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FINAL REPORT: VOLUME I

INCREASING WATER USER PARTICIPATION IN IRRIGATION MANAGEMENT

PHASE I: FIELD TESTING ALTERNATIVE APPROACHES

MAIN REPORT



**Submitted to the Department of Irrigation and USAID
Mission to Nepal, Agriculture and Rural Development Office**

by

The International Irrigation Management Institute

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Executive Summary

Background

The International Irrigation Management Institute (IIMI) was requested by the Department of Irrigation (DOI) to assist in the development and implementation of the action plan on participatory management. The system selected for implementing this assistance was the Banganga Irrigation System (BIS). This collaborative project was supported by the Agricultural and Rural Development Office (ARD) of the United States Agency for International Development (USAID) Mission to Nepal.

The Banganga Irrigation System was one of the sub-projects that was rehabilitated under the Command Area Development Project (CADP) during the period 1982-1989. Under this project, the reservoir was enlarged, the main canal improved, tertiary facilities constructed, support services to farmers initiated, water users groups formed and the irrigation management plan developed. However, the management plan was not implemented and the water users groups formed were found functional. The DOI-IIMI collaborative project was carried out from May 1991 to April 1992 but was extended to July 1992.

Objective

The overall objective of this project was to develop a set of effective approaches for establishing improved irrigation management practices through increasing water users participation in irrigation, that can be used by the Department of Irrigation throughout Nepal. For Phase I of this project, the specific objective was to help DOI build a nucleus of staff with hands-on field experience in developing and implementing participatory irrigation management plans for the jointly-managed systems. The specific tasks in this project were in terms of : 1) institutional development; 2) main system management and 3) analysis of the administrative linkages of Banganga Irrigation System.

This final report presents the major findings and recommendations in fulfillment of the objective and the accomplishments of the project. The final report are in four volumes. Volume I contains the main report. Volume II deals with the details of institutional development, while Volume III covers the main system management. Volume IV presents the administrative linkage analysis.

Results and Findings

The DOI-IIMI collaborative project pursued the above objective and implemented the corresponding tasks. The strengthening of the water users groups led to the actual participation of farmers in operating and maintaining the system and also contributed to improvement in the management of the main system. The analysis of administrative linkages points out the optimal means for using available resources for increasing agricultural productivity in the Banganga Irrigation System. The following findings indicate the accomplishments achieved in pursuing the objective of the project.

Institutional Development

The project completion report for the CADP noted that most of these water users groups (WUGs) were not operating effectively. The IIMI initial field study determined that most of the WUGs were inactive and did not have any record of their members, their landholdings, or records related to the size and sub-command areas of each WUG and federated water users group (FEWUG). These WUGs were not maintaining field channels and farm ditches and were not collecting water service charges.

This report on institutional development in Banganga elucidates on the various reasons why the **WUGs** were inactive. These reasons relate to several factors: i) the WUGs own internal structural cleavages and lack of irrigation leaders, ii) lack of communication between agency staff and farmers, iii) the agency's style of irrigation management, iv) the structural defects of the system, and v) the untimely, unreliable, and inadequate supply of water at certain parts of the system.

IIMI felt that it was important for farmers to observe and hear from other farmers like themselves the possibilities in irrigation management. To this effect, farmer selected representatives and the system manager of BIS participated in a farmer-to-farmer training program. They were taken by the IIMI field staff to two large irrigation systems in the Terai to observe well managed irrigation systems. The farmers were exposed to other irrigation systems that were being managed well by farmers themselves. The system manager was also able to witness the efficacy and capacity of farmer organizations. These field visits to other systems and an awareness of organizational and irrigation management matters motivated the farmers of BIS to convene and form their own water users groups.

It was not only the farmers who were motivated to form WUGs. The system manager also after returning from the field visit, began facilitating the formation of newer WUGs outside the research area.

WUGs defined their responsibilities as: 1) forwarding requests for water, seeds and other inputs to the BIS management, 2) mobilizing resources for system O&M, 3) supervising canal maintenance and cleaning, 4) keeping minutes of the meeting, records of irrigation activities and financial accounts, 5) collecting fines, 6) allocationing and distributing water according to the water distribution schedule, 7) holding regular meetings, 8) resolving water conflicts, 9) implementing rules and regulations, 10) establishing good communication between the farmers and DOI, and 11) assisting in the preparation of the water distribution schedule. Each WUG formulated rules and regulations with the assistance of the District Irrigation Office (DIO) staff. The rules are still evolving as the farmers call meetings when necessary. Fines have been instituted and collected for rule violations.

Water allocation from the main canal to the branch, distributary and main outlets is the responsibility of the DIO. Water distribution within the branch, distributary and field channels is the responsibility of the WUGs. Some WUGs are considering allocating water based on land area or labor contribution, The water distribution schedule is prepared by the BIS in consultation with WUG chairpersons. The actual schedule implementation has been difficult due to water theft, rainfall, disrupted gate regulators, check gates and lack of staff.

A total of 13 WUGs were strengthened and reorganized covering an aggregate area of 2,000 ha. With this strengthened WUGs, nearly 3000 labor days have been contributed to clean about 40 km of canal. Labor contribution was based on land area in some areas and on households in others. Each WUG established fines for violation of rules. Nearly NRs 2300 were collected by seven WUGs. Meetings were held at four levels: 1) DIO and farmers, 2) DIO and WUG, 3) WUG committee and farmers and 4) WUG meetings.

Main Canal Management

Activities pursued in the improvement of main canal management consisted of developing alternative methods for water measurements and control, mechanisms for a continuing interaction between the water users groups and the BIS/DOI staff, and undertaking effective maintenance for the main canal. Main canal management in this project involved the activities dealing with operation and maintenance.

The operational activities were pursued in an effort to attain more equitable distribution of irrigation water. In the 1991 monsoon season, the pattern of distribution was better compared to that of the previous 1990 monsoon season. Despite the reduced rainfall, water availability was not significantly affected in the command area of BIS. More equitable distribution was achieved in the 1992 winter season. These results are significant improvements compared to that of the previous 1990 and 1991 monsoon and winter seasons, in terms of water distribution.

These improvements can be attributed to the contributions made by the organized water users groups and the efforts of the BIS/DOI manager. The 1992 winter irrigation water delivery schedule was formulated in consultation with the water users groups. There were 28 chairmen of water users groups that participated in the pre-seasonal meeting for the 1992 winter season compared to only 8 chairmen for the 1991 pre-seasonal monsoon season. Schedule implementation was undertaken effectively despite the drastic reduction of BIS/DOI staff in BIS from 47 to 4, with the assistance of the water users groups.

In terms of maintenance, three major concerns namely siltation, weed growth and repair of control gates in the main canal. Even at the completion of the CADP in 1989, siltation at the diversion intake canal was already acute. Measurements revealed that only 18 percent of the design capacity was flowing in the link canal (canal joining the diversion headworks and the reservoir).

Weed infestation was another serious problem which blocked and retarded the flow in the main canal. Two activities were undertaken to address this problem. One was an experiment to reduce or prevent weed growth, This involved lining the main canal with layers of gravel. There were two treatments, one with a uniformly graded gravel and the other with mixed gravel. Results of the experiment indicated that the mixed gravel lining was more effective than the uniformly graded gravel.

The other activity was the hiring of a weed expert to suggest ways to suppress these weeds. His recommendations were to continue with the above experiment and to encourage the farmers and BIS/DOI field staff to uproot or remove the weeds. To motivate them, the different weeds were identified and classified for its food, medicinal, forage, and fuel uses. This information

then will have to be disseminated to the farmers and **BIS/DOI** staff,

The status of the control gates along the main canal at **BIS** is deplorable. Only 43 percent were found functional, as indicated by the inventory conducted in 1990. The rotational irrigation schedule was implemented using "mud plugs" in outlets with no gates. It was noted that after the organization of these water users groups, reduction in destruction and vandalism of these gates was observed.

Administrative Linkage Analysis

The administrative linkage analysis of the Banganga Irrigation System covered the following aspects: 1) administrative and budgetary linkages with the Regional Irrigation Directorate and the Department of Irrigation central office in Kathmandu; 2) irrigation system functions in relation to other district level support institutions; 3) the potential for the formation of water users organizations to complement those activities undertaken by the **DOI** staff with emphasis on operation and maintenance and resource mobilization and 4) the role of the District Irrigation Office (**DIO**) in relation to large-scale irrigation management.

Overall, the analysis attempted to bring out the issues beyond system management. The analysis of external and internal administrative linkages were viewed in terms of the irrigation system's immediate objective of increased agricultural productivity. The roles of the **DOI** and farmers are beyond mere water control in post-construction period, and include the management of the irrigation system, the water users organizations and system staff, and that of the support services for agricultural production.

National Workshop on Participatory Management

The accomplishments on this project were reviewed as part of the two-day national workshop on participatory management. The objectives of the workshop were to arrive at guidelines for **DOI's** policy on participatory management in agency-managed irrigation systems and to review and extract lessons from the results of the participatory management programs at Sirsia Dhudhaura, Mahakali and Banganga irrigation systems, which will be useful in the formulation of the guidelines. The workshop was held on 29-30 April 1992, with participants from **DOI**, **DOA**, **ADB**, **ILC**, **ISP**, **UNDP**, **ILO**, **USAID**, **NGOs**, **IoE**, **IAAS** and farmers from several systems.

The workshop was organized jointly with **DOI**, with participation from the System Management Branch and Research and Training Branch. Farmers representatives were invited to write and present papers on their views on the participatory program implemented by **DOI** in different projects. These papers included main system management and the formation of the water users organizations. The proceedings will be published as part of the accomplishment of this project.

A task force on participatory management was organized at the end of the workshop. The task force convened afterwards to draft guidelines for participatory management which will be used in revising the irrigation regulation and **DOI's** participatory management in the agency-

managed systems. The workshop also brought about for the first time farmers participation in a national forum.

Conclusions and Recommendations

The DOI-IIMI collaborative project in Banganga Irrigation System has fulfilled substantially the objectives set forth. The tasks enumerated for the project also were undertaken, resulting in the attainment of planned outputs.

Conclusions

Farmer participation has made a definite impact on irrigation activities in the Banganga Irrigation System. There has been an increase in farmers' participation in preparing water distribution schedule, in meetings with DIO regarding conflict management and the implementation of irrigation rules and regulations, and in the O&M activities of the distributary canals, main outlets, main farm and field ditches. There also has been an improvement in communication and coordination among the farmers themselves and with the DIO through the WUGs.

Farmers through their WUGs have been able to work collectively in acquiring support services and inputs for crop production and crop diversification. Farmers' participation in O&M activities has reduced the O&M cost to DOI. This year alone, the farmers mobilized Nrs. 112,397 for O&M activities in BIS. 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 a feeling of ownership of the system. There has been a gradual introduction of early paddy and crop diversification, with a sense of confidence in the WUGs regarding the acquisition of water and its distribution as well as the safeguarding of crops from free-grazing cattle. The strengthening of 13 water users groups in BIS and the transformation and sensitization of the BIS/DOI staff, in particular the BIS system manager, for carrying out participatory management at BIS are some of the outputs of this project. The farmer-to-farmer training method for effective organization was also demonstrated to be very useful. DOI-farmer dialogue was enhanced through the frequent meetings that the BIS system manager has convened.

Initial improvements in the management of the main canal were in terms of more equitable distribution of irrigation water, reduction of water-related conflicts and reduction of the destruction of irrigation facilities. The use of irrigation delivery days for monitoring and evaluation of water distribution was found practical and effective in this project. The improvements can be attributed to the participation of farmers in decision making particularly regarding seasonal allocation and water distribution, flexibility on the part of the BIS/DOI system manager in accommodating reasonable farmers' demands, and the frequent interactions between farmers and the BIS/DOI staff through meetings.

The analysis of the administrative linkages of BIS showed that the operation and maintenance can be improved and sustained if farmers are organized effectively and budgetary support procedures from the Regional Irrigation Directorate and central DOI office are rationalized. The provision of standards for maintenance requirements based on actual needs and reconciliation of expenditure and outcomes has to be established. Management of agricultural

support services was pointed out as another function that has to be undertaken. This is in conjunction with the provision of timely and adequate irrigation water supply by the DOI field staff. The system manager's role then will need to be reoriented from merely construction activities toward increasing agricultural productivity.

By bringing together the experiences and lessons learned in organizing farmers from three jointly-managed DOI systems, the national workshop on participatory management was a fitting conclusion to the project activities. These lessons were incorporated in the guidelines drafted after the workshop. A task force on participatory management was organized to formulate these guidelines. The pioneering participation of farmers in a national workshop was also an accomplishment of this project.

Recommendations

The following overall recommendations are made based on the foregoing conclusions and findings:

- 1) The water users groups at BIS should be strengthened and organized for the entire system. This necessitates a thorough understanding of the existing situation before any participatory program activities are to be conducted.
- 2) Reorientation of the system manager from construction activities to increasing agricultural production in the command area is one major task in participatory management.
- 3) Training and motivating the DOI field staff in water measurement and control and in organizing farmers should be undertaken.
- 4) A system level confederation of water users organizations should be organized. This third tier organization will then become the BIS management committee that will deal with the district agencies that provide support services to the farmers in the command area.
- 5) Large irrigation systems should have a separate unit within the district until management capability will be established within the DIO.
- 6) Budgetary allocations for operation and maintenance should be based on actual needs and monitored accordingly in terms of productivity outputs. Standards for operation and maintenance budget allocation should be established within DOI and regional irrigation directorates.

The foregoing recommendations are deemed necessary if increased agricultural production in large irrigation systems will be attained.

A proposal for Phase II of the DOI-IMI collaborative project in Banganga is presented which embodies these recommendations. The proposal will have to be considered in the light of changing priorities of DOI and the donor agency. The initial improvements brought about by this project is a clear indication that the participatory management effort should be continued.

Increasing Water User Participation in Irrigation Management

Phase I: Field Testing Alternative Approaches'

1. Introduction

1.1 Background

The Department of Irrigation (DOI) initiated an Action Plan for Participatory Management Program in 1989. This was in line with the other action plan for turning some systems constructed and managed by DOI water users' associations, for operation and maintenance. The action plan for participatory management calls for water users groups to take an increased role in the operation and maintenance tasks of jointly-managed systems. The plan assumes that with increased involvement, farmers will improve irrigation service and mobilize the necessary resources to make irrigation systems self-supporting,

The International Irrigation Management Institute (IIMI) was requested by DOI to assist in the development and implementation of the action plan on participatory management. The Banganga Irrigation System (BIS) was identified as the field site for IIMI to work collaboratively with DOI staff in developing and testing ways for establishing O&M plan through more water user participation. This collaborative program was supported by the Agricultural and Rural Development Office of the United States Agency for International Development (USAID) Mission to Nepal.

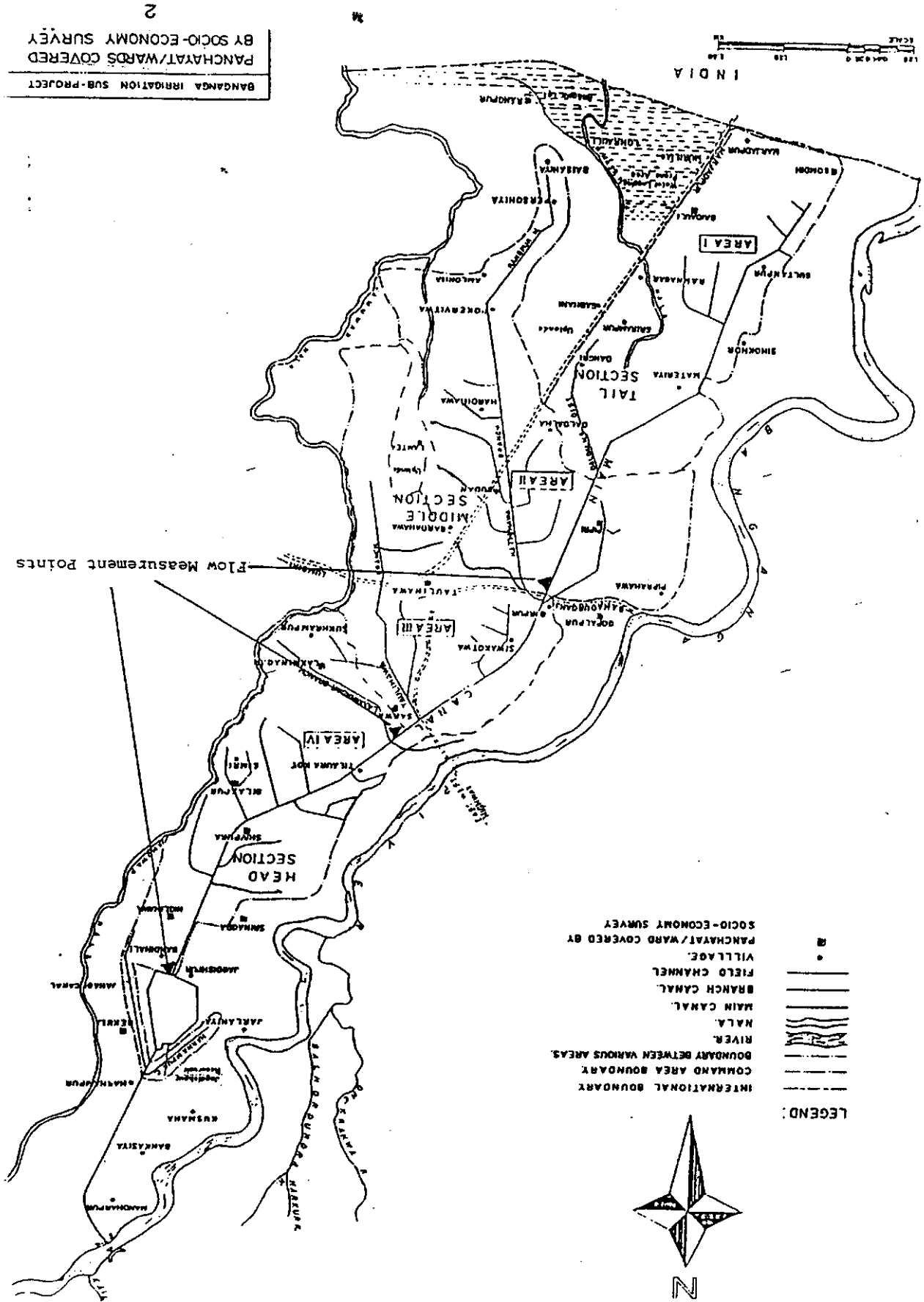
The Banganga Irrigation System was one of the sub-projects that was rehabilitated under the Command Area Development Project (CADP) during the period 1982-1989 (Figure 1). Under this project, the reservoir was enlarged, the main canal improved, tertiary facilities constructed, support services to farmers initiated, water users groups formed at the tertiary block level, and irrigation management plan developed. However, the management plan has not been implemented yet and the organized water users groups were not functional.

During the winter season of 1991, water delivery in the main canal was reliable, but at the field level rotation of water use was not followed and inequitable distribution was observed.

BIS was planned to be jointly-managed by DOI staff and the farmers. At the start of the project, BIS management was under the Western Regional Irrigation Directorate (WRID). It was later transferred to the District Irrigation Office (DIO).

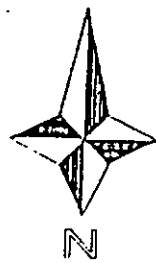
¹ Final Report submitted to the Department of Irrigation and Agricultural and Rural Development Office, USAID Mission to Nepal in partial fulfillment of the requirement of the Cooperative Agreement 367-0153-A-00-1127-00, prepared by Alfredo Valera, Ujjwal Pradhan and Prachanda Pradhan of the International Irrigation Management Institute, August 1992.

Figure 1: Banganga Irrigation System.



LEGEND:

- INTERNATIONAL BOUNDARY
- COMMAND AREA BOUNDARY
- BOUNDARY BETWEEN VARIOUS AREAS
- RIVER
- HALA
- MAIN CANAL
- BRANCH CANAL
- FIELD CHANNEL
- VILLAGE
- PANCHAYAT/WARD COVERED BY SOCIO-ECONOMY SURVEY



Flow Measurement Points

BANGANGA IRRIGATION SUB-PROJECT
 PANCHAYAT/WARDS COVERED
 BY SOCIO-ECONOMY SURVEY

IIMI was requested by the DOI to assist in the implementation of the irrigation management plan for Banganga Irrigation System. This program was carried out from May 1991 to April 1992 and extended up to July 1992.

1.2 Objectives of the Program and the Report

The overall objective of the program was to develop a set of effective approaches for establishing improved irrigation management practices through increased water user participation that can be used by the Department of Irrigation throughout Nepal.

For Phase I, the specific objective was to help the DOI build a nucleus of staff with hands-on field experience in developing and implementing participatory irrigation management plans for the jointly-managed systems.

Specifically, the major tasks proposed for this program were:

- (1) To develop and test methods of strengthening water users groups;
- (2) to facilitate dialogue among water users' groups, for the establishment of an organization to formulate and implement rules and regulations for operation and maintenance in accordance with the Irrigation Regulation 2045 and other DOI guidelines;
- (3) to determine a workable mechanism for continuous interaction between representatives of the water users organization and the DOI Banganga System staff;
- (4) to develop methods for improving delivery of water to farmers, particularly in the main canal, including alternative ways of water flow measurements and collection of relevant information for solving main system management problems and;
- (5) to analyze systematically the administrative linkages among the Banganga field site, the District Irrigation Office, the Regional Irrigation Directorate and the central DOI headquarters in order to determine fiscal and management changes necessary to implement and maintain cost-effective and efficient management of joint farmer-agency systems.

This final report presents the major findings and recommendations relevant to the objectives and expected outputs of the program. It covers four volumes, namely the main report, institutional development, main canal management and administrative linkages. The main report briefly covers the other three volumes.

1.3 Collaborative Arrangements

The implementation of the DOI-IIMI collaborative program in the Banganga Irrigation System was to be undertaken with the DOI staff at BIS, Research and Training Branch (RTB) and System Management Branch (SMB). Activities were planned and initial efforts were undertaken, with the involvement of RTB and SMB staff. Joint visits to BIS were made by the staff of RTB, SMB and ARD/USAID. One field workshop was also held at BIS to identify areas of collaboration with RTB and SMB. Agreement was reached on certain activities to be undertaken jointly with the staff of RTB and SMB. However, these activities were not carried out due to administrative difficulties on the part of RTB and SMB. One of these difficulties was providing field allowances to SMB staff. This was not allowed by USAID in this project.

Despite this inability to work collaboratively in the field or in Banganga, RTB and SMB were informed regularly on the progress of the project through meetings and quarterly reports. The staff of SMB and RTB were also very much involved in organizing the national workshop on participatory management as part of this project. The workshop was coordinated with RTB and SMB and, after the reorganization of the DOI, with the Irrigation Management and Water Utilization Division (IMWUD).

In the case of the BIS/DOI staff, full cooperation was obtained particularly from the system manager. Although the overseers were not interested in the project, the system manager was enthusiastic in implementation specifically in reorganizing the water users' groups (WUGs)². The other BIS/DOI field staff were also supportive of the program. With the staff reduction at BIS and the retention of only 1 gazetted staff, arrangements were made to hire on temporary basis ten field staff to help operate the system during the 1992 winter season.

IIMI fielded one researcher, one field assistant, one research fellow and one driver. Its international staff (one social scientist and one engineer) made regular visits to Banganga to provide support in carrying out the tasks as outlined in the objectives of the project. Additional support was provided by a weed expert, as recommended by SMB and RTB, to study the weeds in the main canal of BIS.

2. Results and Findings

The results and findings of this report are presented in three sections, namely, institutional development, main canal management and administrative linkages.

Efforts made reorganize and strengthen water users' groups effectively for participatory management are necessary in improving main canal management. Such improvement will be useful only if linkages within DOI at all levels are established to support participatory management. Moreover, operation and maintenance budget

² In this report, water users groups (WUG) refers to the lowest level group of water users that is slowly organizing itself for irrigation management and as yet, has not registered as a legal entity in accordance with current irrigation regulation.

Increasing Water User Participation in Irrigation Management

requests based on actual needs should be the major consideration for budgetary allocation. Likewise, linkages within the district between BIS/DOI and other support services for agricultural production should be functional.

2.1 Institutional Development

Two major activities under the institutional development are the DOI-farmer dialogue and Water users' group formation. Both of these activities have been extremely important in increasing the participation of farmers in the Banganga Irrigation as irrigators/farmers of the same WUG within the same village as irrigators/farmers of the same WUG within the same village. The details of these activities can be found in Volume II of the Final Report: "Institutional Development in Banganga Irrigation System."

2.1.1 Overview of activities

This section describes the sequence of activities undertaken by IIMI, DOI, BIS management, and others, and the personnel involved. It highlights the evolutionary nature of the participatory irrigation management project in Banganga.

The IIMI staff made several preliminary field visits to Banganga Irrigation System during the first six months of 1990. These field visits were made to assess the existing situation regarding water management in Banganga and to understand the history and evolution of the system, so as to plan a research activity there.

During the middle of July 1990 IIMI assigned a research officer to be based in Banganga itself to carry out research activities there. The research officer was assisted by several field assistants on and off for different activities.

Throughout August 1990, the research officer observed the irrigation management activities undertaken by the WUGs and FEWUGs. Through such observations and several meetings with the farmer members, the research officer began assessing the activities and efficacy of the users' groups. This process established rapport between the IIMI research staff and the farmers. Furthermore, living at the field site and interacting with them encouraged the exchange of ideas. The farmers felt more comfortable expressing their views and explaining to the IIMI research staff the reasons for undertaking and continuing "irrigation management". Such interactions provided a welcome opportunity to IIMI for evaluate jointly with the farmers the needs and performance of the water users' groups.

For the purpose of detailed observation and data collection, IIMI selected a 500 ha area within the command area. An area of 250 ha was selected in the head reach of the main reach of the main system within Bilaspur distributary and main outlet #21. The remaining 250 ha was located in the main outlets #40, 41, 42, 43 in the tail end of the main system.

Water measurements at the diversion, main and branch canals were undertaken to determine the availability of water at various points within the system.

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Simultaneously, socio-economic and agricultural data were collected for the 500 ha study area. Data collected were: inventory of farmers, their names, landholdings, area under different crops, area left fallow and reasons thereof, cropping patterns, land types, types of crops and their varieties, types and use of fertilizers.

With USAID funds to undertake this project, the research area was expanded to include 500 ha more to the previous 500 ha. The additional 500 ha were distributed among the main outlets 44, 45, 46, 47 in the tailend of the main system and main outlets 24, 26, 27, 28, 29, and 30 in the headend.

Similar data collection activities as carried out in the previous 500 ha were conducted in the additional 500 ha, thus making the research area 1000 ha.

IIMI interacted with the farmers to form new WUGs or restructure old ones within the pilot study area of 1000 ha.

Together with BIS management, IIMI conducted a farmer-to-farmer training tour to the Chattis Mauja and Pithuwa Irrigation Systems. This training was designed to expose and orient both BIS management and farmers to the management practices and capacities of farmers in well-managed farmer irrigation systems.

The IIMI staff facilitated the formation of more WUGs after the farmer-to-farmer training programme. Similarly at the initiative of BIS management and with IIMI's assistance, six WUGs were formed by the farmers outside the pilot research area.

Both BIS staff and IIMI research staff attended WUG meetings and guided the organizational arrangements and the formulation of rules and roles for the WUGs that were recently formed or reformulated. WUGs cleaned their respective canals through their members.

BIS management facilitated the involvement of farmer representatives in the preparation of the water distribution schedule for the winter crops.

A joint field workshop was organized by SMB, RTB, USAID, BIS and IIMI at Banganga to review the status of work in Banganga and to propose collaborative activities between SMB, RTB, BIS and IIMI.

Water measurements and gauge readings continued to be taken until the end of the research project.

A weed experiment was conducted using mixed gravel and uniform gravel, and comparing such use with the "natural" condition of the canal (control) in order to see the effect on weed growth and density.

In this relation a weed expert was hired to assess the nature of weed growth in the main canal and to recommend environmentally and ecologically sound practices to reduce weed growth.

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Data on the number of farmers within a WUG, their landholdings within each WUG, and their villages were verified and given to the farmers for their verification and use as a basis for certain irrigation management activities.

Water level at the Jagadish reservoir was continuously measured.

2.1.2 Situation prior to participatory program

Most of the WUG committees that were formed during **CADP** lacked even a membership list or a record on land areas within their WUG and the size of the area under the individual WUG's jurisdiction for water management. There were hardly any meetings held by the WUGs as a whole or their committees, and routine or emergency meetings and discussions regarding water allocation, distribution, resource mobilization for maintaining their outlet and field channels, and conflict resolution were basically non-existent. The specific duties, responsibilities, and rights of the water users and water users' group committee members, as well as between WUGs, also were not worked out. The WUGs did not collect the water service charges nor were they active in the repair and maintenance of their field channels and farm ditches. In short, there was a lack of coordinated participation of the water users in irrigation management.

The BIS office prepared the water delivery schedule without consulting the **CADP** WUGs, and this schedule was just dispatched to them and other government agricultural agencies. Very few meetings organized by the BIS office. When the IIMI research staff arrived in Banganga, only four meetings had been called by the office. Three of these were for paddy water delivery while one was for wheat. The irrigators informed the research staff that only a few leaders received the notice on the date of meetings. On an average only eight leaders out of **134** WUGs participated in these meetings.

Water delivery into the branch and distributary canals were undertaken by supervisors, gate operators, fieldmen, and dhalpas at the instruction of the system manager. The supervisor made regular field visits and inspected water distribution at the main outlets and the main and branch canals. The assistant engineer also made periodic field visits to the main canal to give further instructions to subordinates regarding water distribution and water adjustment in the branch and distributary canals and the main outlets.

Usually farmers (in groups or individually) approached the gate operators and supervisors to deliver more water to them. The gate operators and supervisors then informed their senior officials at the BIS office of these demands made by the farmers. Some farmers approached the system manager or his assistant engineer directly at the office for more water. The local people and irrigators informed the research team that these were big landlords, political leaders, and certain chairmen of the **CADP** WUGs. Thus adjustments in the water schedule were made at the instruction of senior officials to meet the demands of influential farmers, landlords, or politicians.

Water delivery from the main canal to the branch, distributary, and main outlets was the responsibility of the BIS office, and the WUGs were responsible for distributing the water within their branch and distributary and field channels. Since very few **CADP**

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WUG leaders were notified about the delivery schedule and hardly any of the WUG leaders were consulted in the preparation of the schedule, there was confusion in following the schedule properly. The WUGs did not take up their responsibility in water distribution. Thus, those at the headend diverted all the water (by even making "illegal" turnouts to their fields even though it was not their turn and the tailenders irrigated their paddy fields harvesting the drain water. The research staff observed a lack of understanding between farmers from the headend and the tailend regarding water sharing from the main canal.

Farmers were dissatisfied with the officials for several reasons. Chief among them were: there was always shortage of water being delivered, water was supplied irregularly, water delivery schedule was prepared without WUG involvement, water delivery schedule was not adequately distributed to all concerned, compensation was not paid to all those whose land was acquired for the CADP project, water tax was collected without an assured supply of water, several unnecessary and useless field channels were constructed, and poor relations were maintained with the farmers. Farmers also criticized the officials for not sticking to the very schedule they themselves prepared. Water was not adequately and timely delivered according to this schedule.

On the other hand, the officials claimed that farmers did not want to follow the water schedule and that they preferred continuous water supply. The officials noted that the farmers were not interested in being involved in the preparation of the water schedule and were not active during their own water distribution period.

In short, the research team observed several controversial issues between the farmers and the agency staff. Farmers were critical not only of the office-mode of water management but also of their own ineffective WUGs. The WUG leaders chosen by CADP were not interested in water distribution, in the preparation of water distribution schedule, and in the operation and maintenance activities of their field channels. The farmers noted that during the formation of the WUGs, the roles, rights, and obligations of the various functionaries were not laid down explicitly. The leaders of the WUGs were usually big landlords who were not interested in distributing water or willing to organize resource mobilization for their WUGs on an equitable basis. They did not know all the members of their WUG and how much land these members operated within the WUG's area of jurisdiction.

Internal structural cleavages, land holdings of a single irrigator dispersed throughout the command area, and political influences were cited as examples of problems faced by farmers in water management.

Farmers in general reported the presence of ill feelings between villages, between headenders and tailenders, and between and within the branch and distributary canals. Even within a main outlet, a branch, or a distributary, there were headenders and tailenders, although along the main canal this particular branch or distributary could be at the head or middle end. The headenders usually received abundant water and were not willing to share it with the tailenders.

Due to unavailability of water at certain places in the system and where structure were non-functional, water was harvested from drainage channels for

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irrigation. However, there were also water logged areas where paddy was the only crop grown.

Farmers felt that there was: i) a lack of good WUG leaders responsible for water management, and ii) lack of good coordination and collegiality between farmers and officials. Because of this, the preparation and implementation of the water delivery schedule was not participatory.

2.1.3 Formation of WUGs

IIMI was to select two alternative methods of strengthening farmer organizations but selected only one method: interactions together with farmer-to-farmer training. IIMI field research staff first interacted with various groups of farmers to learn from them the existing situation on irrigation management. An initial step was to establish rapport and gain the trust of the farmers. Later, the research staff facilitated the interaction of groups of farmers with the BIS office staff members through field visits, meetings and discussion sessions with or without the BIS office staff. During these visits and meetings, the IIMI research staff encouraged the farmers to form water users' groups to organize water management activities within their area constituting one branch canal or outlet. By having the farmers discuss their water management problems and by providing examples of effective water user groups, the staff were able to make farmers aware of the possibilities of organizing themselves at least for the purposes of their own area. As previously mentioned, a few water users' groups were formed by the water users themselves, with the by IIMI research team facilitating the process.

In addition to the interactions facilitated by the IIMI research staff among the different farmers and with the BIS office staff members, IIMI with BIS office organized a farmer-to-farmer training for twelve farmer representatives selected by the farmers themselves. This training was undertaken in September 1991. The farmer-to-farmer training has proven to be very successful in BIS. Twelve farmers, one fieldman, and the system manager 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 WUGs to improve their own irrigation management. They started to reorganize the WUGs themselves and also undertook the cleaning and desilting of the canals. It was precisely during the cleaning of the canal that the farmers felt the need for a strong WUG that would provide direction and supervision during any resource mobilization and operation and maintenance work.

IIMI stressed the fact that the formation of water users groups should **only** be done by the farmers themselves and that outsiders can only facilitate the process. It was important to create an environment that brought about awareness among individual farmers of the need for an organization. Talking with the farmers about collective action, the IIMI field research staff met with them every week and in the process brought about interactions among the farmers themselves. During these meetings, the objectives of participatory management as well as the need for the involvement and participation of farmers in the management of irrigation activities were emphasized.

The system manager was part of the farmer-to-farmer training program and also not only the farmer-selected representatives. They were taken to two large

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irrigation systems in the Teraito observe well-managed irrigation systems. The farmers were exposed to other systems that were being managed well by farmers themselves. The system manager was also able to witness the efficacy and capacity of farmer organizations. These field visits to other systems and an awareness of organizational and irrigation management matters motivated the farmers of **BIS** to convene and form their own water users' groups.

It was not only the farmers who were motivated to form WUGs. The system manager also after returning from the field visit, began facilitating the formation of newer WUGs outside the research area.

SMB and RTB were supposed to collaborate in the farmer-to-farmer training but did not. These should have been the institutions that were to train both farmers and fieldmen who, as Association Organizers, were to organize water users in the rest of the command area. In the absence of their involvement, IIMI tried out the complementary approach using interactions with farmers as Association Organizers and the farmer-to-farmer training.

A total of **13** WUGs were formed under the participatory management program in BIS. The rest were outside the pilot area, in Laxminagar, Taulihawa, and Hathihawa branches of Banganga irrigation system's command area.

The WUG committee consisted of a chairperson, vice-chairperson, secretary/treasurer, members, and chowkidar (patrolman). Selection of the functionaries was done by the farmers themselves during general assembly meetings. During such meetings, the DOI staff often interacted by providing comments on activities undertaken by WUGs. The one-year tenure of these functionaries and their remuneration were set during these very meetings. Chowkidars were provided paddy by the farmers as remuneration where others were excused from labor work. The duties and responsibilities of WUGs and their committees were written down in a book of minutes.

Depending on the appropriateness, the WUGs have been formed based on either hydrological or village boundary. The farmers weighed various options regarding the number of water users. Since it was the farmers' first attempt in forming water users' groups, the process was evolutionary and adjustments had to be made by the farmers.

It was noted that in village-based WUGs, landowners and tenants lived within the area, and the main outlet was located usually in the village. This made possible easy communication among the members for resource mobilization, decision making, control of free-grazing, and conflict resolution. The interrelationships between the villagers as irrigators/farmers of the same WUG within the same village facilitated irrigation activities. Established social relations within the village also facilitate ongoing irrigation activities under WUGs.

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The membership criteria of the WUG committee as set by the various groups of irrigators were as follows:

- i) genuine irrigator and cultivator within the outlet
- ii) resident of the village (where WUGs are based on a hydrological boundary),
- iii) experienced with water management activities regarding water allocation and distribution,
- iv) recognized and respected by the community,
- v) able to mobilize resources for O&M, and
- vi) minimally involved in "party" politics.

During several meetings of the general assembly of water users within a single WUG, the assembly (by themselves or at the suggestion of the IIMI research staff or the BIS system manager) decided on the following duties and responsibilities of the committees:

- i) to forward requests for water, seeds, and other inputs and to BIS management,
- ii) to mobilize resources for O&M of field ditches, farm ditches, main ditches, outlets and distributary canals,
- iii) to supervise and monitor canal repair and cleaning work,
- iv) to keep minutes of meetings of WUGs and records concerning irrigation activities, attendance, and accounts of income and expenditure,
- v) to collect fines and fees for not attending canal work or letting loose one's cattle along the canal, etc.,
- vi) to allocate and distribute water by WUG among the outlet and distributary according to water distribution schedule provided by BIS,
- vii) to allocate and distribute water within the WUG area after allocating water between different WUGs
- viii) to hold regular farmers' assembly meetings for irrigation activities as required,
- ix) to resolve water conflicts,
- x) to implement WUG rules and regulations,

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- xiii) to establish good communication and coordination between the farmers and the various line agencies, especially the DIO, and
- xiv) to participate with the BIS office in the preparation of water delivery and water distribution schedule prior to seed bed preparation and wheat sowing.

These tasks were divided among the various functionaries.

Various activities were undertaken by WUGs during the participatory program. Irrigation rules and regulations were formulated by each WUG with the help of the District Irrigation Office (DIO) staff. Farmer dialogues were facilitated by the IIMI. Whenever they were faced with problems regarding irrigation management activities, the WUG committees called farmer assembly meetings for formulating and improving on the rules and regulations. Such behavior is indicative of an evolving and dynamic organization. Fines were imposed on certain restrictions, and these fines were collected.

After the formation of WUGs, farmers cleaned their main outlets and distributary canals and acquired water as groups rather than on individual or ad hoc basis.

Within the newly established WUGs, water allocation has been made on the basis of the stage in the crop life cycle. Individual farmers now request water from their own WUG. Farmers are slowly beginning to relate their resource contribution to canal cleaning and O&M with water allocation. Some WUGs have begun to think about water allocation being based on either land area or labor contribution.

Within some newly formed WUGs, water distribution is slowly being based on priority and felt need for irrigating the crop. If water is plenty and there is adequate soil moisture then continuous water distribution is practiced in each main farm ditch from the distributary and main outlet.

Resources in terms of labor were mobilized for cleaning the canal. After the formation of WUGs, some 40 km of canal were cleaned with nearly 3000 labor days. This was the first time that the farmers cleaned the canals themselves. The amount of and basis for contribution from each of the WUG varied. For example, in Gobari WUG, contribution was on the basis of land area. However in Semari, Shivpura, Tilaura, Gothihawa, Bilaspur, Laxminagar, and Sukhampur it was on the basis of households. Some have questioned the household criterion on grounds of equity, and therefore this basis for labor contribution may change.

Each newly formed WUG established sanctions and fines for violations of the WUG's rules and regulations. For example, penalties and fines were imposed on those absent from maintenance work, steal water, and damage the canal.

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many farmers and to realize the least overall transaction costs and minimal misunderstanding between the agency staff and the WUGs. The agency staff made clear to the farmers that it was not possible for BIS management to deal with individual requests for every irrigation service.

BIS/DOI stipulated that certain **structural** improvements were to be carried out only after the farmers and their WUGs agreed to fulfill out their responsibilities in operation and maintenance too. Thus minor structural improvements were used as bargaining or negotiating chips to bring about operation and maintenance within areas under WUG jurisdiction and thereby bring about social cohesiveness and self-reliance. The BIS manager had contemplated tapping the farmers for these improvements but faced a problem in using them for skilled labor (e.g., masonry) which was usually contracted out. He tried to find ways of involving the farmers in such a way that satisfied the auditors (given the current policies and practices for such minor improvement skilled work).

Not all problems regarding irrigation operation and maintenance and the preservation of structures within the system have been solved by the different WUGs. **Also** some problems were minor and did not undermine the solidarity of the group. For example, when a rod for a gate was stolen and nobody knew about it, the concerned WUG discussed the situation and invited BIS/DOI and IIMI to participate in the deliberations. WUGs had been requesting both BIS/DOI and IIMI to attend their meetings so that the members could interact with the agency and seek help regarding certain organizational issues.

Both BIS/DOI and IIMI acted as catalyst or **facilitators** in addressing organizational issues faced by the different WUGs. They requested several meetings with different groups of farmers and tried to make them aware of the importance of organizing into water users' groups. They took the farmers for a farmer-to-farmer training visit. They made suggestions regarding the organizational **composition** of WUGs, rules, responsibilities, and roles, and made the farmers aware that they (farmers) could accept or reject such suggestions.

Continued farmer-agency dialogue was achieved through both formal and informal meetings. The WUGs recorded their agenda, decisions, and follow-up activities undertaken by their WUGs in their book of minutes. WUGs approached BIS/DOI to act as arbitrator. When conflicts occurred within WUG areas, WUGs committees wanted the support of DOI to resolve the conflicts, especially those related to free-grazing, canal embankments damages, or the creation of illegal **offtakes**. The BIS office met with these farmers and suggested an internal conflict resolution mechanism with rules, sanctions, and chowkidars to enforce them.

New crops such as maize and early paddy were planted within the command area of the pilot WUGs. The farmers said that they now have some confidence in the WUG's ability to assure water supply and control cattle grazing and therefore ventured into planting new crops. The WUG committees collected information on the amount of seeds, fertilizer, and pesticides necessary for the farmers who were planting these crops and submitted these requirements for inputs to BIS/DOI. BIS/DOI in turn forwarded these demands to the various support services located in the district. BIS

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Fines also were collected from those whose cattle grazed along the canal. Fines amounting to nearly NRs. 2300 were collected by seven WUGs.

2.1.4 DOI-Farmer Dialogue

To facilitate communication, information exchange, and decision making, the WUG committees held periodic meetings, both formal and informal. Many of these were held at the request of the IIMI research staff and the **BIS** system manager. However, after the initial stage, these meetings were called and convened by the WUG committees. Four different levels of meetings, discussions, and dialogues were facilitated with farmer participation. These were: **DIO/farmer**, **DIO/WUG**, **WUG committee/farmer**, and **WUG meetings**.³

During the **DIO/farmer** meetings, topics such as the selection of WUG committees, selection of participants for farmer to farmer training, 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 **DIO's** irrigation rules were discussed.

In meetings between the **DIO** and **WUG** Committees, water distribution schedule, cutting of canal embankments, calculation and auditing of labor contributed for **O&M** for paddy crop, and announcement of accounts of the various WUGs were some of the topics usually discussed.

In **WUG** meetings, announcements of annual accounts, labor mobilized and contributed, salaries of patrollers, collection of fines, and ensuring water distribution even in times of water scarcity were the issues covered.

In **WUG** committee meetings, the collection of demands for seeds and other inputs of agriculture to be requested from the various support service offices through **BIS**, application for water from **BIS**, date for general assembly, division of labor for operation and maintenance, and proposition of annual irrigation activities for structural improvement of the system were some of the topics discussed.

In each of these meetings, a constant monitoring and evaluation of irrigation rules and regulations set by the various WUGs were undertaken. At this initial stage of the formation of some WUGs, the meetings provided a forum for learning and enhancing coordination and communication among the parties concerned. It was in these meetings that new working relationships regarding irrigation and related activities were formed and roles, responsibilities, rights, and sanctions were endorsed and took a firmer form.

³

DIO here refers to **BIS office**. In the latter part of 1991, **BIS** was subsumed within **DIO** and thus **DIO/Farmers** or **WUGs** relationships have been used. When **DIO** is referred to during meetings, the staff members representing **DIO** usually consisted of the system manager and one or two of his **overseers**.

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Interactions between the manager and the farmers also revolved around certain activities. Prior to the monsoon season of 1991, a general meeting of the chairmen of WUGs, whether functional or not, was convened by the system manager to inform them of the water delivery schedule. Previously, it was the BIS office that laid down the terms of the water delivery schedule and the farmers were informed only after the schedule had been made.

In 1991, information about the water delivery schedule was conveyed to farmers at the different sections of the canal through successive meetings at those places. During these meetings, the system manager tried to motivate and convince the farmers that cleaning, repairing, and maintaining their canals was for their own benefit. It was the system manager himself who organized these meetings. The IIMI field staff were consulted by him for facilitating discussions and providing examples of farmer organizational strengths elsewhere in Nepal. One example was how some functional WUGs which, as organizations, were functional cleaned outlets and tertiary channels of about 15 km.

During the 1991 monsoon season, the system manager along with the IIMI field staff organized a total of 25 meetings with farmers in 15 villages. These meetings were used to inform and discuss with the farmers about the water delivery schedule for the monsoon season, water users group formation, formulation of rules and regulations, labour mobilization for canal maintenance, and farmer selection for the farmer-to-farmer training activities. These meetings facilitated interactions and dialogues between the agency staff and the farmers. The farmers were informed about the water delivery potential, agency constraints in meeting maintenance costs, and proposed plans for water management activities to be carried out by the agency alone or with assistance from the farmers in the system. Thus, better understanding and rapport were achieved in relation to the operation and maintenance of the system for the monsoon season.

In preparation for the winter cropping season, a general meeting for WUG leaders was held in the BIS office. The purpose of this meeting was to prepare the water delivery schedule for the 1991-92 winter season. A total of 38 WUG representatives participated in this meeting. This was a significant improvement over last year's meeting when only eight WUG representatives attended. The change can be attributed to the willingness of BIS to involve the farmers in formulating the water delivery schedule, the sincerity and efforts of the BIS staff to meet with the farmers and discuss water management problems. In this meeting, the system manager explained and emphasized the necessity of rotation and the proper use of irrigation water due to the limited supply impounded in the reservoir. WUG leaders participated because it was for their benefit to be informed about the water availability situation of the system, represent their group's views, and interact with both agency staff and functionaries of other WUGs.

During the winter cropping season of 1991-1992 and pre-monsoon period, several meetings and visits were held between the WUGs and BIS/DOI. The system manager participated in these meetings which discussed the scheduling of water delivery, water users' group formation, and annual income and expenditures of the various WUGs. During these seasons, BIS/DOI support was provided mainly in terms of continued strengthening of the already formed water users' groups. BIS/DOI stressed the need for strong organizations to deal with the various demands of the

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many farmers and to realize the least overall transaction costs and minimal misunderstanding between the agency staff and the WUGs. The agency staff made clear to the farmers that it was not possible for **BIS** management to deal with individual requests for every irrigation service.

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Both **BIS/DOI** and **IIMI** acted as catalyst or facilitators in addressing organizational issues faced by the different WUGs. They requested several meetings with different groups of farmers and tried to make them aware of the importance of organizing into water users' groups. They took the farmers for a farmer-to-farmer training visit. They made suggestions regarding the organizational composition of WUGs, rules, responsibilities, and roles, and made the farmers aware that they (farmers) could accept or reject such suggestions.

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and WUGs have begun a process for coordinating support services and acquiring them for the various new crop growers.

BIS/DOI together with IIMI explained to the various WUGs about the workshop on participatory management and facilitated the selection of the farmers' representatives to the workshop. These representatives presented papers regarding views on participatory management at the workshop in Kathmandu. During the workshop, DOI-farmer dialogue was elevated to the national level.

2.2 Main System Management

The set of activities dealing for main canal management improvement is a major component of the DOI-IIMI collaborative program. This section briefly describes these **activities** and presents highlights that include procedures used and results obtained in the main canal improvement efforts. Details of this section can be found in Volume 3 of the Final Report, "Main Canal Management in Banganga Irrigation System."

The activities presented here cover *two* seasons, namely, 1991 monsoon season and 1992 winter season. To facilitate management and analysis, the system was divided into head, middle and tail sections (Figure 1).

The cropping pattern at BIS starts in June during the monsoon season and ends in November. Paddy is the main crop. For the winter season, crops planted are wheat, mustard, vegetables, and other cash crops. Cropping starts in December and ends in April. Early paddy, corn and vegetables also are planted in limited areas, starting in March and ending in July.

2.2.1 Monsoon Season Activities and Results

Prior to the monsoon season of 1991, the DOI and IIMI field staff conducted farmer surveys for organizational purposes, initial water flow measurements in the main, canal and other relevant system data collection. A schedule for irrigation water delivery was formulated **by** the system manager and presented in a general meeting. Only **8** chairmen attended this meeting but subsequent meetings were held in the villages within the command area. In these meetings, discussion were on the monsoon schedule, water users' group formation, and topics that dealt with the operation and maintenance of the system affecting farming activities.

Water flow measurement in the main canal was initiated. However, due to siltation and weed infestation, accurate staff gage calibration was not feasible. An alternative method of monitoring water flow that **was** developed was the daily monitoring of flow by recording the number of days water flow was observed in the different outlets, distributary and branch canals along the main canal. This monitoring method fits the schedule of water delivery since it uses the number of days that each

section of the canal is to receive irrigation water. It was found practical and useful by the DOI/BIS field staff.

However, this method does not take into account the actual volume of water flow and also assumes constant flow in the outlets. Verification of the method was undertaken by comparing actual measuring flows in the head, middle and tail sections of the main canal during the 1992 winter season. The results were very similar in terms of seasonal average proportions of flows into each section. Despite the high variability in flows observed in this verification, the alternative method was found effective and useful in monitoring and evaluating water flow and adequacy in the main canal operation.

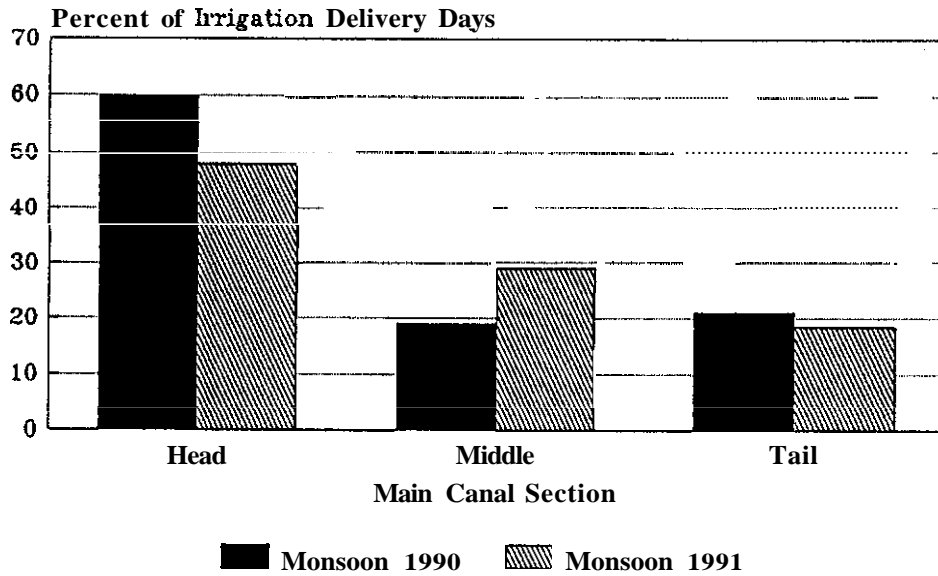
An inventory of the main canal gates was also undertaken. Only 43 percent of these gates were found functional. This is an indication of farmer intervention in the main canal. There was a nominal density of 17 BIS/DOI field staff or 2.3 km of canal per field staff, who were supposedly providing control in the main canal. The laxity of the field staff contributed to the deterioration of the main canal gates. Notwithstanding the intervention of farmers in the main canal and the apparent laxity of the BIS/DOI field staff, efforts were made during the 1991 monsoon season to monitor flows, control gates where feasible, and operate the reservoir outlet gate in a timely manner to effectively use the rainfall. Farmer intervention was reduced due to the 25 meetings held in different villages within the command area. The system manager took the initiative in these meetings to explain to the farmers the merits of a water users organization and to discuss mutual concerns on the operation and maintenance of the system. With these efforts, a total of 13 WUGs were reorganized and strengthened covering about a third of the command area or about 2,000 ha.

A comparative analysis was made of the 1990 and 1991 monsoon seasons. The head section received the largest proportion of irrigation water in terms of irrigation days, although water volume was reduced by as much as 12 percent. There was also an increase in the number of irrigation days in the middle section which show that improvement was being made in the distribution of irrigation water (Figure 2). Rainfall was observed to be 18 percent less in 1991 compared to that in 1990. However, this reduction in rainfall did not affect significantly water availability in the command area of BIS. These results indicate improvement in the effectiveness of main canal management efforts undertaken under the DOI-IMI collaborative program.

2.2.2 Winter Season Activities and Findings

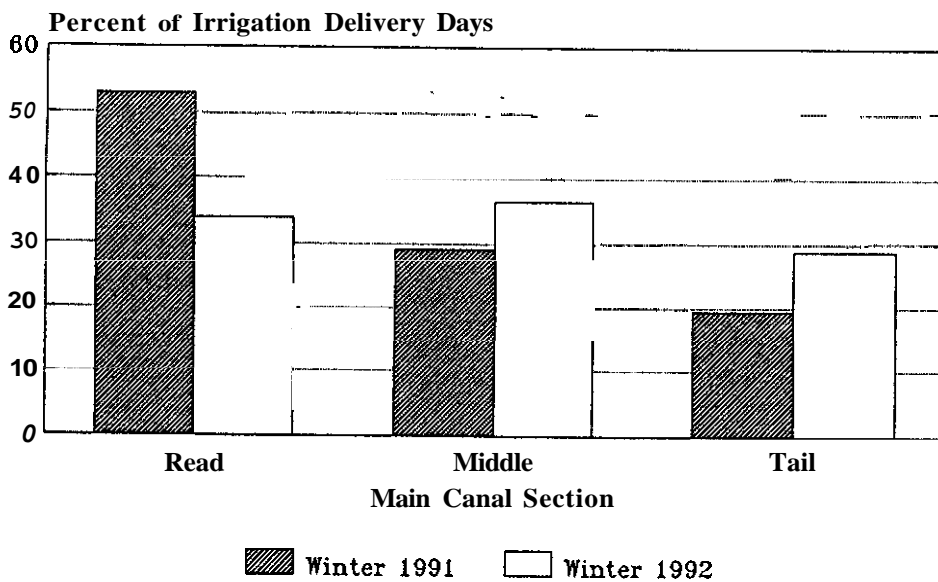
In the winter season of 1992, there were several events that affected the operation at BIS. Among these were the reduction of BIS/DOI staff and the transfer of the BIS management under the District Irrigation Office (DIO). The policy of terminating-project appointed staff reduced the number from 47 to 4 gazetted staff. The BIS system manager was retained as acting DIO engineer, and the temporary hiring of 10 field staff for BIS was undertaken.

Figure 2. Pattern of Water Distribution for Monsoon Seasons 1990 and 1991



Percentage of Delivery Days:
Ratio of actual irrigation delivery days
for each section over the seasonal total

Figure 3. Pattern of Water Distribution for Winter Seasons 1991 and 1992



Percentage of Delivery Days:
Ratio of actual irrigation delivery days
for each section over the seasonal total

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Despite these changes the BIS system manager organized the operation of the system. A meeting of WUG chairmen was called before the start of the winter season. A total of 28 WUG chairmen and 10 farmers attended this meeting which enabled the farmers and the BIS system manager to formulate the winter season allocation and schedule of distribution. The meeting also illustrated to the farmers that their participation in decision-making was important in the operation of the system. The sequence of water delivery schedule agreed upon was to start at the tail towards the headend.

There was a total of three rotational schedules in all for the winter season. The two succeeding schedules were adjusted in accordance with the actual demands of the farmers. This flexibility on the part of the BIS system manager to accommodate the farmers' demands also points out the effectiveness of DOI and farmer interaction through frequent meetings or dialogues. During this season there was a shift away from wheat and on with increase in other crops like oil seeds, vegetables, banana and sugar cane. To a certain extent such crop diversification indicates some degree of confidence in the main canal management undertaken by the BIS/DOI staff.

For the winter season three levels of analyses were done, namely, comparing the patterns of distribution of the 1991 and 1992 winter seasons, comparing plan and actual distribution, and comparing the 1991 monsoon season and 1992 winter season. The 1992 winter season had significantly better distribution than the 1991 winter season. The head section received more than 50 percent of the total irrigation days for the 1991 winter season, while for the 1992 only 33 percent was received by the head section and 36 percent by the middle section (Figure 3). A comparison of the plan and actual water delivery shows that in the 1992 winter season about 12 percent of the total number of irrigation days was in excess of the plan in the head section, about 10 percent was less in the middle section, about 3 percent was less in the tail. Moreover, there was more equitable distribution during the 1992 winter season than during the 1991 monsoon season .

The significant improvement in the water distribution can be attributed to effective participation of the WUGs in the formulation of the winter season irrigation delivery schedule, increased efforts of the temporary field staff to enforce the schedule, cooperation by most farmers in abiding by the agreed upon schedule, and the efforts of the BIS system manager to meet and discuss with the farmers and manage the main canal effectively.

2.2.3 Main Canal Maintenance

In the maintenance of the main canal, 3 problems were highlighted. These were siltation, weed infestation and repair of irrigation facilities in the main canal. Yearly deposition of silt has been monitored at the rate of 25-30 cm per year since 1985. The silt deposition reduced the carrying capacity of the link canal, from the diversion to the reservoir, to only 18 percent of the design capacity. Out of the estimated 600,000 Nrs needed for complete desilting, only 250,000 Nrs was provided. This amount was enough only to desilt 3 km of the 50 km long link canal. Though considered palliative, the desiltation done increased the capacity of the link canal and enabled the reservoir to store more water for the coming 1992 monsoon season.

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Weed infestation also affected the effective operation of the main canal. Weeds retarded the flow, causing unnecessary flows into the ungated outlets in the upstream section of the main canal. The result was lesser number of irrigation days for the tail section in both the monsoon and winter seasons. To reduce the excess delivery in these ungated outlets in the head section, mud was used to plug the outlets, particularly when the schedule for water delivery was intended for the tail section.

An experiment for testing the effects of lining the canal with uniformly graded gravel and mixed gravel was conducted. Results indicate that the mixed gravel lining was more effective than the uniformly graded gravel. After eight weeks, an average weed population density of 20 per meter of main canal length was observed in the uniformly graded gravel. While for the mixed gravel, less than the average weed population density of 4 per meter was observed. The cost of the gravel lining was only 50 Nrs per meter of main canal length. This experiment needs further verification to determine costs and benefits and also feasibility not only in BIS but in other systems as well.

Expert consultation was also tapped. A weed expert was commissioned to study the weeds in the main canal of BIS and to make recommendations for non-chemical suppression. The recommendations were that the experiment should be continued for further verification and that certain types of algae can be used to suppress weed growth in the canal bed bottom. The obvious practice of weed removal including the roots and also for floating varieties was suggested. Moreover, several weeds growing in the main canal were categorized and their uses were identified, such as fodder, fuel, soil binder, food, medicinal material. With such utility, DOI field staff and farmers can be motivated to remove these weeds more often, thus reducing weed infestation.

2.3 Analysis of Administrative Linkages

The administrative linkage analysis of the Banganga Irrigation System covers the following aspects: 1) administrative and budgetary linkages with the Regional Directorate (RD) office and the Department of Irrigation (DOI) in Kathmandu; 2) irrigation system functions in relation to other district level support institutions; 3) the potential for the formation of water users' organizations to complement the activities undertaken by the BIS, with emphasis on operation and maintenance (OSM) and resource mobilization; and 4) the role of the District Irrigation Office (DIO) in relation to large-scale irrigation management.

The succeeding portions of this section highlight the results of this analysis. However, details can be found in a separate report entitled "Administrative Linkages of Banganga Irrigation System", Final Report Volume IV.

Constructed in 1978, BIS was rehabilitated with an Asian Development Bank (ADB) loan, under the Command Area Development Project during the period 1982 to 1989. Since 1990-91, there have been no project activities. The system first came under DOI, later on was supervised by the Western Regional Irrigation Directorate (WRID) in Pokhara, and now is under the DIO in Kapilbastu district.

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The analysis shows that the transition from one project to another and finally to a non-project status was not smooth. During the transition, there was a complete dislocation of every aspect of irrigation activities. Shortage of manpower, insufficient budget for O&M, and high silt deposits in the link and main canals were the general complaints. Specific issues during the non-project status of BIS were: 1) role of the irrigation system manager; 2) manpower allocation in the system; 3) budget provision; 4) support from RD and DOI; and 5) relation between system management and users' organization.

One crucial consideration observed was that the system manager should be able to meet the target of water delivery. This consideration is needed in order to establish good rapport with other district level agencies, and to mobilize services and resources for increased agricultural productivity in the command area. The manpower required depends on among other factors, the O&M needs of the system. Although O&M work is under the direction of the irrigation system manager, manpower allocation is decided by the RD and procedures for allocating the right manpower have not been developed either at the DOI or the RD level.

2.3.1 Administrative and Budgetary Linkages

There are two components of the budget: administrative and program. In the program budget, the relation between the expenditure and its output (either in terms of expansion of irrigated area or increase in agricultural productivity) is not determined. An analysis of budget allocation shows the need establish standards for allocating O&M costs on an effective command area basis.

There has been no input to the Bangangasystem from the RD regarding O&M standards and the formation of users' organizations. Neither technical nor supervisory support has been provided by the RD in the improvement of system management. close interaction can be found only in budget allocation and estimate approval. There is a very weak link between the DOI (central Kathmandu office) and the staff of large-scale irrigation systems. The DOI through the RD is supposed to provide standard and guidelines for the O&M of large-scale irrigation systems. The DOI gets involved only when the O&M problems of these systems become unmanageable.

The government is not capable of continuing to pay the O&M costs of large irrigation systems. The water fee collection rate is below 7 percent, and less than 20 percent of the requested maintenance budget for large irrigation systems like BIS is approved by the RD. Thus, possible alternatives for financing O&M must be considered. Such alternatives call for government and farmers to jointly bear responsibility and for the government to have a strong policy on the joint management of irrigation system. With this vision, it is important to delineate division of work, undertake institutional rearrangements, and strengthen farmers' organizations.

2.3.2 Irrigation System Functions and its Relation to District Level **Support Institutions**

The analysis also points out that there are various line agencies at the district level whose mandate is to provide support services to farmers to help them increase their agricultural productivity. These offices are: 1) District Agriculture Development Office, 2) Agriculture Input Corporation, 3) Agricultural Development Bank, 4) Chief District Office, and 5) District Irrigation Office.

Since the irrigation system manager has a defined area of work, the initiative to bring goods and services to the command area through his coordination is very crucial. Therefore one of his important roles is to manage support services for the command area farmers. The activities as well as the manager's performance are to be focused on the objective of increasing agricultural productivity within the command area. Therefore, productivity targets must be set.

The activities that will help achieve agricultural productivity are: 1) regular maintenance activity, 2) better water distribution, 3) strengthening and activating users' organizations, 4) making credit available, 5) ensuring the availability of agriculture inputs, and 6) water fee collection.

The role of the system manager should be reoriented from construction activities to "management of agricultural production activities." Only with such a reorientation would it be possible for him to take up the initiative of bringing the scattered district level services to benefit the farmers of the command area.

2.3.3 The Role of the District Irrigation Office (DIO) in the Management of Large Irrigation Systems

There are important issues to be considered regarding large-scale irrigation system management under DIO as decided and implemented by DOI. These issues are related to: 1) the initial objective of the DIO to work for district level small-scale irrigation systems, 2) the lack of experience on the part of the DIO in managing large-scale irrigation systems, 3) the possible neglect of large-scale irrigation systems because of the DIO's mandate for the entire district's irrigation systems.

One alternative is having large-scale irrigations systems as a separate entity, directly under the RD. An effort should be made to keep the systems semi-autonomous, in which case guidance from the RD will be more effective. Since most of the large-scale irrigation systems are to be under joint management, the DIO should provide more support than what is currently available.

Overall, the analysis tries to bring out issues beyond mere system management. External and internal administrative linkages were seen in view of the immediate objective of the irrigation system, i.e., increased agricultural productivity.

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Thus, agency staff and users both should be guided by the performance criterion of enhanced agricultural productivity. Both parties, would have to tap support services, make them available for system management, and be accountable to the farmer members in bringing in the resources. The performance evaluation of system management, support services, and water users should therefore be focused on increased agricultural productivity. Corollary to these incentives, rewards, and sanctions should revolve around this performance criterion.

Thus a crucial role for the agency and farmers beyond mere water control in the post-construction period is the management of the irrigation system, water users' groups and system agency staff, and support services.

The analysis also brings out the concern regarding the capability of the DIO in view of merging large scale irrigation systems within DIO.

3. National Workshop, on Participatory Management

To review the accomplishments of the DOI-IMI program at the Banganga Irrigation System, a two-day national workshop on participatory management was held on 29-30 April 1992. This was undertaken also in fulfillment of the stipulations under the cooperative agreement with the donor of the program (USAID Mission to Nepal).

To broaden the scope of the workshop two objectives were pursued, namely: 1) To arrive at guidelines for DOI's policy on participatory management in agency-managed irrigation systems; and 2) To review and extract lessons from the results of the joint or participatory management programs at Sirsia Dudhaura, Mahakali and Banganga irrigation systems, which will be useful in the formulation of the guidelines.

Three topics were prepared for each of the systems. These were on main system management, formation of water users' associations and view from the farmers regarding participatory management.

One of the main features of this workshop was the actual participation of the farmers. The decision to involve the farmers in this national workshop was based on the obvious reason that if farmers are to be partners in development, they must be treated accordingly. From DOI's experience, this was the first time that farmers were invited to write papers, present them and also discuss with DOI staff their views on a program that concerns them.

The entire proceedings of the workshop from paper presentation to discussions and wrap-up were conducted in Nepali. Only when non-Nepali speaking participants intervened was English spoken. This arrangement further encouraged the farmer participants to voice out their views during discussions.

3.1 Summary of Workshop Papers Presented

The following discussion provides a comparative summary and synthesis of the papers presented, highlighting how participatory management has affected main system management, formation of water users' organizations, and farmers' views on participatory management.

3.1.1 Main System Management

In the operation and maintenance of the main system, the involvement of water users' associations was marginal. This was basically due to the stipulations of the Irrigation Regulation of 2045, which confines water users' association participation only in the tertiary level of system operation and maintenance.

The establishment of the Farmer Organization Division which will work closely with the Water User Association Coordination Committee will facilitate the participation of the WUAs⁵ in the operation and maintenance of the main system in the Mahakali Irrigation Project. While in BIS, the involvement of the WUGs in the formulation of the water delivery schedules is a step forward in making participatory management more meaningful and effective.

In the case of the SDIS, the participation of the WUOs at the branch and tertiary levels facilitated the operation of the main system in water distribution and also in the reduction of water-related conflicts. Similarly, in the MIP and BIS, water-related conflicts were reduced due to the formation of the WUGs.

In terms of main system maintenance, there was no participation of the WUOs or WUGs. They were involved only in tertiary level maintenance. However, the impact of this participation can affect indirectly the main system maintenance. The savings generated in maintaining the tertiary canals and facilities can be used to fund the maintenance of the main canal and other facilities. But this is feasible if there is a mandated budget for the tertiary level maintenance from the government.

However, funds for maintenance have been limited for the main canal, with nothing at all for tertiary level. This is one reason why farmers are organizing. Specifically in SDIS and BIS, funds for maintaining the main system have been limited. SDIS and BIS in particular, more funds were acutely needed for desilting, in order to increase intake of river water into the main canal.

There were problems common to MIP, SDIS and BIS cited in the papers regarding main system management. In MIP and BIS, lack of cooperation or more farmer involvement in participatory management and lack of knowledge about new technology on crop production and efficient use of irrigation water by farmers were cited by the system managers. At BIS and SDIS, lack of funds for maintenance was experienced. This is expected, since these systems are dependent on DOI's regular

⁵ Water Users Association (WUA) is the second tier level of organization of water users groups. Water Users Organization (WUO) refers to the formalized as in the cases of SDIS and MIP registered water users groups (WUGs). WUG is defined in footnote number 2 on page 4.

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budget. In contrast, to MIP which is still on a project budget has sufficient funds for maintenance.

3.1.2 Water Users' Organization/Group Formation

The basic issue on water users' organization or group formation is that of organizing for collective action. In all of the three systems, this common purpose made the formation of WUOs/WUGs viable. If the farmers feel that by there is a clear purpose for organizing, in particular to solve problems that confront most of them, then the organization can be functional. These problems can be directly or indirectly irrigation-related, such as unreliable and inadequate water supply or free-grazing of livestock.

In MIP and BIS, previous organizational formation efforts had failed. These efforts were deficient in providing a clear purpose for solving existing problems and in clearly defining specific tasks, responsibilities and rights. In the case of **SDIS**, the initial failure was due to the adhoc formation of WUOs which was based primarily on village boundaries rather than on hydrologic considerations.

Association organizers (AOs) were used extensively in the formation of MIP and **SDIS**. A three-tiered overall organization resulted from these efforts. In the case of BIS and **SDIS**, the farmer-to-farmer training approach was used in facilitating the WUO/WUG formation. BIS also plans to organize into a three-tiered overall organization.

The major difference among the three systems is that they located in different Terai regions, with SDIS in the Central region, MIP in the Far West, and BIS in the Western region. MIP for its part has to share its water source with India. Also the MIP the farmers have no experience irrigation. SDIS and BIS, on the other hand, are relatively older systems.

At **SDIS** and BIS, background information on farmers (particularly on the location of field plots in relation to their primary water source), mapping, and other relevant information were necessary in forming the WUO/WUG. Such information was needed in determining membership in the WUG and the basis for organization (whether village-based or canal-based). This information gathering was a time consuming activity that required patience and determination in discussing with farmers.

Multiplier or demonstration effects were clearly illustrated in the case of MIP, where 2 1/2 years later, all of the tertiary committees were able to form WUAs or the third tier of the overall organization. Similarly, in the case of **SDIS**, the overall organization resulted in the formation of the WUA or sangh (the umbrella organization representing the 13 tols and 43 sub-tolis). However, due to some recent problems (inactive membership) this sangh has become non-functional.

One of the major benefits of WUOs is the reduction of water-related conflicts among farmers. This was highlighted in all of the papers. In MIP, the tailend farmers began to receive water and more effective use of water was observed. Similarly in SDIS, irrigation water delivery became reliable, and water use efficiency increased by

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as much as 20 percent. The result was increased irrigated paddy area from 900 to 1400 ha during implementation of the participatory program. In the case of BIS, more equitable distribution was observed in both the monsoon and winter seasons. In all of the three systems, farmers were very effective in maintaining the tertiary canals.

There were also common problems encountered in WUO/WUG formation such as convincing farmers that organization will alleviate or solve some of their problems, lack of good WUG leaders and mutual trust among farmers, and credibility of the DOI in dealing with farmers' problems. Other problems encountered were mostly system specific.

In both MIP and BIS, the existing DOI staff were very much involved in the formation of the WUO/WUG. This involvement contributed to WUG sustainability in solving water-related problems. The WUGs can also become the organization that will manage support services from other agencies concerned with agricultural production.

3.1.3 Farmers' Views on Participatory Management

There was a consensus in the farmers' papers from SDIS, MIP and BIS that the benefits of WUOs are: a reduction of water-related conflicts, formulation of water distribution schedule, implementation of equitable distribution, mobilization of labor resources for maintenance of tertiary canals and in some cases distributary canals, and inculcation of self-reliance and respect for public property or reduced destruction or vandalism of irrigation facilities and structure.

The MIP farmers expressed the concern that the 25 percent rebate to the WUOs as stipulated in the Irrigation Regulation 2045 should be given promptly by the DOI. Lack of funds for maintenance was also cited by the SDIS farmers. Difficulty was also experienced in mobilizing voluntary labor for maintenance of the tertiary canals at SDIS and BIS. There were also system specific problems which should be addressed accordingly by the respective DOI system manager.

There was unanimous expression of concern from the farmers regarding the lack cooperation from the DOI to make irrigation management effective. This is in contrast to what was claimed by the DOI staff as one of the problems facing main system management. Such contribution clearly shows the need for more and frequent DOI and farmer dialogue, if participatory management will be sustained and successful.

The papers presented by the farmers, **although** brief, clearly pointed out that there is still a lot of room for improvement in effective communication between farmers and system engineers and also in the methods of organizing farmers, particularly in the sustainability aspects of these efforts. The commonalities among systems were extracted which should direct future procedures in organizing farmers. Specific issues raised by the farmers confronting each system will also be useful in addressing similar physical and social environments and conditions.

3.2 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.

3.2.1 Discussions on Papers Presented on SDIS, MIP and BIS

The discussion on the Sirsia Dudhaura Irrigation System centered on the achievements and results of the Irrigation Management Program. Farmers were organized, but after the program, 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, 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, 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 point 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.

3.2.2 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: 1) law and policy; 2) data needs, research and knowledge-building; 3) participation: at what level, where and in what activities; 4) formation of water users' groups or organizations; 5) institutional support for the implementation of participatory management and: 6) 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.

- 1) 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.
- 2) 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.
- 3) 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.
- 4) 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.

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- 5) 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.
- 6) 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 1.

This output of the workshop as part of the program clearly demonstrates one of the tangible achievements of the Phase I program, in fulfillment of the objectives set forth. The proceedings of the workshop will be published in both English and Nepali versions. This publication will be a joint effort of the Irrigation Management and Water Utilization Division of the DOI and of IIMI. The Nepali version will include only the summaries of the papers presented and also summaries of the discussion, except for the farmers' papers which will be published in its entirety.

4. Conclusions and Recommendations

4.1 Conclusions

With just a year of implementation, the objectives of the project were substantially met. Providing definitive conclusions about the impacts or establishment of replicable procedures for increasing water users' participation in irrigation management is not feasible at this time. The procedures presented in this report should be viewed with caution in the light of the limited period in which these

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were tested. Verification and further field testing **will** be necessary for replicable validation in other DOI systems in the Terai.

Nonetheless the following initial achievements and recommendations based on the findings are presented as indications of progress toward increasing water users' participation in irrigation management in Banganga and elsewhere where conditions are similar.

4.1.1 Institutional Development Aspect

Thirteen WUGS were formed during the first phase. Six of them were formed within the pilot area covering an area of 831 ha through farmer to farmer training initiative. The other seven were formed by BIS system manager and his fieldmen who acted as AOs after the farmer to farmer training program. The WUGs have frequent meetings to set their own rules and regulations. The BIS system manager has been very supportive of farmers participation in managing irrigation activities within their respective sub-command areas. He can be counted upon as a resource personnel for DOI as a trainer to undertake Manager-to-Manager training in participatory management.

In terms of collaborative work with DIO and BIS system management itself, a variety of activities were undertaken jointly and very satisfactorily. IIMI field staff worked together with fieldmen of BIS to collect information related to the formation of WUGs. The data collected included information on farm ditch areas, number of households, current situation of the functioning of WUGs, and parcellary maps for effective use of irrigation water.

The research team also worked closely with supervisors to monitor water distribution according to the water schedule prepared for winter and monsoon crops. A close collaboration was also attained with the manager and his overseers on water measurement activities in the main and branch canals to control excess water at the headend of the system.

The findings and recommendations of the administrative linkage study incorporated the different views and situations as expressed by the various line agencies present in the district as well as DIO of Kapilbastu and WRID at Pokhara. Constant exchange of ideas and interaction was fostered to prepare the administrative report in consultation with the line agencies.

A joint field workshop was held in Banganga to identify areas of collaboration with RTB and SMB. Agreement was reached for certain activities to be undertaken jointly with the staff of RTB and SMB. However, unfortunately for collaboration, these activities could not be carried out by RTB and SMB due to administrative difficulties on the part of RTB and SMB.

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The specific impacts of farmer participation on irrigation activities in Banganga can be outlined as follows:

- 1) There has been an increase in farmers' participation in preparing water distribution schedule of DIO.
- 2) There has been an increase in farmers' participation in meetings with DIO regarding conflict management and the implementation of irrigation rules and regulations.
- 3) There has been an increase in farmers' participation in the **O&M** activities of the distributary canals, main outlets, main farm and field ditches.
- 4) There has been an improvement in communications and coordination among the farmers themselves and with the DIO through the WUGs.
- 5) Farmers through their WUGs have been able to work collectively in acquiring support services and inputs for crop production and crop diversification.
- 6) Farmers' participation in **O&M** activities have reduced O&M costs of DOI. This year alone, the farmers mobilized Nrs. 112,397 for O&M activities in **BIS**.
- 7) Being involved as partners in some of the irrigation activities of **BIS** and having invested their time, energy, money, and labor, farmers have begun to develop an ownership feeling of the system as theirs.
- 8) 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.

Among the major achievements in this project, the strengthening of 13 water users groups in **BIS** and the transformation and sensitization of the **BIS/DOI** staff, in particular the **BIS** system manager, for carrying out participatory management at **BIS** are considered the main outputs of this project. The farmer-to-farmer training method for effective organization was also demonstrated. DOI-farmer dialogue was enhanced through the frequent meetings that the **BIS** system manager have undertaken.

4.1.2 Main Canal Management

There were initial improvements in the management of the main canal. These resulted in more equitable distribution of irrigation water in both the monsoon and winter seasons, reduction of water-related conflicts, and reduction of the destruction of irrigation facilities. These can be attributed to the participation of farmers in decision making regarding seasonal irrigation water distribution scheduling, flexibility in accommodating reasonable farmers' demands, and the frequent interactions between farmers and the **BIS/DOI** staff through meetings.

However, despite these initial improvements, there are plenty of opportunities for improvement which can be attained by effectively organizing farmers and providing responsive BIS/DOI staff support.

Effective management of the main system was made possible with the participation of the water users' groups. Flexibility in responding to reasonable farmer demands in adjusting water delivery schedules during the winter season illustrate this effectiveness in managing the main system of BIS. The one-year experience at BIS also show that with existing DOI resources, improvement in water distribution can be attained and more so, will be improved further with more farmers reorganized and also more WUGs strengthened. The experience gained by the BIS/DOI staff in carrying out main canal management was also successful in this project.

4.1.3 Administrative Linkages

The administrative linkage analysis shows that the operation and maintenance of BIS can be improved and sustained if farmers are organized effectively and budgetary support procedures from the regional directorate and central DOI office are rationalized. Programming of maintenance requirements should be based on actual needs and impacts evaluated, rather than on adhoc resource availability and allocation. Furthermore, management of agricultural production support services by effectively harnessing timely and adequate irrigation and the attendant production inputs was shown to be critical in attaining the ultimate objective of increasing agricultural productivity. Such management can be done by having the BIS system manager or DIO engineer coordinate the provision of support services from the other district-based agencies. Although the results of the analysis only leads to recommendations, these nonetheless brought out the alternatives and means of attaining concerted efforts in bringing about timely and adequate irrigation with appropriate levels of inputs in order to achieve increased production.

4.1.4 National Workshop

The national workshop on participatory management brought together the experiences and lessons learned in organizing farmers for jointly managing three DOI systems. The papers presented pointed out that previous efforts in organizing farmers failed due to unclear and wrong perception of the purposes of organization. In all of the three systems, the purpose for collective action was expressed in terms of solving problems that confronted most of the farmers. With effective organization, reduction of water-related conflicts, effective water delivery distribution, and maintenance of tertiary level facilities were attained. Moreover, better a working relationship between the farmers and DOI staff was established with organized participation of farmers in the operation and maintenance of the systems.

The other significant feature of this workshop was the pioneering participation of farmers in a national workshop organized by the DOI. For the first time farmers prepared and presented papers and participated in the deliberations of the workshop. This was an initial effort in a national level to build confidence of both the farmers and

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DOI staff to discuss, resolve and plan for better and effective activities for participatory management. The workshop also demonstrated that farmers are able to discuss matters with upper level DOI management staff and conversely, that DOI staff have the capacity to meet and take into consideration the views of the farmers.

To fully utilize the efforts in this workshop, a task force or committee of participatory management was organized at the end of the workshop. A farmer was also a member of this committee. The recommendations of the workshop were used by the committee to fashion a set of implementing guidelines that sets down the specific actions that will be undertaken by the DOI in carrying out participatory management in all of its systems.

These guidelines specified clear actions on: water and land rights, giving authority to water users' groups for operation and maintenance up to the secondary canal level; formation of a coordinating committee at the main system level; utilization of water cess by water users group for maintenance; and other pertinent issues that will benefit both the farmers and the DOI staff. The complete recommendations of the committee can be found in Annex 1.

The project would have been more successful if full participation of RTB and SMB was made. Also intervening events during the implementation of the project such as the untimely absence of the BIS system manager, drastic reduction of staff, and abrupt merging of BIS management under the District Irrigation Office contributed to the difficulties in carrying out the project. Notwithstanding these difficulties, the project fulfilled substantially the objectives and the tasks set forth and also brought about additional achievements in having meaningful farmer involvement in a participatory management program.

4.2 Recommendations

In view of the accomplishments and implications of the project, the following recommendations are presented for consideration by the Department of Irrigation and other interested parties (donors, consultants, research institutions and other non-government organizations) for large DOI-managed irrigation systems. These are in addition to the recommendations made by the task force or committee on participatory management formed as a result of the national workshop on participatory management. These recommendations or guidelines are found in Annex 1.

4.2.1 Institutional Development

A good understanding of the existing situation, social relations, and irrigation practices is necessary before intervention of any kind is introduced. It is important to find out first why certain activities are being undertaken. Such information will direct the course to be taken in terms of formation of WUGs, their involvement in irrigation activities and their relationship with the agency.

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Constant meetings and discussions between all parties concerned is necessary for communication, coordination of activities, and to ensure greater understanding. Such forums help develop a sense of partnership for mutual cooperation and mutual solving of problems.

The catalytic role of the research staff is very crucial. The staff should not be biased towards one group's viewpoints only. The research staff should reside in the command area of the system to gain the trust of the irrigators and the agency staff and to build healthy rapport with them. At times, they may have to take leadership roles in facilitating discussions and bringing out issues, but in the end these should be done in ways that make it clear that farmers have to take the ultimate leadership roles. Rather than imposing one's own conviction about a certain necessity (e.g., rules, roles, rights, or institutional arrangements), the research or institutional development staff should present alternatives for both the agency and farmers to consider and choose from. That is why the farmer-to-farmer training visit to other irrigation sites proved invaluable because the farmers were exposed to alternative forms of institutional arrangements.

Furthermore, the institutional development staff should always be supportive of good relations between the farmers and the system management. It does no good to tolerate antagonistic relationships. The constraints and the problems should be carefully studied and alternatives that are positive and constructive should be offered for the concerned partners to choose from.

Without a corresponding change in the attitudes and behavior of the agency staff, the farmers may not want to change. The new relationship to be established therefore has to be reciprocal.

To realize the above, higher authorities under whose jurisdictions the system level agency operates will have to be supportive of the participatory management program being tried out at the field level. Frequent turnover of staff, lack or untimely disbursement of O&M funds, and contradicting orders may jeopardize the relations that are slowly being built between farmers and agency staff. Such behavior may be perceived by the farmers as a lack of sincerity on the part of the agency staff towards participatory or joint management of the system.

Thus there should be proper monitoring and measurement of water supply by the agency staff and the implications of fluctuating water supply should be discussed with the farmers.

The water schedule should be prepared jointly by the farmers and the agency staff, and both should make sure that it is enforced. A proper communication channel should be established so that every irrigator knows when his/her turn comes and what amount of water is being allocated to him/her.

The repair of certain structural defects can be used as a bargaining chip by the agency to mobilize local resources for maintaining other smaller structures.

As the different functionaries of the WUG should have responsibilities, so should the various agency staff. Responsibilities need to be balanced by rights. The

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evaluation of agency staff should be such that it takes into account their performance in fostering participatory management, a mandate of the irrigation department under the new irrigation policy.

Like the farmers who were taken for training visits to other sites, agency staff also should be provided training on participatory management because their academic training is not enough.

The irrigation agency (BIS office) should make it a policy to deal with irrigation matters through WUGs. Since not all sections within the command area have active WUGs, it is to the advantage of the agency staff to facilitate and promote the expansion of WUGs and later on a confederation for the whole system. For such an expansion to occur, this report recommends the continuation of the present institutional development efforts for at least one more year.

The BIS management and the confederation can be equal partners in managing irrigation for the system (but with distinct rights and responsibilities). This partnership will certainly reduce overall transaction costs. For a single confederation and a system committee, registration of existing and future WUGs for legal recognition should be facilitated by existing WUG leaders, the agency staff, and the regional irrigation directorate.

A system committee composed of representatives of the confederation and the agency could decide on irrigation management issues. Both parties may present alternatives in carrying out certain activities, and a mutual understanding can be reached taking into account the respective expertise and knowledge base of the farmers and the agency staff. This system committee will be able to promote the management of support services crucial to increasing agricultural productivity, especially since water is only one input to crop production.

4.2.2 Main System Management

- 1) Farmers through water users' associations should be involved in the main system activities of water allocation, scheduling and distribution. These activities can be facilitated through pre-seasonal meetings and frequent meetings with farmers in their villages. This practice of meeting with farmers should become a routine activity for the DOI system managers and water users' groups/organizations/associations.
- 2) Daily monitoring of rainfall and flows from the main canal into the branches, distributaries, and outlets need to be undertaken. Alternative measures such as days of irrigation delivery into these channels can be used as proxy indicators of water flow, provided corresponding water adequacy estimates are also undertaken. Regular measurements of flow by more accurate methods, such as current metering in strategic points in the main canal including the intake of the diversion, and periodic river flow measurements will have to be conducted to

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determine operational capacity and subsequent maintenance if found necessary.

- 3) Diversion of the system into sections should be done to **facilitate** management. The division and organization can be based on distance from the source (head, middle or tail) **or** equivalent distance from the source (**i.e.**, levels of difficulty in providing irrigation water **due** to distance and relative elevation). This will **identify** sections of the main system which need more attention during water distribution, particularly if a rotational method of distribution will be implemented.
- 4) Parcellary maps should be provided to **DOI** field staff and also the WUGs. These maps will provide accurate assessment of water adequacy and also the actual extent of area fully or partially irrigated. Accurate information on the area irrigated is critical for operation and also for planning purposes.
- 5) The **DOI** system managers should be flexible enough to accommodate changes in water delivery schedules, taking into account reasonable demands of farmers.
- 6) **Information** about the status of water availability, update on schedule of water deliveries and maintenance and repair schedule should be made available to the farmers in a timely and accurate manner. These can be relayed through meetings, **or** by the **DOI** field staff to the chairmen of WUGs on a regular basis.
- 7) Water users' groups can also be awarded maintenance contracts for desilting and weeding the main canal. This will further enhance the capability of the WUGs in participating in the maintenance of the main system.
- 8) Operation and maintenance activities at the secondary and tertiary levels should be delegated with authority to the WUGs. However, training should be provided by the **DOI** staff on these activities as **soon** as the farmers are organized.
- 9) If the above activities can be carried out by the WUGs, then the **DOI** staff can concentrate **on** the more complicated tasks **of** data collection and planning for making better decisions regarding water availability and distribution.

4.2.3 Administrative Linkages

- 1) The water users' groups should adopt the following activities for its sustainable existence: a) water distribution and management; b) resource mobilization for canal repair and maintenance; c) fertilizer distribution;

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d) credit mobilization; e) post-harvest **loss** protection; **9** storage facilities; g) collective marketing and land preparation and; h) control of livestock free grazing. These are tangible tasks that will lead to reduction of conflicts and problems facing farmers.

- 2) The role or job description of the **DOI** system manager will include the following activities: a) regular maintenance activity; **b)** better water distribution; c) strengthening and activating water users' groups; d) coordinating the management of agricultural support services for water users' groups and; e) pursuing water service fee collection. These activities will be included in evaluating the job performance of the **DOI** system manager and likewise the other **DOI** staff in the system.
- 3) **DOI** large irrigation systems, the system managers should be a separate unit within the district with its own staff and resources to manage and coordinate other activities in the district.
- 4) Budgetary allocations for maintenance should be based on actual needs and monitored on the basis of its impact on the performance or operation of the system in terms of providing timely and adequate irrigation water supply at the right location.

The above recommendations depend a lot on the **DOI's** sincerity to implement participatory management not only in words but more important in deeds, It will take more than just the right rhetoric to make participatory management happen. The political will and hard work on the part of the **DOI** will be needed to make participatory management a reality.