations & maintenance and oriented the officials towards the type of problems at the field and farmer level. Responsibility for maintenance items and work were identified.

Tertiary committee activities were initiated to gain group support for the widening, cleaning, and construction of field channels, tertiaries, and drains. By the beginning of Monsoon 1989, 811 man/days of labor were mobilized. More than 95% of the existing field channels (12568 meters) were cleaned, widened, and maintained. A total of 4670 meters of new field channels had been built. Overseers were invited by the WUGs to provide advice on field channel size and alignment in about half of the construction. The ten tertiaries were cleaned and a 40 meter drain installed at one tertiary area. Refusals by the farmers to allow land to be used for field channel construction were reversed by WUG. In 95% of the cases the WUGs were aided by AOs and their supervisors in this respect. Chak boundaries adjustments were also made. Farmer Organization Development personnel were called to help farmers solve their disputes. Tertiary committees were urged to take an active role to solve the problems themselves.

The impact drew the interest of farmers living on neighboring canal areas. The farmers demonstrated their ability to maintain the tertiary canals. Tertiary committees started develping and enforcing rules related to system protection, maintenance, and water delivery. The agency acted by cleaning up to the secondary level canal, stopping before the tertiaries. This resulted in a flow of demand for AOs by the farmers of the other tertiaries. Demand for more than 100 tertiaries at a time could not be met. A program was launched to assist the cleaning of the tertiary canals, which was their immediate need.

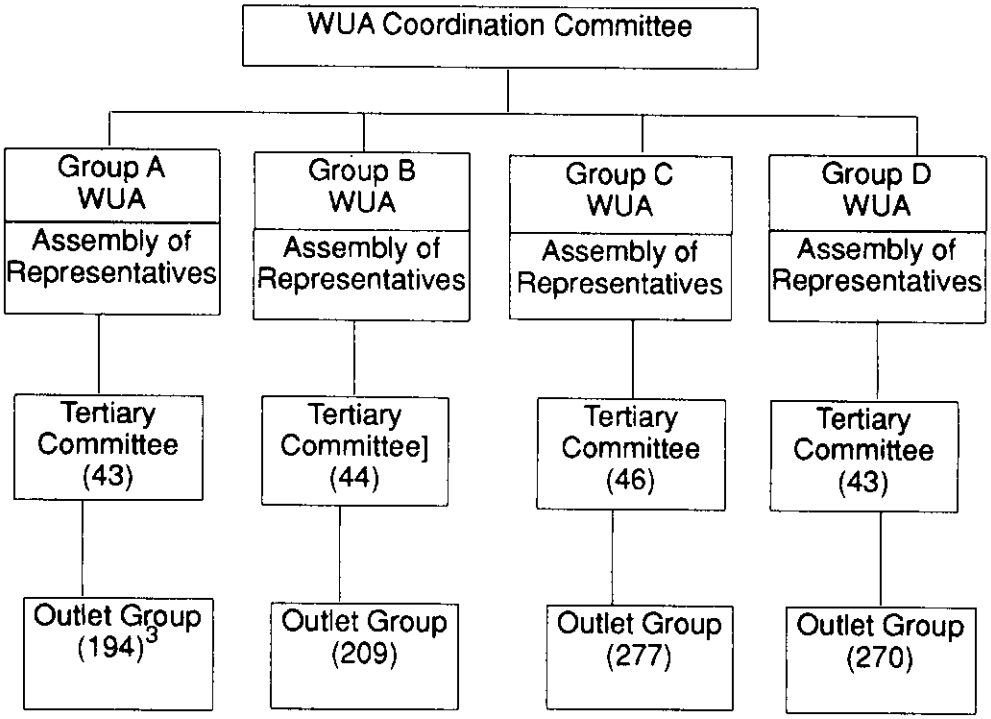
The program started spreading in July 1989. AOs were assigned to additional tertiaries. By December 1991 all the tertiary committees within the system had been formed. Then the Rotation Group level Water User Association was formed. All the tertiary committee chairmen within the Rotation Group formed an "Assembly of Representatives". Among themselves they selected one chairman, one secretary, and two executive members. From the Agency side, the Chief of O&M Division and the Chief of the Agriculture Farm were ex-officio members. From each WUA there were 6 members in each of the four Rotation Groups.

Chairmen of the four WUAs formed a project level WUA coordination committee by selecting one chairman and one secretary among themselves. The project manager was the ex-officio member.

2.4 Training

In addition to pre-job Training and Refresher Training, the AOs were provided with regular field level as well as class room training. AOs were learning by doing in a regularly supervised condition, which was helpful in their confidence building.

Organogram of WUO in MIP



Farmer representatives were trained continuously. The tertiary committee members received training on the concept of joint irrigation management, rotational water supply, and on-farm water management. Field level meetings with 40 to 70 farmers were held to orient the farmers about joint irrigation management.

2.5 WUO Activities

a) Maintenance

The tertiary Committee's main maintenance activity was desilting of tertiary canals. Breaks and rat-holes were common maintenance activities in the area. An Outlet Group maintained the field channel within a chak (outlet area). Farmers constructed and maintained canals that they get water from. This was done at the initiation of the Outlet Group. The individual field channel is the responsibility of individual farmers. The project maintains the system above the tertiary off-take. Maintenance work that came within the responsibility of the project was identified by the tertiary committee. The WUA prepared a list of their work needs and maintenance work suggested by WUGs on priority basis. This list was sent to the respective WUA. The WUACC prepared one list out of four lists supplied by the four WUAs. This list was handed over to the O&M Division of the project. The Division carried out the maintenance work on priority basis considering the available budget. Maintenance work that was selected by the project had to be discussed in the WUACC meeting and was included in the main list.

b) Operation

The project operated the system up to the off-take point of the tertiary and its responsibility ended after the delivery of the fixed amount of water at the tertiary point. The tertiary committee determined the water allocation time to the field-outlets for the chak area. Then the Outlet Groups distributed water among individual farmers within the chak based on their time allocation. The turn of water delivery and canal closure within the Rotational Groups was decided by the WUACC. Monitoring the rotation among Rotational Groups was done by the respective WUA.

c) Resource Mobilization

The tertiary committee mobilized labor for tertiary maintenance. Then it was the responsibility of the tertiary committee executive members to inform the general users within their respective outlet areas. One labor per day from every household irrespective of land holding was the norm. For a tertiary canal located in high silt area, the tertiary committee had been mobilizing 5.5 man/days of labor per hectare per year to keep the tertiary in operation. Contribution of labor for maintaining the field channel was done by the farmers who shared that channel. Labor for drain protection work was done by farmers affected by the excess water. In case of drain protection the project enters into agreement with the tertiary committee demarcating responsibility among the farmers.

d) Water Allocation and Distribution

Water rotation (days/week) for the four rotation blocks commanding almost an equal area was fixed by the WUACC. Once the Branch/Distributory/Minor canal within a rotation block was opened, all the tertiaries within that subsector automatically got a fixed amount of water. Water entering into the tertiary was diverted by one or two field outlets as allocated by the tertiary committee. The Outlet Group allocated water on a hourly basis to individual farmers in proportion to their land area. Farmers also diverted water from the outlet to their field at their respective turn.

e) Conflict Resolution

Conflicts among the farmers in water turn and the right-of-way were solved by the Outlet Groups. Usually the Outlet leader mediated the disputes. If the Outlet leader could not resolve the dispute, then it was referred to the tertiary committee. The few disputants that came to the office directly were discouraged by not entertaining their cases. Only disputes that could not be settled by the tertiary committee were sent to project office through their respective area tertiary committee. More than 90% of such cases referred to project office needed technical assistance.

f) Meeting of WUO

The Tertiary Committee usually met at the chairman or secretary's house a minimum four times per year or more if the chairman requested. The project technician's presence was required in the meeting.

A minimum of four meetings per year were held for the WUACC, usually they were held in the center of the command area, housed in an operator quarter provided by the project.

The WUA met a minimum six times a year and more if required. The four WUA offices were also housed at the operator quarter.

Outlet Groups met a minimum two times a year or more if required. The Outlet Groups met at the house of the Outlet Group Leader.

Roles, responsibilities, rights and sanctions

Roles and responsibilities of all four tiers of the organization were spelled out in the WUO constitution. The outlet leader, who was an ex-officio executive member of the Tertiary Committee, had to get water allocated from the Tertiary Committee meeting and conduct the Outlet Group meeting to allocate water among the individual farmers. He was a prime authority to settle water and field channel related disputes. He informed the outlet farmers about the decisions of the tertiary committee. When farmers did not receive information, the leader was held responsible. The Tertiary Committee Chairman had to deal with the project office, call meetings, organize the farmers for maintenance activities, and manage and operate the committee fund. The Tertiary Committee was free to develop its own norms. Fines and other rules varied from one tertiary committee to another.

Tertiary Committees developed and enforced rules related to the protection of the system, resource mobilization and water supply. Growing of pulses on canal banks attracted mice to dig hole in the canal. This practice was prohibited by the tertiary committees and pulse plants were destroyed. Cutting of canal banks was recognized as a punishable act by the tertiary committees. Norms were established for labor contribution requirements (one labor per household). Fines were imposed for non-participation in group labor, and for water-stealing, all unauthorized pipes were removed through group action. It was the duty of every user to allow a field channel through their field to the downstream farmers.

3. Impact of WUO Participation on Irrigation Activities

When the farmer development organization program began, the concept of irrigation management changed. The concept of supply oriented O&M from the part of

the officials was gradually changed into demand-driven O&M through discussions in the weekly project coordination meeting. Problems in the field were reported and a solution was found which was agreeable to every task Divisions. Feedback through the AOs were brought to the Farmer Organization Division and discussed in a weekly coordination meeting. This communication network was helpful in re-orienting officials who were directly involved in service delivery.

The negative attitude of the farmers towards the project officials began to change. They started to develop ownership feelings toward the system. Some of the following changes were noticed:

a) Tail end farmers started to receive water mainly due to the practice of rotation and the improved discipline among the farmers. Farmer discipline stopped unauthorized way of taking water. Tertiary committees removed as many as seventeen unauthorized pipe outlets from the tertiary canal.

b) Farmers who complained about the amount of water in the tertiary canal, gradually found it sufficient. The program solved more than 95% of the right-of-way issues. Construction of many new field channels helped improve efficiency in water use. The density of field channel reached up to 200 meters/ha. As farmers gained more control through the system water use efficiency increased.

c) Tertiary canal maintenance by the farmers had resulted a reduction in the requirement of O&M budget. The project has saved about Rs 4.5m on O&M (Rs. 31,000 per tertiary) every year.

d) Establishment of WUOs in the system resulted in increased responsiveness of the officials involved in O&M, improving the reliability in water supply.

e) Farmers became very optimistic about the program.

Introduction of Farmer Organization in MIP provided an opportunity for the project to identify weaknesses in the system that were to be addressed from the very beginning of the canal system design. As a result, the MIP stage II successfully implemented the participatory tertiary canal alignment works. Following were the steps followed in this task:

a) AOs met with the users in areas selected and explained the process of participatory design to the farmers.

b) AOs organized meetings with the farmers and facilitated their participation in the determination of farm boundaries within the command area. The design team marked the boundaries on 1:5000 scale aerial photographs.

c) From the farm boundary plot the design team produced tertiary canal alignments conforming to farm boundaries as far as possible.

d) Farmers were organized to attend a walk-through with the design team, showing them the canal alignments. Outlet positions were described with the farmers name and land area who shared water from each outlet. Discussions with the farmers determined what changes the farmers might prefer to accommodate their social requirements. A final alignment was agreed to by all present.

e) The AOs prepared a document of agreement to be signed by farmers in each tertiary group, agreeing to the mutually determined final design.

During the walk-through AOs produced a list of land owners for each outlet. This became the list of the members for each Outlet Group. Then a tertiary group membership was compiled from the combined lists outlet group memberships.

4. Conclusions

4.1 Problems and Issues Encountered

Some of the main problems & issues encountered during the program implementation were as follows:

a) Integration of AOs in project management as well as in the rural system was very difficult. Regularized job of the AOs in the government system resulted in a difficult situation in matching the performance with the program requirement.

b) The in-between role of the Farmer Organization Division was difficult whenever a party defaulted the agreement.

c) There was difficulty in convincing farmers that the Program was really serious about delivering and that the new program was different from the previous one.

d) Some of the project commitments could not be fulfilled in time. Such as remodelling the system and the reimbursement of 25% amount out of water charge collected. Program credibility and activity suffered.

e) Lack of proper communication among the different sections of the project caused unreliability in operation and maintenance which created confusion among the water users. This factor time to time shook the confidence of WUO.

f) The envisaged role of the upper tier of the organization could not be achieved until the lower tiers organization were fully established. The Project Farmer Organization Division had to fill the gap until a complete farmer organizational structure could evolve.

g) The implementation of the program in a limited area at the beginning did not please other farmers. It was hard to the project to make policy exclusively for the limited area.

h) The condition of the contract with the construction contractor and the value system the contractor carried provided very little chance to improve farmer - project relations. Rather the performance of these contractors deteriorated the relations.

i) The O&M activity of the Project was always second priority. Efficient staff with good aptitude in work were assigned in stage II construction.

4.2 Lessons Learned and Recommendations

The lessons learned from the project problems lend themselves to the following recommendations:

a) A Farmer Organization Program required flexibility in terms of staff service conditions and skills. The contract system was recommended to meet the job requirement. The program required constant reevaluation, retasking and retraining throughout the program cycle.

b) The program had to be planned in a way that incorporated the farmer and project needs. The program must be treated as an integral part of irrigation management development.

c) From the beginning the program needed identifiable tasks. Without well planned tasks credibility of the project faltered, making implementation of other new programs difficult.

d) Consideration of the existing capacity needed to be assessed properly before designing any activity related to the farmers.

e) Efficiency and strength of WUO heavily depended upon the project activities. The project needed to be sensitive to performance, which is related to farmer organization and O&M activities.

f) The organizational and participatory activities needed to be considered from the very beginning of the project planning. System construction and development should be done in phases, considering the level of manpower to cover the area with the organizational activities.

g) The construction contract conditions should match the need. Sufficient points needed to be incorporated to help farmer management. The project needed to be open to inform the farmers on its limitation and strength.

h) Operation and maintenance of the tertiary level system was within the farmers financial abilities. Support from the public irrigation agency should never go down to this level.

i) O&M activity should get high priority. Skilled staff with good aptitude should be assigned in O&M activity.

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Concept, Procedure and Strategy of Participatory Management Program for Large Irrigation Projects under ILC Financing Western Regional Irrigation Directorate

Mahendra B. Gurung[1]

1. Introduction/Background

Over the years, the Department of Irrigation (DOI) has constructed, operated, and maintained many large scale irrigation projects [systems covering command areas larger than 500 ha in the hills and 5000 ha in Terai][2]. Continuation of this practice has, however, raised some concerns such as appropriate mobilization of scarce financial resources, records of unsatisfactory project performance, and the indifferent behavior toward the completed projects from the beneficiary farmers, the target group.

The DOI/HMG has formed a policy to share O&M responsibilities between the Agency (DOI) and a legitimate organization of beneficiaries for the large scale irrigation schemes in the hills and in Terai (systems having more than 2000 ha). In such schemes the beneficiary farmers will be a responsible counterpart to the public irrigation agency. They will be organized to take control of certain parts or sectors of the irrigation system for operation and maintenance, and aid in system decision making.

An Action Plan for a Participatory Management Program of large irrigation schemes in the country has been prepared. In May 1989, a team called the Core Group (a subcommittee of the Task Force)[3], was formed under the Chairmanship of the Secretary of Water Resources. The Development Credit Agreement between the HMG and IDA (WB) for Bhairahwa Lumbini Groundwater Project III has laid provisions, under Irrigation Line of Credit (ILC) component, to review the Action Plan for a Participatory Management Program, prepare pilot projects, make plans and time tables, and start implementation.

The M&E (cons) Division of the Western Regional Irrigation Directorate (WRID) has prepared selection procedures, including strategies and implementation processes for potential large irrigation projects that can be brought under a participatory management program. This paper describes the concept, procedure, and strategy for participatory management. Preparation has been based on the guidelines of the Action Plan and assumptions made are based on the experiences and lessons learnt in implementation of assistance to Farmer Managed Irrigation Systems (FMIS) under ILC financing. This

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1 *Divisional Engineer, CRID/DOI.*

2 *Working Policy on Irrigation Development, 1988.*

3 *A 'Task force on Cost Recovery of Irrigation Projects' was formed under the chairmanship of the then Acting Secretary, Ministry of Water Resources. The Task Force presented a policy paper called General Irrigation Management Policy Framework in relation to O&M Cost Recovery. A ministerial decision followed and a Core Group was formed composed of a DDG from DOI, an Executive Director (Legal Affairs) from WECS, Project Manager of Planning and Design Strengthening Project, DOI and Consultant, IMP. The Core Group presented two Action Plans one each for Turn Over and Participatory Management Program in May 1989. HMG/N approved these Action Plans in the following month.*

paper introduces a planned approach to bring large irrigation projects in the western region under participatory management.

1.1 Objectives

The objectives for bringing large projects into a participatory management program are to reduce the financial pressure on DOI/HMG in irrigation development activities, particularly in operation and maintenance phases. Also, to help enhance the performance of the system by involving beneficiary farmers in managing the system. This will help national initiatives toward achieving increased agricultural production by making the completed large irrigation projects more effective.

1.2 Driving Facts

The basic reasons for the DOI/HMG interest in participatory management of large irrigation systems are as follows:

a) The Governments limited personnel and financial resources forces a reduction in its involvement as well as budget allocation for operation and maintenance of completed DOI irrigation projects.

b) Government involvement has not improved the performance of the irrigation projects. If the beneficiary farmers assume full O&M responsibilities of certain parts of the system, the systems performance as a whole would improve.

c) If Agency involvement in O&M responsibilities can be reduced, the DOI could utilize its limited resources on new potential project areas that might prove more productive.

d) Without the involvement of the beneficiaries, the Department cannot maintain the large irrigation schemes that they build.

1.3 Assumptions Made in Preparing Procedures

The WRID has not implemented any DOI irrigation projects for participatory management. The present set of concepts, procedures, and implementation methods are, therefore, based on assumptions which test various approaches toward beneficiary farmers participation in irrigation development. These procedures are backed by two and half years of experience in ILC implementation. The assumptions are:

a) Farmers can operate, maintain, and manage the system below the branches or tertiaries as determined by joint agreement. Without financial backing, they cannot carry out the major Essential Structural Improvement (ESI) works required to make the DOI's large irrigation projects functional.

b) An approach of farmer participation is applicable in all stages of implementation and operation and maintenance.

c) If the project system is divided into sectors, and ESI works and water delivery are preceded by joint agreements and followed by timely completion, the

water user associations will be encouraged to assume the O&M responsibilities for their sectors.

2. Procedure for Selection of Pilot Participatory Management Irrigation Projects

Potential DOI projects are selected for a participatory management program by following procedures.

2.1 Preliminary Prioritization Based on Office Records

The project offices are advised by the WRID to prepare a synopsis of the projects, including important features available in the office records. After having received the reports from different project offices, the WRID will make a preliminary prioritization, if necessary, and notify the project offices and/or the concerned District Irrigation Office (DIO) to carry out a Rapid Appraisal of the prioritized projects.

2.2 Rapid Appraisal and Status Report

In order to assist the rapid appraisal process, a status report format has been developed to collect information. The format covers most aspects of the type of first hand information to be collected in questionnaires and tabular form.

This stage is of vital importance to the procedure. The following steps must be taken.

a) Divide the project system into preliminary sectors with a specific rationale, such as village settlements.

b) Notify different communities within the project area about the occurrence of a mass meeting to be held with project officials for rapid appraisal.

c) Explain the objectives and reasons for introducing a participatory management program in the project.

d) Make joint assessments of actual needs, such as for ESI works, problems likely to be encountered, and for the type of conditions needed for a smooth transition toward participatory management.

e) Explain the program implementation process to the beneficiary farmers. The official project team should collect relevant and necessary information, in cooperation and consultation with innovative farmers and interest groups, from all parts of the command area.

Once completed and forwarded to the WRID, the status reports will represent the situation of those projects.

2.3 Final Prioritization and Selection

The WRID will make the final prioritization and selection using their weighted criteria[4]. The WRID will make sure that the prioritized projects are formally approved. The concerned project offices will be notified of the selection decision and advised to develop a program for implementation.

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4 *In addition to the operation procedures and implementation process, the WRID has developed the Status Report format and a set of weighted criteria for prioritization and selection.*

2.4 Program Development for Implementation:

Selected projects will develop an implementation program using ILC guidelines. The program should indicate the amount of time and resources required for each implementation stage. A flow chart should be used to outline program stages and activities.

Work plans requiring two to three years of completion will constitute the annual participatory management program for WRID. The budget will be proposed accordingly.

3. Implementation Process

The implementation process should be illustrated using a flow chart and should consist of the following stages:

a) Sector establishment

The project system is divided into suitable sectors, depending on the definition provided by the Action Plan and by the beneficiary farmers. These divisions will provide the areas of jurisdiction and responsibility for sector level WUAs, a system level WUA coordination committee, and the irrigation agency.

b) Farmer organization and registration

Once the sectors are established, the sector level WUAs are formed and a system level WUA coordination committee is also formed to coordinate the activities that are beyond the jurisdiction of the individual WUA committees. The project will assist the beneficiaries in organizing and registering their organization. Such sector WUAs may comprise various sub-sector WUAs or outlet groups as necessitated by the needs of the system.

c) General agreements between the project (DOI) and sector level WUAs

The project office and sector level WUAs should enter into a written agreement on roles, responsibilities, and commitments of both parties for different stages of project implementation. Also, an agreement needs to be made between the Agency and the system level WUA Co-ordination committee regarding responsibilities for system level activities.

d) Joint assessment of users needs

The project authority and the sector level WUA members will walk through the project and jointly assess ESI works and other necessary supports to be carried out in order to provide a smooth transition to joint management of the project. Joint assessment and the agreement should guide both the parties to assume their respectively committed O&M responsibilities in their area of jurisdiction.

e) Detail engineering preparation

The next step details engineering and environmental studies within the scope of essential structural improvements in the project. The detail design and cost estimates are made considering the aspects of appropriate design and low cost technology.

The necessary steps in this section are:

i) Design and cost estimates are prepared with the consultation of the sector level WUA members.

ii) Appropriate design and low cost technology should be given preference.

iii) Approval of the design and drawings must be given by MIT/WRID before finalizing the design and approving a cost estimate.

iv) An agreement is made on cost sharing between the two parties as per the Irrigation Policy 1988. Such an agreement should clearly spell out the type of works and time bound responsibilities for both the WUA and the project for implementing the ESI works.

The final designs, drawings, and cost estimates are forwarded to WRID together with the work plans developed for the full implementation. The WRID will review the program and budget proposals in order to arrange for required resource allocation.

f) Mobilization of resources and working agencies

Tendering will be done by the agency to get qualified and competitive contractors bidding on the agencies share of ESI works. Tender operation and contractor selection will be done as per the financial regulation and in presence of minimum of two representatives of the sector level WUA.

The project office will assist the WUA in mobilizing its resources, like labor and other locally available construction materials, for the WUA's share of ESI works.

g) Joint supervision committee for the contractors works

Both WUA and the project will form a joint supervision committee that will supervise daily activities to ensure quality and timely completion of the ESI works.

A member from the executive body of the sector level WUA will chair the supervision committee with representatives from the nearby areas as members.

h) Completion and rectification of ESI works

Upon completion, the contractor will apply for a completion certificate and final payment. Rectification will be indicated by a walk through made by the members of the WUA, WUA coordination committee, and the project officials.

Any incomplete works within the contract should be made complete by the contractor on its own cost. Any work outside the contract will require fresh negotiation and sharing of responsibilities. The corrective works should be completed within a maximum of six months or a period agreeable to both parties, whichever is the shortest. Should any dispute arise in the process, the decision of WRID/DOI will be binding and final.

i) Training for WUA members

While implementation of ESI works is in progress, the members of sector level WUAs are given training by the Agency on participatory management systems, its roles, responsibilities, and scope of the Agency itself. One of the objectives of such training would be to help WUAs internalize the O&M activities for the sectors at their disposal.

j) Gradual assumption of sectoral O&M by WUA and its monitoring

The sector level WUAs will assume O&M of their sectors with the project monitoring their performance for one year after completion of ESI works. During this year the project will provide the necessary assistance to the WUA coordination committee and sector level WUAs and jointly assess when O&M responsibilities can be fully transferred to the sector level WUAs.

k) Assumption of full sectoral O&M by the sector level WUAs

After the joint evaluation of the WUAs performance is made, full operation and maintenance responsibilities shall be formally transferred to the sector level WUAs with the WUA coordination committee remaining in tact. A second stage agreement may be reached at this stage comprising the following:

i) Formal assumption of O&M responsibilities of the sector by sector level WUA committee,

ii) Water fee collection and utilization of such funds for the O&M of the sector and

iii) Continuation of DOI assistance in accidental cases in the form of technical advice whenever needed, and in monitoring.

4. Strategy

A strategy is needed to make the Agency and Association capable of sharing their respective responsibilities in operation and maintenance of the project. It is important that both parties abide by the terms of agreement before, during, and after the implementation process of the participatory management program.

The following are suggested strategies:

a) Head-on strategy

Activities that the Agency must perform directly are:

i) Implement DOI projects that have registered WUAs with outlets, sectors, and coordination committees, ready to share the investment cost in cash and kind, and ready to assume full O&M responsibilities for the respective sectors after construction, and then participate in resolving water distribution conflicts, if any, immaterial of the cause.

ii) Have beneficiary farmers participate in all stages of implementation from planning to commissioning, so that they are familiarized with the system.

iii) Improve the system performance by making the system physically operational, and by making water deliveries reliable at branch or tertiary heads.

This is the meeting point of the irrigation agency's prime responsibility and the beneficiary's participation in system management.

iv) Start promptly followed by steady progress and timely completion. Progress of the implementation process significantly helps in building confidence in the beneficiary farmers toward the Agency.

v) The Agency should monitor (with documentation) the project activities and developments, starting with implementation until full participatory management is achieved.

b) Back-up strategy

The Agency must help the WUAs understand, strengthen, and assume their responsibilities for irrigation system management and resource operation.

5. Activities

The Implementation Agency and the Water User Association need to make schedules for additional activities.

a) Activities for the implementation agency

i) Conduct training programs for Agency staff, acquainting them with Agency responsibilities at their area and at the WUAs areas, during and after the implementation of the program.

ii) Conduct training programs for WUA members and selected groups of beneficiaries to acquaint them with their responsibilities during and after the program implementation.

iii) Provide the WUA with O&M requirements, collection methods and use of irrigation funds, organization rules, water management, and other issues.

iv) Monitor all activities and develop a manual based on performing them.

b) Activities for the water users' association

i) Participate actively in training organized by the Agency and discuss their needs and the scope of their contributions.

ii) Work with the Agency staff by providing actual facts and figures. Participate in joint supervision committees, sector establishment, solving internal water conflicts, and make recommendations for effective operation and maintenance.

iii) Propose plans and activities to mobilize local resources such as labor, and funds. Form an organization during the implementation and O&M of the project. Get technical assistance from the Agency.

6. Supports Required

6.1 Supervision Agency (Regional Irrigation Directorate)

a) Regular supervision and monitoring.

b) Advice and comments for making the Implementing Agency activities more farmer oriented, and at the same time not overstating the farmers' ambitions and agencies optimism.

c) Make notes on difficulties that do not follow the set principles of the ILC process (participatory approach).

d) Play supportive roles between the Implementing Agencies and the policy making Agencies, facilitating prompt decisions and timely progress.

6.2 Policy/Decision Making Agency (DOI)

The DOI will benefit by making prompt decisions so that the scheduled work progress does not get hampered. Use guarded optimism until the objectives are attained.

6.3 Political Commitment

Active participation by local and central leaders in disseminating the national program and objectives to the beneficiaries. Build their confidence and encourage their participation in operation and maintenance.

Political leaders may play key roles in mobilizing resources for program development in their area.

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Banganga Irrigation System: An Exercise in Participatory Management

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1. Introduction

This paper examines the experiences, lessons learned, and problems encountered in the formation of water users' associations during the participatory management program carried out by DOI/IIMI. The program was located at the Banganga Irrigation System in Kapilvastu district in the terai area of Nepal. This program was implemented by the International Irrigation Management Institute (IIMI) and supported by the United States of America, Agency for International Development, Mission to Nepal (USAID), Agriculture and Rural Development (ARD) Office, in collaboration with the Department of Irrigation (DOI) of His Majesty's Government of Nepal (HMG/N).

The overall objective of the program is to develop a set of effective approaches for establishing improved irrigation management practices through water users participation that can be used by the Department of Irrigation throughout Nepal. It is envisaged that these practices will be used in effectively carrying out joint-management (farmer and DOI staff) activities in the medium and large irrigation systems presently being operated solely by DOI.

There are three major component activities in this program, namely: 1) DOI-Farmer Dialogue; 2) Water User Group Formation and Farmer Training; and 3) Management of the Main System. These activities are to be carried out in the Banganga Irrigation System. This system has a command area of 6,000 ha. Approximately 1,000 ha will be selected for testing approaches to water user formation and participation.

1.1 System Background

Banganga Irrigation System (BIS) was constructed by the government in 1978. Prior to 1978, farmers erected temporary brush and stone diversions at various places along the river for irrigation water. The depressed land at Jagadishpur was converted into a reservoir. It had a canal built from it with corvee labour during the Rana regime, during the forties. That canal was known as Raj Kulo. Later, after the government involvement in BIS until 1978, the Command Area Development Project (CADP) was undertaken in BIS with an Asian Development Bank (ADB) loan from 1982 and 1989. The CADP enlarged the system command area and increased the capacity of the Jagadishpur reservoir with a flood control bund in the bank of Banganga river. Service roads, godowns, and fieldmen quarters were constructed. During the project, the physical system improved, agriculture improved, and water users' groups were formed.

During the CADP phase, two levels of water users were formed: i) Water Users' Group (WUG) and ii) Federation of Water Users' Group (FEWUG). WUGs were formed for each turnout and one FEWUG for each secondary canal. The WUGs were charged with the following functions and responsibilities: i) mobilize resources for repair and maintenance of field channels and farm ditches, ii) supervise and regulate proper water

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distribution within tertiary level, iii) implement the cropping calendar and share ideas for preparing water distribution schedule for the system, and iv) encourage farmers to pay their water tax and utilize 25% of the total collected tax for canal repair and maintenance as well as administration cost.

A total of 134 WUGs were formed. Each WUG covered an area between 30 to 70 ha. The WUG representatives were to be members of the FEWUGs. The secretary of the FEWUG was the field-man for the project. Each FEWUG served roughly 200 ha and 28 such federations were formed by February of 1989.

Despite all these WUGs and FEWUGs, the management of BIS was not performance-oriented. An initial IIMI field study on BIS institutional arrangements regarding water users group formation revealed that the WUGs lacked information for implementing water management activities. It was found that the WUGS organizational strengths were lacking the following: i) a list of all WUG members, ii) the size and sub-command area of each WUG and FEWUG, iii) a record of beneficiaries, their land area and land holding size under each WUG, iv) within WUG and its farmers, meetings to discuss water problems, water allocation, distribution, resource mobilization for operation, maintenance, and conflict management, v) repair and maintenance of field channels and farm ditches, vi) specific duties, responsibilities, and rights of WUGs, vii) active farmers' participation in coordinated irrigation activities, and viii) collection of water service charges through WUGs.

2. Formation of New Water Users' Association

2.1 Data Needs

Certain reconnaissance data and information is vital, and must be collected prior to the formation of WUGs. It is necessary to find out the existing situation before anything is "imposed" on it or facilitated. A participatory baseline survey was taken along with the farmers in identifying the following: i) physical boundary of the irrigation command area, ii) water sources, iii) beneficiaries, their characteristics, and their settlement patterns, iv) land holding sizes, v) sub-commands within outlets, vi) cropping cycle, pattern, and intensity, vii) yields, viii) current functioning of WUGs, and ix) current irrigation practices. Some of the findings of the baseline survey are presented in Tables 1 to 3.

2.2 Data Collection

A combination of methods were used to collect data and gather information. Primarily household surveys, groups discussions, and field observations were used. Several joint sessions were held with the farmers during meetings, dialogues, discussions, and trainings. During such sessions and dialogue forums, the farmers were motivated to reorganize WUGs because the previous ones were basically defunct; DOI staff and farmers could communicate and address mutual problems of canal maintenance, proper water use, functions of WUGs, importance of drainage, etc. The farmer to farmer trainings have proven to be very successful in BIS. They were organized by IIMI/Nepal in collaboration with DOI during September of 1991. Several farmers and one field-man from BIS were taken to Pithuwa Irrigation System and Chattis Mauja Irrigation System. After the farmers returned from these systems, they felt the need for effective WUGs to improve their own irrigation management. They started to reorganize the WUGs themselves and also undertook the cleaning and desilting of the canals. Even during the cleaning of the canal, it was felt that a strong WUG was necessary to provide directions and supervision during any resource mobilization and operation and maintenance work.

2.3 Formation of WUGs

A total of 13 WUGs were formed under the participatory management program in the BIS. These were formed during the latter part of 1991. Out of the 13, 6 were formed within the pilot area.

The WUG consists of a chairperson, vice-chairperson, secretary treasurer, members, and chowkidar. Selection of the functionaries were made by the farmers themselves during general assembly meetings. During such meetings, DOI staff often interacted by providing comments on activities undertaken by WUGs. The functionaries tenure is for one year and during the meetings their remunerations are set. The duties and responsibilities of WUGs are written down in the meetings minute books.

Depending on the appropriateness, the WUGs have been formed based on either hydrological or village boundary. For example, the WUGs of Bilaspur and Semari are based on hydrological boundary (Tables 4 and 5). While the WUGs of Gobari, Tilaura, Gothihawa and Shivpura were based on village boundaries (Tables 6-9).

The main reason for village-based WUGs were that the owners and tenants of land within an area and main outlet came mostly from that particular village. This facilitated communication amongst the members for resource mobilization, decision making, control of free-grazing, and conflict resolutions. The interrelationships between the villagers also facilitated irrigation activities. Previous social relations within the village was counted on for facilitating the ongoing irrigation activities under WUGs.

2.4 Nature of WUGs

The membership criteria of the WUG committee were as follows: i) a genuine beneficiary within the outlet, ii) resident of the village (or a nearby village where WUGs are based on hydrological boundaries), iii) experienced with water management activities regarding water allocation and distribution, iv) recognized and respected by the community, v) influential person, vi) ability to mobilize resources for O&M, and vii) minimal involvement with "party" politics.

2.5 Duties and Responsibilities of WUGs

The duties and responsibilities of the WUGs as formulated by them can be outlined as follows: i) collection of demands for water, seeds, and other inputs and forwarding them to BIS management, ii) mobilization of resources for O&M of field ditches, farm ditches, main ditches, outlets and distributary canals, iii) mobilization of labour, kind, and cash for the O&M of the system, iv) supervising and monitoring of canal repair and cleaning work, v) keeping minutes of meetings and records concerning irrigation activities, attendance, and accounts of income and expenditure, vi) collection of fines and fees, vii) water allocation and distribution by WUG among the outlet and distributary according to water distribution schedule provided by BIS, viii) holding regular farmers assembly meetings for irrigation activities as required, ix) resolving water conflicts, x) implementing the WUGs' rules and regulations, xi) innovate irrigation activities, xii) present annual income expenditures to the farmers assembly, xiii) establish good communication and coordination between the farmers and the various line agencies especially DOI, xiv) participate with BIS in the preparation of water delivery and water distribution schedule prior to seedbed preparation and wheat sowing, and xv) allocate and distribute water to areas within its jurisdiction. These tasks are divided among the various functionaries.

2.6 Tasks undertaken by WUGS

Various activities were undertaken by WUGs during the participatory program. Irrigation rules and regulations have been formulated by each WUG with the help of

District Irrigation Office (DIO) Staff and Farmer dialogues. Though the rules and regulations are not comprehensive, the farmers whenever they are faced with problems regarding irrigation management activities, the WUGs call farmer assembly meetings then and there for formulating and improving the rules and regulations. Such behavior is indicative of an evolving and dynamic organization. Fines have been imposed on certain restrictions (Table 10) and these fines have also been realized (Table 11).

a) Water Acquisition

In terms of water acquisition, previously the farmers who required water went to the main system and brought water to their outlet whenever they needed. Usually, in such a case these farmers did not bother to close their outlets after irrigating. However, after the formation of WUGs, farmers have cleaned their main outlets and distributary canals and have acquired water as groups rather than on individual or ad hoc basis.

b) Water Allocation

Water allocation to branch, distributory, and main outlets from the main canal has been the responsibility of the DIO. Within these and field channels the responsibility rests on the concerned WUGs. Earlier, the structures in the canal were not properly used and usually the head-enders captured the water flow and the tail-enders had to at times rely on drainage water. Now, within the newly established WUGs, water allocation has been made based on the stage of the crop life-cycle. Individual farmers from a certain WUG request water from their own WUGs. Farmers are slowly beginning to relate input to canal cleaning and O&M with water allocation. Some WUGs have begun to think about water allocation based either on land area or labour contribution.

c) Water Distribution

A water distribution schedule is prepared by BIS in consultation with the chairpersons of the various WUGs. The actual implementation of this schedule is often disturbed due to water theft at the head-end, rainfall, disrupted gate regulators, check gates at the main offtake, and lack of staff for implementing the schedule by BIS. Water distribution within the branch, distributory, and field channels is the responsibility of the WUGs. Within the WUGs, water distribution is slowly being based on priority and felt need for irrigating the crop. If water is plentiful and there is adequate soil moisture then continuous water distribution is practiced in each main farm ditch from the distributory and main outlet.

d) Resource Mobilization

Resources in terms of labour have been mobilized for cleaning the canal. After WUG formation, some 40 Km of canal has been cleaned with nearly 3000 labour days (Tables 12 - 14). This was the first time that the farmers cleaned the canals by themselves. The amount and basis for contributions from each of the WUG varied. For example, in Gobari WUG, the contribution is on the basis of land area however in Semari, Shivpura, Tilaura, Gothihawa, Bilaspur, Laxminagar, and Sukhampur it is on the basis of household. Some have questioned the household basis criterion on grounds of equity and this labour contribution may very well change.

e) Collection of Fines and Penalties

Each WUG has established sanctions and fines for violations of the WUG's rules and regulations. For example, penalties and fines are imposed on those

who are absent from maintenance work, steal water, and disrupt or damage canal. Fines are also collected from those whose cattle graze along the canal. For example, fines amounting to nearly NRs 2300 have been collected by seven WUGs (Table 11).

f) Meetings, Dialogues, and Discussions

Four different levels of meetings, discussions, and dialogues occurred with farmer participation. These were: DIO/Farmers, DIO/WUGs, WUG committee/Farmers, and WUG meetings. During the DIO/Farmer meetings, topics such as the selection of WUGs, selection of participants for farmer to farmer trainings, and resource mobilization for O&M were discussed. Also, the dates for O&M, conflict resolutions, public hearing on accounts and expenditures, water delivery schedule, and the types of action to be taken on those who refuse to obey the WUGs and DOIs irrigation rules were discussed. In meetings between DIO and WUG committees, they discussed water distribution schedules, disruption of canal banks, calculation and auditing of labour contributed for O&M of paddy crop, and announcement of accounts of the various WUGs. While in the WUG meetings, announcements of annual accounts, labour mobilized and contributed, salaries of patrollers, collection of fines, and ensuring water distribution even in times of water scarcity were the issues discussed. Finally, in the WUG committee meetings, demands for seeds and other inputs of agriculture were requested of the various support service offices through BIS, applications for water were made from BIS, a date for general assembly was set, division of labour for operation and maintenance activities were made, and suggested annual irrigation activities for structural improvement of the system were decided upon.

Thus in each of these meetings, a constant monitoring and evaluation of irrigation rules and regulations by the various WUGs are undertaken. At this initial stage of the formation of some WUGs, these meetings provide a forum for the learning process and enhance coordination and communication amongst the parties concerned. There are many constraints and violation of rules. These situations are to be expected. These changes are indicative of an evolving and dynamic organizational innovation, not to be confused with unsolvable problems. It is in these meetings that new working relationships regarding irrigation and related activities are formed and roles, responsibilities, rights, and sanctions are endorsed and shaped (Table 15 and 16).

3. Impact of WUGs on Irrigation Activities

a) There has been an increase in farmers' participation in preparing water distribution schedules with DIO.

b) There has been an increase in farmers' participation in meetings with DIO regarding conflict management and the implementation of irrigation rules and regulations.

c) There has been an increase in farmers' participation in the O&M activities of the distributory canals, main outlets, main farm, and field ditches.

d) There has been an improvement in communications and coordination among the farmers themselves and with the DIO through the WUGs.

e) Farmers, through their WUGs, have been able to work collectively in acquiring support services and inputs for crop production and crop diversification.

f) Farmers' participation in O&M activities have reduced O&M costs of DOI. This year, the farmers mobilized Nrs. 1,12,397 for O&M activities in BIS.

g) Being involved as partners in some of the irrigation activities of BIS and having invested their time, energy, money, and labour, farmers have begun to develop an ownership feeling of the system as theirs.

h) There is a gradual introduction of early paddy and crop diversification with a sense of confidence in WUGs regarding the acquisition of water and its distribution as well as safeguarding the crops from free grazing cattle (Table 17).

4. Conclusion

4.1 Problems Encountered

a) During data collection, the farmers did not want to give their names because they feared that their land might be acquired by the government, without compensation, as was done during the CADP.

b) Farmers would pay the water tax only if their water delivery was assured. They felt that by virtue of having paid water tax, the O&M costs of the system should be borne by the government. Involving farmers for O&M work in the beginning thus proved to be difficult.

c) In relation to the above, the farmers felt that for the purpose of resource contribution, actual irrigated area should be taken into consideration.

d) Land fragmentation compounded by parcels scattered around the command area made irrigation activities for a single farmer difficult.

e) Initially, it was difficult to set the basis for resource contribution. Similarly, sorting out the basis for sharing water among the distributory, main outlets, and field channels proved difficult.

f) Absentee landlords and insecurity of tenancy have discouraged irrigators from investing time, labour, and energy in irrigation management activities.

g) Some WUGs lack good leaders. Discord in villages and WUGs have made them ineffective. A lack of mutual trust and understanding between irrigators at different locations within the irrigation system has undermined WUG unity.

h) Many farmers do not understand the complex bureaucratic structure of the irrigation department and its line agencies at the district/project level. They have a hard time relating to various programs and experiments launched toward them and their irrigation systems.

i) Due to prevailing lack of organizational coordination in irrigation activities, farmers did not have experience in water management activities such as: water allocation, distribution, conflict management, decision-making within a group, and resource mobilization as a group for irrigation activities.

j) Free grazing by cattle proved to be strain on organizational strength and many conflicts and problems were related to it. These had to be resolved and in the process many WUGs were challenged.

4.2 Lessons Learned

a) Organization was seen as a vehicle for increased farmers' participation in irrigation activities and control.

b) The organization helped reduce water related conflicts and assured a more equitable distribution of water.

c) The organization helped encourage crop diversification and raised agricultural productivity.

d) A good understanding of the existing situation, social relations, irrigation practices was necessary before intervening. It is important to find out why certain activities are being undertaken before imposing new ideas.

e) The organization served as a check on free-riders. It encouraged interdependence and assurance of collective action in water acquisition and delivery as well as safe guarded it.

f) Constant meetings and discussions between all parties concerned was necessary for communication, coordination of activities, and to ensure lack of misunderstandings. These forums facilitate a sense of partnership, mutual cooperation, and solving of problems.

g) A system of rewards, punishment, and sanctions (both positive and negative) proved useful for irrigation related and maintenance activities.

h) Bringing about institutional development and organizational changes are not small tasks. It is only with mutual trust and confidence with one another that organizational strengths can be built. The environment and existing situations have to be carefully assessed. At the beginning many things can go wrong. Support to slowly developing WUGs should be continued. In fact, farmers who were not members of the new WUGs wanted to be included in them because they saw the efficacy of such organizations. This type of "demonstration effect" has a more lasting impact than ad hoc "creation" of WUGs.

i) Not only was farmers' participation useful for the farmers themselves, but also for the agency. Transaction costs in terms of having to deal with individual farmers have been reduced. Resources have been mobilized by the farmers for the system, augmenting the total availability of funds for the system. Collaborative preparation of water delivery schedules between WUGs and the agency reduced many conflicts.

4.3 Suggestions and Recommendations

a) A thorough understanding of existing situations is necessary before implementing the participatory program. Such information will direct the course to be taken in terms of WUG formation, their involvement in irrigation activities, and their relationship with agency.

b) Adequate support from the regional and central level should be provided so that agency management can fulfill its part of the participatory management bargain, as is expected of the farmers.

c) A clear statement of the responsibilities of both the agency and farmers are to be outlined. Slowly, farmers involvement in most activities should be fostered wherever possible to realize full participatory management.

d) Not only should responsibilities but also rights of the concerned parties be spelled out. Provisions of sanctions for both parties ought to be made if mutual accountability is desired. There should be legal backing for the enforcement of rights and responsibilities.

e) At the initial stage, certain structural physical improvements in the system could be used as bargaining and negotiating chips for ensuring more farmers' participation.

f) Unsettled accounts should be taken care of (e.g. land compensation) to show that the concerned party is serious about the program.

Table No.1: Land Area and Number of Households under Main Farm Ditches, of the Bilaspur Distributary and Main Outlets in the Headreach of the Main Canal

Name of System	Total Households	Total Land area in ha	Average Landholding size in ha
1. Bilaspur Distributary:			
(a) Main farm ditch no.11	38	22.43	0.590
(b) Main farm ditch no.12	82	27.47	0.335
(c) Main farm ditch no.13	49	14.15	0.289
(d) Main farm ditch no.14	13	7.71	0.593
(e) Main farm ditch no.15	61	27.66	0.453
(f) Main farm ditch no.16	76	27.31	0.359
(g) Main farm ditch no.17	88	33.55	0.381
(h) Main farm ditch no.18	94	25.24	0.269
(i) Main farm ditch no.19	74	26.51	0.359
2. Main outlet 21-23	141	77.23	0.522
3. Main outlet 24-25	78	46.611	0.597
4. Main outlet 26	46	13.488	0.293
5. Main outlet 27	86	29.107	0.338
6. Main outlet 28	74	36.748	0.496
7. Main outlet 29	46	18.682	0.406
8. Main outlet 30	27	14.74	0.545
Total Household	1073	448.636	-
Real Household No.	472	448.636	0.95

Table No.2: Land Area and Number of Households Under Each of the Main Outlets Numbers 40,41,42,43,44,45 and 46 in the Tailend of the Main Canal

Name of System	Total Households	Total Land area in ha	Landnolding size in ha
1. Main outlet 40	103	33.42	0.322
2. Main outlet 41	58	43.01	0.741
3. Main outlet 42	131	72.76	0.555
4. Main outlet 43	43	14.85	0.345
5. Main outlet 44	104	77.636	0.746
6. Main outlet 45	155	71.604	0.462
7. Main outlet 46	52	28.594	0.550
8. Main outlet 47	100	40.714	0.407
Total Household	746	382.378	
Real Household No.	467	382.378	0.819

Table 3: Average Landholding Size in the Headreach and Tailend of the Main Canal in the Banganga Irrigation System

Section of the main system	Research Area	No. of HH	Total land area in ha	Average land holding size in ha.
Head reach of the main system	Bilaspur Distributary MC 21,22,23, 24,25,26,27, 28,29,30	472	448.636	0.95
Tail end of the main system	MC 40,41,42,43 44,45,46,47	467	382.378	0.819
		939	831.014	0.885

Table 4: Number of Villages, Households and their Land Area under the WUG of Bilaspur

Village	11		12		13		14		15		16		17		18		19		Total	
	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)	No. of household (HH)	Area in ha. (ha)
Thammuna	36	21.83	19	3.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	24.99
Semari	1	0.27	57	21.12	39	7.89	1	0.10	45	23.26	73	24.87	65	22.28	81	22.56	42	8.18	133	130.53
Bilaspur	1	0.34	2	0.84	9	6.29	8	6.25	13	4.44	3	2.56	22	11.53	-	-	-	-	23	32.25
Rudhaula	-	-	1	0.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.33
Shivpura	-	-	2	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2.00
Harrahawa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1.48	6	6.27	6	7.75
Laxminagar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1.30	26	12.11	26	13.41
	38	22.44	81	27.45	48	14.18	9	6.35	58	27.7	76	27.43	87	33.81	92	25.34	74	26.56	234	211.26

* Actual households (without double counting) are given.

Table:5 **Number of Villages, Households and Land Area under the Semari WUG**

Village	Main outlet no.	No.of House-holds	Land Area in ha.
Semari	21-23	121	65.473
Gobari	21-23	20	7.871
Harrahawa	21-23	2	0.447
Laxminagar	21-23	4	1.34
Rudhaula	21-23	9	2.199
		156	77.33

Table 6: **Numbers of Villages, Households and their Land Area under the Gobari WUG**

Village	Main outlet No. 24		Main outlet No. 26		Main outlet No. 27		Total	
	No. of Household	Area in ha.	No. of Household	Area in ha.	No. of Household	Area in ha.	No. of Household	Area in ha.
Gobari	47	38.555	40	11.838	23	7.853	110	58.246
Ramnagar	9	2.775	2	0.313	15	4.228	22	7.316
Semari	22	5.282					22	5.282
Tilaura			7	1.338	22	9.71	29	11.048
Mahita					1	1.333	1	1.333
Thulo Sandawa					22	4.688	22	4.688
Tilaura Dihi					3	1.29	3	1.29
Total	78	46.612	49	13.489	86	29.102	209	89.203

Table 7: **Number of Villages, Households and their Land Area under the WUG of Tilaura**

Village	Main outlet 28		Main outlet 29		Main outlet 30		Total	
	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha
Gobari	18	4.602	6	2.025	2	0.333	26	6.96
Rudhaula	8	5.504	2	0.94			10	6.444
Rudhaladihi	2	0.3					2	0.3
Tilaura	26	13.789	35	14.115	19	13.205	80	41.109
Tilauradihi	20	12.55	3	1.603	3	0.645	26	14.798
Thulo Sandawa					3	0.558	3	0.558
	74	36.745	46	18.683	27	14.741	147	70.169

Table 8: Number of Villages, Households and their Land Area under the WUG of Gotihawa

Village	Main outlet 40		Main outlet 41		Main outlet 42		Total	
	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha
Pipari	40	10.643					40	10.643
Dalpur	11	1.978					11	1.978
Mahauwa	1	0.056					1	0.056
Gotihawa	49	19.504	58	43.009	62	38.416	169	100.929
Sauraha					68	34.113	68	34.113
Banskhor					1	0.233	1	0.233
	101	32.181	58	43.009	131	72.762	290	147.952

Table 9: Number of Villages, Households and their Land Area under the WUG of Shivpura

Village	Main outlet 43		Main outlet 45		Main outlet 46		Total	
	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha	No.of House-holds	Area in ha
Shivpura	42	15.24	38	20.359	48	27.747	128	63.346
Gotihawa			2	0.633	1	0.102	3	0.735
Sauraha			28	4.949			28	4.949
Materiya			3	0.633			3	0.633
Banskhor			82	45.811	3	0.782	85	46.593
	42	15.24	153	72.385	52	28.631	247	116.256

Table 10: Fines Imposed for Different Activities by WUGs

	Bilaspur NRs	Samari NRs	Gobari NRs	Tilaura NRs	Gotihawa NRs	Shivpura NRs
Absent labor	25/Labor/day	25/Labor/day	30/Labor/day	30/Labor/day	30/Labor/day	25/Labor/day
Breaking the canal	Ranges from 25-100	Ranges from 25-100	10-25/incident	Ranges from 25-50	Ranges from 300-500	Ranges from 50-100
Fishing in the canal	Ranges from 25-50			Ranges from 25-50	Ranges from 300-500	Ranges from 50-100
Non compliance rules and regulations			25/incident			
Freegrazing the livestock; Buffaloes	35	30	35-50/animal	Ranges from 10-25	25	25
Cattle	10	30	35-50/animal	Ranges from 10-25	20	25
Goats and Sheep	5	5	10-25/animal		10	10
Pigs					10	

Table 11: Collection of Fines and Penalties by WUG

Name of WUG	Fines imposed for absent labor (Rs.)	Fines imposed for livestock (Rs.)	Fines imposed for refusing the obligation of rules & regulations (Rs.)	Total (Rs.)
Laxminager		340		340
Gobari	390		25	415
Tilaura		315		315
Bilaspur	150	100		250
Gotihawa	120	115		235
Shivapura	275	75		350
Shukrampur	200	200		400
Total	1135	1145	25	2305

Table 12: Farmers Contribution in the Pilot Area for the Cleaning of Canals in Banganga Irrigation System 1991

S.No.	Name of WUG	Canal Name	Km	Ha	Day	Total Labor (man-days)	Rate (NRs)	Total Cost (NRs)
1	Bilaspur	Bilaspur Distributary (MC 11-19)	4.50	212.03	9	600	32.00	19,200.00
2	Semari	Main Outlet No.21,22,23	2.50	77.23	3	130	32.00	4,160.00
3	Gobari	Main Outlet No.24,25,26	3.50	89.23	5	207	32.00	6,624.00
4	Tilaurakot	Main Outlet No.28,29,30	4.00	70.17	4	195	32.00	6,240.00
5	Gotihawa	Main Outlet No.40,41,42	5.00	148.98	8	611	32.00	19,552.00
6	Shivpura	Main Outlet No.43,45,46	5.00	115.05	9	401	32.00	12,832.00
A.	Total:		24.50	712.69	38	2144		68,608.00

Table 13: Farmers Contribution Outside the Pilot Area for the Cleaning of Canals in Banganga Irrigation System 1991

S.No.	Name of WUG	Canal Name	Km	Ha	Day	Total Labor (man-days)	Rate (NRs)	Total Cost (NRs)
1	Laxminagar	Laxminagar Branch Canal (Block No.2,3,4,9)	2.50	139.81	3	79.5	32	2,544.00
2	Sukhrampur	Laxminagar Branch Canal (Block No.8,10,11,12)	4.30	188.32	3	219	32	7,008.00
3	Sandawa	Laxminagar Branch Canal (Block No.1,2,6,7)	0.40	119.47	1	13	32	416.00
4	Mahoriya	Taulihawa Branch Canal (Block No.10)	0.13	32.22	1	37	32	1,184.00
5	Lamtiya	Taulihawa Branch Canal (Block No.14,15)	1.08	55.00	2	54	32	1,728.00
6	Bhander	Taulihawa Branch Canal (Block No.12)	0.62	56.00	4	68	32	2,176.00
7	Ganeshpur	Taulihawa Branch Canal (Block No.16)	1.98	55.00	4	82	32	2,624.00
8	Mahuwa	Hathihawa Branch Canal (Block No.2,3,4)	2.00	198.41	3	44	32	1,408.00
9	Dalpur	Hathihawa Branch Canal (Block No.5,6)	1.50	198.24	4	140	32	4,480.00
10	Hardihawa	Hathihawa Branch Canal (Block No.7,8,9,10)	1.90	253.05	3	125	32	4,000.00
B.	Total:		16.41	1,295.52	28	861.5		27,568.00

Table 14: Total Worth Contributed by Farmers Participating in Cleaning of the Canal No. in BIS 1991

	Area in ha	Km	Day	Total Persons	Total Cost NRs
IIMI Pilot Area	712.69	24.50	38	2,144.00	68,608.00
Outside the Pilot Area	1,295.52	16.40	28	861.00	27,568.00
	2,008.21	40.90	66	3,005.00	96,176.00

Table 15: Person Contribution in Farmers Meetings in the IIMI Pilot Area for O&M

WUGs	Operation				Total		Total Cost NRs
	No.of Meetings	Labor Days	No.of Meetings	Labor Days	Meetings	Labor Days	
Bilaspur	2	34.250	2	34.250	4	68.500	2192.00
Semari	3	74.425	3	42.950	6	117.375	3756.00
Gobari	5	41.000	4	36.000	9	77.000	2464.00
Tilaura	3	10.000	7	66.313	10	76.313	2442.00
Shivpura	4	28.625	1	19.000	5	47.625	1524.00
Gotihawa	2	18.375	2	20.375	4	38.750	1240.00
	19	206.675	19	218.888	38	425.563	13618.00

Table 16: Labor Contribution in Farmers Meetings Outside the Pilot Area for O&M

WUGs	Operation				Total		Total
	No.of Meetings	Labor Days	No.of Meetings	Labor Days	Meetings	Labor Days	NRs
Laxminagar	1	9.31	2	7.81	3	17.12	547.84
Sandawa							?
Sukhrampur	1	11.00	1	11.50	2	22.50	720.00
Hardihawa	2	16.75	1	5.00	3	21.75	696.00
Mahuwa			1	20.00	1	20.00	640.00
Dalpur							?
Mahita							?
	4	37.06	5	44.31	9	81.37	2603.84

Table 17: Introduced of Crop Diversification in Banganga Irrigation System (1992)

Village	Maize			Early Paddy			Onion			Sugarcane			Banana			Total	
	Main outlet No.	No. of house-hold	Area in ha.	Main outlet No.	No. of house-hold	Area in ha.	Main outlet No.	No. of house-hold	Area in ha.	Main outlet No.	No. of house-hold	Area in ha.	Main outlet No.	No. of house-hold	Area in ha.	House-hold	Area in ha.
Bilaspur		18	1.474	12	6	1.58							13	1	0.033	25	3.087
Gobari	24,26	10	1.643	29	8	1.48							24	3	0.35	21	3.473
Semari	21	4	0.312													4	0.312
Talaura	29	2	0.212													2	0.212
Lukhrampur	LB	3	0.212													3	0.212
Laxminagar	LB	4	0.312													4	0.312
(*Bargadawa)	TB																
Ramtiha										TB	16	4.27	HB	4	0.569	36	4.839
Mahuwa																	
Shivpura							43,46	46	2.737							46	2.737
		41	4.165		14	3.06		46	2.737		16	4.27		8	0.952	141	15.184

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

K.C. Shah[1]
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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.

1 *Assistant Engineer, System Management Branch.*
2 *Divisional Engineer, Research and Training Branch, IMWUD/DOI.*

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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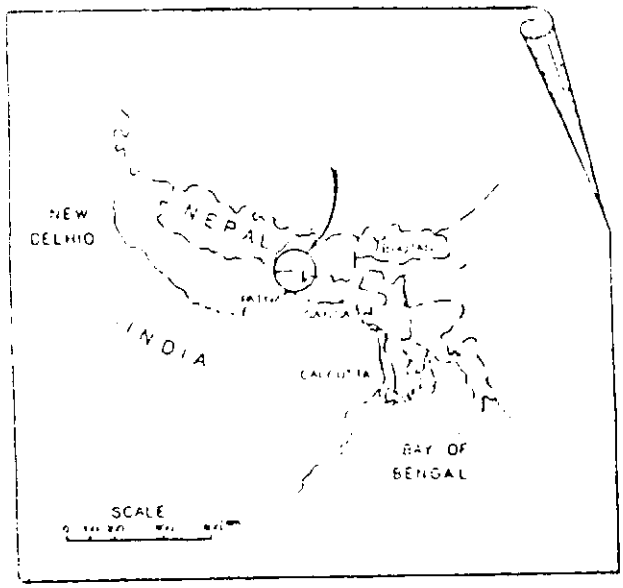

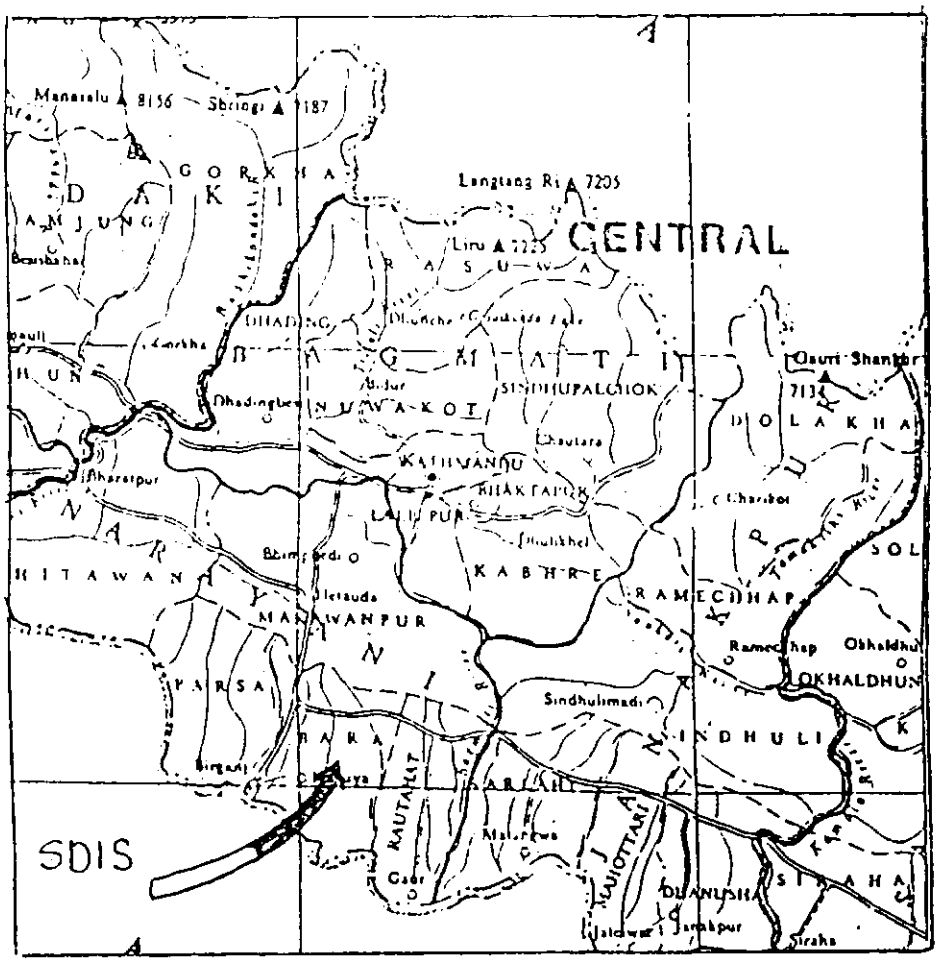

Figure 1: Location of Sirsia-Dudhaura Irrigation System

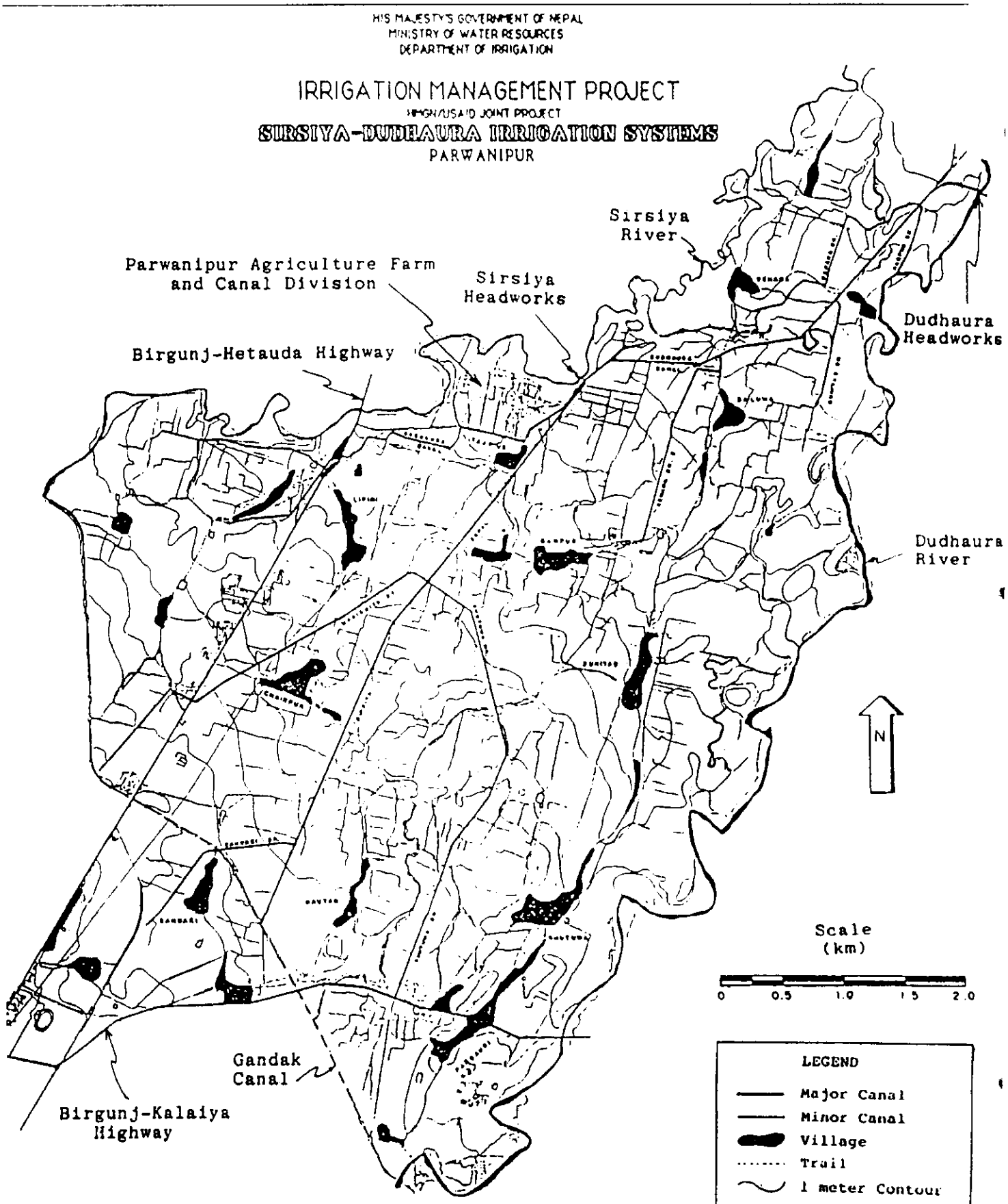

Figure 2: Command Area of SDIS

Main System Management Mahakali Irrigation Project Kanchanpur

M. N. Aryal[1]
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1. Introduction

1.1 System Description

Mahakali Irrigation System (MIS) Stage I starts eastward from the western-most point in Kanchanpur district. It encompasses an area of 4600 ha just south of Bhabhar Zone. It is a compact, well laid out, perennial system, guaranteeing intensive irrigation throughout the year. The system extracts water from Mahakali River through the Sarada Barrage constructed by the British Indian government during early part of the current century.

The 1920 agreement stipulates that Nepal's share of water is 460 cusecs during Kharif, 15th May to 15th October, and 150 cusecs during Rabi, 15th October to 15th May. It lays down two more conditions; 1. that a maximum supply of water up to 1000 cusecs can be provided, if the supply is available and 2. that if the canal head, during Rabi season, is alternately closed and opened for 10 days at a time, the canal will run 300 cusecs whenever it is opened.

In the early seventies HMG - Department of Irrigation (DOI) - started designing and constructing a main canal that would have 1000 cusecs capacity to irrigate 5000 ha. By 1975 the main canal and some major secondaries were completed, but not more than 3400 ha could be irrigated due to water management problems. In order to update the system and layout an extensive command area, development networks with IDA credit was sought. A World Bank loan became effective from 1981. The system, known as Mahakali Stage I, has been operational since mid 1988. A network with 14 Km of long main canal, 10 distributaries and minors, and nearly two hundred tertiaries supplies water to the fields.

The command area is well connected, having gravel roads running through to canal banks and some off canal roads. North-south running principal drains, fed by tertiary drains, drain-out excess water from the command area.

A Pilot Farm has been set up for promoting the establishment of new irrigated farming methods. It demonstrates on-farm water management and provides in-service training for extension personnel and farmers.

The prevailing climatic pattern is monsoon. Of the 80% probable annual rainfall of 1422 mm, 88% falls from June to September; the rest occurs during the winter months. The mean daily temperature ranges from 14.7^{0}C in January to 30.6^{0}C in May.

The standard cropping pattern followed in the area is - monsoon paddy followed by wheat in winter. In the upland, maize is followed by oilseeds. About 100% of the area during Kharif and 92% of area during winter is cropped. The latest cropping intensity is 192.5%, exceeding the staff appraisal report (SAR) target of 165%. Besides the principal

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2 *Engineering Consultant, Sir William Halcrow and Partners, Mahakali Irrigation Project.*

crops of rice, wheat, maize, and rape-seed, some vegetables are also grown. Sugarcane farming is another alternative crop.

More than 85% of the households belong to small landholders, owning less than 2.38 ha (3.5 bigha) of land, 70% of the households are big landholders, and about 12% of the owners have landholdings between 3.5 to 7.5 bighas. Excluding the few large landholders, the farmers till their land themselves.

The benefit of irrigation is slowly percolating down. The 1990/91 project evaluation puts the average farm household income at Rs. 26,343 per annum. The net benefit to the farm family for a small, medium, and large farm is believed to be Rs. 12,185, Rs. 33,414, and Rs. 70,549, respectively. The incremental benefit accrued to small and large farmers from 82/83 to 90/91 is more than five fold.

Figures on literacy and education similarly give an encouraging picture - 68% to 55% of the population has had formal schooling. Improved housing and possession of material goods such as bicycles, radios by individual farmers indicate a general degree of wealth in the command area.

The Project is administered by Mahakali Irrigation Development Board working under the Ministry of Water Resources. The Project authority, stationed at Mahendranagar in Kanchanpur district, is directly responsible for operation of the water distribution system down to the level of off-takes from the tertiary canals. The operation and maintenance (O&M) unit, consisting of a Senior Engineer, two Assistant Engineers, and four Overseers has been set up. Gate operators, inspectors, supervisors, and canal men (Dhalpas) work under the control of block overseers to operate and maintain the system.

1.2 User Group Formation

The Mahakali System is probably one of the more intricately designed Projects in current operation. Its success depends on proper observance of a rotational water supply schedule, and efficient utilization of on-farm irrigation - both factors depend exclusively on active participation by the farmers. Participatory management below the tertiary level has been initiated over the 3 years. Farmer participation at different levels has been institutionalized, and at field level, a measure of successful implementation of these methods has begun.

The users groups have been constituted at different levels in accordance with the Water Resources Act 2024 and Irrigation Regulations 2045. For this agency managed system, the said regulation envisages full control by user representatives in operation and maintenance below tertiary levels. A monetary incentive in the form of 25% of the total water tax collected within a particular tertiary command is to be retained by the concerned user group as a source of income apart from other resources they may be able to mobilize. The upper level user groups, elected from below, coordinate the lower group's activities. They help the agency in operation and maintenance of intake on the main and secondary canals.

2. Operation and Maintenance Procedures

2.1 Operations

Mahakali Irrigation System has to meet the irrigation needs of more than 11,000 ha. Presently, 4600 ha in the Stage I area gets a sufficient water supply, having less rotation, until the Stage II system is completed. The project prepared a rotational schedule based on the total command area of Stage I and II. Water availability in the main canal is variable; less than 1/3 of summer flow is available for rabi crops during

winter. A secondary canal rotation has been designed that takes into consideration the cropping patterns followed by the farmers in the command area.

The total command area in Stage I is divided into four rotational groupings of roughly equal size. The main canal runs continuously throughout the year, except when the Main Canal Head Regulator is closed for Headworks repair, which is usually timed during April for 3 to 4 weeks. During the summer, three rotational groups are "on" while one is "off", and during winter one group is "on" while 3 groups are "off". The design is for one irrigation period per week. The irrigation periods for critical rice seedlings and wheat cultivation are of 4 days duration; ie 12 days "on" and 4 days "off" during rice planting, and 4 days "on" and 12 days "off" during wheat season. These periods could be changed according to the farmers demand and practices.

To achieve water distribution management, the exact amount of water received in the main canal and the flow into different secondary groups according to the schedule must be known. To do this different control structures on the main canal and secondary canals have been calibrated. Rating curves and tables for each important structure have been prepared. At the head of the main canal, right at the Indo-Nepal border, a check weir has been constructed to measure the discharge coming into the system. Discharge is also measured at each head regulator of secondary canals, major escapes, and bridges though which canal flow runs.

The main operations in water distribution management are budgeting, issuing, monitoring, and adjusting. With the rotational system adopted, the gross amount of water to be discharged into each secondary head is 1.0 l/s/ha of command area plus an allowance for losses in the secondary. So far, observations give this loss coefficient as 10%. As the secondary operates at full supply level (FSL), there is only one discharge for that secondary. The budgeted discharge is translated into gate openings and heads over weir crest. In some secondaries this calibration has also been done on check drops.

A gate operator/supervisor is trained to read these levels on structures where levels are painted with the designed level. The discharge passing through the secondary head is monitored up to the tail of the secondary system, including its tertiaries. In blocks I and II, until the system is made compatible to Rotational Water Supply System (RWSS), each tertiary gate has to be opened and the discharge adjusted by gate operators. In blocks 3 and 4 the gates are welded; hence, all tertiary gates work as an orifice passing a particular discharge according to the designed FSL.

To measure actual flow passing through a tertiary, measuring weirs were built and calibrated in blocks 1 and 2. They were placed immediately after the tertiary regulators, where one can read the actual discharge passing through each canal. If the flow is more or less, the regulator gate is adjusted accordingly. In blocks 3 and 4 where tertiaries have the same discharge, the gate at the head has been adjusted to measure each tertiary canal flow by means of a fabricated measuring weir. Such flow measurements can be examined by the users.

Before blocks 1 and 2 are converted into RWSS, each tertiary will be adjusted to 1 l/s/ha by actually measuring the discharge passing through each of them. So, irrespective of the operational methodology in each block, the flow is monitored and adjusted accordingly. As evident from the above blocks 3 and 4 are easier to operate. Distribution from the outlet is adjusted by opening the outlet and closing the downstream flow in tertiary by a check gate, which is switched over to the outlet when flow in that particular chak is to be stopped.

Operation of the system below tertiary head is carried out by the WUG - the tertiary committees which have been functional for some time in the project. There are two rotations to run. One is between different outlets and another between different farmers within one outlet. If a certain secondary system is 'on' for 7 days, each outlet in

a seven outlet tertiary will have twenty four irrigation times, and each farm within that outlet will have to take their turn and time in proportion to their land within a total of 24 hrs. Unless a uniform system of field channels are made, dividing total land within one outlet into basins of consistent size (MIP suggests basin size as 0.1 ha), irrigation for each plot is not possible.

MIP has been insisting that the farmers learn to accomplish on-farm irrigation development. Tertiary Committee (TC) members, who are outlet leaders, are slowly becoming aware of this need, and they are persuading users to construct their field channels. In most outlets at least one principal field channel has been constructed by the farmers. Because the System goes into full rotation after Stage II is operational, the actual significance of rotational water supply has not been felt by the users.

Unlike other irrigation systems, Mahakali Project has its own Agricultural Pilot farm with several officers and an expert consultant agronomist. These people have been training the command area farmers to adopt new farming practices, introducing improved seeds, pesticides, fertilizers, and etc. The agriculture farm and Farmers Organization Division have been eliciting the farmer's ideas regarding a calendar of irrigation supply, adequacy, and efficiency. Now, that the farmer's organizations have developed, its views will be solicited.

2.2 Maintenance

Maintenance consists of regular activities such as; desilting of beds, keeping canal bank in proper level, slope maintenance, clearing of weeds, and oiling or greasing of gates. Emergency maintenance operations might occur due to a serious malfunction - like bank breaches and blocking or overtopping drainages.

Before preparing a yearly maintenance schedule, a block-wise field visit is made. The visiting team includes the Project Manager, O&M Chief, concerned block Engineer and Overseers, the Project Consultant, and the Farmer Organization Division Coordinator, who works as an institutional development consultant. The team meets with the farmers and their respective organizational representative at the site. Engineers, Project Consultants, and farmers discuss different problems faced by the beneficiaries, their likely solutions and measures to be adopted. This information is collected from every site visit and entered into the computer. After processing, the year's total maintenance schedule is prepared, and prioritized. Block Overseers and Engineers then carry out a field survey, taking measurements to prepare a detailed design estimate and technical report. Before the work is approved, the beneficiaries agree to the maintenance operations through their representatives. The steps taken to involve the beneficiaries in system management, aim to clarify official procedures.

To convert blocks 1 and 2 into RWSS more outlets are added, outlet commands are adjusted, gates are replaced, and turnouts are repaired and adjusted to pass only calculated quantities of water into the fields. These operations are taken up as a part of regular yearly maintenance. For this, a team consisting of members from the water management unit, design section, O&M division, and Farmer Organization make a joint visit with the concerned water user's committee members at each tertiary. This team visits the tertiary command and meets the user groups to explain what is being proposed. They fix outlets to be retained or added to allow the designed flow through the outlets, make inventories of any other works like drainage and road crossings to be made, and look to see if erosion control measures need to be added. Designs and estimates are prepared and after approval from the project management, construction work is carried out.

2.3 Roles and Responsibilities

The current irrigation regulations applied to the agency managed system clearly divides operation and maintenance responsibilities between agency and beneficiaries by canal category. Primary and secondary canals are under the agency's control, and tertiary systems downward belong to the users. Participation in management is rewarded by sharing a water tax levied at a 3:1 proportion between Government and Water Users Association, with the proviso that TCs help collect the water cess. Users that participate in the agency's management of the main canal system, are advisory. Water User Associations derive strength from the efficient workings of their respective tertiary committees. They must know their rights and responsibilities in administering the canal system. The beneficiaries operate, maintain, and run the system.

In a rotational system, the TC has to rotate irrigation schedules between different outlets within the allotted time. Conflict resolution between outlets have to be sorted out. Within one outlet command, the outlet leader, who is a TC member, has to rotate irrigation between different farmers. For efficient management, on-farm irrigation has to be followed according to crop design and staggered plantings may be needed.

The land holders should agree to sacrifice their land for laying out field channel networks. This is the responsibility of the users themselves. TC members are requested to educate and convince the individual users to divide their land into small basins to maximize irrigation benefits. Attention should be paid to layout, maintaining the tertiary drain so that excess water can be drained off from each outlet command into a permanent drain. The Mahakali Project is now, extending this concept from the design phase to Stage II areas that are under construction.

The power of sanctions for maintenance and operation of tertiary systems and below rests with the tertiary level committees. They are empowered to make rules to control stray cattle within their areas, make their own cleaning and desilting schedules, and impose fines and penalties for the defaulters. Some of the TCs have already started exerting their full rights and sanctions. The agency has been seeking the higher committee's help to generate people's willingness to protect secondary and main canals from being cut and breached. Acceptance of the rules by all users is better than threat of coercion.

3. Impact of Main System Management

The ease of operation with a fixed quantity of water in the main canal enables MIS to provide equitable distribution of water to the field. When blocks 1 and 2 of the system are converted to RWSS, full rotational schedules can provide equitable distribution of water up to the tertiary head all season. From the tertiary head below, efficient and equitable distribution will depend upon the outlet and tertiary groups. However, to achieve equitable distribution of water at the farm level, on-farm irrigation methods need full development. The system offers an adequate supply of water most of time. The only time it is likely to be under pressure is in December and again in March. Staggered sowing of wheat or adoption of non-traditional cropping patterns, using pulses and oilseeds would ease water demands at all times.

The productivity reached in food grain cultivation show that the average yield of most crops have increased substantially over the years. For the principal crops as much as three times the pre-project figures were reached (192.5%).

4. Conclusions

4.1 Problems and Issues Encountered

Operation, maintenance, and supervision of canal networks in a well developed command area system by a centralized agency, even if it is strongly staffed, is quite a herculean task. Observing kilometers of canals, scores of smaller structures, and supervising water distribution spread out over thousands of hectares is such a complex task that the Government rightly decided to hand the job over to the beneficiaries. This eliminates inefficiencies that are generally associated with the bureaucracy, and gives the beneficiaries a sense of ownership and pride in running their own system according to their needs.

The experience at MIS has not turned out as expected. It took a long time to elect outlet leaders and set up tertiary committees; even in blocks where the distribution system was running smoothly. Individual farmers are still reluctant to let their land be utilized to construct field channels, and wherever field channel construction posed a problem, farmers wanted to have their separate outlets.

The farmers are not aware of basin irrigation. Field to field irrigation takes more time, so the farmers are never sure that the designed flow in the canal and the time allotted for irrigation is sufficient. Also, land that was not leveled reduced the benefits of irrigation. The concept of chaks with 4 ha could have been suitable, had there been fewer owners.

The success of participatory management programme would depend upon attitudes of agency managers and Engineers. They have to be sympathetic to the farmer's problems, listen to their complaints, and be responsive to their needs. Apart from their own vocation, they have to learn to listen to the farmers and practice some Social Engineering. Few officials of proper calibre measure up to this requirement amongst DOI's present breed of middle and lower order management. Availability of sufficiently motivated manpower to run the programme is likely to be a major constraint.

Apart from these issues, prevalent in any irrigation system is the general attitude of farmer's towards the system. The farmers acceptance of participatory management and his desire to benefit from the system is paramount. The agriculture extension programme, availability of agricultural inputs, and access to the market for the farmers output would determine the success of any programme targeted to the farmers.

This particular system has been able to change the quality of life for the command area inhabitants over the years. But, strangely, the general public does not appreciate this fact. It could be either that changes have been too fast and the system is too sophisticated, or that people are not able to understand correctly how to take the full benefit. There is such a deep sense of apathy toward the government's projects, that people refuse to fully comprehend a system basically built for their benefit, making them hesitant to take over operation of the lower canal system.

4.2 Lessons Learned

The participatory system of management has just started to work. Inter-beneficiary conflicts occur less often for the administering authority and people by and large have started clearing their canals. Farmers now approach their own association before erecting field channel networks or making improvements in the system.

Communication has begun between the farmers and agency, but they still have not developed full trust and confidence in each other. What is needed is to continue to run the programme patiently and try to sustain it with new means where it has started to take root. We have quickly introduced new policies, but quicker still to abandon them

without giving them a reasonable chance of success. It is imperative at this point in time that this experiment has a fair trial. Although there have been pitfalls, participation by the beneficiaries in System Management is transmitting encouraging signals.

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Banganga Irrigation System: Preliminary Results on Main System Management Improvement

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1. Introduction

1.1 System Description

The Banganga Irrigation System (BIS) is located in the western terai region of Nepal, Kapilbastu district. The water sources for the system are the Banganga river and the Kaila river. The system is completely dependent on the Kaila river during the dry season, because the discharge of the Banganga river is trapped by the farmers upstream. The water diverted from the Banganga river into the system is channeled into the Jagdishpur reservoir. This feature of BIS is not present in other large irrigation systems in the country. The system covers about 6215 ha, within 16 Village Development Committees.

The Command area has a gentle slope from north to south (Figure 1). Rainfall in the command area is not uniform through out the year. The average annual rainfall (1989-1991) in this area is about 1660 mm, out of which 1500 mm of rainfall occurs from June to September. In the dry season rainfall is minimal, so winter crops depend on irrigation water.

During the rehabilitation period (1982-1989) of the system under the Command Area Development Project (CADP), there was a separate set up for the operation & maintenance of the system. Agency staff numbered 47, including administrative and field staff. When the system merged under the District Irrigation Office of Kapilbastu, only a few staff were involved in the operation of the system, mostly on work charge basis. About 10 persons consisting of dhalpas, chowkidars, and supervisors were engaged in the operation of this system.

The main cropping patterns in the command are characterized by the two seasons namely: monsoon and winter. During the monsoon season the major crop is paddy. This crop is grown from June to October. Winter season starts in November and ends in March. This is the time for growing wheat, oilseeds, vegetables, and other crops. A third cropping pattern is practiced in limited areas for early crops of paddy and maize. These are planted in April and harvested in July.

There has been a shift away from planting wheat in the winter season. During the 1992 winter season oilseeds, vegetables, banana, sugarcane, and chaite crops were grown in many areas. The diversification of crops indicates an improvement in water management.

1.2 Land Holding Size

Land holding size is categorized into three groups based on farm size: small (below 2.38 ha), medium (2.38 to 5.10 ha) and large (above 5.10 ha). This classification was used in the study of Income, Consumption, and Employment patterns of Nepal, 1977 (National Planning Commission).

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About 93% of the households are categorized as small farm size, accounting for 70% of the entire command area, 6% of the households belong to the medium group, representing about 18% of the command, and 1% of the households belong to the large farm size category, representing about 12% of the irrigated area. The estimated average size of land owned is about 0.72 ha for the small farm size, 3.12 ha for the medium, and 8.83 ha for the large categories. This information is based on the sample survey collected by BIS in 1991-1992

The purpose of this paper is to present the procedures used and provide preliminary results achieved in improving the management of the main system. It also includes participatory management results collected during the DOI-IIMI program. This paper points out the need for participatory management, particularly in attaining improvements in the overall performance of large irrigation systems.

2. Operation and Maintenance Procedures

2.1 Operation

The cropping schedule was based on existing cropping patterns and practices used. Operation of the system and irrigation water deliveries followed this schedule. The monsoon season starts the second week of June when the major crop, paddy, is planted in 100% of the command area and ends in November after harvest. From the second week of October until the middle of March, in fields where the paddy crop is harvested, about 15% of the area is then planted with oil seeds (mustard), vegetables, and pulses. The winter crop schedule starts in the middle of November where about 35% of the area is planted in wheat, which is harvested in the middle of May. Sugar cane will be planted in the middle of May and early paddy and maize (chaite crops) are also planted in April for about 5% of the command area.

This cropping schedule developed from discussions with the farmers before the season started. Several meetings were organized in different villages of the command area to explain the operation and maintenance (O&M) of the system. These meetings were also used to strengthen the water users groups, build up the norms related to O&M, discuss problems related to O&M, crop diversification, and other related issues.

Meetings with the chairmen of the water users groups were organized before the start of both monsoon and winter seasons to discuss problems that were observed during the previous seasons and possible solutions for implementation in the future. During these meetings, water delivery schedules were discussed, in particular, with the dates of water releases from the Jagdishpur reservoir. Rotation among the different sections of the system for water distribution was discussed, including the proper maintenance of irrigation and drainage facilities at the tertiary level.

Informal as well as formal meetings were held with other agencies, principally with the Agriculture Input Corporation (AIC) and the Agriculture District Office (ADO). This was done to facilitate the farmers' procurement of production inputs and technology. After a long delay only one meeting of the Sub-Project Coordinating Committee (SPCC) was held. The SPCC was formulated during the construction period of the CADP to assist the project in construction, operation, and maintenance. This particular meeting was held to decide about the handing over of two Godowns constructed within the command area. One was given to a co-operative organization and the other to the AIC. During the same meeting, decisions were made regarding the enforcement of rules and regulations related to irrigation.

Several other meetings were conducted in the villages and in the BIS office to decide on the types of crops, period of sowing, and other relevant matters. These

discussions were helpful in planning the procedures for allocation and distribution of water. The previous records of system operation were also analyzed to provide additional information for deciding on water allocation among different sections of the system. The needs of different sections of the system were also assessed. Using these considerations, a water delivery schedule was prepared for paddy crops in the monsoon season of 1991 The whole area was divided into four blocks, and delivery was made on a rotation basis from head to tail. The water delivery schedule for monsoon season 1991 is presented in Table 1

a) Paddy irrigation delivery pattern during monsoon

The outflow of irrigation water from the Jagdishpur reservoir and inflow to the different outlets in the main canal, distributaries and branch canals were monitored. Monitoring was done in terms of number of days these outlets were to receive water. Several water flow measurements were taken at the diversion headgate, inlet and outlet of the reservoir, and at several points in the main canal. Rainfall and reservoir levels were monitored daily to optimize water delivery the reservoir

A comparison of the actual number of days that water was delivered to the head, middle, and tail sections of BIS for two monsoon seasons (1990-1991) was made (Figure 2). This was made to determine the pattern of water distribution during the monsoon seasons. The resulting pattern of water distribution for paddy crops, indicated that in 1990 the largest number of days was delivered to the head-end. The middle and tail sections received water less than half of the total number of days compared to the head-end. This pattern indicated inequitable distribution; with the head-end getting most of the irrigation water.

In 1991 monsoon season, the head-enders received irrigation water for a greater number of days than the middle and tail-enders, reducing water distribution by as much 12%. Improved control and cooperation were exercised to attain this reduction. The increase of water delivered to the middle section indicated that improvements were being achieved to equitably distribute water during the monsoon season. More control will be needed in the future to minimize delivery of excess water to the head-end and increase the number of days of water delivery to the middle and tail reaches of the main canal. The increase in the number of days of water delivery to the middle reach can be considered a significant improvement. The middle section contains the largest proportion (44.5%) of the command area, so that improved water delivery to this section should alleviate the inequitable distribution during the monsoon season.

Rainfall was monitored in order to use it effectively. If rainfall was sufficient to meet crop water requirements, then the Jagdishpur reservoir outlet gate was closed. This leads to changes in the water delivery schedule as indicated in Table 2.

During the monsoon of 1990, there was a total of 1345 mm of rain. While for the 1991 monsoon season, only 1110 mm rainfall was received. This led to more days of water releases from the reservoir (Table 2). Even though less rainfall was received, water control cooperation from the farmers improved, particularly in the head section of the system (Figure 2).

This illustrates the significance of the reservoir, even in the monsoon season. This also indicates that the operation of the reservoir is an important activity under system management. Regular monitoring, not only of the reservoir, but also of

rainfall in strategic locations in the command area, has to be undertaken to effectively use the rainfall.

b) Irrigation water delivery pattern in the winter season

During the winter cropping seasons of 1991 and 1992, Figure 3 indicates that in 1991 about 50% of the total number of days of water released for winter crop was consumed in the head reach. This shows that an excessive amount of water was wasted at the head reach. Only 30% of the water was provided to the middle and 20% to the tail reach of the system. While during the 1992 winter crop season, the resulting water delivery pattern was much more equitable, because the farmers practiced better control and cooperation. Despite this improvement, there still exists opportunities for further improvement in reducing water waste at the head reaches as indicated in Figure 3. The actual water delivery at the head reach was more than planned by as much as 10%. For the middle reach, the actual water delivered was less than the planned by 10%, and at the tail reach by a small amount.

Changes in the operation of the system had to be made to optimize the available water from the reservoir. It was also noted that one of the major reasons for the tail reach receiving less water than planned was due to the weeds in the main canal, indicating needed improvement in maintenance.

Considering the above problems in operation, the delivery schedule for the entire winter season was not prepared at one time. Before the start of winter season a general meeting of the chairmen of water users groups (WUGs) was arranged to determine relevant problems. The operation of the system and a water delivery schedule was prepared following a tail first to head reach sequence. Three sets of rotation schedules were prepared and conveyed to the farmers. The major lesson learned was that one schedule prepared at the start of the crop season for the whole command area cannot be followed. Irregular rainfall occurring at different locations, resulted in changes in the farmers demand for irrigation water. For this situation a different water delivery schedule was prepared for each set of rotations. All three rotation schedules are attached (Tables 3, 4, and 5).

As for the methods of water delivery and the schedule prepared, it was observed that the delivery was of mixed type (continuous, rotation, and continuous-rotation combined). Because of the scheduling difficulties mentioned above, this was found to be an effective way of using irrigation water. In small areas having the same social, cultural, economic, and environmental conditions a rotational system can be followed satisfactorily, but in the case of a larger area it was found to be difficult due to the differences in the foregoing factors.

c) Water users groups participation in operation

Meetings were conducted for the purpose of forming or reactivating WUGs. During WUG formation, discussions regarding cropping schedule, irrigation delivery schedule, and demand assessment were undertaken. Before the 1991 monsoon season, a meeting for WUG chairmen was held to schedule water delivery. Only 8 chairmen attended. Another meeting of WUGs chairmen was conducted for scheduling water delivery for the winter season beginning November 28, 1991. The number of participants were 38; most were chairmen. During this meeting, the participants themselves decided on the allocation and the pattern of irrigation water delivery. They agreed to follow the pattern or sequence of tail first to head end. This was a very significant achievement in terms of getting

WUGs and other farmers to participate in making decisions on main system management.

2.2 Maintenance

The maintenance budget is planned based on existing problems. These are evaluated and placed in the program of work for the coming year. For this the Ministry of Finance has developed one format. The overall maintenance budget requested was 34 Lakh, but only 7 Lakh was allocated. In this allocation, 1.5 Lakh was for operating the system. Last year, 1.7 Lakh was spent with a wage rate of Rs 25/day for labor. The present rate is Rs 32/day, indicating that 1.5 Lakh is insufficient.

A work estimate for desilting the diversion canal (DC) was prepared for 8 Lakh last year. But for the rehabilitation of the DC, Main Canal (MC), and all the distributaries, only 3 Lakh was allocated. After monitoring the silt accumulation in the DC, it was determined that every year about 25 cm to 30 cm of silt has been deposited. The last time that desilting was done was in 1985. Presently, the estimated silt deposition is about 100-125 cm. Silt and weed build-up in the main canal prevents effective water flow to the tail reach of the system. Last year, the budget allocated for maintenance work, including costs for work charge staff in canal operation, was 5 Lakhs. This amount was not sufficient to undertake the desilting, weed removal, and other structure repairs works.

The estimated regular yearly budget is proposed to overcome the maintenance difficulties and effectively carry out canal operation. In Table 6, the estimated cost per year is 177 Nrs per ha. This can be reduced, particularly in Item No.4, by appointing regular field staff. Item No.3, can also be reduced after two years by handing over the responsibility below tertiary level to WUGs. Even Item No.1 can be reduced, if the main canal could be handed over to the overall central committee of all WUGs in the system.

Weeds can be considered a major problem in the DC and MC, because they reduce the flow of irrigation water. This reduction reduces the amount that reaches the tail-end. With a reduction in flow, a corresponding increase in head upstream occurs, causing losses through the outlets. In some portions of the MC, the rapid growth of weeds require clearing at least twice a year.

Measurements were made to determine the effects of weeds in the main canal. The maximum discharge measured was 2.5 cu.mec at a depth of 1.59 m. The designed supply level (FSL) is 1.3 m and the design discharge is 5.68 cu.mec.. The discharge released was 3.075 cu.mec at a depth of 1 m measured over 5 km of the main canal, which had been cleared of weeds. Other measurements were made as indicated in Table 7.

More than one month after cleaning, almost the same discharge was released at a depth of 1.30 m. Since the reservoir level affects the discharge released, the initial delivery in the reservoir level (RL) was 107.88 m. After more than one month the RL level was 108.5 m. Even with a higher head, the design discharge cannot be attained due to impediment provided by the weeds in the canal. Weed growth over a short period of time indicates that weed removal is an important maintenance activity in order to provide irrigation water and meet the water delivery schedule.

Maintenance affects the operation of the system. As discussed earlier, the tail-end portion of the system received the least amount of water. Poor maintenance of damaged or defective outlet gates in the upstream portions of the main canal is partially responsible for water waste. In the 1991 monsoon crop season, the head reach was cleared of weeds. This resulted in an increase in duration of water delivery to the middle reach, but less went to the tail reach than in the 1990 monsoon crop season (Figure 2).

There are some irrigation and drainage structures that need to be modified or repaired as requested by the farmers. Performing this request is necessary to motivate the farmers to participate in the management of the system. With constraints in the budget, these requests might not be fulfilled affecting the canal operation.

a) Participation of the WUGs in maintenance

Presently, 13 WUGs covering 2,000 ha have been organized under the DOI-IIMI program. In addition to these, there are 16 other WUGs that are actively participating in an O&M program in the system. In the 1991 monsoon season, a length of about 41 km of distributary, tertiary canals, and farm ditches were maintained by farmer members of WUGs. These WUGs have understood their responsibilities and have contributed accordingly in system maintenance. They have also realized the benefit of their contribution.

Other WUGs, have formed their own rules for operation and maintenance below tertiary level. Some WUGs employ chowkidars on a seasonal payment basis. For maintenance, they have agreed upon sharing labor from all households for tertiary canals as well as farm ditches. In some cases only farm ditches are maintained by the farmer members of the WUGs. In other cases, for various reasons, farmers that do not contribute labor are asked to pay.

All 13 WUGs organized have formulated rules and regulations. They fine members for violating regulations, such as livestock animals damaging embankments. Several groups have implemented these rules. Collecting fines has caused problems for many groups. In some cases, these problems are brought to the attention of the BIS office. The BIS Office has assisted the WUGs in enforcing those rules. Seven cases regarding livestock animals, 5 cases of embankment cutting, and dismantling of structures were presented in the office by different WUGs. These cases were solved through WUGs with assistance from the BIS office in the presence of members of the WUGs. This assistance helped the WUGs to effectively implement and enforce rules and regulations.

2.3 Roles, Responsibilities, and Rights

Presently, the WUGs are responsible for the maintenance and operation below tertiary level. Above that, system O&M responsibilities rest with the staff of the Department of Irrigation (DOI).

At the main system level, it is the responsibility of DOI to operate and maintain the canal so that the specified amount of water is delivered at the right time and right place. When the farmers are properly organized and merged into a single central association, maybe main canal operation and maintenance can be handed over to them.

It is the responsibility of the DOI staff to release irrigation water, according to the schedule, to all of the outlets and operate all the check gates and outlets of main system as undertaken by the DOI field staff.

The DOI staff also provides agricultural assistance to farmers relevant to system O&M. This is done in coordination with other agencies to promote agricultural production.

The DOI staff helps provide assistance and a suitable environment for the formation of WUGs. The DOI staff also informs the farmers if there is any problem in the main system, which will delay the operation of the system.

When a maintenance problem occurs, it is the right of DOI to set the priorities of work as in accordance with the budget allocated for the main system. DOI can ask for assistance from the WUGs in emergency cases to undertake repair or other works for

the main system. If a water user violates the rules and regulations, the water user or farmer can be punished by the DOI staff in accordance with the Irrigation Regulation Act of 2045. If any farmer group or farmers damage facilities in the main system or do not follow the schedule, they can be forbidden from taking water from the irrigation canals by DOI. If there are problems, the DOI can change the operation schedule, notifying the farmers in advance while clarifying the problems or difficulties. It is the duty of DOI to inform and discuss with the farmers relevant rules, regulations, and procedures pertaining to the operation and maintenance of the system.

Within DOI, an appropriate set of criteria and procedures for reward and punishment should be made, so that the duties and responsibilities of the DOI staff can be carried out effectively. Presently, a performance evaluation method for the DOI staff does not exist. Performance could be improved through some type of staff evaluations.

In the Banganga Irrigation System, an effort was made to evaluate staff performance at the field level (field-man). Out of seven field-men, two were awarded with two additional grades for good performance. Later, all were terminated including these two. So, it is difficult to say whether they were rewarded or punished.

3. Impact of Main System Management during the Participatory Program

During the 1991 monsoon season, there was drought in the Kapilbastu area. Despite the drought in the command area of BIS, the production of paddy was satisfactory. The farmers developed more confidence in the systems performance. They still experienced difficulties in the tail reach of the command area, which had fewer number of irrigation days. Overall, during the winter crop season of 1992, water distribution was more equitably distributed compared to the previous winter crop season.

The improved performance of the system, encouraged the farmers to plant a third crop and to introduce several new crops like vegetables, banana, sugarcane, chaitedhan, etc.. The change in the cropping pattern increases the cropping intensity, indicating an improvement in the main system management. Fewer conflicts over irrigation water were observed and reported in both winter and monsoon crop seasons as a result of improved management.

4. Conclusions

4.1 Problems and Issues Encountered

a) Lack of operation and maintenance budget: Due to this there is always a canal maintenance problem, and inefficiency in system operation. Budget constraints resulted in farmers reluctance to participate in proper maintenance of the system. The farmers demands for desilting and irrigation structures repair or modification cannot be met by DOI because of limited O&M budget.

b) Lack of field staff: This is a severe problem. The lack of field staff affects the effective operation of the system. Without field staff, critical information about system operation and maintenance is not given to the farmers. Communication gaps between the farmers and DOI will be present.

c) Lack of farmer involvement: Since the farmers were not involved in the early stages of planning and construction, they feel indifferent toward the system and its maintenance. If a policy was drafted to hand over main system management to the farmers through a centralized association of WUGs, then

the farmers might have a sense of ownership and responsibility in the operation and maintenance of the system. Farmer involvement would solve some of the above issues and alleviate budget problems.

d) Irrigation structures not appropriate, creating difficulties between farmers and DOI field staff: All the structures were constructed for flexibility in providing irrigation water, which requires a high degree of management intensity. However, the farmers and DOI field staff were not prepared to cope with structures that need regular supervision and maintenance. The farmers have the impression that DOI has unnecessarily provided them with these sophisticated irrigation and drainage structures and facilities. The use of these structures requires knowledge and skill regarding the systems' operation and agricultural practices for the effective use of water.

e) Lack of institutional development activities at BIS: Institutional development activities should be conducted by DOI to make the farmers aware of how the system functions and what their duties and responsibilities are. These activities should include organization of farmers into WUGs to enable them to make effective use of the systems resources, (water, facilities, and support services from other agencies) and participate in decision making with DOI regarding operation and maintenance.

f) Lack of confidence in the water delivery schedule: With excessive use of water by the head end farmers, water then becomes inadequate downstream, despite the water delivery schedule. Farmers downstream in their desire to get their rightful share based on the schedule will sometimes break the rules and regulations. This contributes to the loss of credibility in DOIs ability to enforce the water delivery schedule. This became more critical with the termination of the DOI field staff.

g) Lack of knowledge regarding agricultural practices and economic use of water: A large number of farmers in the command area are not aware of high yielding crop varieties and irrigation methods that minimize water use. The farmers are dependent on traditional crop varieties and practice "wild" flooding method of irrigation. This method reduces effective water use and leads to inefficiency in the operation of the system.

The above problems and issues describe the present condition of the Banganga Irrigation System. Providing the right amount of irrigation water at the right time and right place would give the farmers confidence in the system. This leads them to constructively participate in the operation and maintenance of the system.

From the experience gained at BIS, every DOI program regarding the preparation of cropping calendars and water delivery schedules should involve the farmers through water users groups. This promotes a feeling of membership within the farmers groups. In new irrigation projects, farmers must be involved right from the start of the planning the system.

A training program for the farmers as well as for field staff should held to instruct them in the proper use of irrigation water and use of irrigation and drainage facilities. The DOI field staff should also be trained in developing knowledge and skills for water users group organization and system operation and maintenance.

Regular monitoring and evaluation of the system are important aspects of system operation. This allows for an analysis of the systems performance to be made and for corrective measures to be adopted for future improvements. Records of cropping patterns, water use, crop yields, areas irrigated, and problems experienced in water distribution for each year should be made and reviewed for making improvements. An action plan for implementing suggested measures and recommendations for improving main system management with participatory management is presented in Table 8.

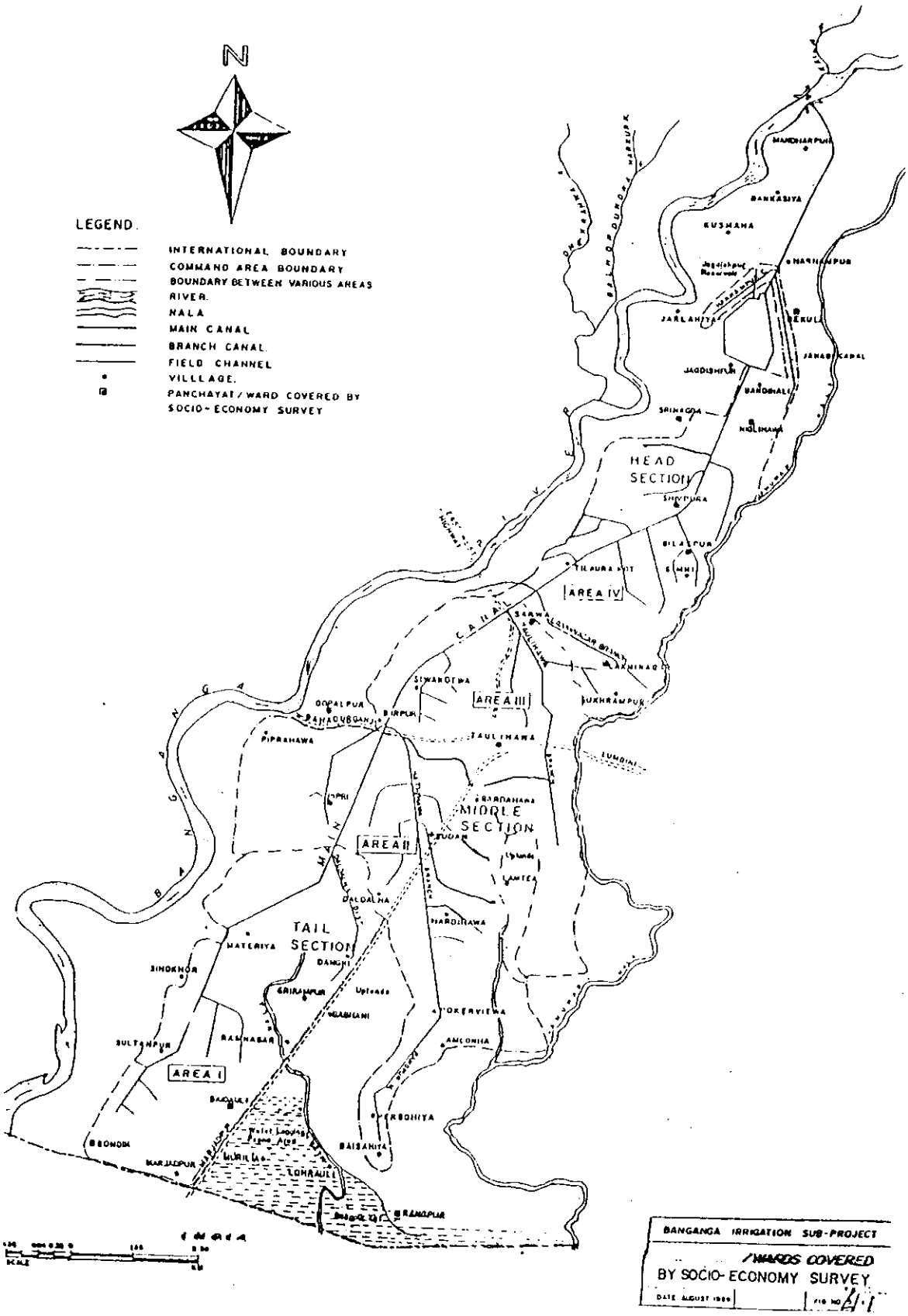
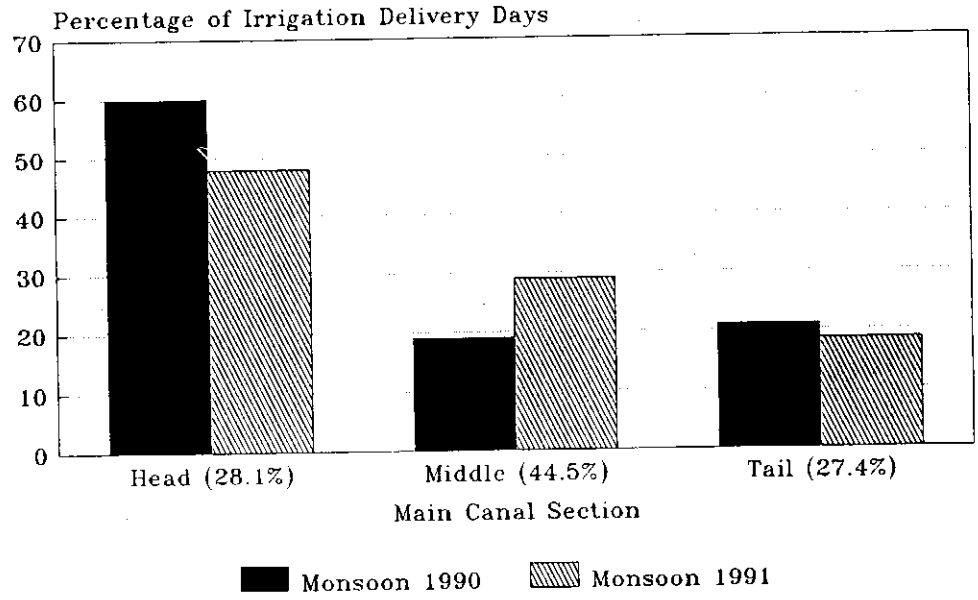


Figure 1: Map of Banganga Irrigation System

Figure 2: Patterns of Water Distribution for Monsoon Seasons 1990 and 1991



Numbers in brackets ()are proportions of area irrigated in each section

Figure 3: Patterns of Water Distribution for Winter Seasons 1991 and 1992

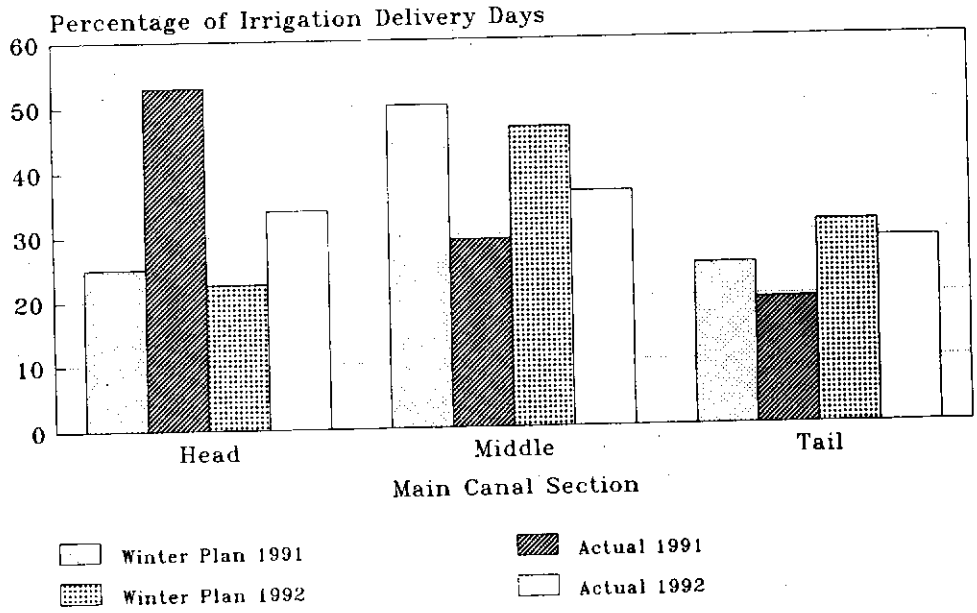


Table 1: Irrigation Water Delivery Schedule for Monsoon Season 1991 (Paddy Crop)

Name of Canal	Block No.	Area	Opening	Closing
1. Main Canal	MC 1-30	691	11Jun-17Jul	10Oct-70ct
2. Laxminagar	MC 1-12	447		
2. Bilaspur	MC 11-19	267		
3. Jahadi Minor	DC 1-4	143		
4. Harnampur		200		
subtotal		1748		
1. Main Canal	MC 31-39	387	18Jun-24Jun	80ct-140ct
2. Birpur	BD 1-5	251		
3. Taulihawa	TB 1-16	662		
subtotal		1300		
1. Pipari	PB 1-5	317	25Jun-1Jul	150ct-210ct
2. Hathihawa	HB 1-15	949		
3. Rangapur		200		
subtotal		1466		
1. Main Canal	MC 40-62	1277	2Jul-8Jul	220ct-280ct
2. Baidauli	BD 1-9	232		
3. Daldalaha	DD 1-5	192		
subtotal		1701		
Total		6215		

Table 2: Water Released from the Jagdishpur Reservoir 1990-1992

Opening Date	Pond Level (meters)	Closing	Pond Level (meters)	No. of Days	Reason for Closing
For Paddy 1990					
15 April	108.32	19 April	108.29	5	
10 June	108.95	07 Jul	107.99	28	Rain
04 August	109.13	12 August	109.03	9	Rain
19 August	109.30	13 Sept	109.25	26	Rain
16 Sept	109.35	15 Oct	109.24	30	Rain
21 Oct	109.37	04 Nov	108.64	16	crop ready
Total				114	
For Winter Crop 1991					
25 Nov	108.94	05 Dec	108.60	10	
09 Dec	108.71	14 Dec	108.61	6	
17 Dec	108.68	27 Feb	107.55	73	
26 March	108.12	31 March	107.84	6	
Total				96	
For Paddy 1991					
14 April	107.86	20 April	107.44	7	
25 April	107.43	26 April	107.41	2	
22 May	107.76	25 May	107.44	4	
11 June	107.93	22 June	108.18	12	Rain
26 June	108.20	30 June	107.99	5	Rain
07 July	108.44	16 August	108.41	41	Rain
02 Sept	109.52	11 Nov	107.08	69	crop ready
Total				133	
For Winter Crop 1992					
30 Nov	107.52	25 Dec	106.97	26	
17 Jan	107.68	18 Jan	107.67	2	
29 Jan	107.92	08 Feb	107.18	11	
21 Feb	107.48	22 Feb	107.48	2	
03 March	107.61	10 March	107.20	8	
Total				41	

Table 3: Water Distribution Schedule for Winter Season 1991-1992 (Wheat Crop), First Rotational Schedule at Banganga Irrigation System

Sequence No.	Name/Location of Canal	Date of Distribution
1.	Hathihawa Branch Canal	01 Dec - 07 Dec
2.	Laxminagar Branch Canal	05 Dec - 07 Dec
3.	Pipari Branch Canal	05 Dec - 07 Dec
4.	MC 53 to MC 62	08 Dec - 11 Dec
5.	MC 40 to MC 52	12 Dec - 14 Dec
6.	Daldalaha Distributary	12 Dec - 14 Dec
7.	Baidauli Distributary	12 Dec - 14 Dec
8.	MC 1 to MC 39	15 Dec - 18 Dec
9.	Birpur Distributary	15 Dec - 18 Dec
10.	Taulihawa Branch Canal	15 Dec - 18 Dec
11.	Bilaspur Distributary	15 Dec - 18 Dec
12.	Jahadi Minor	19 Dec - 21 Dec
13.	Jariahiya Minor	19 Dec - 21 Dec

Note: The sequence of irrigation water delivery will be from tail to head of each branch canal and the next rotation will be repeated after 21 days. A total of four irrigation deliveries will be provided to the wheat crop.

MC - are main canal outlets

Table 4: Water Distribution Schedule for Winter Season 1992 (Wheat Crop), Second Rotational Schedule at Banganga Irrigation System

Sequence No.	Name/Location of Canal	Date of Water Distribution	Remarks
1.	MC 40-62 Daldalaha Distributary Baidauli Distributary	30 Jan - 05 Feb 30 Jan - 05 Feb	The next rotation will be indicated in the distribution schedule
2.	Hathihawa Branch Canal	06 Feb - 11 Feb	
3.	MC 1-39 Laxminagar Branch Canal Taulihawa Branch Canal Bilaspur Distributary	06 Feb - 11 Feb 06 Feb - 11 Feb 06 Feb - 11 Feb 06 Feb - 11 Feb 09 Feb - 11 Feb	
4.	Jahadi Minor Jarlahiya Minor	09 Feb - 11 Feb 09 Feb - 11 Feb	

Table 5: Water Distribution Schedule for Winter Season 1992 (Wheat Crop), Third Rotational Schedule at Banganga Irrigation System

Sequence No.	Name/Location of Canal	Date of Water Distribution	Remarks
1.	MC 40-62 Daldalaha Distributary Baidauli Distributary	03 Mar - 09 Mar 03 Mar - 09 Mar 03 Mar - 09 Mar	Irrigation water released for winter crop such as wheat and early paddy
2.	Hathihawa Branch Canal Pipari Distributary	10 Mar - 14 Mar 10 Mar - 14 Mar	
3.	MC 31-39 Taulihawa Branch Canal Birpur Distributary	15 Mar - 18 Mar 15 Mar - 18 Mar	
4.	MC 1-30 Laxminagar Branch Bilaspur Distributary	19 Mar - 23 Mar 19 Mar - 23 Mar 19 Mar - 23 Mar	

Table 6: Estimated Yearly Budget for Banganga Irrigation System

Description of Works	Amount	Remarks
1. Desilting work	250,000.00	Yearly
2. Weeds clearance	250,000.00	Yearly
3. Structure repair and maintenance	200,000.00	Only for two years
4. Canal operation	300,000.00	75% can be reduced if regular staff will be appointed
5. Others	100,000.00	

Table 7: Jagdispur Reservoir Outlet Data for 1991

Date	Time	Reading H (m)	Discharge cu.m.	Head in reservoir (m)	Remarks
13-06-91	15.10hrs	1.00	3.0753	107.8	Water release for paddy crops just after cleaning the weeds 5 km of MC
14-06-91	13.30hrs	0.70	1.449		
16-06-91	16.12hrs	0.70	1.441		
27-06-91		1.05	2.597		
20-07-91	14.18hrs	1.30	2.9568	108.46	
21-07-91	18.15hrs	1.32	2.6529		
24-07-91	17.45hrs	1.24	2.41728		
03-08-91	16.45hrs	1.19	1.3005		
08-08-91		1.30	1.62933		
12-08-91	16.20hrs	1.53	3.1789		

Table 8: Action Plan

	Activities	Period	Remarks
1.	Farmers training program	Regular	Training program to the farmers should be given in parts or step by step in smaller groups regularly. The DOI should take interest in providing funds and expertise for the establishment of training center for farmer organization or hire NGOs.
2.	Organizing and strengthening of WUGs, to enable them to participate in the O&M of the system.	Always	DOI has realized the importance of farmers participation including it in the new irrigation policy as participatory management.
3.	Enforcement of rules and regulations, delegation of authority to WUG.		Power should be delegated to WUG through legal procedures to enforce the rules and regulations.
4.	Training field staff		Short term training to the field staff should be provided regarding cropping pattern development, water requirement, water distribution and to development of organizational skills.
5.	Request for maintenance and operation budget	Yearly March-April	Problems should be identified during operation period and on that basis proper budget should be requested for the coming year and DOI should make that budget available.

6.	Proper communication between farmers and DOI	Always	Every decision should be made clear to the farmers by DOI in time, to avoid conflicts and for solve problems. It will build up confidence and credibility.
7.	Monitoring and Evaluation of project performance.		
a.	Surveying and record keeping of cropping pattern, cultivated area, amount of water supplied, area irrigated and associated problems.		During canal operation in winter and summer months.
b.	Evaluation and review in preparing future programs and calendar of operation.	Always	Useful in preparation of programs for operation and maintenance of the system.

Participatory Management-Farmers Experience

Mathura Raut[1]
Ram Charitra Shah[2]

1. Introduction

Conditions prevailing before the implementation of the participatory management program in the Sirsia-Dudhaura Irrigation System (SDIS) are described below.

a) Water control

Dhalpas controlled the water supply from the dam to the canal under instructions from - what was then - the Parwanipur canal division. How the water was controlled in that part of the system was unknown to the farmers.

b) Water division

The engineer of the Parwanipur Canal Division, on advice from the dhalpas, ordered for the release of water into the various branch canals. The farmers had no idea what-so-ever regarding the number of days of water supply. Dhalpas received cash and food grains from the farmers, thus favoring the more productive regions. A farmer could also request water from the engineer.

c) Water distribution

A farmer who requested water was given the first priority. After he had irrigated his land, then it was the dhalpas who decided when to stop the water supply.

If a farmer used water without permission and was reported to the dhalpas, he could be locked up as punishment.

d) Repair and maintenance

Repair and maintenance works were conducted by the technicians of the canal division. The farmers had no information regarding the work description, contracts, etc. Sometimes, the farmers were told to do certain maintenance works before water could be released into the main canal and branch canals. The farmers acted accordingly.

e) Resource mobilization

Needy farmers contributed voluntary labor for carrying out repair and maintenance works. A cash donation was not required.

f) Solving disputes

Disputes occurred regarding the use of water. The dhalpas and the office concerned tried to stop illegal users. There were no procedures for settling such issues.

1 *Sirsia-Dudhaura Water Users' Association.*
2 *Sirsia-Dudhaura Water Users' Association.*

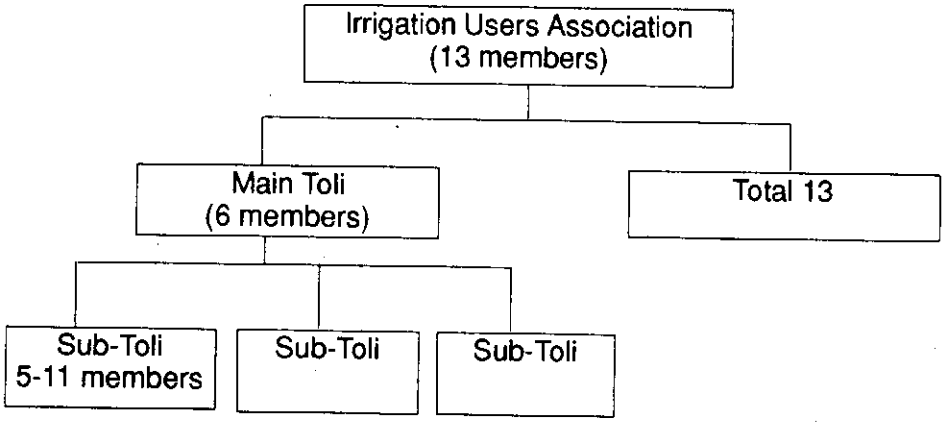
g) Crops

Summer crops: Bhadaiya and Aghahani paddy were the main crops

Winter crops: Pulses, musoori, Khesari, gram, and wheat were grown.

2. Formation of Water Users Group (WUG)

At the beginning of the Irrigation Management Project (IMP) one or two representatives from the irrigated area of each branch canal were chosen. In the command area of the SDIS fourteen ad hoc groups were formed, each with 9 to 11 members. The chairman of each toli became an honorary member of the Water Users Association (WUA). Among the 14 members, one chairman, vice-chairman, and a secretary were chosen. All this was on an ad hoc basis. To give it a constitutional status, a users group was instituted. The term of office was fixed at three years, according to the constitution. The WUA was registered with the government. Only 13 tolis were formed with three sub-tolis in each toli. The chairman and secretary of each sub-toli became members of the toli and they comprised the toli. The chairman of each toli was an honorary member of the users group. There were 13 members in the sang.



2.1 Selection of Officials

The criteria for selection of officials are as follows:

- He has to be a farmer,
- mentally fit,
- not suffering from infections diseases,
- well known by all the farmers, and
- conform to the conditions set in the constitution.

2.2 Rules and Regulations Prepared by the Farmers' General Meeting

The general meeting of farmers in the group was held according to the constitution. A consensus was required for elections. In some places, like Rampur, a consensus was not reached and voting was undertaken. During the voting to

elect the association's chairman some disputes arose. The farmers enthusiasm was noteworthy.

2.3 Cooperation of Irrigation Office and Association Organizer (AO)

- AO provided information on the needs of the toli and association for irrigation justification provided for having both toli and association
- AO provided information regarding the procedures for toli and association election.
- AO aided in the formation of sub-tolis, formation of associations, drafting the constitution, and registration with HMG, etc.

2.4 Canal Operation, Repair and Maintenance

a) Canal operation

i) **WUG's role**

The water distribution chart passed by the association was aided by the AO's suggestions. It was aimed at an equitable distribution of water.

The release of water into the canal is done according to the recommendation of the toli, and it followed the water distribution chart that had been agreed upon. Toli's recommendation was responsible for reducing or increasing water supply in the canals or for changing the water distribution time-table. The dhalpas were instructed accordingly and it was published for the knowledge of all.

ii) **Procedures for preparing the water distribution timetable**

Each toli chairman, after a discussion with farmers on their water requirements, informed the association regarding their needs. This was the basis for canal operation. The office was then given the job of releasing the water according to the timetable prepared.

A timetable was also decided upon by the toli members for irrigating fields from the painis (mini-canals). The water distribution chart was passed at the monthly meeting of the association.

iii) **Irrigation office-farmer relations**

Problems or changes in the water distribution timetable was made known in time for the AO to request its implementation. Cordial relations existed for cooperation.

iv) **Resource mobilization**

The farmers who devoted time to the preparation of the water distribution chart or in attending meetings were considered to have contributed, and no remuneration was provided. They provided their presence at other times as needed.

b) Repair and maintenance works

i) **WUG's cooperation**

Most of the sub-branches and painis (mini-canals) were cleaned by the farmers themselves. The irrigation office paid for the cleaning works undertaken on the main canal. The farmers were involved as much as possible, and 10% of the payment received for the works was deposited into the toli fund.

Small repair works were done by utilizing the toli fund. Sometimes voluntary labor was also called for.

Mass meetings were organized to curb encroachment by cattle and regulation were devised to levy fines on defaulting farmers.

ii) **Resource mobilization**

Voluntary labor on an equitable basis was called for if cleaning works on the painis (mini-canals) had to be undertaken. The same was done if emergency works were needed.

Group suggestions made to the irrigation office for the implementation of repair and maintenance works was helpful. The time and labor spent was considered as social work.

2.5 Role, Duties, Rights, Penalties

a) WUG's role in the implementation of irrigation management activities:

- Help in repair and maintenance program.
- Help in preparing the water distribution timetable.
- Equitable distribution of water.
- Resource mobilization for repair and maintenance works.
- Supervision of the canal.
- Help in preparing a record of the irrigated area.
- Help in canal operation works.
- Quality control over repair and maintenance.
- Help in food distribution works.
- Participation in training program.
- Demarcation of command area.
- Help in collecting data on repair works.

b) Rights and responsibilities

- Circulate the water distribution chart.
- Change the chart if necessary.
- Create understanding between the group and irrigation office regarding repair and maintenance works.

- Quality control over repair maintenance works.
- Create records of farmers benefitting from irrigation facilities.
- Judicious use of toli fund.

In carrying out these responsibilities, if any farmer refuses to follow the rules he is liable to be assessed a penalty as decided upon by WUG.

2.6 Present State

There has been a U-turn on the use of the above mentioned rights and responsibilities. WUGs are not receiving the required amount of cooperation from the irrigation office.

The water management activities are now limited to the toli level. WUG meetings are rarely held and decisions arrived at are not enforced.

2.7 WUG's Influence on Present Irrigation Program

The irrigation management related activities have narrowed down since the formation of WUG.

The water distribution and canal operation procedures are not reliable. Some tolis near the source of Dudhaura canal system have been able to meet their own requirements, but not in the Sirisya region.

Dhalpas are indifferent toward the canal operation works. Management of the canal system has deteriorated.

Lack of budgetary allocation is used as an excuse for not carrying out repair and maintenance works by the irrigation office. But, the smaller maintenance works by the farmers are still done. The WUG is lost as to what steps it has to take.

Disputes relating to water are still settled by the toli. The overall conditions are now worse than what it was before the implementation of the IMP program.

3. Conclusion

3.1 Lessons

a) Realization among farmers that the irrigation system and facilities are for their own benefit.

b) Ties were made with agricultural development program.

c) Understanding of the group and the association's significance.

d) Preparation of water distribution charts and its importance.

e) Procedures for cleaning the canal.

f) Procedures for resource mobilization.

g) Methods of canal supervision.

h) Canal maintenance.

i) Improved farming techniques through training.

j) Technical knowledge regarding quality of repair works.

k) Ways to deal with disputes.

l) How to conduct meetings.

m) Preparation of a water levy record

3.2 Problems

a) Difficulties in forming tolis.

b) Resistance while preparing water distribution chart.

c) Difficulties in requesting voluntary labor.

These problems are not that important at this time. But, supervision of the canals by the farmers is still a problem.

The biggest problem is the lack of repair and maintenance works for head gate, regulator gate, sluice, and etc.

3.3 Expected Cooperation from Irrigation Office

a) Adequate budgetary allocation for repair and maintenance works

b) Support from irrigation office towards irrigation management program

c) Formation of water levy team from the WUG

d) Cooperation in elections of WUG

e) Availability of consultants like AO

f) Division of water for irrigation canal over Dudhaura and Sirsiya rivers.

3.4 Recommendations

a) A long-term program must be envisaged while implementing the participatory management program in the irrigation system.

b) An adequate training program must be organized by the irrigation office.

c) Training for improved farming techniques must also be conducted.

Participatory Management - Farmer's Viewpoint: Mahakali Irrigation Project Mahendranagar, Kanchanpur

Khem Raj Pandey[1]

1. Introduction

Mahakali Irrigation Project (MIP) lies in Kanchanpur district of the Far-Western Development Region of Nepal. Water for irrigation is brought from the Indian-built Sharada barrage, based on the Indo-Nepal treaty of 1920 AD.

Water supply wavered between 460 cusec to 1,000 cusec (supplied by India) from 16th May to 15th October during the rainy season. In winter season (16 October to 14 May), 150 cusec is provided continuously.

Prior to the implementation of the participatory management program, the World Bank assisted the irrigation system development from 1984 to 1989 in the first phase.

In the first phase, the aim was to irrigate 4,600 hectares of land, but this couldn't materialize.

1.1 Situation Prior to the Implementation of Participatory Management Program

a) Water control

The main tributaries supplying the reservoir are the Seti and Mahakali rivers. In India the Mahakali river is known as Sharada.

The source of this irrigation system is on the Mahakali river. Water to the tertiary canals from the Sharada canal flows at the rate of 30 liters per second. The water is supplied from India to Nepal.

b) Water division

The canals of this project are divided into four branch canals. Water supply is continuous.

c) Water distribution

Water flow in the main, branch, and tertiary canals was uninterrupted so long as it was not blocked by the Indian government. Certain technical problems in some tertiary canals caused them to remain dry.

d) Repair and maintenance

Prior to the implementation of the irrigation management program, cleaning, repair, and maintenance works on the main and tertiary canals were under-

1 *WUO Mahakali Irrigation Project.*

taken by the irrigation project itself. Cleaning of the main, branch, and tertiary canals was done by the irrigation office.

e) Resource mobilization

Before implementation of the joint irrigation management program, resource mobilization for the repair and maintenance works on the canal were done through government funds.

f) Resolving disputes

Punitive measures from the local administration was the only way for resolving disputes.

g) Crops

Summer crops: Paddy, and Maize

Winter crops: Pulse, and Peas.

2. Formation of Water Users Group (WUG)

WUG refers to the committee formed by water users in the command area to streamline water use.

2.1 Procedures of Formation

First, an outlet leader is chosen from among the users. A chairman and member-secretary are chosen for the tertiary - totalling seven members.

The selection of officials is made on the basis of a consensus at the lower levels, and if necessary, through secret ballotting at the higher level (association level).

Some rules have been decided upon through the WUG and the general meeting of the farmers. The tertiary committee rules are similar in most respect but the amount of penalties and enforcement patterns vary. Whatever it may be, the main objective of WUG has been to generate farmers' participation and conservation of public property.

2.2 Canal Operation, Repair, and Maintenance

a) Canal operation

WUG is operating the canal in the tertiary area only. It arranges for water supply when needed; otherwise the water is turned back to the branch canal. The operation of the branch and main canal is done on the basis of understanding between the irrigation office and WUG.

The main canal committee was formed on 8 Magh, 2048, and so it doesn't seem to have taken up its full role. Water is supplied to each outlet at least once a week for a maximum period of 24 hours.

b) Resource mobilization

The users have had to supply their own tools and equipment while carrying out canal clean-up works. This is because WUG has no funds to carry out such works. So far, the users haven't had to contribute labor on the branch and main canal. Voluntary labor is the only resource mobilized at this time.

c) Repair and maintenance

The users group, having just been formed two months ago, hasn't become active in undertaking repair and maintenance works on the canal. The repair and maintenance works on the branch and main canal is still being done by the irrigation office. All repair works on the tertiary canal is done by the WUG through the general participation of the users.

There is no control along the canal banks because of political pressure from the administration as the local elections are coming up.

WUG is supposed to receive 25% of the revenues for repair and maintenance works according to the irrigation regulation of 2045, but the tertiary committee formed since then is still without any funds.

d) Role, responsibility, rights, penalties

WUG has played a significant role in devising equitable distribution of water, carrying out repair works, and taking up resource mobilization works. Its responsibility is to resolve disputes related to water and irrigation facilities. Its rights are limited to the 2045 BS regulations. It hasn't been effective in collecting penalties from rule violators.

e) WUG's influence

Irrigation management has somewhat improved with the formation of WUGs. The tertiary committee distributes water in rotation to each outlet for irrigation purposes.

The members of WUG being farmers work for the benefit of all farmers.

Continuous flow of water in the canal can be achieved only if the 1920 AD treaty with India is discarded.

Now new techniques have been taken up in the operation of the canal.

As far as possible the WUG tries to settle most of the disputes, but some remain unresolved.

Improvements have been concentrated at the tertiary level, but no such works have been done effectively in the main and branch canals.

The MIP pilot farm distributes seeds and plants exhibition plots. It has roused agricultral growth in the command area. Agricultural production has increased by 10% annually with three crops a year.

There is a provision of including the chiefs of MIP in the repair and maintenance section and MIP pilot farm in the users group. The project chief of the MIP is an honorary member of the coordination committee. These factors help in fostering not only good relations between the users and the office but also speedy solution to difficulties and problems of the farmers.

3. Conclusions

3.1 Lesson

a) Inculcation of working unitedly.

b) Ability to punish rule violators.

c) Development of a cooperative attitude.

d) Development of will power and self-control..

e) Conservation of public property.

f) Realization that damages to public property lead to problems for oneself

g) Capacity to find solutions to one's own problems.

3.2 Problems

a) Lack of water in some sub-branch canals.

b) No repair work has been under taken in the haphazardly constructed drainage system.

c) Water over-flowing the main canal.

d) Water wastage because the weldings on the tertiary canals are not opened.

e) Control over unauthorized pipes given by the project employees, before the implementation of the participatory management program.

3.3 Recommendations

In order to make the participatory management program more effective and successful the following are needed:

a) WUG must be provided the 25% fund for maintenance works as provided by the 2045 B.S. irrigation regulations.

b) Penalties on rule-violators should be realized together with water tax as a part of government revenue.

c) WUG must also be a part in the discussion with India on the closing of the canal for one month every year.

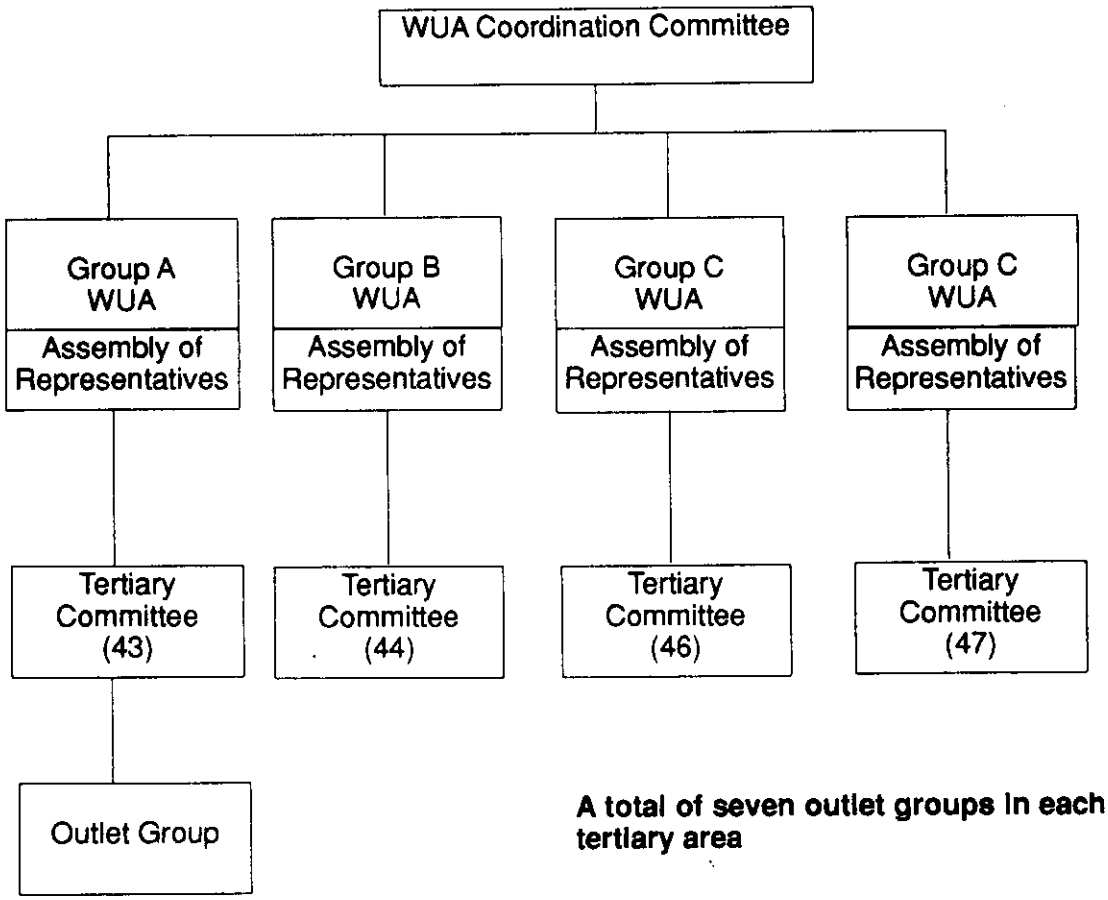
d) The WUG must be given the authority to initiate repair and maintenance works or direct the irrigation officers to do so.

e) Disbursement of 5% of funds, instead of the earlier provision of 25%, to the tertiary committee so that they can include branch and main canal for repair and maintenance works.

f) The budget for construction, repair, and maintenance must be spent only at the recommendation of the WUG. Funds for the command area must not be diverted. WUG must be given the right to evaluate the construction or improvement works done by the office and to send its report on such works to the irrigation department or the ministry.

It is felt that if these conditions are fulfilled, within two years, Kanchanpur is sure to make great progress.

Organogram of WUO in MIP



Participatory Management-Farmer's Viewpoint

Raghunath Bhatta[1]

1. Introduction

Irrigation facilities have been provided by Mahakali Irrigation Project (MIP) for 4600 hectares of Suda-Sisaiya, and some areas of Mahendranagar municipality. The construction started in 2028 B.S., with its completion in 2046 B.S. The irrigation management program was implemented from 2046 B.S.

1.1 Situation Prior to the Implementation of Irrigation Management Program

a) Water control

The main canal was constructed from the Banbasa barrage built by India, based on the Indo-Nepal treaty of 1920 A.D. The flow capacity varies between 460 to 1,000 cusec in the rainy season and reaches a low 150 cusec in winter season. Permission for closing the gates has to be sought with the Indian government.

b) Water division

There is no specified criteria for water division. Water supply in the main canal is provided according to the agreement with India. In the branch canals it is divided into four blocks. From the branch canal to the tertiary, 30 liters of water per second is supplied. There are seven outlets in the tertiary. The number of outlets in each tertiary is not fixed. In some places tertiaries have been constructed directly from the main canal.

c) Water distribution

Water was distributed from the main canal into the contractor-built canal. The amount of water required and land area were not taken into consideration.

d) Repair and maintenance

The irrigation office carried out repair and maintenance works on tertiary or branch canals prior to the implementation of the irrigation management system.

e) Resource mobilization

The irrigation system's construction has been carried out with the cooperation of the World Bank. Resource mobilization was done by the MIP.

1 *Chairman, WUG, Mahakali Irrigation Project.*

f) Solving disputes

Without any fixed rules and regulations for water distribution, disputes arose between water users. Farmers even quarrelled with employees of the MIP. There was no effort on anyone's part to search for a reasonable solution.

g) Crops

The main crops are paddy and corn in the rainy season, and wheat, mustard, pulse, peas, and etc. during the winter.

2. Formation of Water Users Group (WUG)

2.1 Procedure and Criteria

A tertiary committee is formed from users in the tertiary or outlet command areas. The tertiary committee is comprised of a chairman, secretary, and members. The tertiary committee chairmen constituted the branch canal association. All the chairmen of the branch canal association constitute the main canal coordination committee. This committee prepares policy and regulations to be enforced within the command area, being acceptable to all users.

The users' meeting usually selects the officials for the canal committee at the outlet and tertiary levels. In the branch and main canals, elections were resorted to for electing the executives. If a consensus cannot be reached among the farmers, then secret balloting is undertaken.

2.2 Decisions Made by the Users' General Meeting

The tertiary committee is the basic group in the hierarchy of MIP. Decisions made by the tertiary committee are as follows:

a) Persons grazing their cattle on the canal are to be fined Rs.100. Cutting of the canal in unsystematic way carries a fine of Rs.50. A fine of Rs.50 for those not following the water distribution timetable, and a Rs.35 fine for those not contributing labor for cleaning the canal. Every tertiary has its own set of rules and regulations. Funds raised are deposited in the tertiary group's name.

b) The AO program conducted by the farmer organization division of MIP gave the users information regarding water users association (WUA) and the WUG for irrigation management. The role they played was appreciable.

2.3 Canal Operation, Repair and Maintenance

a) Repair and maintenance

It refers to the reconstruction of damaged portions of the canal and its supervision.

The main and branch canal committees have been constituted only since Magh 12, 2048 B.S. No major decisions or works have been undertaken. Repair works on the tertiary canal have been done by the tertiary committee

b) Canal operation

It refers to the continuous flow of water in the canal and water distribution to the users according to need.

The tertiary canal operation is carried out by the tertiary committee concerned. No major steps have been undertaken, since the association and coordination committee have only been recently formed.

- **Water distribution chart**

  Water distribution is being designed so that there is no adverse effect on the users. The main canal committee, while preparing the chart, gave a full supply of water to groups A and C, and B and D in the winter season. In the rainy season all groups received water equally. In every tertiary there are seven outlets. Water distribution will be based on land area in the future, but this isn't practical at this time.

- **Farmer-irrigation office ties**

  A committee has been formed at the main canal level to enhance cordial relations between the irrigation office and the farmers. It is known as the water users association coordination committee. Its function is to make the irrigation office undertake construction projects, which the farmers aren't able to do by themselves. Farmers provide labor for these activities.

  To promote good farmer-irrigation ties, the chiefs of the MIP repair and maintain the canal. The Agricultural Pilot Farm staff are honorary members of the main canal coordination committee. This helps in resolving problems on a timely basis.

- Resource mobilization

  The committee has no funds for canal operation. The users did not contribute labor for main and branch canals, but in the tertiary area the farmers, using the group as a medium, make voluntary labor available for cleaning, repair, and maintenance works.

- Repair and Maintenance

  For the two months the main committee has been together in the MIP, it hasn't been able to get the farmers to contribute labor. Presently, the repair and maintenance works on the main and branch canals are being carried out by the irrigation office. But in the tertiary area such works are done by the users themselves. In the future such works are to be conducted completely by the users.

c) Resource mobilization

According to irrigation rules 2045 B.S., the WUG was to receive 25% of the revenues collected as water levy, but that hasn't been made available so far. The tertiary committee has collected funds through rough penalties levied on defaulters. In some areas the rules haven't been effectively enforced.

d) WUG'sinfluence on present irrigation program

WUG's influence has increased because of the implementation of the water distribution time-table and controls put on haphazard distribution of water. The feeling of cooperation among the farmers has increased.

Water flow is uninterrupted as long as the Indian government allows it.

e) Management

The WUGs in the MIP fix water distribution according to the land area.

f) Crop production

Production has shown remarkable increases.

3. Conclusion

3.1 Lessons

a) Working collectively benefits the farmers.

b) Control is easy for those who don't do their part.

c) Protecting oneself through self-control and will power.

d) Protection of one's own wealth and property.

3.2 Problems

a) Water supply is not sufficient in the tertiary.

b) Cleaning works are incomplete.

c) Water overflows the main canal bank.

d) Winter crops are destroyed because the welding on tertiary canal gates wouldn't open.

e) Distribution of pipes on various tertiary and branch canals are provided by the irrigation office.

f) Uneven terrain.

3.3 Expected Support from Irrigation Office

Cooperation is expected in solving big problems, and in providing financial support for buying expensive equipment and technical assistance.

Participatory Management in Banganga Irrigation System: Farmers' View Point

L.P. Kurmi[1]

1. Introduction

Banganga Irrigation System developed when a dam was constructed on the Banganga and Kaila rivers. It lies in Kapilvastu district. The length of the canal from Laxmanghat dam to Jakhira (lake) is 5 kilometers. A reservoir covering an area of 165 hectares has been constructed near Jagdishpur village. A 20 kilometer long main canal has been constructed from Jagdishpur to Kopawa Somdiha. Five distributary canals were built: Bilaspur, Birpur, Pipri, Bakodkaha, and Baidauli. Between 1 to 62 main MFD canals have also been constructed. This canal has provided irrigation facilities to 16 village development committees (VDC). The canal from Jakhira lake passes through a number of villages: Baidihuli, Nirgalihawa, Srinagara, Ramapur, Shivapura, Thumuwa, Rughaula, Gobari, Tilaura, Sikaurawa, Jamuhara, Malshara, Kaudauha, Pipri, Gotihawa, Shivpura, Bhatchariya, Baskhor, Madhyanagara, Budapur, Sultanawapur, and finally arrives at Kopawa Somadiha. The total command area of the canal is 6,000 hectares of land.

1.1 History

The Banganga canal dam was constructed in 2028 B.S. as a government project. The total area of Jakhira was only 65 ha. By 2043 B.S., its area was increased to cover 165 ha. The command area development project was implemented in 2039 B.S. prior to the construction of the canal. Under the participation of the local farmers, irrigation facilities were made available through the Raj Kulo from Laxmanghat to Baskhor Materiya.

Conditions that prevailed prior to the implementation of participatory management program are as follows:

a) Water management

The employees of the project had the responsibility of supplying water from the dam to Jakhira and from there to the main and branch canals. Farmers didn't participate in this operation. Sometimes, the chiefs of the federation were called to the project office for meetings. Attendance at such meetings were minimal. Only 8 or 10 chiefs would attend meetings out of a possible 28. Allocation of water was decided upon but work on implementing it often failed. A water distribution chart was prepared but not everyone was aware of it.

b) Water division

Water was released from the main canal into the branch and sub-branch canals by employees from the project office. The division of water was based on land holding, but it effect it wasn't so. The lack of proper gates on branch canals and MFD allowed illegal diversion of canal water by farmers of

1 *Chairman, Shivpura Water Users Group.*

Daldalha, MC 38,39,36, and Laxminagar branches in the lower lying areas, who were deprived of water. Good relations with the employees of the project could be rewarded by adequate supply of water. Water for irrigation wasn't requested for by the farmers in general or collectively. Water division was done haphazardly. The farmers had no idea about the water distribution chart.

c) Water distribution

Rules were not made for the distribution of water from the main canal. farmers, on an individual basis, used the water flowing in the main canal. There was no control on the proper use of the water supplied. Influential farmers forcefully used the water for their own purposes. Farmers had their own basis as to who would have the turn to utilized the water for irrigation purposes. The distribution of water from the canal did not depend on meeting the collective demands of the farmers. Lack of proper repair and maintenance of the canal also effected the distribution of water.

d) Repair and maintenance

Depending on the project's budget allocations, repair and maintenance works were carried out in certain parts of the main canal and distributary on a contractual basis. The MFD, FD canals were repaired by farmers themselves. But, such works were not carried out on a regular basis. The repair and maintenance works carried out were negligible. This was the case with the diversion and other canals, resulting in decreased capacity.

The reason for their negligence was that being a government project the farmers felt it to be the government's job to carry out repair and maintenance works.

e) Resource mobilization

Farmers did not participate in resource mobilization. The repairs works were carried out from the resources of the project, depending on the budgetary allocation. Some farmers had contributed labor for the construction of Kulos (mini canals).

f) Solving disputes

There were no formal meetings to discuss and resolve disputes relating to water and the canal. Disputes within the block and sub-branches relating to irrigation were decided according to the desires of the influential and rich farmers. These disputes sometimes lingered on.

g) Summer crops

The main crop is paddy. There are two paddy varieties; (i) Wosan - is planted from the 2nd week of Asadh to 1st week of Srawan. The harvesting is done normally in the second week of Ashwin. (ii) Zadan - is planted between the 1st week of Shrawan till the 3rd week of Bhadra. The crop is ready for harvesting from Marga to Poush.

h) Winter crops

After the Wosan paddy, mustard, potato, and peas are planted; these are followed by onion and garlic. Generally, after zadan paddy, wheat, gram, pulse, and peas are planted.

2. Formation of Water Users Group (WUG)

2.1 Procedures for Forming WUG

First of all, the employees of the Banganga Irrigation Project (BIP) visited the farmers at their houses or in their fields to disseminate information about irrigation management. Information was also given about the procedures for the formation of WUG, its importance, rights, responsibilities, and duties. Farmers were informed of their responsibility for the repair and maintenance works of the MFD, while the main canal's responsibility lay with the government (canal office). Descriptions were given of canals being operated by the labor and resources of farmers in other districts. The example used was of Pithuwa canal in Chitwan. After hearing this information, formation of WUGs took place.

2.2 Basis for the Selection of Officials for WUG

a) A WUG consists of five to nine members depending on the village, its resources, and block area.

b) The person has to be a user within the WUG.

c) Be a permanent resident of the village.

d) Have experience in social works or trusted by the gathering.

e) Have the ability to enforce rules and regulations, carry out repair and maintenance operations, and resource mobilization works.

f) The majority's choice was agreed upon.

2.3 Regulations Prepared by the WUG and Farmers

a) Policy and rules were formulated for the functioning of WUG.

b) Division of the group's works.

c) Rules and regulations concerning duties and responsibilities.

d) Fixation of fines for users who absent themselves from works.

e) Fines fixed for those who damage the canal or steal water.

f) A fine was fixed for each cattle to control cattle trespassing.

g) Timing for meetings.

h) Fixing the term of office of WUG members.

2.4 Role played by the employees of Banganga Irrigation Office, & International Irrigation Management Institute in the formation of WUG

a) Explained the WUG's significance.

b) Gave information concerning the government's and farmer's separate responsibilities regarding the canal.

c) Trained the farmers individually or collectively.

d) Aided in the demarcation of each group's area.

e) Extended help while forming WUG and its policy, rules, and regulations

f) Helped prepare a user list and user area.

2.5 Canal Operation, Repair and Maintenance

a) Canal operation

The WUG is invited to a meeting at the irrigation office prior to releasing water in the canal. The group aids in preparing the water supply chart. The WUG provides the following:

- Information on planting.
- Agreement and decision on which branch or block is to be supplied with water first.
- Decisions for the turns by which farmers are to receive water, informing the farmers on receipt of the water distribution chart.
- Information about any farmers stealing water against the water distribution chart. They help the irrigation office and farmers solve problems in their field and simplify water distribution.
- Demand water according to necessity with the irrigation office.

b) Repair and maintenance

The WUG mobilized its own resources for the cleaning, repairing, and maintenance works in the branch and sub-branch canals. The WUG has fixed a plan to complete these works before planting the summer crops and again before planting winter crops.

Farmers have been fined for damaging the canal or illegally using canal water. This measure has discouraged such action on the part of farmers.

Free grazing by cattle has not only damaged the canal but also standing crops. Levying of penalties on farmers concerned has reduced such tendencies.

2.6 Role, Responsibilities, Rights and Penalties

Irrigation management rules and regulations have been formulated to solve problems relating to irrigation by the general meeting of the farmers. The WUG's job is to implement such decisions. If the group is unable to implement them a mass meeting is called to discuss and find a reasonable solution. A mass meeting is called if amendments are to be made in the existing rules and regulations. The WUG has the responsibility to simplify water distribution, canal repair and maintenance, and mobilization of resources. The WUG has a right to water distribution. It has the right to impose fines. It also has the right to request water from the canal office.

a) The group has been unsuccessful:

- In controlling free grazing of cattle
- In the collection of fines
- In water distribution

b) Reasons

Implementing controls on free grazing of cattle could lead to other social problems. There is a fear of reprisals.

Voluntary labor on the basis of land area was protested by the large landlords (zamindars). A verbal agreement was reached this year to contribute labor on a house number basis, but next year it will be on a land area basis.

There was a problem of water division in the Laxminagar branch, Bilaspur distributary, Hathihawa branch, etc. but they were solved by calling a meeting of the farmers concerned.

Realizing penalties for leaving their cattle stray was done with the active cooperation of the irrigation office.

2.7 WUG's Influence on Irrigation Program

The formation of the WUG has influenced the irrigation program in the following areas:

a) MFD and FD canals were cleaned and repaired through voluntary labor.

b) Repairing and cleaning of the MFD and FD canals has facilitated the distribution of water. Water supply to the extreme end of the canals has been possible.

c) Distribution of water on demand, on individual basis, or by local leaders did not result in equitable distribution. After the formation of WUG, the water distribution date is made known to the users and they can demand water directly from the group itself.

d) The water distribution chart is made public to all and with everyone's participation.

e) Awareness has developed that participation by the farmers in canal related works provides a feeling ownership.

f) The power of unity has been realized among the users.

g) The users have developed the system of resolving problems and difficulties through discussions during general meetings of the users.

h) The tendency toward illegally taking water from the canal has diminished.

i) Discussions and sharing knowledge or information among the farmers and irrigation office-farmer has developed.

j) Good ties now exist between WUG and irrigation office employees.

k) Free and frank discussions about irrigation related problems is done with the irrigation office employees.

2.8 Solving Disputes

A system has developed by which if any irrigation related dispute arises, then as far as possible a settlement is to be reached in the village itself. If this is not possible, then the help of irrigation office is taken.

3. Conclusion

a) Participatory management program has led farmers toward working collectively, irrigating their fields, mobilizing local resources, being disciplined, and being self-reliant. The idea that it's government's responsibility to do the cleaning, repairing, and maintaining of the canal has ceased. The farmers have learned to solve problems through discussions among themselves, but the importance of the group hasn't been fully understood.

b) Problems were raised when some users did not contribute voluntary labor. Such problems were solved in Tilaura, Gobari, Mahuwa, and Gotihawa through the active participation of irrigation office chief and IIMI staff.

c) Cooperation expected from the Banganga Irrigation Office was for repair and maintenance works on big structures, and supply of hume pipes.

3.1 Recommendations

a) Water must be distributed during the bean season (Falgun to Jestha), so that farmers can benefit from vegetable farming.

b) Water supply should be provided every fifteen days or less for paddy, especially in villages like Shivpura, Materiya and others.

c) Division in the responsibility for the cleaning, repair, and maintenance of the canal must be arrived at between the office and the WUG. To give such works to contractors is not reliable.

d) If water is released in the branch or blocks with the mutual consent of canal employees and WUG, then the water distribution system could be made more effective.

e) Water must be distributed through the office on request from the WUG.

f) Necessary suggestions and support from the irrigation office must be continued.

g) For dealing with irrigation management problems, the irrigation office could arrange a training program for the farmers.

Participatory Management in Banganga Irrigation System: Farmer's Viewpoint

B.M. Kurmi[1]
L.P. Kurmi[2]

Conditions prevailing prior to the implementation of participatory management program.

1. Introduction

Banganga irrigation system lies in Kapilbastu district of Lumbini zone in the far-western Development Region of Nepal. Before the implementation of the Banganga Command Area Development Project (CADP) the farmers of the area contributed labor to bring water for irrigation purposes from the raj kulo. Irrigation facilities were used by 16 mauja (limited areas), including Shivapura, Rughaula, Gobari, Tilaura, Shivagarh, Derawa, Jamauri, Sikatawa, Sudwa, Chhotaki, Taulihawa, Mahuwa, and Kudan. But the area of land irrigated was not extensive. In the feudal (Zamindari) system, water division and distribution was done according to the mauja. In some places, ponds were filled with rain water or with water from the raj kulo. This water was used for irrigation purposes when necessity arose. Every mauja had a badghar who made the farmers contribute voluntary labor for cleaning, repair, and maintenance of the raj kulo. Water division was done by the badghar on the basis of labor contributed by the farmers. Influence peddling and stealing water was common. Disputes were settled by the raj kulo subba (official). If disputes could not be settled according to the system, the bada hakim made the decision.

In 2029 B.S. the canal division of the irrigation department, His Majesty's Government, constructed the present canal system - inclusive of the raj kulo.

A dam was constructed at Laxmanghat on the Banganga and the water was diverted to a lake about 5 kilometers away. A 20-km long main canal was then constructed southward to the border of India. There were some branch and sub-branch canals. After the construction, canal operation, division, distribution, repair and maintenance, and supervision works were completely looked after by the canal division.

With Asia Development Bank (ADB) and HMG's Irrigation Department, the Banganga Command Area Development Project (CADP) was implemented in 2038 B.S. Under this program, the construction of embankments at Laxmanghat headworks, enhancement of Jakhira's capacity. Construction of many main outlets in the main canal, field channels, various structures, field-men quarters, go-down, and roads were also carried out. This project covered an area of 6,000 hectares and benefitted 16 village development committees. During the project period water users groups at various levels were formed. The WUGs were ineffective because:

- Farmer participation was not included in canal operation and maintenance works.

1 *Gobari Water Users Group.*
2 *Chairman, Shivpura Water Users Group.*

- While forming, the WUGs duties and responsibilities were not adequately defined.
- There was a lack of attention given to the social aspects.
- Sometimes members of the group did not belong to the block or did not own land within the block, and so they were indifferent to the canal related works.
- A water levy was enforced, but the group did not receive 25% of the revenue.
- Proper coordination between the irrigation office and the farmers was lacking.
- The water distribution chart was prepared by a limited group of WUG chairmen.
- No incentive was given for crop diversification.
- Farmer suggestions were not listened to.
- Group programs relating to irrigation management were not provided.

a) Water control

The supervision of Laxmanghat head works, opening and closing of the diversion canal gates, supervision of Jagdishpur reservoir (Jakhira), release of water from the reservoir into the main canal, release of water from the main canal into branch, tertiary, and main outlets, etc. were done by the supervisor, dhalpa - gate operator of the office. A farmer in need of water, when water was flowing in the main canal, would open the gates of the main outlet or the branch canal or block the main canal with mud in order to bring water to his field. Collective voluntary labor to bring water to the branch or tertiary canal was unknown.

b) Water division

Water division from the main canal into the branch, sub-branch, and main-outlets was not done on any grounds. The irrigation office had no set rules for water division. The amount of water to be released in each branch or sub-branch canals was not fixed. But, on the farmers request, the water supply was increased. As most of the main outlets had no gates, there was a regular flow of water towards the upper regions of the main canal.

c) Water distribution

The water distribution chart was prepared before the planting season. Very few federation chairmen took part in its preparation.

Water distribution was based on the area of land. When the water supplied was insufficient the farmers damaged the gates or dropped the check gates to steal water. Influential farmers had the optimum use of water for irrigation purposes.

d) Repair and maintenance

Repair works on the main branch and sub-branch canals were done by the office itself.

The WUG or the farmers did not participate in repair or maintenance works, so they felt no responsibility and considered it to be a government project. The government raised the water levy so the farmers' expectation was for water availability only. Sometimes field channels were cleaned for bringing water to one's field.

e) Resource mobilization

All repair and maintenance works on the canal were done by the Banganga Irrigation Office through government funds. There was no mobilization of resources for repair and maintenance works on the part of the farmers.

f) Solving disputes

Disputes between the farmers and the office and among farmers themselves were common towards the extreme end of the canal. Settlement of disputes by a meeting of the farmers was uncommon. First the dispute was taken to the irrigation office, and if no solution was found, then it was forwarded to the district administration.

g) Crops

Rainy Season: The main crop is paddy. Two varieties of paddy is produced; wosdhan and zadan. Wosdhan is planted within the first two weeks of Ashadh and the crop is ready in Ashoj. Zadan is planted during the first two weeks of Bhadra and it is ready in Marga-Poush.

Winter Season: The main crops grown are wheat, mustard, pulse, peas, and potatoes.

2. Formation of Water Users Group (WUG)

2.1 WUG Formation and Structure

A meeting of all the users within the sub-branch, tertiary canals, and field channels was held to choose the WUG officials. The groups' formation was done in two ways: on a village basis and canal construction basis. The WUG consisted of the chairman, vice-chairman, secretary, members, and peon. The number of WUG officials was based on the work load on the canal, and varied between five to ten in number. The WUG formation was initiated from 14 Bhadra 2048. At present, 13 WUGs have been installed.

a) Duties and responsibilities

- Supervision, cleaning, repair, and maintenance of the sub-branch, tertiary canals, and field channels through voluntary labor.
- Proper division and distribution of water provided by the irrigation office is in accordance with the water distribution chart to the sub-branch, tertiary canals, and field channels.
- Cooperate with the irrigation office in preparing the water distribution chart.

- Call for adequate voluntary labor.
- Find solutions for disputes regarding water supply.
- Request water, seeds, and fertilizer when needed by the farmers from the irrigation office.
- Maintain coordination between the irrigation office and the farmer.
- Prepare a record of the users.

b) Selection of WUG officials

A WUG official must:

- be a water user
- be a permanent resident farmer in the area
- have the goodwill and respect of all the farmers
- be a social worker and development-oriented
- be experienced in irrigation management
- be able to mobilize local resources
- be able to offer the right sort of leadership.

c) Irrigation regulations

- Provision of penalties for resorting to illegal means to take water. The penalty rates differ from group to group e.g: from Rs. 25 to Rs. 100 in Bilaspur, Semari, Tilaura; Rs. 10 to Rs. 100 in Shivapura; Rs. 300 to Rs. 500 in Gotihawa.
- If a user fails to contribute voluntary labor for canal cleaning and maintenance works a cash fine equal to one days labor is collected, or he has to contribute double labor the next day. One day's labor in cash terms is equivalent to Rs 25 per person in areas under Bilaspur, Semari, Shivapur water groups, while it is Rs 30 in areas under Gobari, Talaura, Gotihawa water groups.
- If a farmer is in great need of water, but he has no field channel or outlet, then the WUG carries out inspection works to mark the point for an outlet.
- Some WUGs have fixed voluntary labor in terms of the land area of the user concerned. A user with over two bighas of land has to provide one person every day. Users with less than two bighas of land have to provide one person every alternate day. For land areas below 9 kathas, one person every two days has to be provided.
- If a user defaults in following the irrigation management regulation he is liable to be fined Rs. 25.
- Grazing of cattle on the branch, tertiary, and field channels is prohibited, and if it is done then there is a provision of penalties for such. The penalty rate varies from Rs 5 to Rs 30 per animal.

2.2 Assistance from Irrigation Office Staff

a) Role of Banganga Irrigation Office

The office chief is provided with knowledge about the responsibilities of the farmers in participatory management, and the duties and responsibilities of the irrigation office. He is also given information regarding the duty, responsibilities, and rights of the WUG. Such information was provided during a meeting of farmers in each village while forming the WUG.

The office assisted the WUG and the farmers in preparing irrigation regulations. It also helped in solving disputes by calling a meeting of the WUG and the farmers; e.g. in Gobari group the case of cutting the main canal, and cutting of the embankment in the branch canal of Basantpur and Hardihawa.

The International Irrigation Management Institute (IIMI) has played a significant role in visiting every farmer and conducting discussions individually or in groups regarding certain problems. They have explained the importance of farmers in participatory management, and what the WUG's duties and responsibilities are.

IIMI also helped the WUG and the farmers during the formation of WUG. They aided the WUG to organize for cleaning and repair works on the canal, resolving disputes, preparing policy and rules for irrigation management, collection of fines, and account management.

IIMI has helped create a good rapport between the irrigation office staff and farmers. It has aided the WUG prepare an inventory of the users, and a list of their land areas in every field channel, tertiary, sub-branch, and main outlets under each group. It has shown the importantce of taking attendance of WUG officials, writing the meeting decisions, and making rules on income-expenditure.

2.3 Canal Operation, Repair and Maintenance

a) Canal operation

All the WUG chairmen are informed by the Banganga irrigation office before the planting season to prepare a water distribution chart. This year, before planting the winter crop, a maximum number of WUG chairmen and some active farmers participated in the joint meeting to discuss the water distribution chart. Thirty eight participants helped prepare the chart. The decisions made on the chart were provided to every WUG chairman. The WUG then informed all the users regarding the water supply chart. The decision regarding the basis for the supply of water and its amount in each outlet was made later.

Coordination between farmers and BIS in water distribution are as follows:

- The water distribution chart was prepared with the participation of the maximum number of farmers, WUG chairmen, and BIS chief.
- All the users have been informed of receiving their water supply according to the chart.
- A farmer who has not received water makes a request for some with the WUG, which forwards such requests to the irrigation office. The irrigation office after careful study of the appropriateness of the demand provides water.

- Sometimes, if there is shortage of water in the tail of the main canal the irrigation office staff will ask the farmers in the source area to allow a supply of water to reach the far end. This understanding is on the rise.
- The users have developed the ability to discuss matters relating to water with the BIS employees.
- Supervision of the total length of the canal is made by the office chief, supervisor, and dhalpas. Sometimes, the overseer also undertakes supervision works.
- At times, a misunderstanding is created between the BIS staff and the farmer; e.g. when the checkgates are closed and the water diverted goes into the wrong field.

b) Repair and maintenance

The WUG mobilizes labor for cleaning works on the canal, supervision of works, and when and where to start works. Attendance records are kept for those contributing labor. Penalties are imposed on those not abiding by the irrigation rules and regulations.

c) Resource Mobilization

Since the formation of the WUG, a total of 41 kilometers of various sub-branch, tertiary, and field channel were cleaned through voluntary labor. Persons numbering 3000 contributed voluntary labor, which is worth RS 96,276, at the rate Rs 32 per person per day. The WUGs of Bilaspur, Sukhrampur, Gobari, Tilaura, Gotihawa, Shivapura, Laxminagar, Semari, Sadwa, Mahuwa, Dalpur, Hardihawa, Lamtiha, Bhader, and Ganeshpur participanted in these maintenance activities.

Nineteen meetings for canal operation and 19 meetings for repair and maintenance have been conducted by 6 WUGs of Bilaspur, Semari, Tilaura, Gobari, Shivapura and Gotihawa. The 38 meetings were attended by 426 persons - the equivalent to labor worth Rs. 13, 618.

2.4 Role, Responsibilities, Rights and Penalties

The responsibilities and rights given to the WUG by the farmers are:

- To take action against those users who damage the canal, steal water or let their animals graze on the canal.
- To mobilize local resources and use it for carrying out repair and maintenance works on the canal; and impose penalties or take necessary action on those who don't contribute labor.
- To meet with the farmers to finalize programs for carrying out cleaning, repair, and maintenance works on the canal.
- To solve disputes regarding water use and call a meeting of the users if the dispute can't be settled.
- To present an annual report on the farmers meetings regarding repair and maintenance works needed, and if such works are not feasible

through voluntary labor then the irrigation office is asked to provide financial and technical assistance.

- To present the annual income-expenditure report to the general meeting.
- To coordinate relations between the farmers and the irrigation office.
- To introduce new crop varieties and cropping patterns, and to request the office concerned for the necessary seeds, fertilizer, etc. according to the farmers requirements.

a) Penalties

Some rules for irrigation management through the WUG have been implemented but some haven't worked perfectly. The area where implementation has been satisfactory is in collection of fines, totaling Rs 2305/ from users not contributing voluntary labor, breaching the canal, and unauthorized grazing of animals on the canal. This system has been successfully applied in WUGs of Laxminagar, Gobari, Tilaura, Gotihawa, Shivapura and Sukhrampur.

Full enforcement of rules to curb grazing of animals on the canal and stealing water hasn't been possible. The reasons are: enmity develop with WUG officials if penalties are imposed, threats to burn down WUG officials' houses, cattle stealing etc., and for example, in Laxminarayan the WUG chairman's brother was beaten up.

2.5 WUG's Influence

The sub-branch, tertiary and field channels have been properly cleaned with voluntary labor. This has facilitated water flow throughout the length of the canal. Now, it takes three days for the water to reach the tail; before it took 15 days.

A maximum number of farmers and WUG chairman have participated in preparing a water distribution chart. The farmers are also aware of the chart and its importance.

The office concerned is made aware of the user's name and land area and the farmer's requirements regarding seeds, fertilizer, and water. This has helped the office in making timely arrangements. For example, Gobari, Tilaura and Semari were provided technical assistance for growing maize. The farmers were also provided with paddy and maize seeds and technical assistance from offices concerned on request from the irrigation office.

The irrigation office disregarded the influential farmers, zamindars (landlords) or local leaders, but respected collective requests or request made via the WUG.

Disputes regarding water are often settled by the WUG and if it's not possible then a meeting of the users is called to discuss it and impose penalties on the

defaulting party according to the rules prepared for irrigation management. If the dispute still remained unresolved then the help of the office was sought.

Planting winter paddy, maize, banana, and sugarcane has been undertaken from this year.

Water is being made available by the irrigation office according to the chart, but if the office is informed of inadequate water supply in any branch or sub-branch then alternative arrangements are made.

The farmers are aided by visits from the irrigation office chief to every village, solving various problems and difficulties at farmer's meeting. The farmers are also reaping exceptional benefits from collective resources through irrigation management.

Awareness regarding their own ownership of the irrigation system has developed among the farmers.

3. Conclusion

3.1 Lessons

a) It has made the farmers disciplined, self-reliant, and thorough.

b) It has taught the farmers to implement various rules and regulations, impose penalties, clean and carry out maintenance works through mutual cooperation and understanding.

c) They have learned the methods and basis for the preparation of a water distribution chart, when to fill the reservoir, when to release water, method of carrying out repair works, etc.

d) They have realized the importance of the WUG and the office concerned for assistance in getting financial and technical help.

3.2 Problems

a) There are big landlords in the area who don't want to contribute labor, who use large amounts of water, and do not want to contribute voluntary labor in terms of land area. This is causing hardships for the small farmers, and the WUG is not able to muster the necessary voluntary labor.

b) Uncertainty over the supply of water in the main canal has proved to be an obstacle to the WUG in the division of water in the area under its jurisdiction.

c) The biggest problem is the cattle grazing on the canal. They damage the canal and destroy standing crops.

d) There are reports of corruption. But they are without substantial proofs.

3.3 Assistance Expected from BIS

a) It is hoped that BIS will carry out repair works on the various types of gates, hume pipes and other structures on the canal.

b) Technical assistance for repair works on field channels.

c) As the rules and regulations for irrigation management has not been fully prepared, help from BIS is expected to strengthen and enforce them.

d) Regular meetings should be conducted with the office, WUG and farmers as participants, to discuss rules for water disputes, canal operation, cleaning, and repair works.

3.4 Suggestions

a) Equitable division of water according to the water distribution chart is not possible because the condition of the checkgate, gates on the branch, sub-branch, and tertiary are very poor. Proper management of the canal must be done with the WUG and the office jointly.

b) Assistance from the office must be provided for the formation of rules deemed necessary for irrigation management program.

c) At present the WUG is not capable of taking up all the responsibilities regarding canal operation, repair and maintenance.

d) Assistance and coordination from various agriculture related agencies will be given to the WUG, if the farmers decide to try new crops.

e) Educational tours to better managed irrigation systems must be arranged for WUG officials. Training programs must also be arranged to bring about a gradual improvement in the group's efficiency.

f) To make the WUG efficient and stable help from the irrigation office is needed to register it.

Issues and Concepts Related to Participatory Management: The Context for Nepal

Ujjwal Pradhan[1]
Alfredo Valera[2]

1. Introduction

In this paper, we would like to provide some background information on existing Nepali legal documents and policies that pertain to participatory irrigation management. We then try to tease out some of the critical issues regarding participatory management.

1.1 Policy and Legal Background

The Approach to the Eighth Plan (1992-97) produced by the National Planning Commission in November 1991 states that "the growing income and wealth inequalities in the face of meager economic growth has pushed more people below the poverty line. Between 8 and 9 millions of the total population are estimated to be below the poverty line and deprived of the basic minimum needs for human living. Population growth has outpaced the increase in food supply resulting in a declining per capita availability of food grains."

The government of Nepal views improved irrigation management as crucial to its rapid development program. Above all, it has chosen to focus on the users of irrigation systems as key elements in helping the government achieve its highly ambitious of having some of the largest farmer managed systems in the world, responsible for over half the country's irrigated area, better management is now being viewed in terms of progressively reducing the role of the state and enhancing farmer participation. In the same Approach to the Eighth Plan, a set of policies have been specified incorporating some sort of farmers participation. It outlines that "the management of large irrigation schemes is possible only if users are involved in the design of these schemes from the inception and planning stages. Therefore, it should be the norm for these projects to have user group participation early on. Locally available technologies and methods will be promoted in community irrigation schemes which will be constructed and managed by the users. Large irrigation schemes will be divided into smaller units for management of water and will be managed through a group of smaller, community units and organizations from within the command area for the collection of the water cess and for the repair and maintenance of secondary and tertiary canals."

In 1988, the Government introduced a Working Policy on Irrigation Development for the Fulfillment of Basic Needs, to facilitate urgent and effective action in the irrigation sector. This document provided new direction to Nepal's irrigation policy by mandating the participation of farmers at all levels of development, from project identification, design and construction to operation and maintenance of completed systems.

This new policy also reflects the government's acknowledgement of the relative success of existing farmer managed irrigation systems which constitutes a significant portion of Nepal's irrigated area. Studies have shown that farmers in Nepal are capable of constructing and managing irrigation systems 1000s of ha in area without government

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help. The Working Policy also spells out the sharing of costs by farmers in small and medium surface irrigation projects, STWs and deep tubewells.

This policy was to be implemented by means of two Action Plans - one for turning over some systems constructed and presently managed by the DOI to farmers for operation and maintenance, and the other to increase participation of farmers in the management of jointly managed systems.

The objectives of the Action Plan for Participatory Management program are "to share the system O&M responsibilities of large scale irrigation systems between the water users' organizations (WUO) and the irrigation agency. The decentralization of O&M responsibilities from the agency will attract the water users to actively participate in the improvement of O&M of sectors entrusted to them. This could be achieved by developing effective WUOs. The WUOs are strengthened by training their representatives and the water users thus enhancing their knowledge on participatory management. This will help the WUOs to assume greater O&M responsibility. This enables the agency to use allocated government resources on those works that WUOs are unable to carry out."

Nepal's difficult fiscal situation means that funds for operation and maintenance of DOI managed systems are also shrinking. With farmers sharing in these activities and in construction costs, the financial burden on the DOI is reduced. Overall, this policy facilitated a cost-effective solution to meeting Nepal's irrigation needs.

The various objectives of previous policy and action plan documents are currently being consolidated into a new irrigation policy document. The objectives of the proposed new irrigation policy (still in draft form) are:

i) to promote irrigation development that is cost-effective, economical, technically viable, institutionally and environmentally sustainable contributing to a reliable increase in agricultural production and productivity.

ii) to promote and support private sector development of irrigation development and expansion

iii) to integrate all support services crucial to irrigation expansion

iv) to maximize the involvement and participation of users so as to decrease government responsibilities in irrigation implementation and thereby promoting local resource mobilization and self-reliance.

v) to support personal and community efforts in irrigation development.

vi) to support and strengthen the capacity of other non-government and government agencies in irrigation development

There are provisions relating to contracts between the government and the WUGs, the types of systems for joint management, responsibilities and liabilities of both sides, sharing of resources by both parties, and guidelines for joint management are provided in this newly proposed irrigation policy.

The current irrigation regulations, directives, DOI directions (with reference and based on provisions made in earlier acts like the Canal, Electricity, and other related Water Resources Act 2024, Development Board Act 2013) pertain to the authority of irrigation officer, the procedures for irrigation distribution, formation of water users groups, associations, and coordination committee along with their functions, duties, and powers. Other provisions relating to water charge and incentives to WUGs in its collection, and licensing are also provided. The directives encompass provisions relating to registration of WUGs and eminent domain. Hopefully the proposed new Water Resources Act and the Regulations would also make provisions for mutual accountability

and rights of the WUGs. The Association Act has a legal recourse to possibly bringing about mutual accountability. However this has to be seen within the context of eminent domain. It is also hoped that there is institutional capacity within the goverment to implement and enforce these acts.

The proposed Water Resources act has a very important feature of setting up a hierarachy of water use rights. It also makes provisions for the complete ownership of systems that are turned over to the farmers. Yet, the proposed act is silent regarding the "co-ownership" of jointly managed systems. Furthermore, with the proposed repeal of Article 1 of the Law on Land Reclamation, Muluki Ain, existing customary and traditional rights seem to be in jeopardy. Likewise, the proposed regulations (as of April 1992) are abound by rights and duties from the point of view of the state or agency irrigation management rather than a balanced "rights and duties" on the part of Water Users Groups. The regulations bestow power to agency management but do not focus on rights of WUAs e.g., to defensible water rights, on to timely and reliable supply of water, etc.

2 Issues on Participatory Management

With this background on the existing and proposed irrigation policies and regulations, let us turn to the concept and issues relating to participatory management. We would like to take the liberty of quoting some of the deliberations during a similar workshop on participatory management in Sri Lanka:

There was general agreement on what participatory management meant, and what its character was. There was general consensus that officials and farmers represented the two sides of the equation. However, there was a sharp difference of opinion on its boundaries and limits.

This disagreement in a way can be anticipated from the manner in which the participatory management equation was worked out. Its formulation at once raises the ideological and theoretical issues in which the conflicts of bureaucracy vs. peasantry, controllers vs. users, have become key debating points in the social sciences. The present workshop concern was fortunately more mundane. It boiled down to the question of defining the relative roles of the officials and farmers, and that was decided largely on their relative capacities. However, a residue of a paternalistic attitude, inherited from a bygone era of colonial administration, was evident in the way some officials wished to define the limits of farmer-participation. They preferred to confine the farmers to the downstream and the officials to the main system, with a possible concession in regard to the systems in between consisting of distributory channels, in which a combination of official and farmer control could be allowed. On the other hand, some researchers suggested a larger concession with officials confined to the head-works and its regulation and limited to the maintenance and law enforcement of the rest of the system. The officials were unduly apprehensive about the farmers' capacity whilst the researchers were overly confident.

While talking about either joint or participatory management, it would be important to address issues relating to farmer/agency partnership regarding their respective power relations, rights, responsibilities, sharing of activities, duties, and mutual trust and accountability. We believe it is the intention of this government to strive for a true partnership taking into account the strengths, weaknesses, and the potential of the partners involved with real ownership powers and the associated rights. This is in contrast to partners termed as "beneficiaries" and real ownership as "sense of ownership" (Ambler, 1992).

It is true that a series of legitimate reasons can be voiced in favour of particpatory management as was done yesterday in the paper presentations. Those reasons relate to reducing cost, enhancing performance, enhancing agricultural productivity, shifting into newer roles for agency and to curb spreading itself too thin everywhere, etc. The question of the need for participatory management can be posed this way too: Is participatory management being promoted because of fiscal crisis and the inability of the government to shoulder all the administrative, financial, and logistical burdens of irrigation management and expansion or is it because of the genuine interest in partnership and support of local initiatives? This can also be seen from the aspect of resource mobilization crises and the legitimacy crisis. Is the government willing to support rather than supplant local initiatives and thereby not only augment its resource mobilization but also in the very process share power with the local/users, now partners, by empowering them to control resources that affect their own lives and thereby the government gain legitimacy in the eyes of the public? Thus as farmers become involved in the management of their "own" resources, they have more control over their own lives, both economically and socially. Shared participatory irrigation management has the potential for improving both agriculture production and social well-being.

3. Issues for Discussion

Below are some of the issues pertaining to the implementation of participatory management program in irrigation development. It is hoped that these topics would act as an introduction to the issues to be deliberated during the individual sessions tomorrow in greater details. We can expand the number of issues to be tackled too. However, it is hoped that the deliberation of the issues agreed upon will lead to the formulation of certain guidelines regarding participatory management as well as a task force including farmers that would finetune these guidelines hopefully to be incorporated into the new irrigation policies and regulations. The tentative issues are:

a) Law and policy

Has participatory management in Nepal's irrigation schemes been accepted as policy, and if yes does it correspond with the existing Nepal laws and acts? Are there any contradictions in the existing laws?

What types of irrigation systems should have participatory management? What criterion, e.g., size, or technical or organizational complexity?

What policies or legal enactments ensure both parties, i.e., agency and water users/farmer organizations, as equal partners such that there are legal provisions for each other's: i) legal recognition, ii) accountability, iii) authority, iv) responsibility, and v) rights? What legal provisions safeguard and/or compensate local rights? Or, for that matter, are these legal enactments necessary in the first place?

How can flexibility in policies and laws be incorporated such that it can be adapted to the differences between old and new schemes, large and small

schemes, and to recognize the variations within and between individual projects?

What mechanism should be followed to incorporate farmers' involvement in policy and law reformulations towards participatory management in a more perpetual manner?

What mechanisms or policies/laws should be adopted for the government to support and encourage local efforts/participation rather than supplant them?

b) Data needs, research, and knowledge-building

Several papers this morning pointed out to problems relating to data collection, the need for information on existing systems, the need to distill lessons and issues confronted during participatory management endeavours.

Therefore, what are the data needs of participatory management? What types of baseline information, inventories, social and economic data, maps facilitate the introduction and refinement of participatory management?

What are the appropriate data collection methods? Who all should be involved? Is it possible to have participatory research with the farmers/water users such that research is also seen by farmers as the necessary input for information necessary for participatory irrigation management?

How can a participatory research process be institutionalized such that experiences from participatory management can be documented, analyzed, and inputs be provided for finetuning further participatory irrigation management?

c) Participation: at what level, where, and in what activities?

What level of the irrigation system should the two parties participate? (For example, main canal, secondary canals, tertiary canals, headworks, watershed, reservoirs, etc.) What is the meeting point? Is it different from one system to another? How is this "meeting point " decided?

Can the level of farmers participation in the irrigation system be enhanced so as to resume more responsibilities and therefore manage all that is possible by them? If it is possible for the farmers themselves to manage the whole system, should the agency pull out? Should such an objective be pursued and if yes, should this be carried out in phases?

In what activities should there be participatory management?

- decision making, including for main system management
- which irrigation activities e.g., construction, O&M, etc.
- mutual accountability such that both parties fulfill their respective responsibilities
- conflict resolutions

Would the involvement of farmers in the above activities enhance their organizational capacity and also would it enhance agency's capacity to deal with water users groups?

d) The formation of Water Users Groups (WUGs)

What has been our experiences regarding WUGs and need there be amendments in the existing laws and regulations given these experiences and lessons?

How can constitutions of WUGs be made to be flexible so as to adapt to local and historical conditions?

What are the rights of WUGs and are there legal enforcement that would make the various parties involved with WUGs in irrigation management accountable?

What should be the basis for the formation of WUGs? Hydrological or human settlement, or an element of flexibility taking into account local conditions and prior social relations?

What are the incentives for WUGs to organize and how can these be fostered or encouraged?

What procedures involving farmers themselves too have proven effective in organizing WUGs, e.g. peer (farmer-to-farmer) trainings? What organizational elements strengthen WUGs and therefore how can these be facilitated? What are the training needs of WUGs and how can these be made available to them?

What mechanisms should be adopted to inform farmers correctly and timely the various policies and laws relating to WUGs?

How can accountability on the part of WUGs be enhanced?

e) Institutional support for the implementation of participatory management

What types of support can be realistically expected from the centre and regional level for participatory management? Conversely, what types of information and input is expected from local level for finetuning the implementation of Participatory management?

What procedures are to be adopted to enhance the decentralization of management activities such that participatory management can occur at the local level?

What legal backing is available for agency staff to carry out their duties and authorities especially those that relate to punishing defaulters and resolving conflicts?

What would be the criterion for evaluating performance of agency staff involved in participatory management such that these staff members feel that they are being evaluated on the basis of the objectives of participatory management and not something else? Needless to say, how can their involvement with the formation of WUGs and staff's efforts in interacting with them be taken into consideration for the agency staff's performance evaluation and promotion?

f) Rights, responsibilities, and mutual accountability

Can both parties be co-owners of the irrigation system and therefore by this very provision facilitate other secondary rights?

What should be the local/water users rights and the agency rights? Should there be legal sanctions and backing to enforce these rights? How can local rights be made defensible? How can traditional or customary rights be made defensible?

How can mutual accountability and trust be fostered? What legal and institutional provisions are necessary for enforcing such accountability? What institutional activities are necessary for facilitating accountability on both parties concerned?

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Summary of Workshop Discussions

The summary of the papers are presented above, and the following section will deal with the synthesis and summary of the discussions, the workshop proceedings, and resulting work of the task force organized at the end of the workshop.

1. Discussions on Papers Presented on SDIS, MIP and BIS

The discussion on the Sirsia Dudhaura Irrigation System (SDIS) centered on the achievements and results of the Irrigation Management Project. Farmers were organized, but after the project, additional resources particularly for maintenance were withdrawn. Although the organization of farmers is still functional, the third tier of the farmers' association is not effective anymore. The question of sustainability became the focus of discussion. The general consensus was that the program helped, but sustaining improvements is apparently not viable. Lessons can be learned from this experience in organizing farmers for participatory management.

In the Mahakali Irrigation Project (MIP), the concern was on the share of the water users' organization in the water levy. In accordance with the Irrigation Regulation of 2045, the WUOs are entitled to 25 percent of the levy. The farmers were not satisfied with the answers given by the Project Manager. Returning the 25 percent to the farmers was being processed, but there were no procedures established to make this rebate effective.

The other issue raised was that of operation and maintenance costs. Cost reduction through farmer participation was also discussed. Guidelines on O&M are still being prepared to address this issue. It was pointed out that activities involving farmers in MIP and SDIS were effective in addressing the problems of the system. However, there was concern that after the project, MIP will end up like SDIS, where maintenance resources from the DOI are not anymore provided.

In Banganga Irrigation System (BIS), there was concern on its continuity and sustainability. The experience at BIS is quite recent, compared to SDIS and MIP, and the promising results are impressive. There was concern on institutionalizing the results at BIS. After IIMI completes the program at BIS, the DOI might not be able to complete the program or learn from this experience. There was consensus that the program at BIS should be continued and see organizing most of the farmers for the entire system should be completed. DOI then will have the responsibility of sustaining the achievements attained in this program at BIS.

These discussions pointed out that the implementation of participatory management in DOI-managed systems urgently needs to be improved. The irrigation policy is undergoing revisions, and the action plans of DOI have been the basis for its program on participatory management. Changes in the action plans are being made to improve on program implementation.

2. Workshop Issues

The second half of the workshop involved discussion of issues that are central to the implementation of the participatory program. These issues were grouped under six broad categories namely: a) law and policy; b) data needs, research and knowledge-building; c) participation: at what level, where and in what activities; d) formation of water users' groups or organizations; e) institutional support for the implementation of partici-

patory management and: f) rights, responsibilities and mutual accountability. The following summarizes the discussions of these issues.

The participants were divided into two groups that facilitated the discussions under the limited period of time. The farmer participants were distributed equally in these two groups. Each group addressed three issues. One of the highlights of these group sessions was the opportunity for the farmers to express their views on the issues.

a) In the law and policy group session, it was clear that the farmers were not very much informed of the laws and policy pertaining to irrigation. Water rights were not explicitly recognized by the DOI and provisions were not made to accommodate such rights. Compensation was used to placate the need to understand and accommodate this issue.

b) In terms of data needs, the Research and Training Branch (RTB/DOI) will be the repository of data and research for participatory management. A commitment was made to include farmers in research and data collection. Other institutions like the Institute of Engineers and Institute of Agriculture and Animal Sciences are to be involved in this issue particularly in research and knowledge-building.

c) On the issue of participation at what level, where and in what activities, the consensus was that the capability of the water users' organization is important. However, no commitment was made by the DOI participants as to the minimum level of participation. Also participation was limited to after-construction and did not include planning before construction. The group discussion did not lead to a clear consensus as to what levels, where in the system and what particular activities will be sanctioned by the DOI.

d) In the formation of the water users' groups, recommendations included that engineers should be involved in every activity of the water users' association. Transparency of accounts and control of the organization was also discussed. Legal provisions to protect the water rights of the water users' groups were another concern. Other issues were not thoroughly discussed for lack of time, but there was enough consensus that laws must be passed to support and protect the rights of the water users' groups/organizations.

e) On institutional support, legal recognition of WUGs/WUOs will be necessary before anything else is done. It was expressed that preparation of budgetary requests for operation and maintenance of systems should involve the WUGs/WUOs, particularly in determining which items need attention. Upon implementation, transparency on the program of activities for maintenance was also discussed. Experimentation was also encouraged in developing new programs for institutional development. However, the involvement of non-government organizations should be limited only to small systems and on an experimental basis only. Joint planning with WUGs was also recommended. Discussion on needed support centered on the yearly allocation of resources in the operation and maintenance of the irrigation system.

f) On rights, roles, responsibilities and accountabilities, it was recommended that traditional or existing rights must be preserved and be a part of the constitution of the WUGs/WUOs. Legal recognition is also necessary for preserving these rights. Accountability of both the DOI and WUGs/WUOs was also discussed and recommended for thorough discussion and formal agreement in each system.

The recommendations from these working sessions were synthesized and presented at the plenary session towards the end of the workshop. To fully utilize the output of the workshop, a task force on participatory management was organized by the DOI Director-General. The task force recommendations in turn will help the DOI formulate and implement effectively its own program on participatory management in view of the changes, revisions and amendments made on its existing irrigation policy and irrigation regulation. The recommendations of the task force recommendations are found in Annex 3.

This output of the workshop as part of the program clearly demonstrates one of the tangible achievements of the DOI-IIMI collaborative project, in fulfillment of the objectives set forth.

National Workshop on Participatory Management in Agency-managed Irrigation Systems

Workshop Schedule
29 - 30 April 1992

Venue: Banquet Hall, Shangrila Hotel, Lazimpat, Kathmandu

Day 1: April 29, Wednesday

9:00 - 9:30	Arrival and Registration of Participants
9:30 - 10:30	Opening Ceremonies
9:30 - 9:40	Welcome Address by Mr. S.R. Pant, Director-General, Department of Irrigation
9:40 - 9:45	Welcome Address by Mr. R.R. Katel, Chairman, Pithuwa, Water Users Organization
9:45 - 9:50	Inauguration of the Workshop by the Mr. G.N. Rimal, Secretary, Ministry of Water Resources
9:50 - 10:05	Opening Remarks by the Guest of Honor, Mr. G.N. Rimal
10:05- 10:15	Vote of Thanks by Mr. M.M. Shrestha, Deputy-Director General, IMWUD, Department of Irrigation
10:15 - 10:30	Tea Break
10:30 - 12:00	Paper Presentations: Sirsia-Dudhaura Irrigation System (Moderator: Mr. Y.L. Vaidya, DDG/DOI)
10:30 - 10:50	Main System Management under Participatory Management Program: Experiences from Sirsia-Dudhaura Irrigation System (Mr. K.C. Shah, Assistant Engineer, System Management Branch, and Mr. R.C. Mahato, Divisional Engineer, Research and Training Branch, IMWUD/DOI)
10:50 - 11:10	Formation of Water Users' Association in Sirsia-Dudhaura Irrigation Project (Mr. R.R.S. Neupane, Chief, Research and Training Branch, IMWUD/DOI nd Mr. R.L.Shrivastav ,Assistant Engineer, Bara District Irrigation Office, CRID/DOI)

11:10 - 11:30	Participatory Management - Farmers' Experience (Mr. M. Raut and Mr. R.C. Shah, Sirsia-Dudhaura Water Users Association)
11:30 - 12:00	Open Forum: Questions and Answers Session
12:00 - 1:00	Lunch
1:00 - 2:30	Paper Presentations: Mahakali Irrigation Project (Moderator: Mr. B.K. Aryal, SE IMWUD/DOI)
1:00 - 1:20	Main System Management: Mahakali Irrigation Project (Mr. M.N. Aryal, Project Engineer, MIP/DOI and Mr. S.R. Sharma, Engineering Consultant, Sir William Halcrow & Partners, Mahakali Irrigation Project)
1:20 - 1:40	Formation of Water User Organization in Nepal: Case of Mahakali Irrigation Project (Mr. R. Subedi, Socio-Economics Consultant, ISSP/WB and Dr.U. Gautam, Team Leader, ISSP/WB)
1:40 - 2:00	Participatory Management - Farmers' Viewpoint (Mr. R.N. Bhatta and Mr. K.R. Pandey, WUO Mahakali Irrigation Project)
2:00 - 2:30	Open Forum: Questions and Answers
2:30 - 2:45	Tea Break
2:45 - 4:15	Paper Presentations: Banganga Irrigation System (Moderator: Mr. M.M. Shrestha, DDG IMWUD/DOI)
2:45-3:05	Banganga Irrigation System: Preliminary Results on Main System Management Improvement (Mr. V.S. Mishra, Divisional Engineer (Acting), Kapilbastu District Irrigation Office, Western Regional Irrigation Directorate)
3:05-3:25	Banganga Irrigation System: An Exercise in Participatory Management (Mr. Durga K.C., Research Officer and Dr. U. Pradhan, Social Scientist, IIMI-Nepal Field Operations)
3:25-3:45	Participatory Management in Banganga Irrigation System: Farmers' Viewpoint (Mr. B.M. Kurmi, Gobari Water Users Group and Mr. L.P. Kurmi, Shivapura Water Users Group)
3:45-4:15	Open Forum: Questions and Answers
4:15 - 4:20	Concept, Procedures and Strategy for Participatory Management for Large Irrigation Projects under ILC Financing Western Regional Irrigation Directorate (Mr. M.B. Gurung, Divisional Engineer, CRID/DOI)

4:20 - 5:00	Open Forum (For All papers)
	(Moderator: Mr. N.Ansari, Joint Secretary, Ministry of Water Resources
5:00	End of First Day Workshop Session
7:00 - 9:00	Cocktail and Dinner at Shangri-la Hotel hosted by IIMI-Nepal Field Operations in honor of the Workshop Participants.

Day 2: April 30, Thursday

9:00 - 10:30	Discussions on the Concept of Participatory Management
	(Moderator: Mr. N. Ansari, Joint Secretary, Ministry of Water Resources)
9:00-9:15	Concept Presentation of Participatory Management
	(Dr. U. Pradhan, Social Scientist IIMI-Nepal Field Operations)
9:15-10:30	Discussions of Issues in Participatory Management
10:30 - 10:45	Tea Break
10:45 - 12:00	Group Session I
12:00 - 1:00	Lunch
1:00 - 2:00	Group Session II
2:00 - 3:00	Group Session III
3:00 - 3:30	Tea Break
3:30 - 4:45	Presentations and Discussions of Sessions I-III
	(Chairman: Mr. S.R. Pant, Director-General DOI)
	Formation of Task Force on Participatory Management and Workshop Summary
4:45 - 5:00	Closing Ceremonies
	Closing Remarks
	Dr. A. Valera, Head, IIMI-Nepal Field Operations
	Mr. S. R. Pant, Director-General, DOI

List of Participants

No.	Name	Designation	Organization
1.	Mr. S. R. Pant	Director General	Department of Irrigation Panipokhari
2.	Mr. M.M. Shrestha	Deputy Director General	Department of Irrigation Panipokhari
3.	Mr. Y.L. Vaidya	Deputy Director General	Department of Irrigation Panipokhari
4.	Mr. L.R. Bhattarai	Western Regional Director	Pokhara, Nepal
5.	Mr. S.N. Poudel	Central Regional Director	Bagbazar
6.	Mr. Keshab Sharma	Sr. Divisional Engineer	CRID, Bagbazar
7.	Mr. K.K. Shrestha	Eastern Regional Directorate	Biratnagar
8.	Mr. Binod Aryal	Superintendent Engineer	IMWUD/DOI Kamaladi
9.	Mr. Rishi R. S. Neupane	Chief	RTB/DOI Kamaladi
10.	Mr. Ram P. Satyal	Chief	SMB/DOI Panipokhari
11.	Mr. V.S. Mishra	District Irrigation Engineer	BIS Kapilbastu, Taulihawa
12.	Mr. M.N. Aryal	Project Manager	MIP Mahakali Irrigation Project Dipayal, Far Western Region
13.	Mr. I.C. Adhikari	System Management Branch	IMWUD/DOI Panipokhari

14.	Mr. Ram Chandra Mahato	Divisional Engineer	Research & Training Branch, IMWUD/DOI, Kamladi
15.	Mr. K.C. Shah	System Management Branch	IMWUD/DOI Panipokhari
16.	Mr. N.P. Gautam	IMWUD/DOI	Panipokhari
17.	Mr. M.S. Poudel	Planning Division	Dept. of Irrigation Panipokhari
18.	Mr. B.R. Adhikari	Project Manager	Rajapur Rehabilitation Project, SMB/DOI Panipokhari
19.	Mr. N. Ansari	Joint Secretary	Ministry of Water Resources, Singha Durbar
20.	Mr. S.N. Upadhaya	Executive Director	WECS, Singha Durbar
21.	Dr. D. Molden	Team Leader	IMP/TA Kamladi
22.	Mr. J. Rana	Irrigation Mgmt Specialist	IMP/TA Kamladi
23.	Mr. B. Thoreson	Researcher	IMP, RTB/DOI Kamladi
24.	Dr. H.S. Plunkett	Deputy-Chief	ARD/USAID Rabi Bhawan, Kalimati
25.	Mr. Prayog Pradhan	Project Officer	ARD/USAID Rabi Bhawan, Kalimati
IIMI			
26.	Dr. A. Valera		
27.	Dr. U. Pradhan		
28.	Mr. T.M.S. Pradhan		
29.	Mr. Durga K.C.		
30.	Mr. M. Bhattarai		
31.	N. Abeywickrema		
32.	Dr. Upendra Gautam	Team Leader	ISSP/ILC Panipokhari

33.	Mr. Rajan Subedi	Socio-Economic Consultant	WB/ISSP, Panipokhari
34.	Mr. Mahendra Gurung	Divisional Engineer	WB/ISSP, Panipokhari
35.	Mr. S. Palteng	Team Leader	NIA Consult/ISP Panipokhari
36.	Mr. S. Lakhey	National Consultant	ILO/SPWP Panipokhari
37.	Mr. A.K. Shukla	Coordinator	IMSG, IAAS Rampur, Chitwan
38.	Mr. Bradford Philips	Sr. Project Engineer	AWD, ADB Manila
39.	Mr. Ramesh B. Shrestha	Chief, SFDP	ADB/N, Ramshahpath
40.	Mr. Yoshihiro Kishi	Assistant Resident Representative	UNDP, UN Building, Pulchowk
41.	Mr. S.R. Sharma	Engineering Consultant	Sir Williams, Halcrow & Partners Mahakali Irrigation Project
42.	Mr. Manik Lal Pradhan	Director General	Dept. of Agriculture Harihar Bhawan
43.	Ms. Uma Shrestha	Joint Secretary	Ministry of Agriculture Evaluation Section Singha Durbar
44.	Mr. S.K. Hyoju	Hill Irrigation Development Project	SINKALAMA Project Satdobato, Lalitpur

Farmers Representative

45.	Mr. R.P. Yadav	Chairman	Water Users Group Sirsia-Dudhaura Nepal
46.	Mathura Rawat		Sirsia Dudhaura Nepal
47.	Ram Charitra Shah		Sirsia Dudhaura Nepal

48.	Rishi Ram Katel		Pithuwa Nepal
49.	Laxmi Bhagat		Chandra Nahar Saptari, Nepal
50.	Mr. Bed Bahadur K.C.		Handetar Irrigation Project Nepal
51.	Mr. Raghu Nath Bhatta		Mahakali Nepal
52.	Mr. Khem Raj Pandey		Mahakali Nepal
53.	Mr. Bal Mukunda Kurmi		Gobari, Kapilbastu
54.	Laxmi Prasad Kurmi		Shivpura, Kapilbastu
Press			
55.	Mr. Subarna Chettri		Group Three Pvt. Ltd. Kamladi, Kathmandu
56.	Ms. Bandana Shrestha		The Independent
NGO			
57.	Dr. Ganesh R. Shrestha	Executive Director	Centre for Rural Technology P.O. Box 3628 Tripureswor, Kathmandu
58.	Representative		National News Agency Singha Durbar
59.	Mr. S.P. Yadav		Community Development and Welfare Society
60.	Mr. S.N. Pathak		Institute of Engineering Pulchowk
61.	Mr. R.N. Kayastha	Project Manager	Institutional Development Support Project Jawalakhel

Task Force Recommendations on Participatory Management

1. Objective

a) Under joint management, the irrigation systems beyond 2000 ha in Terai and 500 ha in Hills will be undertaken.

b) The farmers will be involved right from the project identification.

2. Supports to Participatory Approach

2.1 Policy Arrangements

a) Under joint management projects, the work responsibilities of Water Users' Association will start from tertiary canal and gradually go upto branch canal level, wherever such associations become capable.

b) The remaining works, other than mentioned above, will be under the jurisdiction of government agency.

c) The government agency will help/assist in the capacity building of the users.

d) The Regional Irrigation Directorates will be responsible for the resolution of conflicts / misunderstandings between the government agency and the users.

e) The Water Users' Association and the Officer will sit together and frame up the rules pertaining to all kinds of joint management and will also delineate the boundary of the command area. In this work, IMWUD will assist them.

f) The Users' Association will be gradually granted autonomous status.

g) The non-governmental and private sector organizations also will be involved in the joint management activities on an experimental basis.

2.2 Institutional Arrangements

a) The work that can be carried out by the Water Users' Association will be done by itself and the supervision of work quality will be done by the same organization.

b) The points of disagreement between WUA and agency need to be resolved as soon as possible and in a situation where it is not possible, each should inform the other about it on time.

c) In Regional Irrigation Directorates, a System Management Unit will have to be set-up.

d) The budget for the maintenance works in succeeding year will have to be prepared by the month of Chaitra (March/April) each year indicating the priority of work.

e) In order to provide continuity to the Joint Management Program, it should be necessarily implemented through the institutional medium of the department.

f) The management's capacity and the accountability of the Users' Association will have to be improved gradually.

g) While allocating the budget, it should clearly indicate the allocation for each activity independently.

2.3 Legal Arrangements

a) Once the capacity building of the users has been achieved even the ownership of the irrigation system will be gradually handed-over to them.

b) The agreement entered into by the users and the HMGN agency must be given legal validity.

c) The protection of traditional water rights should be taken care of by the constitution of the users committee itself.

d) Water Tax has to be clearly defined and managed as irrigation service charge.

e) The rules should have a provision for allocating 25% of the total irrigation service charges to be raised by WUA at the local level.

f) The WUO/WUA of all the big projects should be provided legal status by registering them.

g) A provision should be made such that the Water Users' Association do not have to renew their registration annually.

2.4 Research Arrangements

a) The statistics/data relating to total irrigated command area, calibration of outlets, water discharge at the source and crop-water requirement should be obtained through the assistance from RTB.

b) For collecting above data, Participatory Observation Methods, Diagnostic Analysis and RRA appear to be appropriate methods.

c) Academic institutions like Engineering Institute should teach preliminary courses on Irrigation Management.

d) As RTB has been developed institutionally, the Central Documentation Centre established under this branch should provide teaching arrangements.

3. WUA Duties and Responsibilities

a) The management capability of Users' Association should be improved.

b) The rules of the Association should equally apply to the officials of Users' Association as well as government agency.

c) There should be a provision to delegate the authorities vested upon irrigation officer to the Users' Association.

d) The Users' Committee itself should collect irrigation service charges and should deposit 25% of it in the bank account of the committee.

e) Under the project, a Production Management Coordination Committee (PMCC) should be formed wherein, alongwith the farmers' representatives, other related government agencies should also be made members.

f) The time-scheduling of maitenance work and the work itself should be carried out according to the advise of the users, within the scheduled time.

g) In order to direct the activities of Water Users' Association there should be a system of check and balance and for that the PMCC should actively work.

4. Others

a) There should be an incentive system for those officials who work for participatory management.

Abbreviations and Acronyms

ADO	- District Agriculture Development Office/Officer
ADBN	- Agricultural Development Bank of Nepal
AIC	- Agriculture Input Corporation
AO	- Association Organizer
ARD	- Agriculture and Rural Development Office
AsDB	- Asian Development Bank
BIS	- Banganga Irrigation System
BMC	- Banganga Management Commmittee
CADP	- Command Area Development Project
CDO	- Chief District Office/Officer
cms	- cubic meters per second
CRT	- Center for Rural Technology
cumecs	- cubic meters per second
cusecs	- cubic feet per second
DIO	- District Irrigation Office
DOI	- Department of Irrigation
FEWUG	- Federated Water Users Group
ha	- hectare(s)
IIMI	- International Irrigation Management Institute
ILC	- Irrigation Line of Credit of the World Bank
ILO	- International Labor Organization of the United Nations
IMWUD	- Irrigation Management and Water Utilization Division
IoE	- Institute of Engineering
ISP	- Irrigation Sector Project
ISSP	- Irrigation Sector Support Program
km	- kilometer
lps	- liters pers second
m	- meter
MC	- Main Canal
MIP	- Mahakali Irrigation Project

mm	- millimeter
NGO	- Non-Governmental Organizations
NIA Consult	- National Irrigation Administration of the Philippines Consulting Inc.,
Nrs	- Nepal rupees
O&M	- Operation and Maintenance
RTB	- Research and Training Branch
SDIS	- Sirsia Dudhaura Irrigation System
SMB	- System Management Branch
UNDP	- United Nations Development Program
USAID	- United States Agency for International Development
WRID	- Western Regional Irrigation Directorate
WUA	- Water Users Association
WUG	- Water Users Groups
WUO	- Water Users Organization