Water Resour Manage (2008) 22:1173–1189
DOI 10.1007/s11269-007-9219-3

Scientific Perceptions and Community Responses in a Participatory Water Management Endeavor

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Received: 28 August 2006 / Accepted: 5 October 2007 /
Published online: 14 November 2007

Abstract People and technology are the two major ingredients considered to enhance benefits and provide opportunities in farming system. Perfect blending of these ingredients not only leads to maximize the agricultural production but also helps in improving livelihood. Openhanded efforts have been initiated to understand farm resources, production constraints and support services in order to suggest need based and cost effective technologies/practices, which can be adopted by the farmers employing participatory approach without or least financial incentivization. This approach is in contrast to earlier approaches where quality inputs and incentives are provided by project implementing agencies to promote technologies/practices. As in the earlier approach the farmer's involvement in planning and implementation is poor, introduction of participatory process and technologies/practices remains no longer sustainable and once the financial support from the project area is withdrawn farmers' follow the same age old traditional practices. This led to realization that perspectives of local people's needs to be in the center of development, research and extension efforts, if substantial impact is to be made. The objective of this paper is to share the experiences of a multi disciplinary and multi institutional participatory approach undertaken, in ICAR-DFID collaborative project in India, to improve livelihood of community including poorest of the poor through integrated land and water management. The purpose here is to establish a more differentiated communication and a conceptual framework, which can help researchers and practitioners

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to make better choices and more informed decisions when designing their research, communication and dissemination approaches.

Keywords Participatory water management · On-farm water management · Scientific perceptions · Community responses

1 Introduction

The paper presents a part of the study undertaken in two sister projects entitled "Integrated management of land and water resources for enhancing productivity (R7830) and Improved livelihoods through improved crop and soil management – Bihar and Uttar Pradesh (R7839)" sponsored by Department for International Development (DFID), U. K. The projects were designed around the 'on-farm water management' (OFWM) idiom that was popularized in the 1970s (Anonymous 2004). The OFWM approach was on the diagnosis that irrigation problems lay 'below the outlet' with typical top-end-bottom-end distribution problems leading to inefficiency and inequity in water use. This resulted in advocacy of Water Users Associations (WUAs) formed amongst farmers served by a distributary.

Hence, the aim here was to facilitate the formation of institutions and the development of strategies for sustainable and socially acceptable land and water management through community participation (Sikka et al. 2004). Expected innovations from the project were in the following areas:

- Development of participatory processes that would involve wider constituencies in land and water management than under the existing WUAs, and the development of new institutional arrangements,
- Development of tools to facilitate/support this participatory process.

There are different development contexts linked to participatory frameworks for intervention, and there are different domains of action in participation (Khanal 2001; Vincent and Khanal 2003; Vincent 1997). The different development contexts of participation do have different concepts of innovation and different sets of participatory methodologies linked with them. As most of the problems India faces today in irrigation management are the result of nonparticipation of stakeholders in irrigation management. Water productivity cannot be increased unless subsidies that foster inefficiencies are eliminated raise the price of canal water to reflect its cost, shift to more water efficient technologies, and more water efficient crops. This is not possible without people's participation. But this is not an easy task in India, because needs and opportunities vary greatly, often at local level, management approaches need to be flexible and capable of adopting to reflect local conditions (Chaurasia 2000).

Hence, traditional and innovative mechanisms need to be resolved in terms of new water contract amongst various stakeholders so that "Green Revolution" which was achieved by scientists single handedly may now be an everyone's business enabling individuals and communities to understand their options for change, to choose from different options, to assume the responsibilities that these choices imply, and then to realize their choices could radically alter the way the world uses its limited water resources.

Considering these, this paper discusses the scientific perceptions for different on farm water management (OFWM) practices as suggested during the course of project and change

in scientific perceptions due to people choices besides people perceptions on different OFWM practices.

2 Study Area

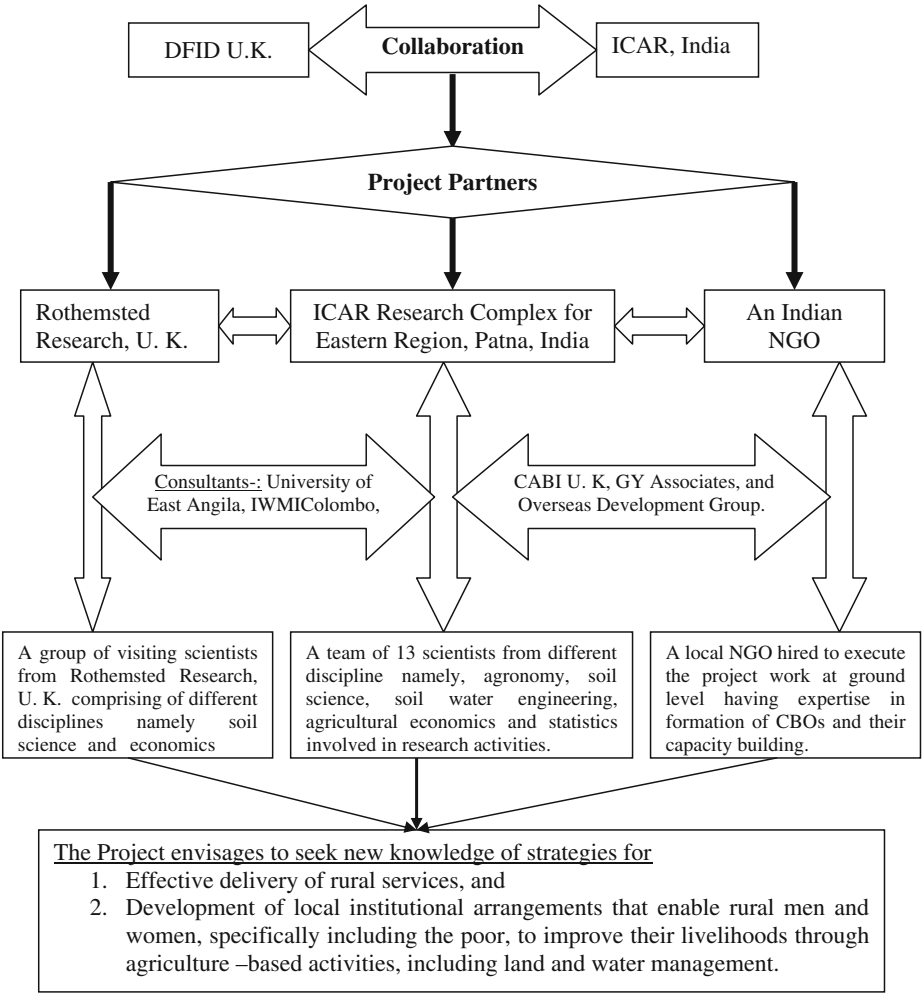
The study area falls under sone command of Bihar fed by Right Parallel Channel (RPC-V), a distributary of Patna Main Canal (PMC). *Kharif* (monsoon season) and *Rabi* (winter season) are the two main seasons in this area. Transplanted Paddy is the main crop in the area during *kharif* season as there are hardly any options for any other crops barring some patches of uplands alongside the RPC-V where people normally grow fodder. *Rabi* season in the area does provide options for growing various types of crops in addition to wheat such as pulses, oilseeds and vegetables. But the major area in *Rabi* season is occupied by wheat and *masur* (lentil, a pulse crop). Most of the soils in the command are heavy in nature and contain more of clay. Hence due to excessive watering in the paddy fields or rains in October, the moisture conditions prolong up to November and December in many cases delaying the sowing of *Rabi* crops. The irrigation in the area is provided by the canal mainly alongside the RPC-V and *Tegrila* (a sub-distributary of RPC-V), while most of the area falling at lower end of the command uses groundwater by extracting water through shallow tube wells using diesel pump sets. The irrigation water to fields flows through field to field. There is no practice of field channels except channels coming out from the outlets of RPC-V towards fields up to a certain distance. Even the channel length varies outlet to outlet and some of the outlet do not have even field channels. The RP Channel-V and its sub-distributary *Tegrila* has various pipe outlets. Most of these outlets are newly constructed and size of these outlets, varies from 3 to 9 in. circular opening. RPC-V provides only towards its right side through outlets located at different locations whereas *Tegrila* has outlets both at its left and right side. There are no distinct sign of water logging in the area barring surface ponding in monsoon months.

A non-registered WUA existed at initial stages of the project having two tier body namely Distributary Level Committee (DLC) and Village Level Committees (VLC). Frequent interactions with the members of Water Users Association and other community members provided an opportunity for the project team to address the problems regarding land and water management at outlet level. This was realized and well taken by members and led to some serious thoughts over canal management by forming several *Outlet Management Groups* (OMGs) by involving water users of a particular outlet. This development strengthened the faith and belief in members for project team. Moreover this act of the WUA also supports the policy guidelines of Command Area Development Authority (CADA) on Participatory Irrigation Management. However in case of Patna main canal system WUAs has only two-tier system in the form of Distributary Level committee (DLC) and Village Level committee (VLC). The major advantage felt by existing WUA here was that this will benefit to address the problems and constraints of members even placed at outlet level and also it will strengthen linkages of water users who are not in direct contact or representing DLC and VLC's.

3 Project Organization and Approach

Broadly three categories of facilitators/project partners (will be termed as experts further) involved in this endeavour, (a) a team of multidisciplinary scientist representing ICAR

Research Complex for Eastern Region (ICAR-RCER), Patna, Bihar, India, (b) group of scientists/consultants mainly based in different Universities of U.K led by Rothemsted, U.K., and (c) an Indian NGO and its apex bodies. All the project partners had different background, training, exposure, expertise, and working style. The organogram of the project is shown below;



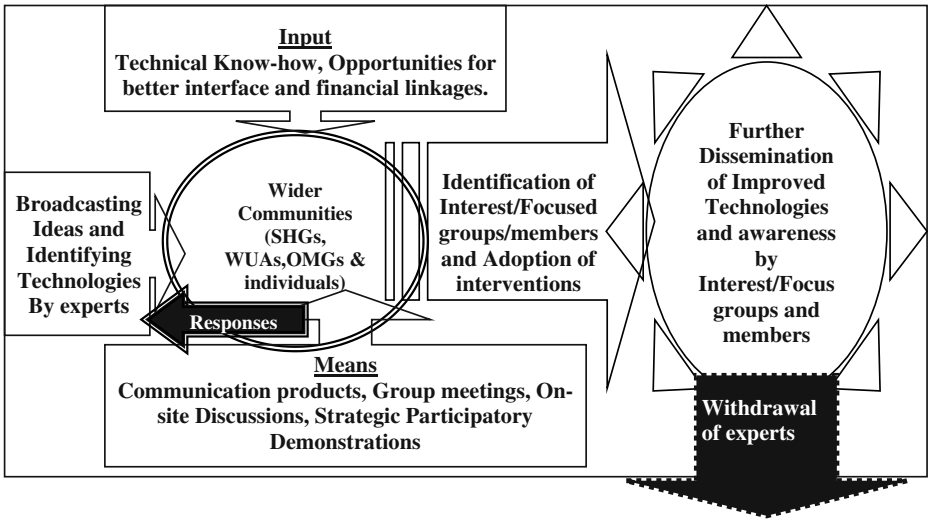
With above organizational structure of project having same goal it was observed that at initial stages partners lacked similarity in their working approaches, as everyone followed their own route to achieve the defined project outputs. Initially experts representing ICAR-RCER followed typical scientific diagnosis, interacting with members (mainly belonging to landed group and Water User Associations), whereas on the project line it was reflected that UK based and NGO experts who were having some common line of action mainly concentrated on poorest of the poor to motivate the members for formation of Self Help Groups (SHGs) (members including men and women largely representing landless, sharecroppers, farm labourer and small and marginal land holders). The action by experts

from ICAR-RCER facilitated direct contact and identification of key informants in the area along with identification of problems and constraints with respect to management and utilization of rain, surface, groundwater and on-farm water resources, reasons for low productivity and poor socio-economic aspects. Whereas action by other two partners resulted in identification of group volunteers at village level who further facilitated the formation of SHGs. Major activities undertaken by SHGs were weekly saving and loaning out of group saving initially to members on demand at a nominal interest rate. Group volunteers acted as a facilitator during members meet and coordinated the proceeding along with assisting them to maintain the weekly account. Later after self realization by the project partners on their way of working attempts were initiated to resolve conflicts amongst project members and partners which led to harmonize their synergies to become a focused project team by evolving following tradition during the remaining course of project;

1. Tradition of healthy discussions within the project meetings,
2. Complimenting each others efforts,
3. No imposition on project partners to follow a fixed approach,
4. Modification/refinement of project log-frames at critical stages to facilitate better coordination and to achieve project goal based on past experiences and learning of project members,
5. No closed door discussions in decision making for path forward to undertake technical activities.

4 Participatory Methodology

In the process, a mechanism was developed to involve wider constituencies of stakeholders including interested individual/groups, SHGs formed by the project, OMGs for drawing land and water management strategies based on lessons learnt by the project partners and members. The developed participatory approach had following key elements (Singh et. al. 2005a, b, 2006, and Saha et al. 2005);



This process resulted in (a) emergence of innovative ideas leading to increased agricultural production and diversification, (b) ideas were easily implementable as the community members had personal stakes in the outcomes, and (c) the participatory approach seemed sustainable even after withdrawal of facilitators, because most of the interest/focussed groups/members started acting as facilitators as the process followed the "bottom-up" process rather "top-to-down" route.

Besides this some of the other major project achievements were;

- A participatory method to generate cadastral maps of agricultural fields by involving community members using tools such as GPS etc.,
- A tool for economic analysis of the options for conjunctive use of canal and groundwater,
- An interactive decision-support tool based on a water balance approach at the distributary level to illustrate various water management options and their effect on spatial and temporal water availability in the command.

With this background, various activities were undertaken in the project to achieve different outputs as mentioned above. This paper further discusses the activity which reflects the process of dialogue in broadcasting ideas based on scientific perceptions related to land and water, change in scientific perceptions to develop new ideas as solutions for different problems faced by different stakeholders and their responses. The discussion is mainly based on the activities undertaken in Right Parallel Channel-V (RPC-V).

5 Results

5.1 Community Feedback

Some of the key constraints and problems identified specific to land and water management in the study area after interaction with farming community and other stakeholders were;

- Scattered and fragmented land holdings,
- Field to field Irrigation,
- Over dependency on unreliable canal water,
- Reluctance in use of groundwater,
- Seasonal waterlogging/water congestion near canal and drain.
- Unproportionate outlet sizes,
- Unauthorized cuts in distributaries/subdistributary,
- Ungated outlets,
- Obstruction in canal flow to raise the water level,
- Conflicts amongst water users over water distribution,
- No representation and lack of coordination among canal managers and water users,
- Low water productivity,
- Lack of awareness about recent water management technologies.

These issues can be categorized under technical, social, managerial, hydraulic, institutional and financial, and administrative problems. The major concern here was what should be the right approach of participation to resolve these issues? To resolve this several round of walkthrough surveys and face to face dialogue with stakeholders in the study area were undertaken. This helped in understanding the current status of the study area and the

genuine problems being faced by stakeholders. Experiences and lessons over the time helped in development of a participatory approach (as mentioned earlier) which was able to establish dialogue within the community related to land and water and also provided opportunities for better interface within the communities for sustainable livelihood improvement. One of the major encouraging achievements at this stage was formation of OMGs (Outlet Management Groups) at outlet level. Reason being that two tier systems do not fairly represent the hydrologic boundary as the lowest representation was only at Village level. The OMGs comprise of minimum five members representing a particular outlet. Initially it was thought that OMG will act as a bridge between the main body of WUA at village, distributary level and water users of a particular outlet and later it will play a greater role in on-farm development activities. The role of project team in this regard was the necessary motivation and providing awareness regarding need of a strong institutional arrangement represented by wider members of the agricultural community.

5.2 Scientific Perceptions and Change Due to Responses

5.2.1 Scientific Perceptions

Following are the major scientific perceptions emerged out after interactions to resolve various solutions related to land and water (Singh et al. 2005a, b, and Bhatnagar 2005);

- Motivation for conjunctive use of water,
- Awareness regarding use of canal water and its management,
- Timely transplanting of rice and sowing of *rabi* (winter) crops,
- Ways to utilize maximum rainfall,
- Productive use of water congested lands,
- Increased dialogue within the community and other stakeholders on land and water related issues.

Some of the major ideas for these perceptions proposed to community members and WUA were installation of tube wells, timely release of canal water, ways to optimize the use of canal water, restricting the manhandling of canal structures and obstruction of canal flow and proper maintenance of canal structure etc, raising of bund heights for arresting rainfall, change in agricultural practices in water congested areas, involvement of small, marginal and landless in different activities and WUA related to land and water, timely sowing of crops etc. Several numbers of group meetings were organized (mostly attended by land owners directly involved in agricultural activities) to collect their responses on these ideas.

5.2.2 Responses

The responses received on various ideas are as follows which led to change in scientific perception;

- Installation of tube wells – This idea was mainly focused to motivate the members for increased use of groundwater at least during nursery raising of rice and at critical growth stages when water from other sources was not available, to reduce the dependency on canal water and facilitate the conjunctive use of rain, surface and groundwater. Members were reluctant to adopt this idea, some of the major reasons were;
  - Heavy cost of installation of tube wells (Rs. 10–20 thousand excluding prime mover pump) even for medium and large farmers,

  - Fragmented land holdings due to lack of land consolidation–this factor is a major constraints to those members also who are capable of investing the installation cost,
  - Huge difference in cost of water received from canal and tube well – The rate of canal water range between Rs. 75/− and Rs. 150/− per acre of irrigation during whole season whereas the cost to irrigate from tube well in similar situation range between Rs. 600/− and 1,000/− per irrigation per acre,
  - Irregular supply of electricity,
  - Lack of awareness about selection of pumps.
- Timely release of canal water – This idea was broadcasted to facilitate better linkages amongst water users and canal managers. The major shortcomings noticed were;
  - Existence of an unregistered WUA in command having two tier system mainly comprising of large farm holders,
  - Lack of any sort of linkages leading to no faith of water users over canal managers, as hardly canal managers pay any visit to the area,
  - Unreliable release of canal water, since the water release was supply driven rather than demand driven,
  - No say of small farmers in WUA,
- Ways to optimize the use of canal water – This idea was broadcasted to bring awareness amongst water users over proper sharing and distribution of canal water in a way to minimize the over use of canal water at upper and middle reaches so that water users situated in lower middle and tail reaches may also get their share. The dialogue around this idea mainly reflected that;
  - Conflict within the water users over water sharing mainly between lower middle reach and tail end water users and middle and upper reach water users,
  - Wastage of canal water due to faulty irrigation practices (field to field irrigation).
- Restricting the manhandling of canal structures and obstruction of canal flow and proper maintenance of canal structure etc. – It has been noticed that at various places in middle reaches water users obstruct the flow of canal water just after the outlet to raise the head which results in reduced supply at downstream resulting into conflicts. In this regard it was observed that WUA was not competent enough to take the maintenance in present situation in their hand and they also have very little say on water users in case there is a need to resolve any conflict on sharing of water. It was reported that till the handover process of distributary is not completed from Water Resources Department to WUA the responsibility for maintenance is of canal managers which are being hardly maintained and are in very bad shape.
- Raising of bund heights for maximum utilization of rainfall – This idea was broadcasted amongst members with a view to motivate members to get maximum benefit of rainfall to fulfill the need of water requirements of their crops. It was noticed that more than 70–80% of land holders have bund heights <7.5 cm with hardly 5–7 cm width. Considering the rainfall in the area it was concluded that if the bund height are between 20 and 25 cm, 80–85% of the rainfall can be utilized. Members were made aware of this fact. There were mixed reactions of members on this idea as majority of the members agreed on this aspect and also reported that this was in practice previously but slowly due to carelessness now the bunds are just to identify the boundaries of a particular field. But many of them assured that they will try to renovate their bunds as suggested. On the other side some members were of the view that by increasing the bund width and height part of net cultivated area will be lost resulting into reduction in production.

- Use of water congested areas for beneficial purposes – This idea was broadcasted as it was noticed that most of the part of the low lands which are seasonally water congested (surface ponding to saturated condition) during July to late January are either utilized for single crop or no crop with very low productivity. Ideas for fish farming came from members in discussion besides some members were interested for suitable rice varieties in such conditions. Mixed reactions were observed over fish farming as some of the members reported that there is danger of theft as most of these locations are in remote areas. Whereas as some members reported that most of the recommended rice varieties for low land situations have very low productivity and most often they do not even get the input cost.
- Involvement of small, marginal and landless in different activities related to land and water – Some hesitancy was observed on this idea from medium and large farmers as their view was that small, marginal and landless community are not the actual user of canal water. But in spite of this small and marginal farmers wished to have their say in various activities related to canal management and on-farm water management as many of them do sharecropping by taking land on lease from land owners.
- Timely sowing of crops – This idea was broadcasted to motivate early nursery raising of rice so that transplanting of rice can be started from last week of June. The practice in the area is to transplant rice very late which normally starts after mid of July and continues up to August. The reason behind this delay in transplanting is (a) a social myth – where during June 8–22, (Mrigshira Nakshatra) agricultural operations are restricted socially and (b) irregular, inadequate, untimely and unreliable canal water.

5.2.3 Change in Scientific Perceptions

Some of the major learning to the project members were;

- In no case idea (interventions/technology) should be imposed,
- The ideas developed should be as per need and capability,
- Ideas should be cost effective, easily understandable, transferable, and implementable,
- Need to involve wider group of community members (farming and non-farming),
- Need to evolve a proper communication strategy, which should be supported with quality dialogue and communication products for awareness about improved agricultural practices in participatory mode,
- Proper motivation and guidance to WUA to strengthen their institutional setup as well as facilitate to develop strong linkages with water users and canal managers,
- Need to facilitate linkages with financial institutions and other line departments

Based on above learning, the responses were analyzed further and dialogue with stakeholders were established to find out what sort of technologies they would like to suggest and prefer as per their priority. This resulted in identification of following themes on which members demanded a proper know-how;

- Selection of pumps,
- Water management in rice,
- Multiple uses of water and land,
- Canal water management,
- Rainwater management,

Illustrative communication products in the form of leaflet in local language were prepared and were distributed amongst the members by organizing group meetings in different reaches of command. This also facilitated wide range of discussions between the project members and community members. Some focused/interested individuals/groups were also identified with whom few strategic participatory field demonstration were undertaken mainly incase of multiple uses of water and land and for rainwater management themes. Time to time technical know-how was also provided to members who approached project members to enhance their understanding.

5.3 Study Limitations

The study was conducted in head, middle and tail reaches of RPC-V and a democratic effort was made to consider and collect opinion of different category of land and water users in order to have fair representation of problems/constraints as well as impact of various communication products and responses of farming and non-farming community. However it is possible that some of the respondents even without verifying or experiencing the content of communication product in real time may have responded. Secondly, the survey was planned by organizing a group meeting at several locations in head, middle and tail reaches of command and people were be requested to fill the survey form on their own voluntarily. This may have resulted in less number of respondents as expected.

6 Survey

6.1 Methodology/Theme Definitions

A survey was undertaken after a year of this event with a purpose to know the community responses on these themes, adoption level and impact on mind set of community members. A democratic methodology was followed in the survey process where by organizing group meetings discussions were made on these themes at several locations in head, middle and tail reaches. After every meeting members were requested to fill up the survey questionnaire. A total of 273 responses were received from members representing different reaches. The responses were analyzed on following points;

- Peoples' choice for themes,
- Reach wise peoples' choice for different themes,
- Peoples' choice for themes based on the land holdings,
- Choice for themes based on different communities,
- Knowledge that inspired most from communication product to members,
- Present and expected level of adoption by members,

For ease of discussion different themes have been designated by codes as follows which will be used in graphical presentation as well as in discussions;

Themes	Code
1. Selection of pumps	(CM-1)
2. Water management in rice	(CM-2)
3. Multiple uses of water and la4nd	(CM-3)
4. Canal water management	(CM-4)
5. Rainwater management	(CM-5)

6.2 Results Presentation

The first query from members was regarding which theme they like most which can help them to improve their livelihood. As illustrated graphically in Fig. 1, which shows that communication product based on multiple uses of water and land comprising of know-how on fish based farming has been opted by maximum number of members (27%) followed by ways to select pump to explore groundwater (20%), ways to utilize the rainfall in crop production system (19%), enhancing know-how for improved water management practices in rice (18%) and lastly canal water management (16%).

The CM-3 motivates to utilize their water congested or water logged areas for fish production by having either only fish production option in deeper locations or fish along with in rice in rice fields where the depth is shallow. As per the members this option may provide either higher income from same location or additional income along with rice.

6.2.1 Reach Wise Peoples' Choices

Members' responses when analyzed reach wise on different themes shows huge variation in their priorities (Figs. 2, 3 and 4). The trend shows that in head reach more numbers of members opted for CM-3 (39%) against 22% members in middle reach for CM-5 and 32% members for CM-1 in tail reach as their first option.

This reflects that members situated in head reach are not much concerned about water availability rather exploring options for new avenues which can help them to improve their livelihood. Against this mixed responses can be observed with very little difference in views of people situated in middle reaches for different themes. Whereas in case of people situated in lower reaches the scenario has completely changed. Here it can be observed that most of the people are concerned about water availability as they are more eager to get aware regarding CM-1 which relates to groundwater use.

6.2.2 Peoples' Choice Based on Land Holdings Sizes

Members responses based on different land holding sizes were analyzed for their options as shown in Figs. 5, 6, 7, 8 and 9. The responses had been presented under five categories (a) members possessing land sizes up to 1 acre, (b) members falling between 1 and 2 acres, (c) members between 2 and 3 acres, (d) members between 3 and 4 acres and (e) the last category those possessing 4.0 acres or above.

By observing the trend it is noticed that there is considerable variation in the choices amongst different categories. It can be observed that most of the members falling up to 2 acre or below prefer income generation activities and have shown their first option for

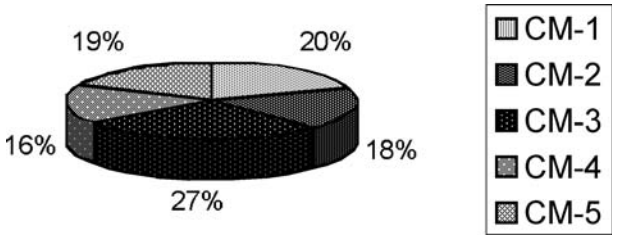


Fig. 1 People choices for different themes

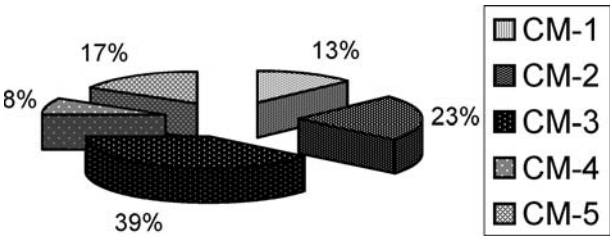


Fig. 2 Choices of upper reach people

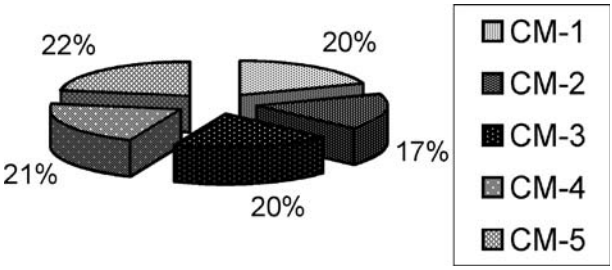


Fig. 3 Choices of middle reach people

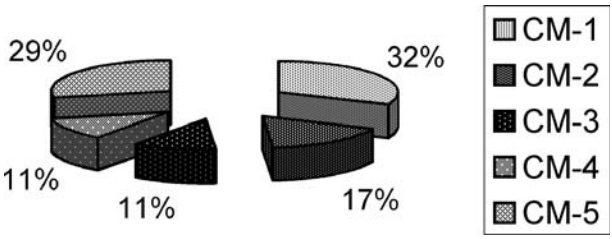


Fig. 4 Choices of lower reach people

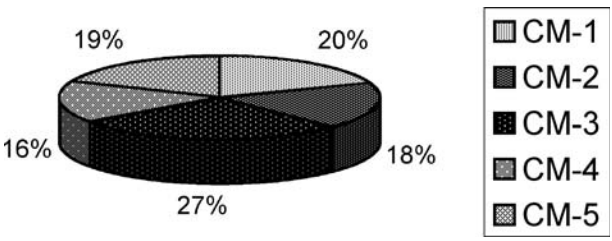


Fig. 5 Choices of members below 1 acre holding

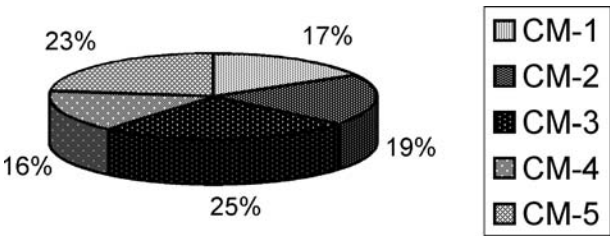


Fig. 6 Choices of members of holding >1.0–2.0

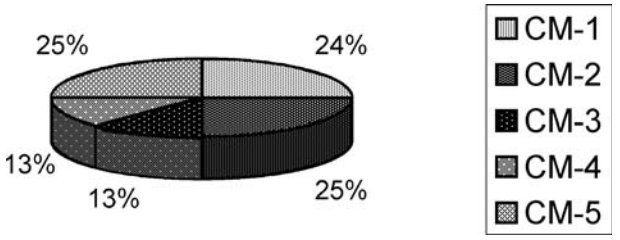


Fig. 7 Choices of members of holding >2.0–3.0

rice based fish farming by opting for CM-3, as the holding size increases members' priorities change as in case of members possessing holding sizes between 2 and 3 acres prefer their top priority for better crop management practices and concern to utilize benefit of rainwater i.e CM-2 and CM-5 respectively (25% in both the cases) as their first priority, closely followed by groundwater utilization i.e. CM-1 (24%). Similarly, members falling under category between 3 and 4 acres prefer CM-1, CM-4 and CM-5 (25% in all the cases) as their first priority which shows their concern for availability of water in crop production. Whereas incase of large holding size farmers possessing area greater than 4 acre the options are CM-3, CM-4 and CM-5 (22% in all the cases) which is indicative of their concern regarding fulfilling water needs for growing crops and opportunity of new sources of income by adopting fish based farming to raise their source of income.

6.2.3 Community Based Choices for Different Themes

Analysis of choices of SHG members mainly comprising of mixed groups including small and marginal farmers, landless, landless associated with crop production through leasing others lands and few medium and large farmers, reflects that SHGs have their prime preferences for income generation activities as more number of members have opted for fish based farming CM-3 (44%) followed by improved cropping practices CM-2 (35%). They have shown very little concern on other themes. In respect to this the responses when analyzed of members consisting only share croppers who are basically landless but involve directly in on-farm activities it is observed that this category also prefers fish based farming CM-3 by (45%) as their first option followed by their concern about canal water management CM-4 (22%) on which they don't have much say. Trend of both the categories do reflect that they have a lot of promise to contribute in farming system if they are provided opportunity (Figs. 10 and 11).

The responses have also been analyzed of members possessing lands which reflects that though this group have opted for fish based farming CM-3 (26%) as their first choice but very closely they also opted for CM-5 (22%), CM-1 (19%) and CM-2 (18%) showing their

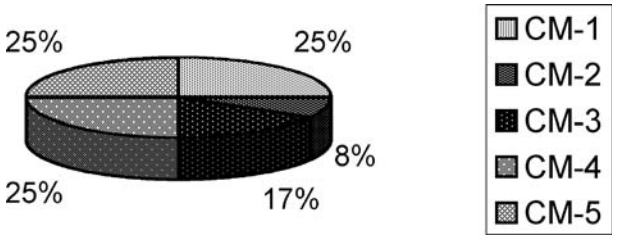


Fig. 8 Choices of members of holding >3.0–4.0

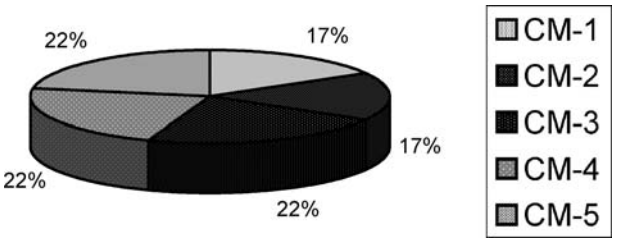


Fig. 9 Choices of members of holding >4.0

concern for rain water utilization, use of groundwater and improved cropping practices besides least for canal management CM-4 (15%), Fig. 12.

Comparing the responses of all categories it is observed that in most of the cases their first option is CM-3 which is fish based farming and reflect their concern to improve their livelihood. It also reflects that though the land holders and some of the members involved in crop production besides opting CM-3 as their first choice but have shown their concern for other themes.

6.2.4 Themes which Inspired Most to Improve their Livelihood

Opinion has been sought for the new knowledge, which has inspired them most (Fig. 13). It has been observed that 27% members have opted for fish based farming CM-3, followed by 20% in case CM-5, 19% in case of CM-1 and CM-2 and least 15% think for CM-4.

6.2.5 Present and Expected Level of Adoption

Opinion of members were also taken for present level of adoption and in future what members desire to bring changes in their activities after getting know-how from different communication products on various themes. The adoption trend was found very different from their responses which have been discussed earlier. Figures 14 and 15 show the trend, where it can be observed that the adoption level of CM-5 i.e. rain water utilization has been highest (63%) followed by CM-2 (23%), CM-1 (9%), CM-4 (4%) and only 1% in case of CM-3. Whereas, in earlier discussions members have preferred CM-3 as their first option. After query it was reported by members that since finance is a major constraint hence they tried to adopt those options presently which involve less investment.

But if we observe their desire for future adoption trend it is very similar to their earlier trends as they desire to adopt (47%) CM-3 i.e. fish based farming closely followed by rainwater utilization. While incase of CM-1 and CM-2 the response was only 6 and 9%

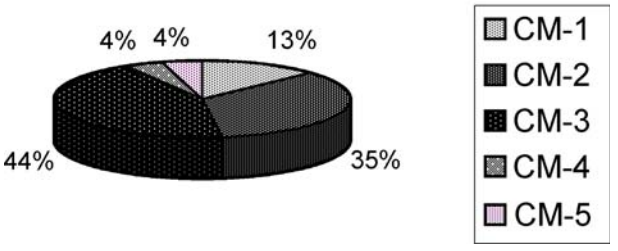


Fig. 10 Choices of SHG members

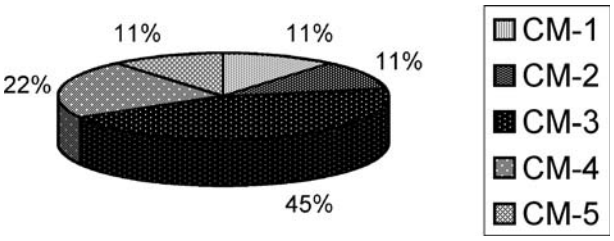


Fig. 11 Choices of share croppers

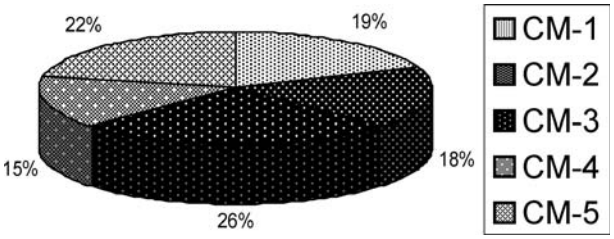


Fig. 12 Choices of land holders

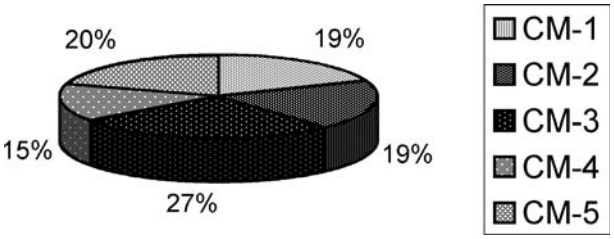


Fig. 13 People inspired

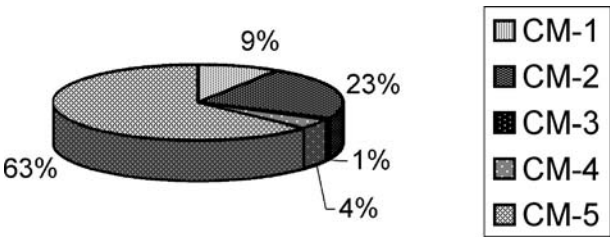


Fig. 14 Adoption of interventions

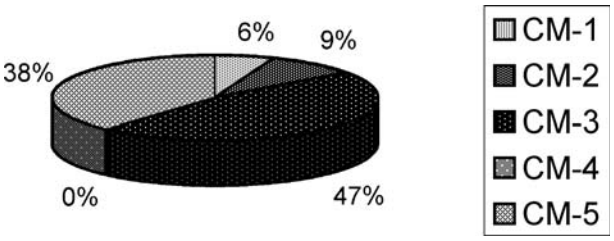


Fig. 15 Thinking for future adoption

respectively but most shocking was that none of the members from any category have opted for CM-4 which relates to canal water management in their future endeavor. Reasons given by members that the canal water supply is very irregular and the most important one is that they don't have any say on management neither any linkage with water resources personnel. Hence, they don't have any vision what they can plan in future.

6.3 Discussion and Limitation

It is a small piece of study which was carried out towards closing end of the project. Hence, it needs further investigation before scaling up. But this study certainly gives an idea that technology/intervention which is need based and cost effective, immediately draws the attention of farmers. Technology transferred to the farmers considers available farm resources, overcomes production constraints and strengthens support scenarios, the chances for promotion and propagation of such technology seems brighter. The experience also shows that farmers mainly emphasise on such technology/intervention first which bring improvement in yield, net return, employment and livelihood of poorest of the poor and such type of technology will be self propagative, convincing and sustainable. Hence, a major learning is that technologies/interventions imposed on farmers with financial support are not being sustainable and effective in long run. Also, participatory approach is quite effective in understanding of the production constraints and limited availability of resources and suggesting suitable technology/interventions.

7 Conclusion

Overall this study provides a learning platform for working in partnership mode, understanding production constraints by employing a participatory approach. The study also highlights the importance of need based cost effective technologies/interventions, role of communication products while adopting participatory approach, option of technologies/interventions based on different categories of farming and non farming community. It was also observed that option for a particular technology/intervention by a farmer is guided by his land holding. Besides this the study very clearly reflects that flexibility in participatory approaches are very important which comprises of a blend of top-to-down and bottom-to-up approaches with scope for innovation. For effective on farm water management activities the outlet should be considered as the hydraulic unit and involvement of representatives of even micro organizations such as SHGs, OMGs, focused/interest groups/members should be mandatory.

Acknowledgements This paper is an output of R7830 and R7839 Projects carried out at ICAR Research Complex for Eastern Region, Patna and funded by the UK Department for International Development (DFID), through the High Potential Production Systems Research Portfolio of the Natural Resources Systems Programme (NRSP). Authors thankfully acknowledge the support and cooperation of ICAR and DFID in bringing out this publication.

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