

Prioritization of Problems in Integrated Agriculture: A Case of Rampur Village in Sub Humid Region of Eastern India

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ABSTRACT

To infer about the real needs of farming community in integrated agricultural system, Participatory Rural Appraisal (PRA) was conducted in Rampur village of Patna situated at southern Bihar in the sub humid region of eastern India. The Ranked Based Quotient (RBQ) was calculated followed by Value Based Indicator (VBI) to find out the ranking of the problems in that area. The menace of Nilgai was ranked as foremost problem, followed by scarcity of irrigation water, shortage of labour, pest of rice crop, animal health related problems etc. Problems were categorized in researchable and non researchable format and then extension requirements research scopes and policy implications were made based on the need and priority.

Key words: *Ranked Based Quotient; Participatory Rural Appraisal; Animal menace; Irrigation water scarcity;*

Specified solution of problems is the sole purpose of research. There are so many problems one encounters in a particular situation but a few are researchable and its identification itself requires a scientific intervention. The intervention should be based on certain methodology and criteria for better efficacy and greater applicability to that particular agro-climatic condition. A few of the research and extension programmes are relevant to farmers' needs. Too often, research and extension have become top-down, bureaucratic organizations that are not receptive or responsive to the needs of farmers (Swanson, 1997). Therefore, need based research is highly required now a days for proper solution of agricultural problems.

Farmers' participation in problem identification has greater contribution towards the applicability of most of the research and of the research findings. Farmers' participation is one of the crucial components for successful implementation of projects. If research and development works are participatory, need-based and formulated based on the severity of the problem, certainly the adoption rate would be satisfactory. In this context, it is very pertinent to identify the problems belongs to different micro farming condition in integrated farm production systems and accordingly execute the

research and development mechanism to resolve the problems.

The programmes and projects which one to be undertaken should be based on specified planning. Classifying the problems and defining the needs of the farmers is an important step in this planning process. Participatory Rural Appraisal (PRA) offers an innovative approach to put down the steps for envisaging the needs and problems of farmers. Participatory Rural Appraisal (PRA) is an important tool to comprehend the technology adoption profile in a cropping system, to get first-hand information about their needs, resources available, identify location specific problems and researchable issues to come up with tangible possible solutions drawn as an action plan (Rajula et. al, 2004). It is a flexible, low cost and time saving set of approaches and methods applied to enable the rural people to collect and analyze information of their local situation. It helps to understand the rural people and the conditions existing in rural areas which provide a thorough and comprehensive idea regarding problem, potential, resources and solutions to formulate realistic development programmes by the villagers themselves. The purpose of PRA is to enable development practitioners, government officials and local people to

work together and to plan appropriate programs. It is a strategy for shared learning between local people and outsiders and a process which helps to understand the technology dissemination process, rural development activities, linkage mechanisms existing among research, training and extension, credit and input supply systems (Mathialagan, 2000). In this context the present study was conducted with objective to identify and prioritize the problems for integrated agriculture through PRA tools.

METHODOLOGY

The study was conducted in Rampur village as part of field experience training of Agricultural Research Service during July 2013. Where, the following specific steps were executed for quantification and prioritization of problems in integrated agricultural system.

Identification of Key Informants (KIs): Five (5) progressive farmers were identified from the village as Key Informants (KIs) whom the average farmers in the village frequently contact for different purposes. They were asked individually to list out the problems faced by the farmers in agricultural activities.

Identification of the farmers: In continuation with these key informants another 30 farmers were selected using stratified random sampling technique, as representatives of all the sections of the villagers for assessing the problems in agriculture activities can be possible effectively through the sampling technique. Through interview the farmers were asked to list out the prudent field related problems and rank them as per their economic importance. More than eight problems were identified by the farmers, for effective ranking of those problems preferential ranking through paired comparison technique was applied.

Collection of data: PRA offers a “basket of techniques” from which those most appropriate for the project context can be selected. The central part of any PRA is semi- structured Interviewing. While sensitive topics are often better addressed in interviews with individuals, other more general topic is confer in focused group discussion (Cavestro, 2003). In this study semi structure interviewing and focused group discussion was conducted for data collection.

Quantification of data: The problems based on the information obtained from the farmers were ranked, the data were quantified and the rank based quotient (RBQ) was calculated using the following formula:

$$RBQ = \frac{\sum f_i (n + 1 - i)}{N \times n} \times 100$$

Where,

- f_i = Frequency of farmers for the i th rank of the attribute
- N = No. of farmers contacted for factor identification
- n = Maximum no. of ranks given for various factors.
- i = Rank of the attributes

Preferential ranking technique, utilised in the present study, provides the scope of constraint analyses through participatory approach. Unlike simple ranking technique, this technique takes into consideration the average affected area as well as percentage of economic loss caused by the constraints as perceived by the farmers to prioritise the constraints on the basis of overall magnitude value (Sabarathnam, 1998).

Assessment of magnitude of village problem: After interrogating selected farmers, several problems were identified and among them nine problems were selected based upon sensitivity and severity. Paired comparison technique was used to rank the problems as it is easy for the farmers to compare fairly between two problems at a time. The extent of damage (per acre/ animal) and average monetary losses of the village were calculated for each problem. Frequencies of each rank for a problem were calculated and tabulated in rank frequency table after that Rank Based Quotient (RBQ) was calculated by above mentioned formula. The magnitude of the problem associated with the village was estimated through Value Based Index (VBI) using following formulae:

$$VBI = \frac{RBQ \times Av. loss experienced \times Area of crops}{No. of Animal} \times 100$$

Problem-causal & solution tree: After identifying and ranking the problems, some of the farmers were interviewed again to get an idea about the possible causes of each of the problems. Following discussion, the identified problem at various levels and their possible causes the problem causal tree was drawn for the most severe problem. Problem solution tree was also drawn by indicating the point of interventions in which area the research project can be formulated to mitigate the problem.

RESULTS AND DISCUSSION

Village background: The Rampur village is located at Latitude 25° 32' N, Longitude 84° 58' E, in Patna

District, 32 km away from Patna junction in Bihar. It is a small village situated in 550 acres having total 2018 population. Out of that, male comprises of 1165 and female 1028 (*Census 2011*). In kharif season mainly Rice and Maize were grown whereas, in Rabi season Wheat, Potato, Mustard, Lentil, and Bengal gram are grown. Horticultural crops like Guava, Mango, Lemon, Papaya, and Banana were grown in orchard and different seasonal vegetables like Okra, Pumpkin, Tomato, Brinjal etc. are grown. In animal Crossbred Holstein Frasier (HF), Crossbred (Jersey), Crossbred (Sahiwal) are found. In cattle, *Murrah* breed of buffalo, Black Bengal of goat, Local and *Divyan* breed of Poultry and Khaki-cambell type of Ducks were found in the village.

Magnitude of village problems: Based on the responses of farmers the extent of damage was calculated by using RBQ and severity was estimated through VBI is presented in Table 1 and 2. The data provided by the villagers were further validated by scientists of ICAR-Research Complex for Eastern Region, Patna and Project Director, Agriculture Technology Management Agency, Patna.

The Table 2 depicts, the crop destruction by *Nilgai* (*Boselaphus tragocamelus*) was the first and foremost problem faced by the farmer of Rampur village followed by inadequate availability of irrigation water. Being located near Patna city, the unavailability of agricultural labour at crucial time was recorded as next problem. Stem borer in rice crop was ranked as fourth followed by brown plant hopper. In line with the response of farmers, tick infestation, reproductive problems and Mastitis in cattle was ranked as sixth, seventh and eighth respectively. Whereas, another problem in orchard has been identified i.e. wilting and fruit cracking may be due to boron deficiency.

Problem causal and solution tree:

Menace of Nilgai: Based on the magnitude value, it was identified that menace of 'Nilgai' (antelope) was the biggest problem affecting the farmers of Rampur village. Crop-damage by Nilgai has been widely reported from India. The problem is not only with Rampur but whole Bihar, Uttar Pradesh, Parts of Madhya Pradesh,

Table 1. Problems identified in Rampur village; rank frequency table

Problems Identified	Ranks									Total
	1	2	3	4	5	6	7	8	9	
Insufficient availability of irrigation water	15	4	5	-	-	-	1	1	4	30
Unavailability of labourers at crucial time	8	10	4	2	2	-	1	3	-	30
Crop destruction by <i>Nilgai</i>	6	7	-	-	3	4	-	5	5	30
Wilting and fruit cracking in orchard	-	-	2	-	2	1	2	5	18	30
Brown Plant Hopper in Rice	-	-	2	1	9	3	11	4	-	30
Stem Borer in Rice	-	2	1	8	2	11	6	-	-	30
Reproductive problems in cattle	1	2	10	6	6	1	-	4	-	30
Mastitis in cattle	-	3	4	8	4	2	6	3	-	30
Tick infestation in animals	-	2	2	4	2	9	3	6	2	30

Table 2. Problems identified in Rampur village; RBQ and VBI table

Problems Identified	RBQ	% loss	VBI	Rank
Inadequate availability of irrigation water	78.15	45	12,30,862	II
Unavailability of labourers at crucial time	78.15	30	8,20,575	III
Crop destruction by <i>Nilgai</i>	57.78	90	18,20,070	I
Wilting and fruit cracking in orchard	22.96	10	28,700	IX
Brown Plant Hopper in rice	43.70	25	3,27,750	V
Stem Borer in rice	52.96	35	5,56,080	IV
Reproductive problems in cattle	64.07	40	1,03,520	VII
Mastitis in cattle	56.30	40	90,080	VIII
Tick infestation in animals	45.56	20	1,36,680	VI

Haryana and Punjab are also affected by this especially Central India is highly affected by this animal. Lack of natural predators, deforestation, overgrazing and the protection of these animals from Hindu communities are reasons for their overpopulation. All kind of crops (both rabi and kharif crops) are attacked by them. It has been observed that eating less but destroying more by trampling and causing damage (Goyal *et al.*, 2000). Most of these affected areas are situated on soils of alluvial origin in the low rainfall zone. Regarding the issue, after discussion with some prominent farmers the probable reasons of the problem were identified. A problem causal and solution tree (Fig. 1) was prepared based on the reasons cited by the farmers and interview with Scientists, Officers of Bihar Agricultural Marketing and Extension Training Institute, Agricultural Technology Management Agency and Block office. We came to know that in this region *Nilgai* is very common. In search of food these animals in groups often forage in the crop fields and completely destroy the crops. It is the main reason that the farmers are afraid of vegetable cultivation from normal rice-wheat system despite the soil being highly fertile. Though *Nilgai* is a kind of antelope, but the tag 'Gai' (cow) made them sacred to the villagers.

Scarcity of irrigation water: Scarcity of irrigation water was the next problem according to the magnitude of severity. Similar result was found by *Rajula Shanthy et al., 2013* in Pullagoundanpudur village of Coimbatore district, Tamil Nadu state by conducting PRA based agro-ecosystem analysis. Water is an indispensable input in agriculture and in upcoming days it will be the key factor of production to be concerned most. In this issue the probable reasons were identified and problem causal and solution tree (Fig. 2) was made. According to the response of farmers, the field crops related major problems are concentrated to rice mainly. Most of the farmers rear cattle and other animals in an integrated manner, so problems related to animal husbandry, particularly in case of cattle are also prevalent in the study area. A peculiar scenario have been observed that the upper eastern Indo-Gangetic region i.e., Northern part of Bihar is flood prone, where as the Southern part is facing acute shortage of rainfall for past few years. The consequence is dearth of irrigation water during the rice growing period. A severe climatic change has already left footprints on agricultural sector of this village as the canal which is the main irrigation source of the village has been dried for last 4-5 years and ground water table is also depleting.

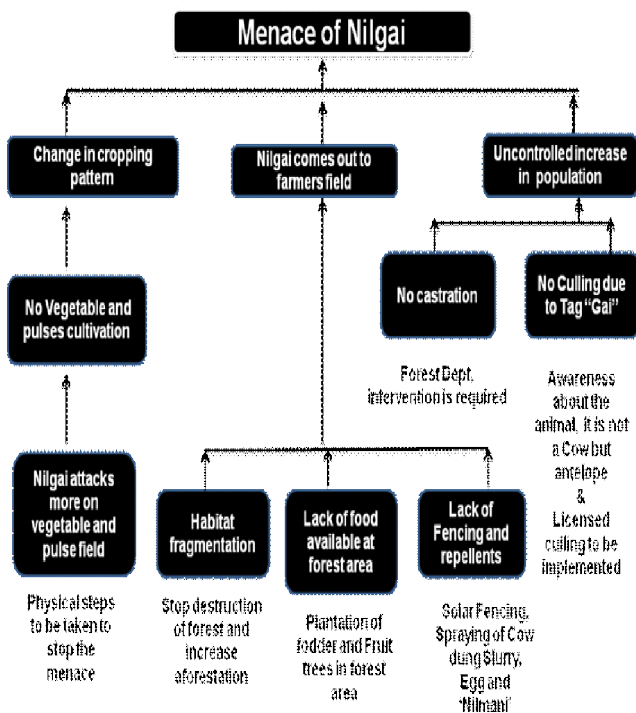


Fig. 1. Problem causal and solution tree for menace of *Nilgai*

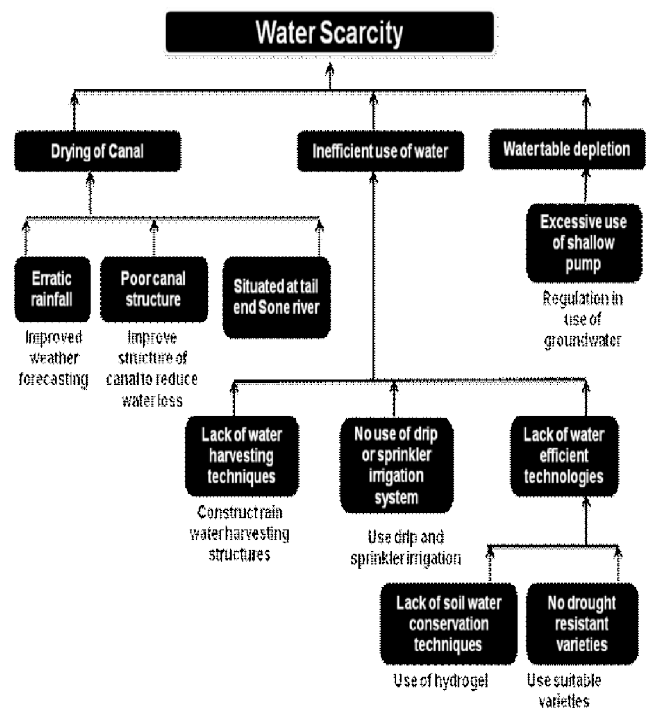


Fig. 2. Problem causal and solution tree for water scarcity

Labour shortage at crucial time: Rampur, being nearer to Patna city, is also facing the problem of labour shortage at the peak period. Most of the landless labourers remain unavailable for farming activities as various jobs at Patna city are more remunerative to them.

Insect pests of rice: As rice is the main crop of the farmers in the study area, the infestation of insect pests

causes huge economic loss to the farming community. The study team has identified the problem and its probable solution through the problem causal and solution tree depicted through Fig. 3.

Animal health related problems: Integrated Agriculture comprises animal husbandry, fishery, poultry etc. In the study village animal health related problems are very common and some specific diseases are creating loss in farm income. So another problem causal and solution tree has been constructed after discussion with the farmers and experts (Fig. 4).

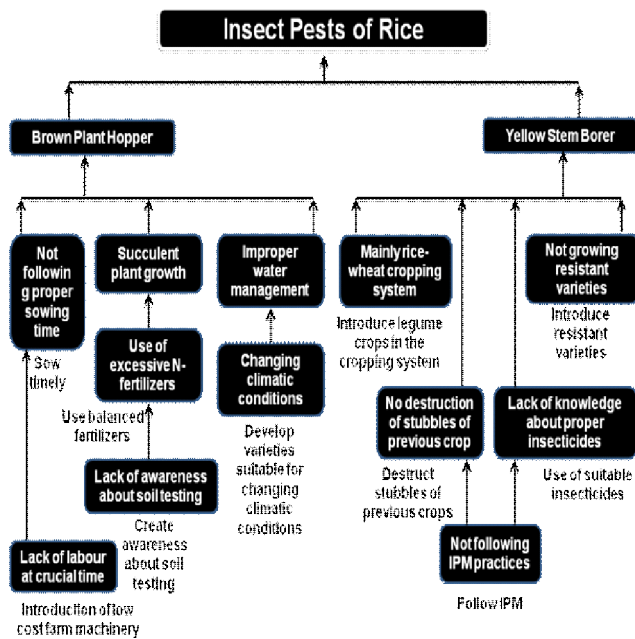


Fig. 3. Problem causal and solution tree for Insect Pests of Rice

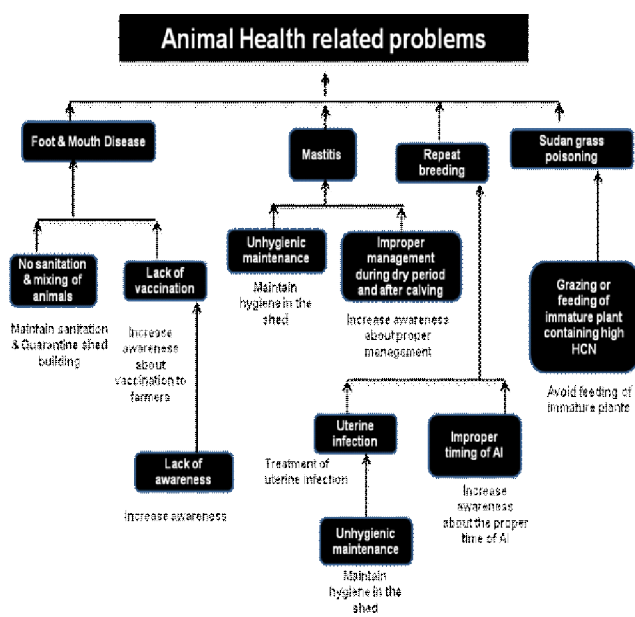


Fig. 4. Problem causal and solution tree for animal health related problem

The common trend of the resourceful farmers of the village now is to shift toward fruit orchard rather than field crops. On one hand high yield and market value of fruits and on the other hand lack of irrigation water and labourers are instrumental for such shift. So, some orchard related problems are also being faced by the farmers.

Perspectives of problem: Problems can only be handled or taken care of if the perspective of the problem is understood. In the above mentioned problems, the perspective was identified, analysed and conceptualize as the problems are arising out of gaps in extension, research and policy. Identified problems have been classified into two group Researchable problems and Non-researchable problems. There are three problems listed under the first group based on severity and need viz. scarcity of water, insect pests of rice and animal health related problem, which can be addressed by different research options by research organizations. The non researchable group, consists of problems like menace of antelope i.e. Nilgai and shortage of labour during crucial time of agricultural intervention that can be addressed either through policy or by extension or in combination by government departments and developmental agencies.

Main gaps related to extension policy and research, identified has been enumerated as follows:

Extension requirements

1. Awareness about rain water harvesting and efficient use of water in agricultural operation was felt as an important gap in the study area. Water is so precious it should be used judiciously. Use of drip irrigation, sprinkler irrigation, techniques like hydro gels etc have to make more in focus of the farmers. Though the village has ample amount of

annual rainfall but harvest and use is to be taken care of otherwise in future it will face difficulties more than present condition.

2. Regarding menace of Nilgai, one awareness programme should have to be taken for these Nilgai affected area to aware them about the antelope, its nature, habitat and the possible measures to restrict it.
3. Another important loop hole is the availability of drought resistant varieties of rice suitable to the same agro ecological condition. So many GO's and NGO's are working in the drought resistant varieties. It is the responsibility of extension worker to take the available technology in use of farmers.
4. Farmers have awareness about Integrated Pest Management (IPM) but proper knowledge is to build-up with some readymade solutions.
5. Awareness about judicious use of fertilizers was of prime importance from post green revolution and is still relevant. That can only be possible through the soil testing which maximum farmers cannot access. The soil testing based recommendation facility is the need of the hour.
6. Health and hygiene of animal should be the prime focus to sustain the livelihood of farmers having integrated farming system. Knowledge about animal health related issues, vaccination types and procedure as well as disease management have to be under taken.

Research scopes

1. Multidisciplinary study on the behaviour of wild animals and assessment and refinements of available methods and devices to check wildlife damages in agriculture are the need of the hours.
2. As the southern Bihar is getting erratic rainfall over the last three years, there is a need for area specific crop-weather forecasting intervention through modelling for crop yield forecasting as well as weather based crop insurance to reduce the risk of farmers.
3. Soil testing is not a common practise by the farmers of Bihar; there is a need of customized, control release formulation of fertilizer and pesticides suitable for drought prone area.
4. As severe drought and flood are quite common in

Bihar for specific condition of this agro climatic condition drought and flood tolerant varieties should be developed in rice and wheat crop.

5. For integrated farming it is require having good health management and food management. The health management issue can be resolved by extension activities but food related aspect should be cater by the scientists by developing area specific mineral mixture for enhance productivity in livestock.

Policy implications

1. A clear cut state level policy is required for combating the menace of wild animal either in the area of relocation of wild animals or policy to reduce habitat fragmentation or policy regarding licensed culling of wild animals creating menace in agricultural field.
2. Policy regarding labours and employment is to be rethought especially in the area where labours are not available during peak crop seasons due to MNREGA and other employment generation schemes.
3. Rain water harvesting is highly required in drought prone area. For this policy regarding water conservation should be formulated to encourage farmers to harvest more water.
4. Soil testing followed by judicious use of fertilizer should be encouraged to reduce the excess use of fertilizer.

CONCLUSION

According to the need of farming community our topmost action plan should be formulated and have to be executed accordingly. The whole farming community of the study area thinking more in terms of their immediate needs and situations. The long term needs are not in topmost priority to farmers. It is the obligation of scientific fraternity to create awareness among farmers of the long term effects of different cropping systems and to show the way of dynamism to keep pace with changes in the system. For this purpose, we the scientist fraternity, should have to develop expertise for creating awareness, dissemination of proper knowledge and skill to the doorstep of the farmers. This process is not an easy task; it needs to be approached sensitively and sensibly with good research planning based on the selected research and extension gap. This

Participatory Rural Appraisal exercise is a tool to develop a great insight of ground reality and better understanding of technical know-how to approach farmers, identify their problem and empower them to face the days ahead for betterment of them. We all know problem

identification is the first step for solution. Problem prioritization can be done by involving farmers for betterment of them as well as of the nation.

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