

NATURAL RESOURCES SYSTEMS PROGRAMME
PROJECT REPORT¹

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R7830 and R7839

Report Title

Exploring options for better use of water at RCP-V.
Annex Biii of the Final Technical Report of projects R7830 and R7839.

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Summary

Our vision in the project was to facilitate the formation of land and water management strategies and institutions that are socially acceptable and broadly replicable. The paper describes the participatory process developed and adopted for exploring options for better use of water with focus on a single distributary RPC-V (Right Parallel Channel – V) of Patna Main Canal system under Sone Command through cost effective participatory mechanism involving poor farmers, landless and share croppers. A key difference in our approach has been the identification and elaboration of possibilities of bringing improvement through dialogue with poor and marginal stakeholders empowered in relation to the larger-scale farmers who traditionally dominate the on-farm water management (OFWM) through self-help groups (SHGs). Dialogues were initiated between experts, local communities and other key stakeholders such as the Irrigation Department. Emergence and role of Outlet Management Groups (OMGs) and Self Help Groups (SHGs) during the project period provided an interface to explore opportunities for efficient land and water management. The overwhelming response from the community has clearly demonstrated that the involvement of wider constituency of stakeholders provided good opportunities for the adoption of need based OFWM technologies leading to more effective participatory irrigation management (PIM). Adoption of need based, low cost interventions such as raising of bund height for rainwater conservation, optimization of rice transplanting time, multiple water use and productive utilization of seasonally waterlogged areas and selection of pumps for lifting ground water by the farmers using their own resources was a testimony for the success of the participatory process. Recognizing the need for establishing linkages between the OFWM and main canal system management, a broader framework between water users and canal managers is suggested. Strategies for scaling up are also discussed in the paper.

1.0 Introduction

Low irrigation rates and increased establishment charges result in neglect of canal maintenance leading to infrastructural deterioration, unreliability, excessive water losses, social conflicts and low agricultural production. To overcome these problems, various approaches of participation amongst stakeholders have been recommended for arriving at workable solutions regarding water use and its management. Realization over the time has resulted in paradigm shift towards stakeholders' participation in water distribution and management. This led to the inclusion of various provisions for stakeholders' participation in the National Water Policy of 1987 and its scope was even widened to include wide range of stakeholders in National Water Policy 2002 under Command Area Development (CAD) program. The basic premise of this study was to facilitate the formation of land and water management strategies and institutions that are socially acceptable and broadly replicable in this region. Participatory technology development and its dissemination was the main driving force in this endeavor to improve productivity and livelihoods. This project is being implemented in RP Channel-V (RPC-V) a distributary of the Patna Main Canal under the Sone Canal System in Bihar.

1.1 General Features of RPC-V

The study was conducted in the command of RPC-V (25°26' – 25°27'30" N; 84°52'25" – 84°56'40" E, 60m above MSL) a distributary of Patna Main Canal under Sone Canal Systems (Fig. 1).

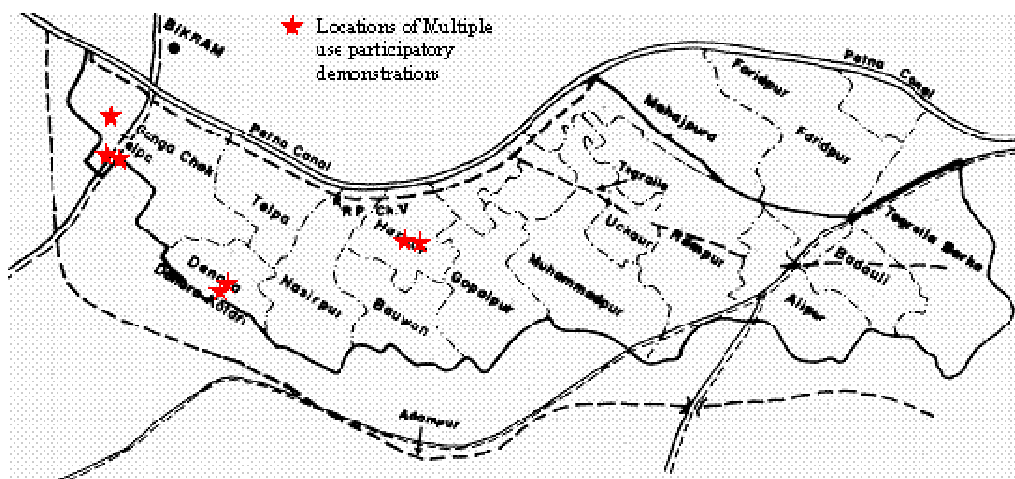


Fig. 1 Study area comprising of command of RP Channel V distributary and locations of participatory demonstrations carried out on multiple uses

The command is located in Vikram Block of Patna district, Bihar. The 5.8 km long distributary bifurcated at 5.1 km RD and Tegraia minor offtakes and extends up to 3.8 km up to village Tegraia. Hence, the total length of the distributary is around 9.5 km. It has CCA (culturable command area) of 2200 ha. As per normal schedule, the water is released in the distributary between 25th June to 25th October during kharif season, while 25th December to 25th March during rabi season. At lower sides of the command a drain exists, which carries runoff from a catchment extending several kms beyond the study area, as well as surplus canal flows. The water level in the drain rises up during monsoon season, engulfing lands surrounding it, sometimes more than 50 to 100 cm on both sides of the canal. The water stagnation is artificially created by closing the gate on the drain (located within one km away from the end of Tagraia minor) to protect further aggravation by back flow due to rise in

water level in the river Punpun which drains into Ganges. The rainfall starts in the month of June and the runoff starts accumulating in the low lands by the end of June. With release of water in the distributary and due to un-gated outlets the surplus water from the outlet commands also flows to low lands and accumulates there. The visible condition of waterlogging starts from the 2nd week of July and remains till late December but in some pockets it remains even upto February. A non – registered Water Users Association (WUA) existed in the area comprising of large and landed farmers which had two tiers body namely Distributary Level Committee (DLC) and Village Level Committees (VLC). The WUA was normally involved in canal management at a very low profile and were struggling to get due recognition both from water users as well as water resources department.

1.2 Outline

This report further describes the methodology/processes adopted in section 2 which comprises of mainly participatory processes identified, executed, modified and identification of low cost interventions for further execution including collection of basic and secondary information. The section 3 of the report discusses the results and impact of participatory processes and interventions undertaken reflecting lessons learnt and new knowledge generated. The section 4 of the report concludes the salient features of the study and finally section 5 presents strategies for further up scaling of the project experiences and need for linkages to strengthen the participatory process to facilitate dialogue at a wider scale.

2.0 Material and Methods

This section describes the method of information collection either from primary or secondary sources and identification of constraints, participatory technology development process, identification of interventions and their implementation besides methods for response collection of participatory process implemented and interventions adopted.

2.1 Collection of preliminary and secondary information and constraints identification

In order to explore the possibility of improvement in land and water productivity and livelihood improvement in the command of RPC-V, problems and constraints creating wide gaps between water availability and demand in canal command besides causes for low productivity were identified through interaction with members of the communities in different reaches i.e head, middle and tail. Information and basic data pertaining to a) hydraulic behaviour of Patna Main Canal and RPC-V, b) discharge versus time variation, c) operation schedules (actual and official) and number of outlets and their positions of RPC-V, d) water balance components and status of waterlogging in the command, e) role of Water Resources Department in canal management, f) role of Water Users Association in the study area, g) people perception regarding canal water availability and its availability at various reaches, and h) relevant socioeconomic facts were collected.

The information was collected through various methods which included a) published sources, b) walkthrough/transect walk, surveys along the distributary in the command and towards lowers end along the drain, c) field measurements for physical canal structures and measurement of water balance components through field lysimeters, d) face to face dialogues with the community members individually and in group, and e) frequent dialogues with WUA and Water Resources Personnel regarding canal management. This helped in identifying the constraints and problems. Some of the major constraints and problems specific to water management included a) field to field irrigation, b) over dependency on unreliable canal water, c) reluctance in use of groundwater, d) scattered & fragmented land holdings, e) seasonal waterlogging/water congestion near canal and drain, f) unproportionate outlet sizes, g) unauthorized cuts, h) ungated outlets, i) obstruction in canal flow to raise the

head and j) conflicts amongst water users were some of the major problems observed. Details about constraints are also available in ANNEX- B-ii section 2.2.

2.2 Participatory Technology Development Process and Identification of Interventions

Initially the project partners i.e. ICAR-RCER and CIRRUS followed separate and mutually independent routes to achieve their respective outputs. Researchers were involved in understanding their work based on scientific diagnosis by interacting with Water User Associations and individual farmers while CIRRUS focused on formation of SHGs largely constituting of poor marginalized sharecroppers and landless. The major challenge here was to develop a sustainable participatory mechanism which not only helps in establishing dialogue within the community for enhancing land and water productivity but also to provide opportunities for better interface within the communities for sustainable livelihood improvement besides providing solutions to the problems based on peoples' capacity need and priorities. Failure of most of the on-farm activities and use of faulty agricultural practices has been linked with unreliable and mismanagement of canal waters by members. Various issues relevant to water management were highlighted by members namely; i) low productivity of rice and wheat and delayed sowing ii) small fragmented and scattered holdings in absence of land consolidation which restricts taking up activities like installation of tubewells iii) poor investment capacity of members iv) weak WUA v) main canal management and existing gap between managers and water users etc.

One of the major conflicts observed during group meetings and face-to-face dialogue was on distribution of canal water at outlets. The existing WUA was informed in this regard and they organized few meetings by inviting farmers and project team members. During these discussions role of WUA was discussed and it was realized by members that two tier system in terms of DLC (Distributary Level Committee) and VLCs (Village Level Committees) is not able to represent properly the interest of wider constituency hence some arrangement is needed in the present WUA structure which provides a fair representation to the members at the outlet level also. This led to emergence of Outlet Management Groups (OMGs) at each outlets which was decided to comprise of five members representing that particular outlet. The OMGs will have direct contact with their respective VLCs for management of canal water etc. It took around six months to form these OMGs and it was reported that by the end of June 2002 all the outlets were having OMGs except one at Telpa at RPC-V. Besides this the project also conceptualized taking support of and involving Self Help Groups (SHGs) formed earlier through other project partner CIRRUS as part of Project 7839.

2.2.1 Participatory Technology Development (PTD) Process

The need for PTD was felt because it was often realized that the technologies promoted by scientists are not of interest to farmers and most of the time technologies disseminated to farmers supported with subsidies and other resources end up once these supports are withdrawn. Secondly there was need to develop a process that could operate at a developmental scale with minimum involvement of scientists because the time of scientist as a resource person is expensive.

Identification of Participatory Process

While identifying the participatory process project ideology was considered which comprises of mainly two components a) not to impose any ideas on members and b) not to provide any monetary incentives. Based on this the process was devised which comprises of following steps:

1. Identification of ideas based on basic information
2. Broadcasting the ideas amongst members

3. Analyzing Responses
4. Providing solutions and technical know-how and
5. Collecting responses.

Identification of Interventions (Ideas)

Based on the preliminary activities in the project area the following ideas/interventions were identified by the project partners to broadcast amongst members:

1. Maximum utilization of rainfall for crop production.
2. Steps to improve canal management.
3. Adoption of improved irrigation practices.
4. Conjunctive use of water.
5. Waterlogging.

2.3 Execution of the Process

The next step was to decide how the process can be executed effectively? Decision was not so simple as it was assumed. Several conflicts during discussions emerged amongst project partners regarding target groups with whom the process can be initiated and how the process should be implemented? Ultimately it was resolved by deciding that the process initially will be executed with SHGs (formed under project) and steps to execute the process should be such that the participatory process is cost effective and provides greater role for volunteers as a facilitator. Hence scientists will not interact directly with members but their ideas will be broadcasted through volunteers to SHG members who will be informed about the ideas by CIRRUS in their weekly meetings which take place at different locations in head middle and tail reaches of RPC - V. Responses received by volunteers if any will be routed back to scientists through CIRRUS for further action.

The participatory process as mentioned above was executed initially with SHGs (formed by the project). This resulted in one response which was related to problem of water logging. Experts analyzed the responses and on the request of members visited the site for discussion. It was analyzed during the discussion with members that this problem is not a localized one but it is due to excess runoff from upstream of the command and requires wider support and involvement of other members also besides SHG members. Based on this SHG members decided that they will discuss this matter with other members and once they arrive on some consensus they will report back. But no response was received after that meeting. The project team was concerned due to poor response. To take stock of the situation whole process was revisited and analyzed by the project partners. It was found that:

- Either information was not properly broadcasted by the CIRRUS to volunteers due to communication gaps or
- SHG members did not find these ideas interesting.

Hence following steps were formulated to improve upon the process

- Direct interaction of project team with SHG volunteers during their weekly meetings at head middle and tail reaches facilitated by CIRRUS and
- Referring back the responses of SHG members to project team by SHG volunteers during and after their weekly meetings.

This facilitated a wide range of discussions about water related issues between project team and SHG volunteers which reflected that volunteers have a good understanding about water related problems and vision for their solutions. Still responses received were poor. Volunteers

reported that broadcasted ideas were of less interest to SHG members. The major reason was reported as poor financial capacity of members. This led to the project team members to directly interact with SHG members in search of answers.

Hence in next step the same process was repeated by having direct interactions of project team and SHG members in head middle and tail reaches during their weekly meetings. Some of the highlights of direct discussions are as below.

- Members due to financial constraints are not able to take up the broadcasted ideas
- SHG members are least interested in fixed investments as most of the ownership in their cases are floating and they are engaged as share croppers in agricultural activities
- They are more concerned in short term gains as most of the water related ideas need some sort of investments and deliver long term benefits
- Small fragmented and scattered holdings in absence of land consolidation was reported to be one of the major barriers in their livelihood improvement
- Contacts with WUAs are not significant
- Least interest in Canal Management.

2.3.1 Lessons Learnt

Some of the major lessons drawn by project partners after analyzing the whole situations are given below.

1. SHGs WUAs OMGs etc. alone cannot tackle the water and land related issues
2. Need to involve wider constituency of community
3. Direct but informal contact of experts with the members was helpful in understanding the peoples' needs priorities and capabilities so it can be one of the step of the participatory processes at initial stages
4. Lack of dialogue within the community has resulted in absence of interface between rich and poor
5. Landless sharecroppers or small and marginal farmers do not have their prime priority for land and water related issues firstly due to floating ownership and secondly their reluctance to participate due to involvement of expenditure on creating infrastructure for improved water management practices
6. Absence of land consolidation is a major drawback for adoption of water management practices
7. Improvement in poor financial capacity of members do require strong linkages with financial institutions
8. Ideas broadcasted need blending of technical as well as peoples' perception to have greater stakes of members on broadcasted technologies
9. The participatory processes must be supported with an appropriate communication strategy
10. Technologies providing options to generate additional income can be attractive amongst wider sets of constituencies
11. WUA needs proper motivation and guidance to strengthen its institutional setup.

2.4 Process Revisited and Modified

Different elements of the participatory process were revisited and analyzed to bring need-based modifications in earlier strategies. This proved to be the major “**turning point**” in the overall approach of the project and its partners which not only brought changes in project ideologies as a whole but also changed the individual perceptions of project team members. Some of the major changes brought under participatory strategies were:

1. Involvement of wider constituency of communities in participatory process as a target groups□
2. Identification of ideas/technologies based on peoples' need □priorities and capabilities□
3. Support dialogues with quality communication products□
4. Identification of interest/focus groups/members to act as facilitators in future technology dissemination processes once the active participation of experts is withdrawn considering the effective role of group volunteers in earlier process.
5. Providing technical know-how to interest/focus groups/members through group discussions□on-site discussions and few need based strategic field demonstrations for technologies in which they are interested.
6. Providing motivation and devising mechanism for better interface amongst different communities/groups□
7. Opportunities for linkages to financial institutions.

Some of the major changes observed in project partners approaches were:

1. Convergence of parallel approaches to draw common road map on a mutually agreed strategies□
2. Increased democratic discussions within project partners by complimenting each other to harmonize their synergies□
3. A focused project team.

2.4.1 Process Modified

The modified participatory process (Fig – 2) comprises of five major key elements;

1. Identification of technologies and broadcasting ideas□
2. Identification of interest/focus groups/members□
3. Enhancing know-how of interest/focus groups/members through group discussions supported by quality communication product (leaflets in local language)□
4. Providing technical know-how on technologies to interest/focus groups/members through on-site discussions and strategic field demonstrations.
5. Slow withdrawal of experts from study area to facilitate increased interactions amongst interest/focus groups/members with other members of the community over technologies/interventions adopted for further self dissemination.

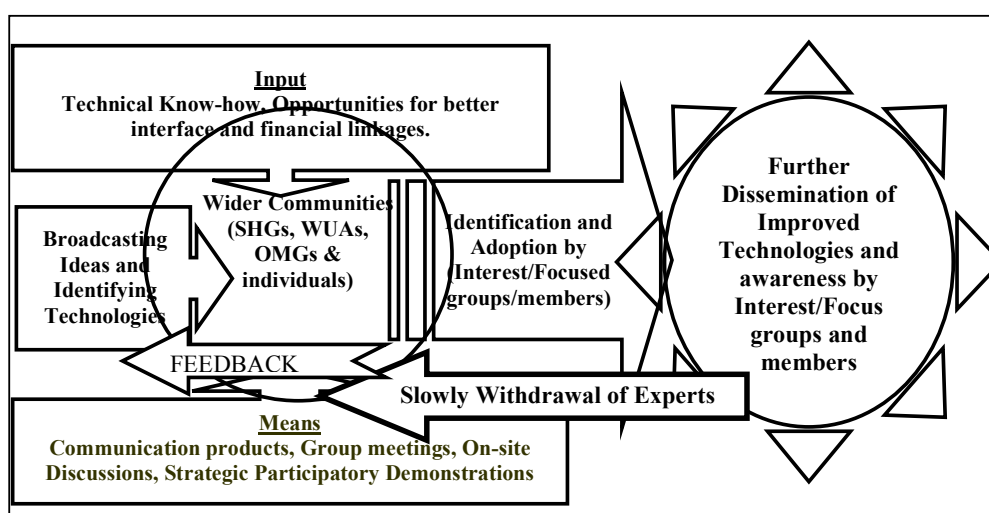


Fig – 2: Participatory Process Developed

2.4.2 Methodologies adopted to execute the process

An appropriate methodology to execute the process is necessary for timely introduction of key elements to make the participatory process more effective. Following steps were identified to execute the developed participatory process:

1. Information to the community regarding experts visits in the study area (date, time and venue) through key informants.

Members are informed initially through key informants regarding expert's visits to discuss on water management issues. The key informants are mainly project field functionaries (associated with the project on contractual basis for field works), farmer who is in close contact with experts, group volunteers etc. None of these key informants are paid specifically for forwarding this message. They are requested to pass the message in the villages near to venue area amongst members with a message that anybody interested to discuss issues related to water management is welcome on a particular date, time and place, but no attempt by key informants to force the members to join the discussion with experts. Care has been taken to decide venue, date and time in such a way that venue should be a public place, date and time should be such that members can afford some time out of their schedule on their own to attend the discussion.

2. Visit of the experts to the study area.

On a given date and time the visit must take place by the experts even if there is possibility or information that members may not be able to attend the meeting. On reaching at venue site, experts will introduce themselves with members already there and hold an informal discussion not necessarily related to water management issues but to remove any hesitancy to either side. The formal dialogue should be initiated by experts. The process of dialogue should be such that experts should get maximum time to deliver their thoughts. Care should be taken by experts that dialogue should revolve as per the agenda of meeting and should be helpful to extract, what is needed? There should not be any fixed time for the duration of the meeting but it will mainly depend on how useful the dialogue is? Once all the ideas are broadcasted and discussed, the meeting should come to an end with a request from experts to members that they should give thoughts on these discussions and in case of any further information they can contact the project staff.

3. Next visit of the experts on members' information. Date, time and venue decided by members and informed to experts by their sources or through key informants.

On request of members or groups for meeting, next visit of expert takes place, where again the ideas will be broadcasted to initiate the discussions. This opportunity by experts will be availed to identify the ideas/interventions on demand by members and also to identify interest/focus groups. Ideas/interventions on which members need detailed know-how, they can be assured that, it can be provided through communication products, which can be prepared and distributed in the next meeting.

4. Preparation and distribution of communication products in next meeting organized by interest/focus groups/members.

Communication products should be prepared and distributed by experts in meetings organized by interest/focus groups/members. This meeting will facilitate a detailed discussion amongst experts and interest/focus groups.

5. Expert's visits for on site discussions and identification for any need based strategic field demonstrations of potential interventions on members' request.

On the request of interest/focus group/members on-site discussions will take place. Decisions for need based strategic demonstration can be taken on some identified ideas/interventions. Members will be made aware of this decision in the meeting to

select few locations to undertake demonstration. Members must be informed that the contribution of the project will be very nominal in terms of kind and major cost of demonstration will have to be met by concerned members/group.

6. Undertaking participatory strategic field demonstrations and delivering any technical know-how to members willing to adopt interventions.
Participatory strategic field demonstrations were undertaken under the supervision of experts and on-site technical know-how was provided to members in the process to adopt ideas/interventions on member's request.
7. Start of slow withdrawal of experts but undertake visit on requests from interest/focus members/groups to provide know-how.
Process of withdrawal by experts starts with occasional visits on repeated requests by members.
8. Undertake few visits by the experts in the study area where new members have tried to adopt the interventions by getting initial knowledge from interest/focus groups /members and they need technical know-how which can not be delivered by the interest/focus groups/members perfectly but on members demand.
9. Withdrawal of experts at faster pace than earlier and avoiding visits to study area.
To facilitate increased dialogues amongst interest/focus groups/members and new members interested in ideas/interventions experts' visits are minimized.
10. Providing know-how to those who come in contact with experts at expert's location.
Experts avoid field visits but welcome members who approach them at their work place to enhance their technical know-how.
11. Complete withdrawal of experts to facilitate self dissemination of technologies.
No visit by experts to the study area. In case new members approach they are referred to interest/focus group/members for technical know-how.

Besides these the binding on project team existed in terms of no provision of any type of financial assistance except technical know how to members and no commitment for further meeting by experts. The process was initiated in April/May 2003 as per the proposed methodology. Initially several meetings by experts were organized with the help of key informants in different reaches of canal command. By the end of May 2003 following ideas/interventions were identified for preparation of communication products by holding several meetings of interest/focus groups/members (comprising of SHGs, WUAs and its apex bodies individual farmers etc.) at various locations in head, middle and tail reaches of the command.

1. Selection of pumps for groundwater utilization
2. Water management in rice
3. Multiple use of water
4. Canal water management
5. Raising bund heights for maximum utilization of rainwater
6. Water management in wheat
7. Advantages of irrigation through field channel against field to field irrigation

Five communication products (1-5) in the form of leaflets were distributed during *kharif* 2003-03 out of the seven identified above and responses of these are discussed in section 3.0 Result and Discussion. Distribution of communication product started in the last week of June in group meetings organized by members. Detailed discussions took place on each of the communication products. Surprisingly it was observed that some new members also attended these meetings. This process continued nearly for one month. Copies of communication products were also kept with some of the interest/focus group/members on

demand to deliver to those members who failed to attend the meetings but are willing to read the product. A record in this regard was also maintained at each location. This facilitated wide range of discussions between project team and members and also within the community. Sensitization increased awareness and interest amongst members which resulted in further invitation to project team to visit their areas to further demystify their concept and strengthen their know-how through group meetings. This brought some individual members and groups forward with a genuine interest in adoption of improved technologies.

2.5 Methods for Response Collection about the Process and Interventions

The response of members for participatory process undertaken and the ideas broadcasted and adopted were undertaken in participatory mode in group meetings. This comprised of initiating dialogues by scientists in group meetings and observing their reactions at three locations each in head middle and tail reaches. Members were requested to fill the questionnaire developed by the project team on voluntary basis. These were distributed to members only who wished to respond. Besides this individual members who came forward to implement some of the ideas were also interviewed personally by the project team to seek their views. A total number of 350 questionnaires (100 from head 200 from middle and 50 from tail reach) were demanded by the members from project team. Out of this 293 responses were received (84 from head 174 from middle and 35 from tail reaches). The responses were analyzed and are discussed in the following section.

3.0 Results and Discussions

This chapter discusses the salient achievements of the study and analysis of the responses of members for the process adopted and interventions discussed during *kharif* 2003-04.

3.1 Impact of OMGs and SHGs

Though at initial stage of the project there was lack of understanding amongst project partners on these types of grass root level groups but later with increased understanding amongst the partners most of the participatory activities developed good interface amongst SHGs OMGs WUAs and farmers where they complimented each other needs to improve their livelihood. These attempts led to adoption of improved interventions such as multiple uses raising of bund height use of ground water raising of early nursery of rice etc at on farm and most importantly installation of low cost wooden gates (Fig – 3) at outlets by OMGs to check the free flow canal water. It was observed that canal water management was not of interest to landless sharecroppers and marginal farmers but the enthusiasm of WUAs and the newly formed OMGs was encouraging. The OMG at outlet no.4 of RPC-V took a historic step in deciding to regulate the flow from their outlet by installing a low-cost wooden gate (Rs.20 for the gate and Rs.80 for associated brickwork). The installation of this gate inspired two more OMGs to install similar gates at their outlets. During the whole season these were used to regulate the canal water for irrigation. To date 6 OMGs have installed gates.



Fig – 3: Low Cost Wooden Gates fabricated and installed by OMGs

3.2 Responses of the Process and Interventions

After completion of the participatory actions a survey was conducted in different stages through questionnaires. The basic objective of survey was to know the peoples' perception on the process and interventions. The survey was also helpful to know the level of adoption of ideas broadcasted and discussed in various meetings. These surveys were undertaken in most of the cases by the project field functionaries and during group meetings. The responses were analyzed with mainly two objectives—first to know the impression of the community on participatory process which comprises of broadcasting ideas and raising their awareness by means of communication product to bring change in existing agricultural practices and secondly to know the choices of the members based on different categories for different interventions broadcasted.

The questionnaire comprised of following questions:

1. Have you read all the communication material?
2. Is it beneficial for your agricultural activities?
3. Whether suggestions & knowledge were appropriate?
4. Which suggestions & knowledge has inspired you most?
5. Whether you have tried to adopt some of the knowledge & suggestions?
6. Whether these types of products will be useful for farmers?
7. In future do you like to have some more communication products?
8. In your knowledge—has any other farmer tried to adopt the interventions as suggested?
9. Do you have any other things to say?

Responses were also collected and presented during one-day meet of experts and members (total 27 in numbers) mainly comprising of focus/interest groups at ICAR-RCER. The objective of this was to expose members about various techniques experimented at research plots.

3.2.1 Members Responses on Participatory Process

Most of the responses reflect that they have experienced first time such type of close interactions with any agency where the major emphasis was on creating awareness and enhancing knowledge base about advanced technologies/practices opposed to earlier instances where some selected farmers or group of farmers were benefited. The members also mentioned in their testimony that communication products were very informative and useful and many have reported that after reading they are trying to bring changes in their farming practices. But they wanted this process to continue for some reasonable period of time for sustainable adoption of advanced technologies/practices in the area.

3.2.2 Members Responses for Different Interventions

Responses of members on different interventions have been analyzed on following aspects;

- Peoples' choice for interventions—
- Reach wise Peoples' Choice for different interventions—
- Peoples' choice for interventions based on the land holdings—
- Choice for interventions based on different communities.
- Knowledge from interventions inspired all the members.
- Present and expected level of adoption of interventions by the members.
- Requirement of information/new knowledge through communication product by members of the community.

The graphical presentation has following codes for different interventions;

Title of the Communication products/Interventions	Code
1. Selection of pumps for groundwater exploration	- CM-1
2. Water management in rice	- CM-2
3. Multiple use of water	- CM-3
4. Canal water management	- CM-4
5. Raising bund heights for maximum utilization of rainwater	- CM-5

Peoples' choice for Interventions

It has been observed that the first priority of the people is to bring improvement in their livelihood as 27% of the members opted for multiple use of water which has an inbuilt advantage of fish growing (Figure - 4) and this type of activity can generate additional income for them.

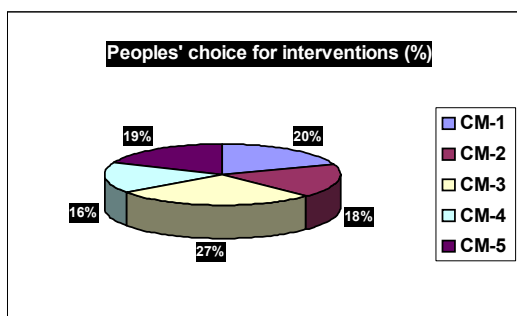


Fig – 4: Members choice for interventions

Reach wise Peoples' Choice for different interventions

The trend in Figure – 5 shows that in Upper Reach people opted for multiple uses of land and water in middle reach canal management has been opted by more number of people while in tail reaches the know-how about pump selection has been opted by more number of people.

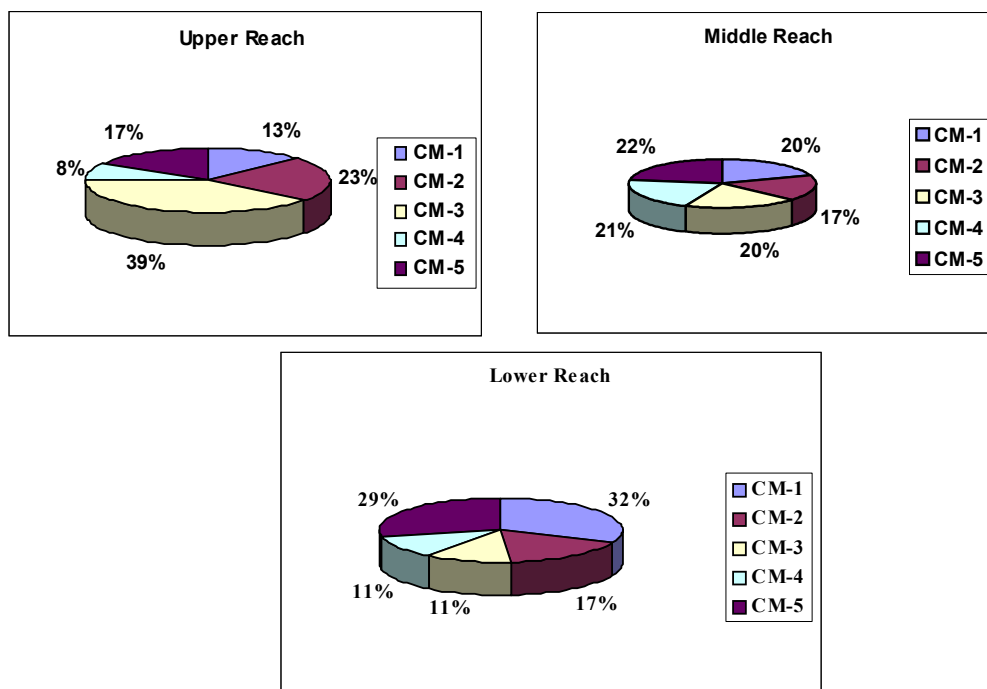


Fig- 5: People choice in different reaches

It is indicative of the fact that at upper reaches members are not bothered much about water availability in comparison to tail enders who have to think for other options such use of ground water.

Peoples’ choice for interventions based on the land holdings

Responses based on land holding sizes reflect that small holders are more concerned for income generation. As the holding size increases priorities change towards technologies by which they can improve their agricultural practices.

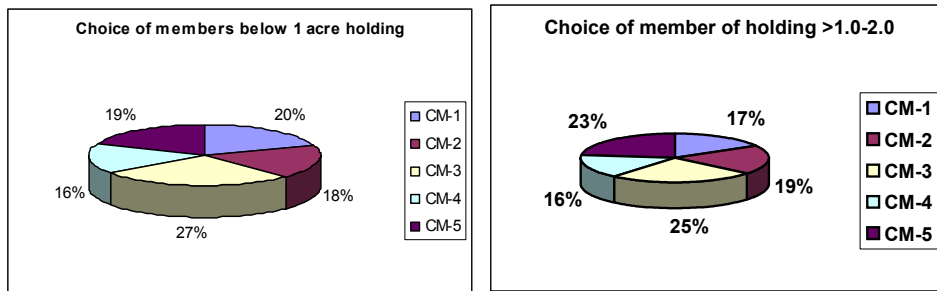


Fig – 6: Members choice of interventions belonging to different categories

As depicted above in Figure - 6 members possessing land holding sizes less than one acre and 1-2 acre have inclination towards fish production as they have opted for multiple uses of water. Whereas members between 2-3 acres and 3-4 acres and above land holding sizes are equally concerned about improved farming practices such as water management in rice maximum utilization of rainwater by raising bund heights ground water utilization and canal management too in spite of their concern to develop additional sources of income generation Figures - 7.

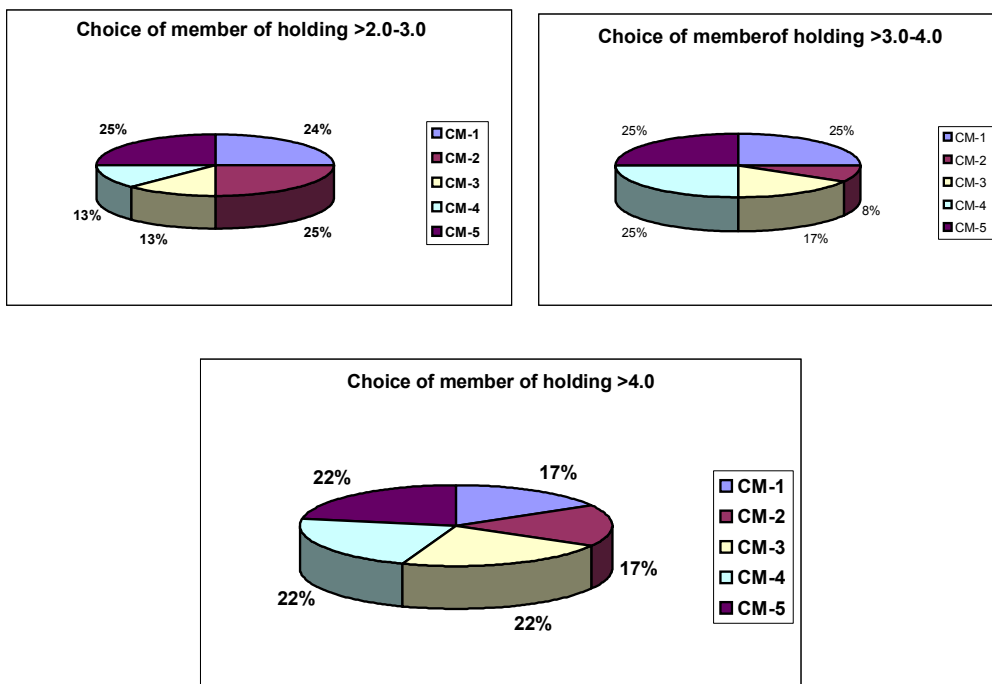


Fig –7: Members belonging to different land holding Categories and choice for interventions

Choice for interventions based on different communities

Analyzing the choices based on communities reflects that concept of multiple uses of water has been opted by not only SHG and share croppers but also members representing landed groups (Fig. - 8). The difference has been that in case of SHGs and share croppers around 44% and 45% members opted for multiple uses of water whereas in case of landed groups it is opted by 26% only. Details of multiple use interventions are given in ANNEX-B-v.

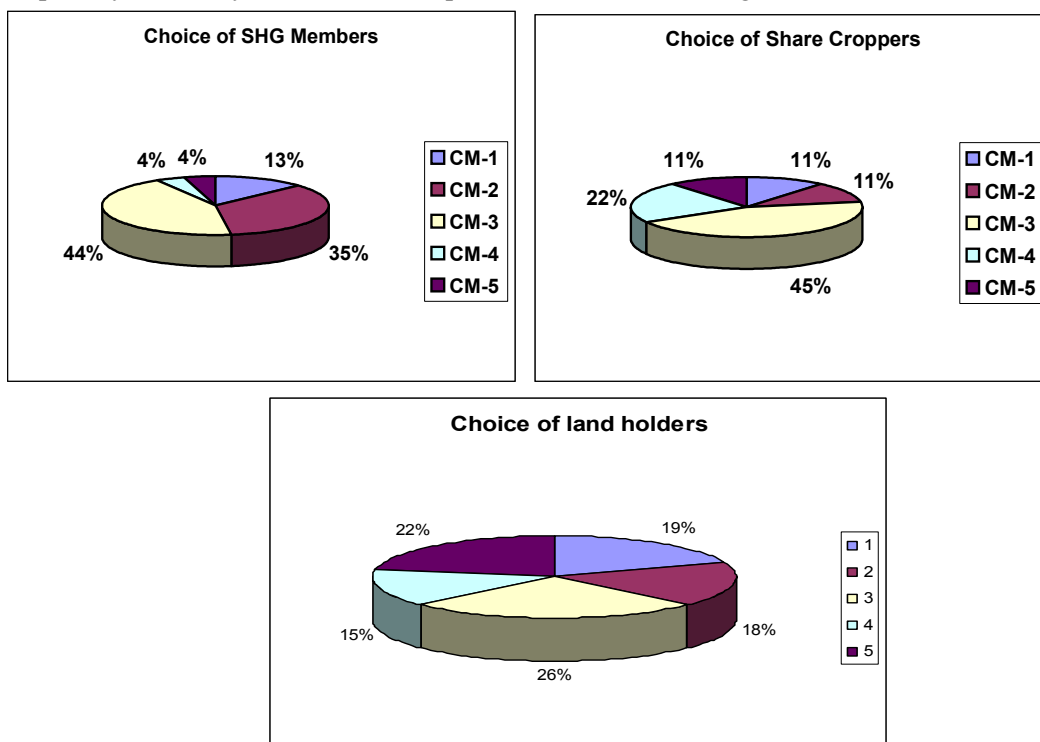


Fig – 8: Members belonging to different communities and choice for interventions

Knowledge from communication product that inspired most

Members when asked that which idea or new knowledge has inspired them most they reported that fish based farming has inspired them most Figure - 9.

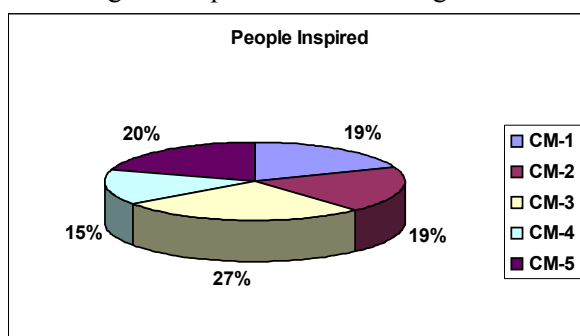


Fig - 9: Members options for interventions which inspired most

Additional Requirement of information/new knowledge through communication product by members of the community

The survey undertaken also reflected that besides these concepts they would like to have additional information through communication products in future on various aspects depicted Figure - 10.

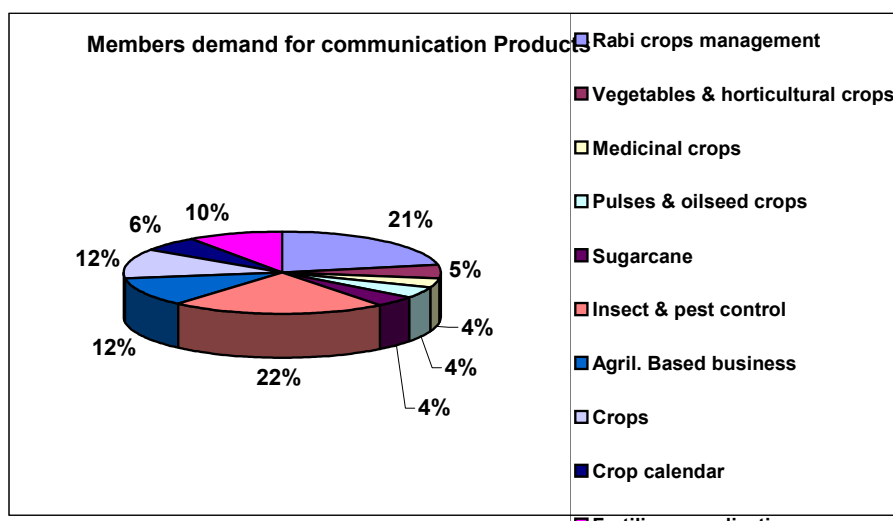


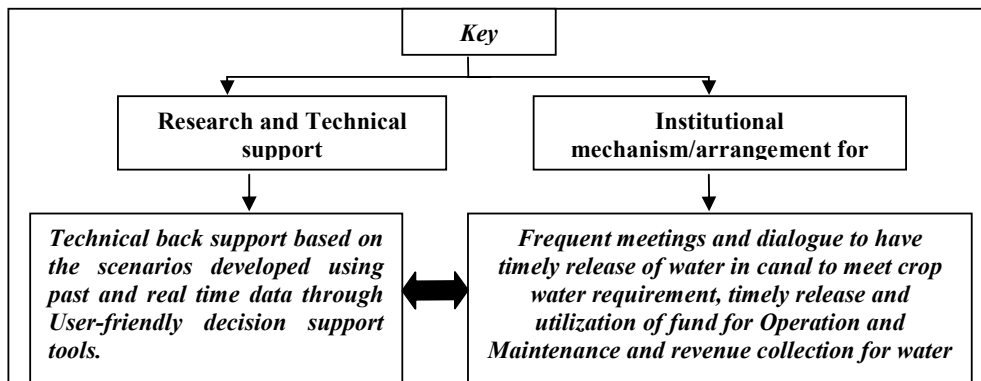
Fig – 10: Demand of additional information

Reponses during one-day meet held at WALMI Campus

An exposure visit cum group discussion of members of RPC-V with the scientists was organized at ICAR-RCER. Farmers were exposed to various advanced practices and technologies under research and development. During the group discussions several members narrated their experiences which showed that they have tried some of the ideas broadcasted by the project team to bring improvement in their farming practices [Appendix – I]

3.2.3 Path Forward

None of the members responded for canal management in their future agenda even though there is a high degree of dependence on canal water. This reflects the lack of confidence amongst high-volume water users about canal water supply and canal managers. Some of the members reported that to achieve the objectives of OFWM the supply of water from the canal must be ensured. This indicates a valid and strong reason for OFWM linkages to main canal management. This led the team members to explore the possibilities of balancing the expectations of water users and canal managers. The project team interacted with both groups in several group meetings. Canal managers agreed that in order to correct or reduce the mismatch between canal water supply and demand a strong linkage between OFWM and canal operation and management is needed [ANNEX-xii). OFWM alone cannot improve water productivity and livelihood. The discussions highlighted the two important key factors for efficient use of canal water as shown in the box below.



This has led to a path forward to explore the opportunities of developing decision support tools and its promotion so that supply and demand scenarios can be predicted and management decisions in real time can be taken by integrating it to GIS to develop self explanatory maps (ANNEX-B-vi and B-vii). Dialogue with members also raised the issue of conjunctive use of different sources of water. Considering that members are highly dependent on canal water and reluctant to use groundwater team members tried to motivate members to use groundwater while practicing improved practices like optimization of rice transplanting time and on-farm irrigation (ANNEX-B-iv). In this context project developed a decision support tool which is self interactive (in visual basic) to understand the economic benefits of use of groundwater and canal water. This tool was demonstrated in head middle and tail reaches of RPC-V and got encouraging response because the decision support tool was capable enough to explore the options of conjunctive use in the reaches convincingly (Fig 11).



Fig – 11: Live Demonstration of decision support tool among water users to explore the possibility of conjunctive use

4.0 Conclusions

Overall the study drew a great interest and provided much needed awareness amongst community and learning to project members on participatory process for technology development in livelihood programs. The outcome shows that participatory process that involves a wider constituency of stakeholders including WUAs SHGs OMGs and other interest groups provides good opportunities for the adoption of need based OFWM technologies leading to more effective PIM. This could be helpful in the effective implementation of PIM in irrigation projects. The convergence of parallel approaches and

ideas of project partners was a notable achievement in forging better working partnerships so the work moved forward in better understanding. This learning is expected to feed into the development of similar projects focusing on integrated land and water management issues. The study also reflected that OFWM approaches that ignore (while widely acknowledging) the problems caused by erratic and unpredictable main canal system management can only have limited success. A broader framework to establish linkage and dialogue between water users and canal managers was developed by: firstly providing an institutional mechanism for dialogue and secondly need-based technical backstopping.

The project successfully demonstrated that subsidies and incentives can be avoided and are not necessarily essential for the adoption of effective OFWM interventions in the command when such interventions are supported with effective communication dialogue and the process of participation. Need-based low-cost interventions such as selection of pumps for groundwater exploration water management in rice optimization of rice transplanting time multiple water use canal water management and efficient use of rainwater undertaken by the farmers using their own resources have shown encouraging response and similar interventions are expected to be taken up by large number of members. This is a testimony to the success of the participatory process and its sustainability.

5.0 Strategies for Up scaling

Attempts to up scale the project achievements started right from the project workshop in August 2004 where project activities and findings were presented in depth to sensitize various line Departments including Ministry of Water Resources Govt. of Bihar. By the end of March 2005 a program was started by ICAR-RCER Patna namely Technology Acceleration Programme (TAP) with institutes own resources to disseminate these ideas for up scaling even in areas outside the study area. A notable progress has been achieved in this programme where Water Resources Department (WRD) Bihar has shown interest to promote development of water-logged areas adjoining to Mujaffarpur district in participatory mode. The WRD Bihar is also convinced to incorporate the water management aspects in PIM activities. Two training programs (two day each) have been sponsored by Water Resources Department to provide exposure to farmers from north Bihar about our activities. Continued efforts are also being made to share these experiences at higher level meetings of the managers and policy makers for its upscaling.

Appendix – I

Some of the examples of adoption of interventions, views and suggestions of the community members narrated during one day exposure cum face to face interaction meet at ICAR-RCER, Patna are presented below.

1. **Sachidanand Verma, Gopalpur : (Middle Reach)**
 - Raised bunds of the field up to 30 cm helped in saving minimum two irrigations from canal.
 - Suggested that Land consolidation '*chakbandi*' can encourage the members to take up improved irrigation practices.
 - Appreciated the suggestions mentioned in communication products and trying to implement one by one.
2. **Jitendra Kumar, Fatehpur : (Middle Reach)**
 - Interested in rice-fish cultivation in low land field after visiting the strategic field demonstration at Aspura belonging to SHG.
3. **Jwala Dubey, Uchoree :(Tail Reach)**
 - Three years before undertook the fish cultivation in 2 *Katha* and experienced deficit of Rs. 20000/-.
 - After reading the content of the communication product and judging the performance of the members who have undertaken fish production intervention, is again thinking of fish cultivation.
 - The team provided the detailed information about finger ling production and its management in response to his question.
 - Appreciated the suggestions mentioned in communication products and desired more communication product on other crop.
 - Recommended the used of field channel for irrigation purpose, though the co-ordination among themselves is necessary.
4. **Sudarshan Pal, Badauli : (Tail Reach)**
 - Shared his experiences about rainwater management by raising the bund height.
 - Informed that there was saving of 2-3 irrigation in rice in this season and also the moisture status in the field remained for longer time.
5. **Madan Mohan Mishra : Sharampur :(Tail Reach)**
 - Explained the problem of labour from nursery to harvesting of rice.
 - Informed that he has incurred a loss of about Rs. 15000/- in fish production in his earlier attempt, but judging the performances of interventions undertaken in the project, he is encouraged to undertake the fish production venture again.
 - Causes of failure of fish cultivation in his earlier attempt was discussed and also reported that his purpose to attend the meeting was to collect the detailed information on fishery, goat and piggery.
6. **Bijender Sharma, Gangachak : (Head Reach)**
 - Interested in fish cultivation after visiting the strategic field demonstration at Aspura belonging to SHG .
 - Require detailed technical know-how about fish cultivation.
7. **Ramayodhya Prasad, Gangachak : (Head Reach)**

- Reported that he has also undertaken the fish cultivation earlier by putting 2000 fingerlings in a pond but harvested only 1 kg of fish.
 - After reading the communication product he is again interested for fish cultivation under the guidance of ICAR.
8. **Shiv Bihari Singh, Aspura : (Head Reach)**
- Interested in fish cultivation after visiting the strategic field demonstration at Aspura belonging to SHG.
9. **Bhola Singh, Aspura : (Head Reach)**
- Raised bund height and reported advantages of saving of irrigation as per his estimate 2-3 irrigations were saved.
10. **Ramprakash Sinha, Aspura : (Head Reach)**
- Discussed the working of pump.
 - Reported that his purpose was also to collect information about duck rearing, sericulture and mushroom cultivation.
 - Emphasized weekly face to face dialogue between farmers and scientists.
11. **Chandrama Singh, Aspura : (Head Reach)**
- Narrated the successful cultivation of rice-fish.
 - Narrated his experiences of rain water management.
12. **Sanjeev Kumar, Aspura : (Head Reach)**
- Raised the bund height upto 22 cm after reading the communication products reported saving in irrigation cost and expected good yield.
 - Required communication products on pulses crops and duck rearing.
13. **Pankaj Kumar, Aspura : (Head Reach)**
- Interested in fish cultivation in waterlogged area after visiting the strategic field demonstration at Aspura belonging to SHG.
14. **Sachdev Kumar, Aspura : (Head Reach)**
- Raised bund height upto 20-22 cm and reported that due to this moisture was available for longer period in his field in comparison to earlier years.
 - Required the communication products on duck rearing and *rabi* crops.
 - Required irrigation calendar for *rabi* crops.
15. **Laxaman Singh, Aspura: (Head Reach)**
- Raised the bund height and revealed the advantages of rain water management.
 - Faced the problem of disease in paddy in response to this the team member described the protective measures & fertilizer application method.
16. **Suresh Singh, Aspura: (Head Reach)**
- Described the step by step cultivation of fish after receiving technical know-how from project team.
17. **Sh. Satyendra Chowdhary Harpura: (Middle Reach)**
- Narrated his experiences of Rice – Fish cultivation.
 - Also presented the total expenditure occurred and profit earned.

Salient Responses of Members

1. Raising of bund height have resulted in moisture availability in rice fields for longer periods.
2. Raising of bund height of fields have at least saved about 2 to 3 irrigation to rice crops in this season.
3. Members suggested that land consolidation would be very effective for adoption of water management studies.
4. Some members informed that after reading the communication product on fish cultivation they are again motivated for adoption as in their earlier attempts they incurred huge loss.
5. Various members (SHG and Farmers) who have adopted the interventions after reading the communication product narrated their experiences in the house to educate the others who are willing for further adoption.
6. Shri Kaushal Kishore Sharma (Secretary of WUA RPC-V) informed that under the interventions for canal management the wooden gate has helped to reduce the waterlogging area in nearby plots and also informed that approximately 30% of canal water has been saved.
7. He also informed that if 5 to 6 outlets have gate to control flow of water then water at tail end may be easily available.
8. Members also suggested for frequent dialogues amongst scientists and farmers and communication products on other topics also.