

Background Paper

**Impact on Livelihoods: The Paal Revival Project
Alwar, Rajasthan, India**

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Poverty-Focused Smallholder Water Management
*Promoting Innovative Water Harvesting and Irrigation Systems
to Support Sustainable Livelihoods in South Asia*

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Section 1: Introduction to the study

1.A. Introduction to DFID's Sustainable Livelihoods Framework ¹

DFID's Sustainable Livelihoods Framework is largely an adaptation of work done at the Institute of Development Studies such as that of Scoones, 1998.

The following definition of livelihood is used for the purpose of the livelihoods analysis framework:

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base".

The central point of the framework is an analysis of the five different types of assets that individuals draw upon to build their livelihoods. These capital assets are:

- Natural Capital

The natural resource stock from which resource flows useful for livelihoods are derived.(e.g. land, water, wildlife, biodiversity, environmental resources).

- Social Capital

The social resources (networks, membership of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods.

- Human Capital

The skills, knowledge, ability to labour, and good health important to the ability to pursue different livelihood strategies.

- Physical Capital

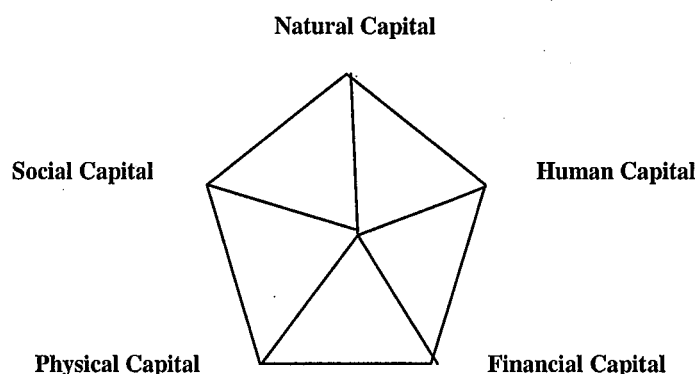
The basic infrastructure (transport, shelter, water, energy and communications) and the production equipment and means that enable people to pursue their livelihoods.

- Financial Capital

The financial resources which are available to people (whether savings, supplies of credit or regular remittances or pensions) and which provide them with different livelihood options.

¹ Source: Carney Diana, Sustainable Rural Livelihoods: What contribution can we make?, DFID. 1998.

Figure 1: Capital assets central to the DFID livelihoods analysis framework.



The different types of assets are presented in the shape of a pentagon, indicating the importance of a holistic rather than a sectoral approach to the analysis of livelihoods. The framework is expected to highlight strengths of the households rather than the needs. The framework is generally used in order to identify the most appropriate type of intervention for a particular project. However, sustainable livelihoods approaches have been used in different ways²; in project design, programme design, project review and impact assessment, review of programme, and assessment of sectors.

Within the sustainable livelihoods framework, Scoones³ identifies three broad clusters of livelihood strategies. These are agricultural intensification/extensification, livelihood diversification, and migration. Most rural households pursue a combination of strategies together or in sequence. The combination of activities that are pursued can be seen as a “livelihood portfolio”. Some portfolios may be highly specialized, with a limited set of activities, while others may be highly diverse. The types of livelihoods pursued will vary by season and could change over the years, as new options replace existing ones. Over generations, substantial shifts may occur as external and local conditions change.

The degree of specialization or diversification of livelihoods is influenced by resources available to the household and the degree of risk associated with the different livelihood options. The livelihood strategies of the households, particularly the poorer households, usually take into account risk factors. It is observed that members of the households take up different activities so that at least one source of income is available to the household at any given time of the year. The mix of activities undertaken by different members of the household protects the household from risk of loss of income that may occur during the course of the year. Rural livelihoods rely heavily upon the natural resource base, and the mix of activities undertaken by a household is influenced by the degree of access and availability of the natural resources on which their livelihoods depend.

² Farrington John et al, Sustainable Livelihoods in Practice: Early Applications of Concepts in Rural Areas, Natural Resource Perspectives, Number 42, June 1999, Manage and ODI.

³ Scoones Ian, Sustainable Rural Livelihoods, A Framework for Analysis, IDS Working paper 72.

Socio-economic factors and livelihood resources are inter-dependent. Socio-economic factors impact access to livelihood resources, and successful livelihood strategies can change the socio-economic status of the household. Within the Indian context, caste, class and religious affiliations can often determine the livelihoods that are pursued by the household and the level of access to various resources. It is important therefore to take these aspects into account while analyzing the livelihood strategies of the household.

Further, the degree of access to resources is either facilitated or restricted by institutional arrangements at the micro and macro levels. Different forms of institutional arrangements exist which support or deny access to households, for example; members of the village governing body at the local level may have greater access to resources, membership to the local cooperative dairy may ensure availability to fodder resources, membership to a savings group may facilitate access to credit from financial institutions, etc. Livelihood strategies of households are influenced by institutional arrangements and processes and an analysis of these is important to understand why specific livelihood portfolios are pursued by different households.

1.B. Purpose of the study

The purpose of this study is to analyse and understand the livelihood implications of smallholder land and water management innovations. The project sites identified for this study are IWMI's partners in an ongoing research project on smallholder irrigation.

1. Paal revival project, PRADAN, Alwar, Rajasthan
2. Five percent technology, PRADAN, Purulia, West Bengal
3. Integrated watershed development initiative, Seva Mandir, Rajasthan
4. Wastewater usage, IWMI Hyderabad

While the first three research sites are project interventions in land and water management, the fourth site is a research site where no project interventions have been made. Although the methodology used for all the sites is similar, the purpose of data analysis is somewhat different for the research sites where project interventions have been made, and the wastewater usage site where no intervention has been made. This report deals with the impact of the Paal Revival Project being implemented by PRADAN in Alwar district in Rajasthan.

For the purpose of studying the impact of the project interventions on the livelihoods of the households, the core concept of the framework is used to assess the changes in livelihood assets. The specific purpose of the study was to assess the impact of the project interventions on the socio-economic situation of the households, the importance of various assets in securing the livelihoods of the households, the changes that have taken place in the livelihood strategies after project intervention.

1.C. Methodology for the Study

1.C.1. Identification of project locations and sample for the study

The locations for the study within the project areas were identified with the project partners at each project site. The locations selected within the project area were more or less representative of the range of land and water management interventions implemented by the project.

The specific parameters for the selection of locations were:

1. Type of interventions implemented under the specific project.
2. Number of interventions implemented.
3. Age of interventions.
4. Institutions set up for the project and whether these are functioning.
5. Homogeneity and heterogeneity of the population.

A purposive sample was selected from the population. The purpose was to cover the full range of interventions and livelihood portfolios of different households. The sample was selected with the project partners after discussions and field visits.

The specific parameters for selection of households were:

1. Type of benefits derived by the households from the project interventions.
2. Type of interventions implemented on the lands of different households.
3. Main sources of income of the different households.
4. Caste/community of the household.

For the purpose of the study four paals were identified. Each paal forms a micro watershed. A sample of 10 percent of the total number of farmers from the micro watershed of each paal was selected. The sample represented four categories of farmers: a) farmers who had benefited from the paal but did not have irrigation, b) farmers who benefited from the paal and also had wells, c) farmers who have wells and field bunds, d) farmers with only well and no paal, and e) farmers without any project intervention on their fields. Data was analysed by location and by the category mentioned above.

The four paals identified for the study are

- Bede ka Bas
- Chorbasai
- Rustam ka Bas
- Khanpur Mewan

The total number of households studied from each paal are as follows:

Sample distribution: Paal Project, Alwar District, Rajasthan

Type of intervention	Chorbasai	Beda Ka Bas	Rustum Ka Bas	Khanpur Mewan
Only Paal	3	2	3	--
Only Well	--	1	3	1
Paal + Well	6	3	4	4
Well + Field Bund	--	2	--	--
Without Paal & Well	2	3	--	--
Total	11	11	10	5

1.C.2. Tools and methods of data collection:

Since the purpose of the study was to study the impact of the project interventions at the household level, the household questionnaire was the primary source of data collection. The questionnaire was tested in the field with at least two households at every location, before it was finalized.

The questionnaire was designed to collect information on the five capital assets which form the center of the livelihoods framework, the livelihood activities or sources of income of the households and institutional affiliations of the household. Since most income generating activities of the rural households are land and agriculture related, the information regarding livelihood activities was collected and analysed by season. In the Indian context there are three main agricultural seasons, *Kharif* or monsoon, *Rabi* or winter and summer.

Section 2: Introduction to the project and study area

2.A. Introduction

The Paal revival project is being implemented by PRADAN, an NGO, in Alwar district, Rajasthan state. Paals are earthen embankments which are constructed in order to harvest rain water in the fields. In the past, communities, in order to store water, had raised their field boundaries (10-20 ft high) into earthen dams by putting earth across the drains running from their fields. Water from four-five fields flows into, gets collected and submerges agriculture lands. The water stays for two to three months in the fields and percolates into the soil. The accumulated water helps to retain moisture, in the soils to produce a rabi crop without irrigation, control soil erosion, and recharge ground water. Series of such *Paals* on a drain were constructed by the community, thus evolving a system of water harvesting. The cascading arrangement of *Paals* was a perfectly designed traditional watershed management system. It is estimated that there were about 3000-4000 of such *Paals* in Alwar district, which were the backbone of rainfed agriculture in the area.

PRADAN's strategy for the revival of the Paal system involves forming a committee for planning and implementation of the work at the village level. This committee generally consists of farmers who own the most degraded lands. The committees are strengthened through capacity building which includes training, exposure visits, assigning them roles and responsibilities, and fostering leadership. These committees meet at fixed intervals on fixed dates of the month. The frequency of the meeting is usually twice a month. The committees plan the work to be done, sanction the work and make payments to the beneficiaries and the labourers. The Committees federate at the macro watershed level. Farmers are expected to contribute 30-50% of the costs.

2. B. Regular savings and credit as the basis for group development

A savings and credit programme has been introduced so as to encourage the village level committees to save money on a regular basis. These savings are used to provide credit to the committee members. This helps in creating a savings fund for individual members, and also meets the credit needs of the group members. The savings activity has motivated the members to meet regularly and hold the fortnightly meetings for project implementation. Earlier, before the introduction of the savings and credit activity, the members would not see any point in coming to the meetings every fortnight, because there would not be an interesting agenda for them to discuss at every meeting. The meetings were therefore not held regularly. After the introduction of the savings and credit activity, the members have an agenda for every meeting, discuss the funds, applications for credit, loan recovery, etc.

Section 3: Analysis of data

3.A. Introduction

The data has been analysed at the household level by location and within each location, for each of the four categories of farmers: a) farmers who had benefited from the paal but did not have irrigation, b) farmers who benefited from the paal and also had wells, c) farmers who have wells and field bunds, d) farmers with only well and no paal, and e) farmers without any project intervention on their fields. For each category the average values have been used for analysis.

3.B. Case Studies

Bede ka Bas

3.B.1. Average Family Profile

Eleven households were interviewed in this micro watershed. The average household size in the sample from Bede ka Bas is 9 members, with average number of children below 18 years being 4 and average number of children above 18 years being 3. Most adults are illiterate, while children are going to school.

3.B.2. Land ownership and land use

Average values per household	Only Paal	Paal +Well	Well + Field bunds	Only well	No Paal & no well
Average increase in total land owned	0	0	0.25 hectares	0.15 hectares	0
Increase in area under cultivation	0.37 hectares	0.07 hectares	0.5 hectares	0.75 hectares	0.25 hectares
Total area benefited by the project	0.5 hectares	2.22 hectares	1 hectare	0.75 hectares	0.9 hectares
Rainfed degraded area brought under cultivation	0.45 hectares	0.5 hectares	0.5 hectares	0	0.32 hectares

The landholdings of farmers who have wells and field bunds and those who have only wells have increased. There is an increase in area under cultivation for all categories, the highest being for those who have wells. The total area benefited by the project is highest for those who benefit directly from the paal and also have wells. Farmers from all categories except those who have wells have brought small areas of previously uncultivated and rainfed, degraded land under cultivation.

3.B.3. Changes in income of household

Paal	Average amount per household in Rupees Before project	Average amount per household in Rupees Today
Total income of the family	26820	72630
Contribution by men	7860, (29%)	23460, (32%)
Contribution by women	7960, (30%)	16810, (23%)
Contribution by children	10100, (38%)	15714, (21%)
Contribution by elders	900, (3%)	1980, (2.7%)
Avg. income of each family member	3831	10375
Paal + well		
Total income of the family	38710	137133
Contribution by men	15158, (39%)	43600, (32%)
Contribution by women	16518, (43%)	46600, (34%)
Contribution by children	7033, (18%)	41833, (30.5%)
Contribution by elders	0	5100, (4%)
Avg. income of each family member	2765	9795
Well		
Total income of the family	13800	38700
Contribution by men	7200, (52%)	18300, (47%)
Contribution by women	6600, (48%)	10800, (28%)
Contribution by children	0	9600, (25%)
Contribution by elders	0	0
Avg. income of each family member	1971	5528.5
Well + Field bund		
Total income of the family	27952.5	93475
Contribution by men	11575, (41%)	36800, (39%)
Contribution by women	11662.5, (42%)	36800, (39%)
Contribution by children	4715, (16%)	19875, (21%)
Contribution by elders	0	0
Avg. income of each family member	2541	8497.70
No paal & no well		
Total income of the family	20433	50293
Contribution by men	4267, 21%	16233, 32%
Contribution by women	2485, 12%	9500, 19%
Contribution by children	6173, 30%	4600, 9%
Contribution by elders	4866, 24%	3400, 7%
Avg. income of each family member	4086.60	10058.60

The contribution of family members includes the number of labour days put in for agriculture in their own fields. Children are making a significant contribution to the household income. With increased agricultural activity all members of the household have to contribute labour. Children also work in the fields and look after livestock. There is a substantial increase in income for all households. The highest increase is for the families whose lands are benefiting from the paal and who also have wells for irrigation.

In households whose area under cultivation has increased, the contribution to household income by women has decreased and contribution by children has increased.

3.B.4. Livelihood activities

Households are engaged in agriculture, livestock rearing and selling of milk. Livestock and sale of milk brings in cash income all round the year. Only two households have taken up non-land based activities.

3.B.5. Water resources

All households responded that more water is available now than before for drinking, domestic use and irrigation. There is a decrease in the number of sources they have to use in order to get sufficient water to fulfill their needs. There is no significant difference in the amount of water available from various sources by season. Although the quantity has definitely increased, half the households felt that the quality of drinking water was the same as before. The sources of water that provide water for the longest period are the paal structures.

3.B.6. Livestock

Livestock is considered to be an investment to be sold in emergency. Five out of eleven households have increased the number of livestock, while others have reduced or kept the same number as before. The value of livestock has increased and the decision to purchase livestock is determined by the amount of money available to make this investment.

3.B.7. Non-agricultural produce

There is an increase in availability of fuelwood, fodder and other non-agricultural produce, largely due to pasture development activities undertaken during the project intervention. Special effort was taken to plant fuelwood and fodder trees. Households are more dependent than before on common lands. Produce from common lands has decreased at present because of low rainfall in the past 2-3 years.

3.B.8. Physical assets

All households responded that they owned more physical assets than before, and the value of their assets is greater now than before. Households have purchased electrical goods, agricultural equipment, houses and three respondents have purchased cars. Households also responded that their financial capacity to hire tractors, engines and other agricultural equipment had increased after project implementation.

3.B.9. Social capital

All households responded that social relations in the village are good and people from different groups interact with each other. Friends meet often and discuss household issues. Friends borrow money from each other mainly for agricultural needs, but also during illness and for other household needs. Households responded that they had good relations with the local moneylender. They explained that they received better services from the local shopkeeper and moneylender if they had good relations with them. They obtained goods on credit from the local shopkeeper.

All households responded that friends and relatives share knowledge and information about farming practices and help each other in farming activities, like working in each others' fields without wages. Half the households said that they shared investment costs like pumping water for irrigation, purchase of seeds and fertilizers etc. Friends also engage in sharecropping activities. They collect fuelwood and fodder from each other's fields.

All but two households felt that political affiliations affect social relations in the village. Social relations had deteriorated in the village, but due to project interventions, new relations were formed as a result of the Paal Committee. The main benefit of these new relations is that their knowledge of agriculture has increased. Conflicts in the village are generally resolved in a meeting.

3.B.10. Access to infrastructure

Public services like transport, health services, education, etc are easily accessible. Electricity is available. Respondents said that if these services had not been easily accessible, and the quality of these services had been poor, they would have to spend more time and money to access these services from a greater distance.

3.B.11. Impact of Project interventions

The investments made on private lands per households were on an average above Rs. 10,000. A large part of this investment was made by the NGO, PRADAN. Households contributed in cash and labour. Land structures like field bunds were made. In general the project interventions on the lands have arrested soil erosion and raised the water table. While the work was in progress, wage labour was available.

Households responded that they themselves would maintain the structures and interventions made on their lands. None of the households have tried out the same treatments on other plots that belong to them. Some of the respondents mentioned that they did make some modifications to the land and water treatments on their land.

Most respondents said that they have introduced new crops and are using organic manure rather than chemical fertilisers and are using improved seeds. The result has been an increase in crop yields and profits.

The factors which determine the choice of crop, are the expected profit, and quality of soil. The amount of produce the household will sell or store for home consumption depends upon the cash resources with the family at the time.

3.B.12. Changes in standard of living

Households responded that the standard of living had improved in all aspects, food, clothing, education, housing etc. The quality of family life has also improved with men spending more time with the children and women getting time to interact socially.

3.B.13. Institutional support

All households are members of the Paal Committee. The benefits of the membership are the structures for land development on their lands. Most households attend every meeting of the Committee. In the meetings, decisions are taken after discussion among members. There is no problem in the working of the Committee. Respondents felt that the land and water treatments would not have been possible without the help of the NGO. The maintenance of the structures however, was their responsibility.

3.B.14. Problems and suggestions regarding the project interventions

Before this paal was constructed there was some disagreement about the location of the spillways. Households now feel that some more structures need to be made, people should participate more and more trees should be planted. There is a ban on tree felling and free grazing, which is currently being followed.

3.C. Chorbasai

3.C.1. Average Family Profile

Eleven households were interviewed in this micro watershed. The average household size here is 13 members, with average number of children below 18 years being 7 and average number of children above 18 years being 5. The highest education level in the family is 3rd standard.

3.C.2. Land ownership and land use

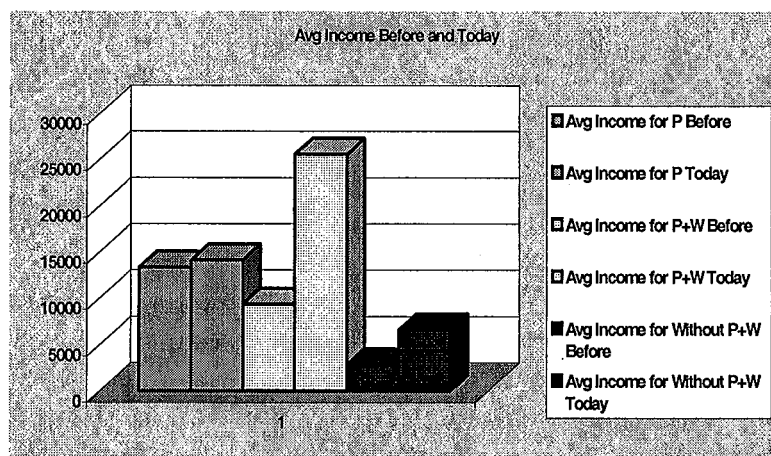
Average values per household	Only Paal	Paal + Well	No Paal & no well
Average increase in total land owned	0.07 hectares	0.3 hectares	0.25 hectares
Increase in area under cultivation	0.08 hectares	0.3 hectares	0.50 hectares
Total area benefited by the project	2.9 hectares	1 hectare	0.12 hectares
Rainfed degraded area brought under cultivation	0.4 hectares	0	0.5 hectares

There is an increase in area owned for all households. The area under cultivation has also increased. Households benefiting from the paal as well as those on whose lands no interventions have been made, have brought under cultivation some area of rainfed land which was not being cultivated earlier.

3.C.3. Changes in household income

Paal	Average amount per household before in Rupees	Average amount per household today in Rupees
Total income of the family	53225	56366
Contribution by men	19596, 37%	19416, 34%
Contribution by women	24566, 46%	31783, 56%
Contribution by children	5728, 11%	5166, 9%
Contribution by elders	3333, 6%	0
Avg. income pf each family member	13306	14091
Paal + well		
Total income of the family	37196	102313
Contribution by men	15116, 40%	34041, 33%
Contribution by women	15440, 41%	35950, 35%
Contribution by children	3731, 10%	24966, 24%
Contribution by elders	2957, 8%	7291, 7%
Avg. income pf each family member	9311	25562
Without paal and well		
Total income of the family	11297	26250
Contribution by men	4687, 41%	7500, 29%
Contribution by women	4300, 38%	16500, 63%
Contribution by children	1137, 10%	2250, 9%
Contribution by elders	1172, 10%	0
Avg. income of each family member	2824	6562

3.C.4. Average income before and today for households in the Chorbasai paal micro watershed



Children are contributing labour towards agriculture and livestock rearing. There is an increase in income for all households, but significantly larger increase for those households whose fields benefit from the paal and who also have wells.

3.C.5. Livelihood activities

Households are engaged in agriculture, livestock rearing and selling of milk. Livestock and sale of milk brings in cash income all round the year.

3.C.6. Water resources

All households responded that more water is available now than before for drinking, domestic use and irrigation. There is a decrease in the number of sources they have to use in order to get sufficient water to fulfill their needs. There is no significant difference in the amount of water available from various sources by season. Although quantity has definitely increased, half the households felt that the quality of drinking water was the same as before. The sources of water that provide water for the longest period are the paal structures.

3.C.7. Livestock

Livestock is considered to be an investment to be sold in emergency. Half the number of households have increased the number of livestock, while others have reduced number of livestock. The value of livestock has increased. The decision to purchase livestock is determined by the amount of money available to buy the animals they want and availability of fodder.

3.C.8. Non-agricultural produce

Six out of eleven households responded that there was a decrease in availability of fuelwood, fodder and other non-agricultural produce, largely due to drought and tree felling. Common lands have not been conserved even though the dependence on common lands for fuelwood and fodder has increased. Pasture development activities have been undertaken on private lands.

3.C.9. Physical assets

All households responded that they owned more physical assets than before, and the value of their assets is greater now than before. Households have purchased electronic goods, agricultural equipment, improved their houses and purchased cars. Households also responded that their financial capacity to hire tractors, engines and other agricultural equipment had increased after project implementation.

3.C.10. Social capital

All households responded that social relations in the village are good and people from different groups interact with each other. Friends meet often and discuss about the village and gossip. Friends borrow money from each other mainly for agricultural needs, but also during illness and for other household needs. Households responded that they had good relations with the local moneylender. They explained that they received better services from the local shopkeeper and moneylender if they had good relations with them. They obtained goods on credit from the local shopkeeper.

All households responded that friends and relatives share knowledge and information about farming practices and help each other in farming activities, like working in each others' fields without wages. Four of the households said that they shared investment costs like pumping water for irrigation, purchase of seeds and fertilizers etc. Friends also engage in share-cropping activities. They collect fuelwood and fodder from each other's fields.

Households felt that political affiliations affect social relations in the village. Social relations had deteriorated in the village, but due to project interventions, new relations were formed as a result of the Paal Committee. The main benefit of these new relations is that their knowledge of agriculture has increased. Conflicts in the village are generally resolved in a meeting.

3.C.11. Access to infrastructure

Public services like transport, health services, education, etc are easily accessible. Electricity is available. Respondents said that if these services had not been easily accessible, and the quality of these services had been poor, they would have to spend more time and money to access these services from a greater distance.

3.C.12. Impact of Project interventions

The investments made on private lands per households were on an average above Rs. 10,000. A large part of this investment was made by the NGO, PRADAN. Households contributed in cash and labour. Land structures like field bunds were made. In general the project interventions on the lands have arrested soil erosion and raised the water table. While the work was in progress, wage labour was available.

Households responded that they themselves would maintain the structures and interventions made on their lands. None of the households have tried out the same treatments on other plots that belong to them and were not covered under the project. Some of the respondents mentioned that they did make some modifications to the land and water treatments on their land.

Most respondents said that they have introduced new crops and are using organic manure rather than chemical fertilisers and are using improved seeds. The result has been an increase in crop yields and profits.

The factors which determine the choice of crop, are the expected profit, and quality of soil, and cash resources available for making the necessary investments. The amount of produce the household will sell or store for home consumption depends upon the cash resources with the family at the time.

3.C.13. Changes in standard of living

There was a significant improvement in standard of living for all households.

3.C.14. Institutional support

All households are members of the Paal Committee. The membership has helped them in constructing the structures on their lands. Most households attend every meeting. Decisions are taken after discussion. There is no problem in the working of the Committee. Respondents felt that the land and water treatments would not have been possible without the help of the NGO. The maintenance of the structures will be undertaken by them.

Respondents said that the committee was not functioning properly. Meetings were not held regularly, contributions were not collected properly. Efforts need to be made to improve the functioning of the Committee.

3.C.15. Problems and suggestions regarding the project interventions

Before this paal was constructed there was some disagreement about the location of the spillways. They now feel that some more structures need to be made, people should participate more and more trees should be planted. There is a ban on tree felling and free grazing, which is currently being followed.

3.D. Rustam ka Bas

3.D.1. Average Family Profile

Ten households were interviewed in this micro watershed. The average household size was 13 members, with average number of children below 18 years being 8 and average number of children above 18 years being 4. The highest education level is 2nd standard and lowest is 1st standard.

3.D.2. Land ownership and land use

Average values per household	Only Paal	Paal + Well	Only well
Average increase in total land owned	0.84 hectares	1.06 hectares	0
Increase in area under cultivation	0.24 hectares	0.5 hectares	0
Total area benefited by the project	1.8 hectares	3.8 hectares	0.75 hectares
Rainfed degraded area brought under cultivation	1.5 hectares	0.43 hectares	0.82 hectares

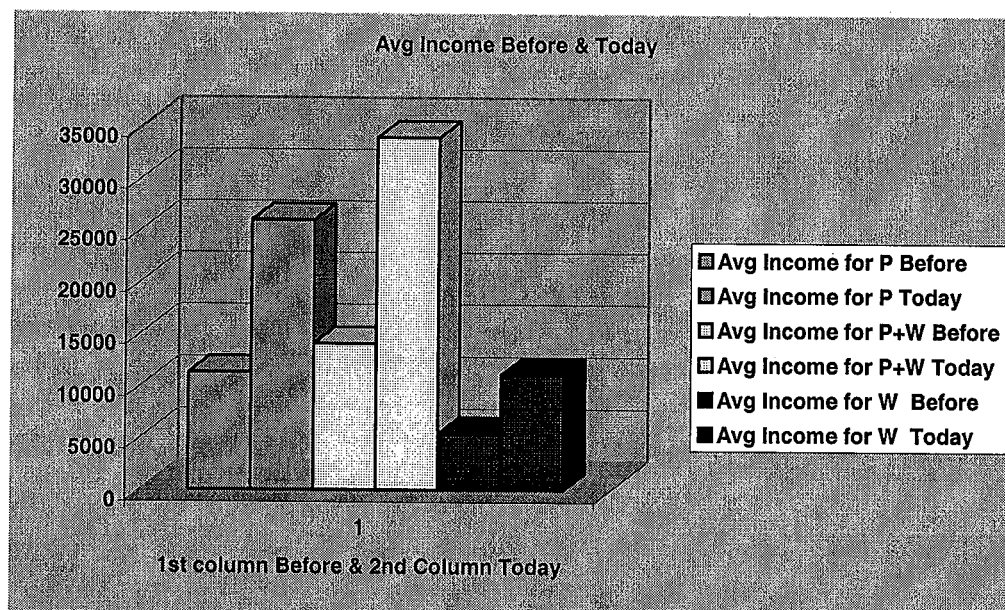
There is an increase in land owned for both categories of farmers, those whose lands benefit from the paals and those who also have wells. There is also an increase in area

under cultivation for these categories, but the increase is greater for those who have well irrigation. The total area benefited is significantly higher for those who have irrigation.

3.D.3. Changes in income

Paal	Average amount per household before in Rupees	Average amount per household today in Rupees
Total income of the family	44920	103720
Contribution by men	17973.3 , (40%)	41640, (40%)
Contribution by women	17933 , (39.9%)	41020, (39.5%)
Contribution by children	5746.67, (12%)	16920, (16%)
Contribution by elders	3266.67 , (7%)	4140, (4%)
Avg. income per family member	11230	25930
Paal + well		
Total income of the family	56090	135898
Contribution by men	17995, 32%	34072.50, 25%
Contribution by women	21955, 39%	53335, 41%
Contribution by children	11150, 20%	40830, 30%
Contribution by elders	5015, 9%	7660, 6%
Avg. income pf each family member	14028.80	33974.4
Well		
Total income of the family	25680	44340
Contribution by men	10173.30, 40%	18600, 42%
Contribution by women	9866, 38%	17580, 40%
Contribution by children	1600, 6%	8160, 18%
Contribution by elders	2040, 8%	0
Avg. income pf each family member	5920	11085

3.D.4. Average income per household before and today in Rustam ka Bas paal microwatershed



There is a significant increase in income for all households but the largest increase for households whose lands benefit by the paal and who also have wells for irrigation.

3.D.5. Livelihood activities

Households are engaged in agriculture, livestock rearing and selling of milk. Livestock and sale of milk brings in cash income all round the year.

3.D.6. Water resources

All households responded that more water is available now than before for drinking, domestic use and irrigation. There is a decrease in the number of sources they have to use in order to get sufficient water to fulfill their needs. There is no significant difference in the amount of water available from various sources by season. Although quantity has definitely increased, half the households felt that quality of drinking water was the same as before. The sources of water that provide water for the longest period are the paal structures.

3.D.7. Livestock

Livestock is considered to be an investment to be sold in emergency. Eight out of ten households have increased the number of livestock, while others have reduced the number of livestock. The value of livestock has increased and the decision to purchase livestock is determined by the amount of money available to buy the animals they want and the availability of fodder.

3.D.8. Non-agricultural produce

There is no increase in availability of fuelwood, fodder and other non-agricultural produce, from the common lands. Nothing has been done on private or common lands for fodder development. No effort has been made to plant fuelwood trees.

3.D.9. Physical assets

All households responded that they owned more physical assets than before, and the value of their assets is greater now than before. Households have purchased electrical goods, agricultural equipment, houses and vehicles. Households also responded that their financial capacity to hire tractors, engines and other agricultural equipment had increased after project implementation.

3.D.10. Social capital

All households responded that social relations in the village are good and people from different groups interact with each other. Friends meet often and discuss household issues. Friends borrow money from each other mainly for agricultural needs, but also during illness and for other household needs. Households responded that they had good relations with the local moneylender. They explained that they received better services from the local shopkeeper and moneylender if they had good relations with them. They obtained goods on credit from the local shopkeeper.

All households responded that friends and relatives share knowledge and information about farming practices and help each other in farming activities, like working in each

others' fields without wages. Two households said that they shared investment costs like pumping water for irrigation, purchase of seeds and fertilizers etc. with other farmers. Friends also engage in share-cropping activities. They collect fuelwood and fodder from each other's fields.

Households felt that political affiliations affect social relations in the village. Social relations had deteriorated in the village, but due to project interventions, new relations were formed as a result of the Paal Committee. The main benefit of these new relations is that their knowledge of agriculture has increased. Conflicts in the village are generally resolved in a meeting.

3.D.11. Access to infrastructure

Public services like transport, health services, education, etc are easily accessible. Electricity is available. Respondents said that if these services had not been easily accessible, and the quality of these services had been poor, they would have to spend more time and money to access these services from a greater distance.

3.D.12. Impact of Project interventions

The investments made on private lands per households were on an average above Rs. 10,000. The large part of this investment was made by the NGO, PRADAN. Households contributed in cash and labour. Land structures like field bunds were made. In general the project interventions on the lands have arrested soil erosion and raised the water table. While the work was in progress, wage labour was available.

Households responded that they themselves would maintain the structures and interventions made on their lands. None of the households have tried out the same treatments on other plots that belong to them, nor made any changes or modifications to the treatments on their lands.

Most respondents said that they have introduced new crops and are using organic manure rather than chemical fertilisers and are using improved seeds. The result has been an increase in crop yields and profits.

The factors which determine the choice of crop, are the expected profit, and quality of soil. The amount of produce the household will sell or store for home consumption depends upon the cash resources with the family at the time.

3.D.13. Changes in standard of living

There was a significant improvement in the standard of living for these households, in terms of food, clothing, housing, quality of family life, education for children etc.

3.D.14. Institutional support

All households are members of the Paal Committee. The membership has helped them in constructing the structures on their lands. Half the households attend every meeting and the other half once in a while. Decisions are taken after discussion. There is no problem in the working of the Committee. Respondents felt that the land and water treatments

would not have been possible without the help of the NGO. The maintenance of the structures will be undertaken by them.

3.D.15. Problems and suggestions regarding the project interventions

Before this paal was constructed there was some disagreement about the location of the spillways. They now feel that some more structures need to be made, people should participate more and more trees should be planted. There is a ban on tree felling and free grazing, which is currently being followed.

3.E. Khanpur Mewan

3.E.1. Average Family Profile

Five households were interviewed in this micro watershed. The average household size is 14 members, with the average number of children below 18 years being 9 and average number of children above 18 years being 3. Most adults are illiterate, while children were going to school.

3.E.2. Land ownership and land use

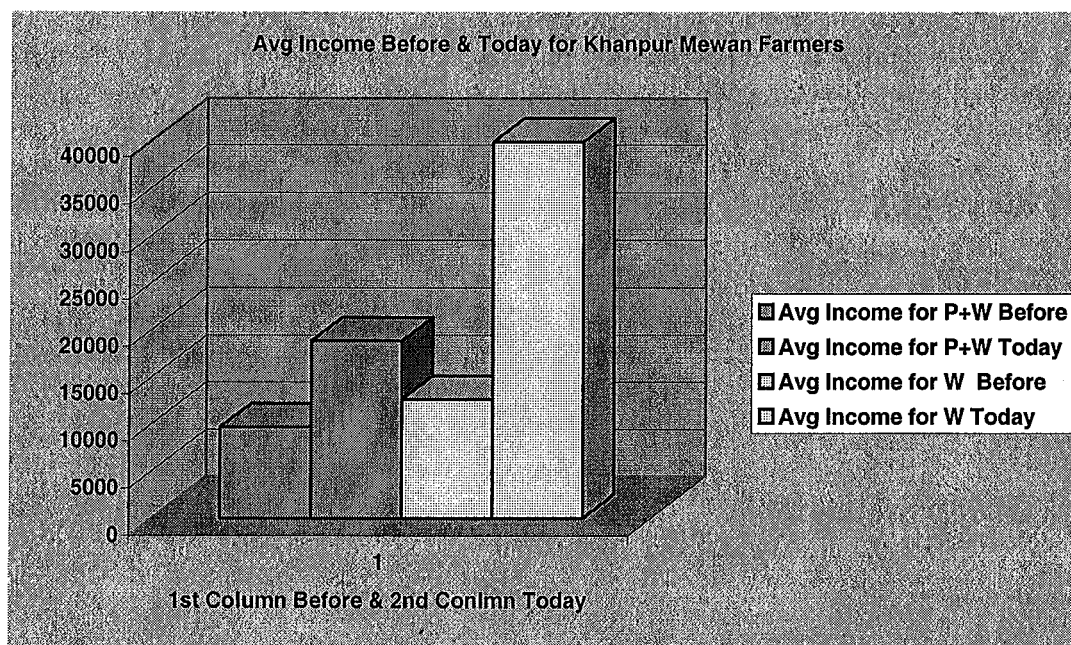
Average values per household	Paal + Well	Only well
Average increase in total land owned	1.8 hectares	0
Increase in area under cultivation	0.31 hectares	0
Total area benefited by the project	3.6 hectares	3.75 hectares
Rainfed degraded area brought under cultivation	3.6 hectares	0

There is an increase in total area owned for those farmers whose lands benefit from the paal and also have wells. Area under cultivation has also increased for these farmers, who have brought under cultivation land which was earlier not in use.

3.E.3. Changes in income

Paal + well	Average amount per household before in Rupees	Average amount per household today in Rupees
Total income of the family	44920	103720
Contribution by men	17973.3 , 40%	41640, 40%
Contribution by women	17933 , 39.9%	41020, 39.5%
Contribution by children	5746.67, 12%	16920, 16%
Contribution by elders	3266.67 , 7%	4140, 4%
Avg. income per family member	11230	25930
Well		
Total income of the family	56090	135898
Contribution by men	17995, 32%	34072.50, 25%

Contribution by women	21955, 39%	53335, 41%
Contribution by children	11150, 20%	40830, 30%
Contribution by elders	5015, 9%	7660, 6%
Avg. income pf each family member	14028.80	33974.4



There is a significant increase in income for households that benefit from the paal and have wells for irrigation. Although the income for farmers who have wells has increased, the amount increased is much less than that for the households who also benefit from the paal.

3.E.4. Livelihood activities

Households are engaged in agriculture, livestock rearing and selling of milk. Livestock and sale of milk brings in cash income all round the year.

3.E.5. Water resources

All households responded that more water is available now than before for drinking, domestic use and irrigation. There is a decrease in the number of sources they have to use in order to get sufficient water to fulfill their needs. There is no significant difference in the amount of water available from various sources by season. Although the quantity has definitely increased, half the households felt that the quality of the drinking water was the same as before. The sources of water that provide water for the longest period are the paal structures.

3.E.6. Livestock

Livestock is considered to be an investment to be sold in an emergency. One household has increased the number of livestock, while others have reduced or kept the same

number as before. The value of livestock has increased and the decision to purchase livestock is determined by the amount of money available to make this investment.

3.E.7. Non-agricultural produce

There is a decrease in the availability of fuelwood, fodder and other non-agricultural produce, largely due to less rainfall tree felling. Nothing has been done to develop private or common pasture lands. No special effort was taken to plant fuelwood and fodder trees. Households are more dependent than before on common lands.

3.E.8. Physical assets

All households responded that they owned more physical assets than before, and the value of their assets is greater now than before. Households have purchased electrical goods, agricultural equipment, houses and three respondents have purchased cars. Households also responded that their financial capacity to hire tractors, engines and other agricultural equipment had increased after project implementation.

3.E.9. Social capital

All households responded that social relations in the village are good and people from different groups interact with each other. Friends meet often and discuss household issues. Friends borrow money from each other mainly for agricultural needs, but also during illness and for other household needs. Households responded that they had good relations with the local moneylender. They explained that they received better services from the local shopkeeper and moneylender if they had good relations with them. They obtained goods on credit from the local shopkeeper.

All households responded that friends and relatives share knowledge and information about farming practices and help each other in farming activities, like working in each others' fields without wages. Two households said that they shared investment costs like pumping water for irrigation, purchase of seeds and fertilizers etc. with their friends. Friends also engage in share-cropping activities. They collect fuelwood and fodder from each other's fields.

Households felt that political affiliations affect social relations in the village. Social relations had deteriorated in the village, but due to project interventions, new relations were formed as a result of the Paal Committee. The main benefit of these new relations is that their knowledge of agriculture has increased. Conflicts in the village are generally resolved in a meeting.

3.E.10. Access to infrastructure

Public services are good in the area. Because the services are good they are able to save money.

Public services like transport, health services, education, etc are easily accessible. Electricity is available. Respondents said that if these services had not been easily accessible, and the quality of these services had been poor, they would have to spend more time and money to access these services from a greater distance.

3.E.11. Impact of Project interventions

The investments made on private lands per households were on an average above Rs. 10,000. The large part of this investment was made by the NGO, PRADAN. Households contributed in cash and labour. Land structures like field bunds were made. In general the project interventions on the lands have arrested soil erosion and raised the water table. While the work was in progress, wage labour was available.

Households responded that they themselves would maintain the structures and interventions made on their lands. None of the households have tried out the same treatments on other plots that belong to them. Some of the respondents mentioned that they did make some modifications to the land and water treatments on their land.

Most respondents said that they have introduced new crops and are using organic manure rather than chemical fertilisers and are using improved seeds. The result has been an increase in crop yields and profits.

The factors which determine the choice of crop, are the expected profit, and quality of soil. The amount of produce the household will sell or store for home consumption depends upon the cash resources with the family at the time.

3.E.12. Changes in standard of living

There is a great improvement in the standard of living of these households.

3.E.13. Institutional support

All households are members of the Paal Committee. The membership has helped them in constructing the structures on their lands. Two households attend every meeting and three once in a while. Decisions are taken after discussion. There is no problem in the working of the Committee. Respondents felt that the land and water treatments would not have been possible without the help of the NGO. The maintenance of the structures will be undertaken by them.

3.E.14. Problems and suggestions regarding the project interventions

Before this paal was constructed there was some disagreement about the location of the spillways. They now feel that some more structures need to be made, people should participate more and more trees should be planted. There is a ban on tree felling and free grazing, which is currently being followed.

Section 4: Conclusions and Recommendations

4.A. Conclusions

4.A.1. Average Family Profile for the four paals

The average family size ranges from 9 members in Bede ka Bas to 14 members in Khanpur Mewan. The average number of children below 18 years ranges from 4 to 9 and average number of children above 18 years ranges from 3 to 5. Most adults are illiterate in Bede Ka Bas and Khanpur Mewan, while the highest education level in the family is

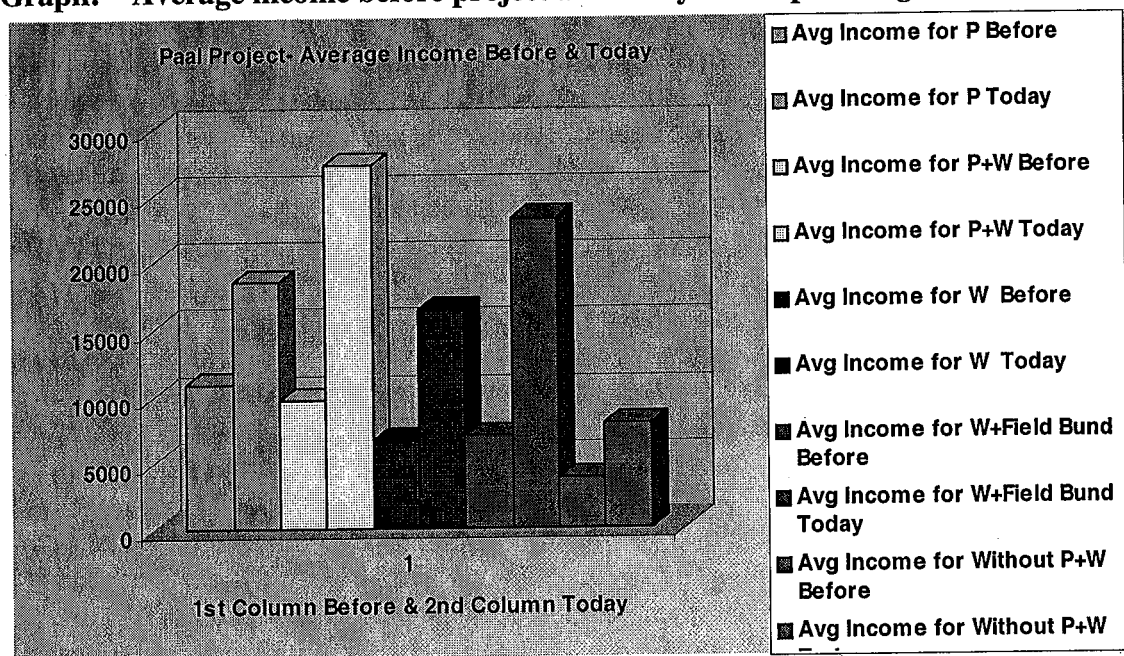
3rd standard in Chorbasai and 2nd standard in Rustam ka Bas. In the present generation, children are being educated, but the level of education completed is not higher than primary level.

4.A.2. Land ownership and land use

Area under cultivation has increased for all categories of farmers; only paal, paal and well, only well, and well and field bunds, in the four locations. Farmers in all locations have brought small areas of previously uncultivated and rainfed, degraded land under cultivation after project implementation. However, there is an increase in area of land owned only for those farmers who benefit from the paals and also have well irrigation and for those who have only well irrigation, in all the four locations. The total area of land benefited by the project is also highest for those with well irrigation, with and without the paal.

4.A.3. Changes in household income

Graph: Average income before project and today for all paals together



Before the paals were repaired and other land treatments were done, farmers whose lands benefited from the old paals, had the highest income. Today the farmers who benefit from the repaired and reconstructed paals, and also have wells, have a substantially higher income than the others. The paals help to retain water in the monsoon, and later, moisture in the soil, for a long period. The paals have helped to secure their monsoon crop and maybe harvest a second crop if the rainfall is good. Also due to the soil moisture, farmers are able to grow grass fodder and increase their income from livestock. However, it is the irrigation that makes a significant difference to agricultural production and income, by enabling them to harvest cash crops and ensuring a second crop.

With increased agricultural activity all members of the household have to contribute labour. Children also work in the fields and look after livestock. Children are therefore making a significant contribution to the household income. In households whose area under cultivation has increased, the contribution to household income by women has decreased and contribution by children has increased.

4.A.4. Livelihood activities

Households are engaged in agriculture, livestock rearing and selling of milk. Livestock and sale of milk brings in cash income all round the year. There has not been any change in livelihood activities over the years. The significant change is decreased dependence on agricultural wage labour and increased contribution by children to agricultural production and livestock rearing. Only two households in Bede ka Bas have taken up non-land based activities.

4.A.5. Water resources

Households in all four locations responded that more water is available now than before for drinking, domestic use and irrigation. There is a decrease in the number of sources they have to use in order to get sufficient water to fulfill their needs. There is no significant difference in the amount of water available from various sources by season. Although quantity has definitely increased, households felt that quality of drinking water was the same as before. The sources of water that provide water for the longest period are the paal structures.

4.A.6. Livestock

Livestock is considered to be an investment to be sold in emergency. Five out of eleven households have increased the number of livestock, while others have reduced or kept the same number as before. The value of livestock has increased and the decision to purchase livestock is determined by the amount of money available to make this investment.

4.A.7. Non-agricultural produce

In Bede ka Bas there is an increase in availability of fuelwood, fodder and other non-agricultural produce, largely due to pasture development activities undertaken during the project intervention. Special effort was taken to plant fuelwood and fodder trees. Households are more dependent than before on common lands. Produce from common lands has decreased at present because of low rainfall in the past 2-3 years.

In Chorbasai, six out of eleven households responded that there was a decrease in availability of fuelwood, fodder and other non-agricultural produce, largely due to drought and tree felling. Common lands have not been conserved even though the dependence on common lands for fuelwood and fodder has increased. Pasture development activities have been undertaken on private lands.

In Rustam Ka Bas, there is no increase in the availability of fuelwood, fodder and other non-agricultural produce, from the common lands. Nothing has been done on private or common lands for fodder development. No effort has been made to plant fuelwood trees.

In Khanpur Mewan, there is a decrease in availability of fuelwood, fodder and other non-agricultural produce, largely due to less rainfall and tree felling. Nothing has been done to develop private or common pasture lands. No special effort was taken to plant fuelwood and fodder trees. Households are more dependent than before on common lands.

4.A.8. Physical assets

Households in all four locations responded that they owned more physical assets than before, and the value of their assets is greater now than before. Households have purchased electrical goods, agricultural equipment, bought or improved their houses, a few have purchased cars. Households also responded that their financial capacity to hire tractors, engines and other agricultural equipment had increased after project implementation.

4.A.9. Social capital

Households in all locations responded that social relations in their villages were good and people from different groups interact with each other. Friends meet often and discuss household issues. Friends borrow money from each other mainly for agricultural needs, but also during illness and for other household needs. Households responded that they received better services from the local shopkeeper and moneylender if they had good relations with them. They obtained goods on credit from the local shopkeeper.

Friends and relatives share knowledge and information about farming practices and help each other in farming activities, like working in each others' fields without wages. Half the households said that they shared investment costs like pumping water for irrigation, purchase of seeds and fertilizers etc. Friends also engage in sharecropping activities. They collect fuelwood and fodder from each other's fields.

Most households felt that political affiliations affect social relations in the village. Social relations had deteriorated in the village, but due to project interventions, new relations were formed as a result of the Paal Committee. The main benefit of these new relations is that their knowledge of agriculture has increased. Conflicts in the village are generally resolved in a meeting.

4.A.10. Access to infrastructure

Public services like transport, health services, education, etc are easily accessible. Electricity is available. Respondents said that if these services had not been easily accessible, and the quality of these services had been poor, they would have to spend more time and money to access these services from a greater distance.

4.A.11. Impact of Project interventions

The investments made on private lands per household were on an average above Rs. 10,000. A large part of this investment was made by the NGO, PRADAN. Households contributed in cash and labour. Land structures like field bunds were made. In general the project interventions on the lands have arrested soil erosion and raised the water table, resulting in recharging of wells. While the work was in progress, wage labour was available.

Households responded that they themselves would maintain the structures and interventions made on their lands. None of the households have tried out the same treatments on other plots that belong to them. Some of the respondents mentioned that they did make some modifications to the land and water treatments on their land.

Most respondents said that they have introduced new crops and are using organic manure rather than chemical fertilisers and are using improved seeds. The result has been an increase in crop yields and profits.

The factors which determine the choice of crop, are the expected profit, and quality of soil. The amount of produce the household will sell or store for home consumption depends upon the cash resources with the family at the time.

4.A.12. Changes in standard of living

Households responded that the standard of living had improved in all aspects, food, clothing, education, housing etc. The quality of family life has also improved with men spending more time with the children and women getting time to interact socially.

4.A.13. Institutional support

All households are members of the Paal Committee. The main benefit of the Paal Committee as perceived by them is that the Committees enabled the implementation of the project and land development interventions and paal revival were possible only because of the project. Most households attend every meeting of the Committee. In the meetings, decisions are taken after discussion among members. There is no problem in the working of the Committee, except in Chorbasai. In Chorbasai, meetings are not held regularly, contributions were not collected properly. Efforts need to be made to improve the functioning of the Committee.

Respondents felt that the land and water treatments would not have been possible without the help of the NGO. The maintenance of the structures however, was their responsibility.

There is a ban on tree felling and free grazing, which is currently being followed, but not completely.

4.A.14. Problems and suggestions regarding the project interventions

Before the paals were constructed there was some disagreement about the location of the spillways. These differences were sorted out through discussions with the concerned farmers. Households now feel that some more structures need to be made for rainwater harvesting, more trees should be planted. They also feel that farmers should take more initiative in implementing any more projects in their area.

4.B. Learning and Implications for replication

The Paal Committees need to be considered to be at the core of learning and replication strategies. Strong involvement of the farmers needs to be encouraged from the onset in order for successful implementation to occur. Farmer-to-farmer training should be

stimulated to ensure that gradual, grass-roots replication occurs without as much involvement from Pradhan or other NGO's.

4.B.1. A strong institution at the local level is a pre-requisite for sustainability

PRADAN began implementation with the formation of the Paal Committees and over time strengthened them to manage the paals and maintain the structures without NGO support. The members of the Paal Committee accept that it is now their responsibility to manage and maintain the paals. The Committee provides them with a platform for meeting and discussing issues and problems related to the management of the paals and also acts as a mechanism for conflict resolution. Since the formation of the Committee and its functioning was a precondition for project implementation, farmers had to resolve their differences and work together so that the project could be implemented. When plans were being made for the reconstruction of the paals, there were conflicts over the location of spillways, but these differences were resolved through discussions so that the project could move forward.

With the introduction of the savings and credit activity, the paal committees were strengthened, as the Committees also fulfilled the credit needs of the members. In addition, it brought members closer together as they attended meetings more regularly. During the meetings they also discussed problems related to agriculture and exchanged information on farming practices. The NGO also helped the Committee to access new knowledge and information about seeds, fertilisers etc.

At this time, when the NGO has already begun to limit its role in the project area, the farmers have already taken over the responsibility to manage and maintain the paals, field bunds and other interventions made during the project implementation period. The NGO has also encouraged and strengthened through the Paal Committee, the tradition of "paal daan" or donation towards a fund for maintenance of the paal. Farmers whose lands are in the submergence area donate 10 kgs of grain per bigha which is equivalent to 0.25 hectares, and farmers who have well irrigation are required to donate 40 kgs per bigha or 0.25 hectares of area under well irrigation. This donation fund is managed by the Paal Committee. Each member in rotation has the responsibility to maintain the accounts. The box containing the accounts and relevant documents is handed over to the person currently in charge of the accounts. This process helps in keeping the members involved and makes each one responsible for the functioning of the Committee. The experience also fosters leadership qualities among the members.

4.B.2. The NGOs need to evolve their own role in the project area

Although it is true that the land and water interventions would not have been possible without NGO support, the NGO needs to recognize from the beginning that it can and should only play a supporting role and act as a catalyst for initiating the process of change. The role of the NGO needs to evolve and change as the local institution takes form. Emphasis needs to be given to strengthening the local institution to ensure sustainability of the project. Farmers in all the four locations responded that they would not have undertaken any land development work on their own, and neither have they replicated any of the interventions at their own cost on their own fields, other than those

that benefited from the project. This emphasizes the need for “outside” intervention to enable and support financially and technically, land development activities for agricultural improvement especially for small landholders. However, the NGO also needs to invest in local capacity building and institution formation in order to make the interventions sustainable. Once project funds are over, the NGO is often unable to give the same amount of time and inputs to the project location as they did when the project was being implemented. Even if they do not officially or technically withdraw from the location, funding constraints limit the investment they can make. In such situations, the interventions are likely to fail in achieving the objective. If local institutions are created to carry the work forward, the interventions are more likely to succeed.

4.B.3. Social capital and human capital supports the fulfillment of livelihood needs

Social networks are very important for providing support, knowledge and assistance to meet livelihood needs. Households help each other in agricultural activities, share investments and provide credit for meeting different needs. Very often this access to informal credit is what enables farmers to obtain seeds and fertilizers at the required time. Small holding households are sometimes unable to spare cash resources to hire labour for agricultural work. At such times households agree to work in each others’ fields in a reciprocal arrangement without cash wages being exchanged. Labour pays for labour. This becomes necessary particularly when agricultural work increases after project intervention; as more land is brought under cultivation, more labour is required. All members of the family have to contribute labour, including children.

The paal system is unique, in that although the paals benefit private lands, these lands are connected hydrologically as they occur in a cascading manner. The whole system works only if all the paals are maintained. Therefore although the interventions are on private lands, the farmers have to work all together to make the system work. The Paal Committee is therefore a very important mechanism for making the paal system successful.

4.B.4. Importance of common lands

Although land development activities increases the productivity of private lands, particularly in the case of smallholders, the dependence on common lands for fuelwood and for grazing animals does not decrease. In fact if farmers invest in more livestock their dependence upon common lands increases. It is very important therefore to conserve and manage the common lands. Although farmers are growing fodder in their lands after the project interventions, they mentioned that their dependence on common lands had increased over the years. Where common lands have been treated like in Bede Ka Bas, there is an increase in the availability of fuelwood and fodder. In the other three locations, the common lands have not been managed or maintained due to which the needs of the households for fuelwood and fodder cannot be met. In addition, the recurring drought over the last three years has made matters worse.

4.B.5. Access to irrigation along with rainwater harvesting makes a significant impact on the economic condition of the household

Land and water interventions through rain water harvesting and related activities increases the agricultural productivity and secures the rainfed crop, but significant increase in income comes only when irrigation becomes available. In all the four locations, the highest increase in income occurred for those households whose lands benefitted from the paal and who also had well irrigation.

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