Banganga Irrigation System: An Exercise in Participatory Management

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1. Introduction

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

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

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

1.1 System Background

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

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

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

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

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

2. Formation of New Water Users' Association

2.1 Data Needs

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

2.2 Data Collection

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

2.3 Formation of WUGs

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

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

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

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

2.4 Nature of WUGs

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

2.5 Duties and Responsibilities of WUGs

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

2.6 Tasks undertaken by WUGS

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

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

a) Water Acquisition

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

b) Water Allocation

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

c) Water Distribution

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

d) Resource Mobilization

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

e) Collection of Fines and Penalties

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

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

f) Meetings, Dialogues, and Discussions

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

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

3. Impact of WUGs on Irrigation Activities

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

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

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

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

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

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

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

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

4. Conclusion

4.1 Problems Encountered

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

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

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

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

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

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

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

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

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

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

4.2 Lessons Learned

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

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

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

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

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

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

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

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

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

4.3 Suggestions and Recommendations

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* Actual households (without double counting) are given.

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

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

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

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

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

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

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

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

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

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

Table 10: Fines Imposed for Different Activities by WUGs

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

Table 11: Collection of Fines and Penalties by WUG

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

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

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

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

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

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

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

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

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

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

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

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

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