ENHANCEMENT OF PEARL MILLET PRODUCTION AND PRODUCTIVITY THROUGH PARTICIPATORY RURAL APPRAISAL (PRA)

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ABSTRACT

Participatory Rural Appraisal (PRA) is a set of effective methods undertaken for identifying, assessing, and prioritizing problems for the village community and the steps taken to solve that. It is a planning methodology in which the community themselves actively participate and analyze the situations to find solutions. The present study was conducted in the institute adopted village Ujaliya of Jodhpur district revealed that the pearl millet productivity is as low as 8-9 q/ha with an alarming decrease of ground water level. The reasons dominated for low yield of pearl millet in the village were lack of improved seeds, lower soil fertility status, old age production techniques, lower productivity per ha. of land, salinization of both land and water due to excessive drilling & low rainfall coupled with poor quality ground water. Based on the PRA, an action plan was prepared & the action initiated collectively.

INTRODUCTION

Participatory Rural Appraisal (PRA) is a term emerged in the late 1980s or early 1990s and has been called as 'an approach and method for learning about rural life and conditions from, with and by rural people' (Chambers, 1992). It is considered as one of the popular and widely advocated methodology for compiling and processing the information collected at village level to take appropriate decision focused for rural areas. It derives its strength from the participation of local people right from the beginning stage (Mukherjee, 1993), making it more reliable and cost effective and to be increasingly used in agricultural research and development programmes. This technique is also considered to be one of the most effective tools, which could be utilized to understand the locally available resources, existing cropping cycle & cropping pattern, available technology profile of the farming community and to get the first hand information about the individual and village needs, priorities, problems, prospects and available solutions of the farming community (Rajula Chandran *et al.*, 2004).

PRA as a method, participative and empowering the resource poor farmers to critically made aware their own agro-ecosystems by merely facilitating and enabling them to act upon by taking responsibility and sharing the information gathered with their fellow farmers. This process will definitely help them to understand the rural development activities, technology dissemination process, linkage mechanisms existing among research, training and extension, credit and input supply systems (Jones, 1995; Mathialagan, 2000). Keeping the above, the present study was undertaken to identify the best possible solutions to improve the pearl millet productivity through participatory mode.

RESEARCH METHODOLOGY

The study was conducted at Ujaliya village of Baori block in Jodhpur district of Rajasthan with population of 1802 with 418 households. Agriculture is the primary occupation for the majority of the households. Bajra, Moong, Guar, Sesame, Cotton & Castor crops are grown during Kharif, while Wheat, Mustard, Cumin, Carrot are in Rabi. Majority of the farmers belong to large farmers category possess land holding of more than 4 ha. Inspite of possessing large land holding the decreasing trend in

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productivity of major crops provide ample scope for technological interventions. The PRA exercises were carried out in order to identify and prioritize problems and apprising strategies to tackle are discussed below.

RESULTS AND DISCUSSION

Agro-Ecosystem & Transect Details

In order to get a clear idea about the location and distribution of resources, features, landscape & mainland, a walk was conductedthroughout the village diagonally in a particular direction along with the informants. During the walk it was observed (Fig. 1) that Ujaliya village of Baori block is located at $26^0 29$'N latitude and $73^0 04$'E longitude and an elevation of 251 MSL at Jodhpur district of Rajasthan state. It falls under the western dry region (Type XIV) of the classification of agro-climatic zones under Planning Commission. On an average, the area receives approximately 350 mm rainfall in an year with major share from South-West Monsoon. The
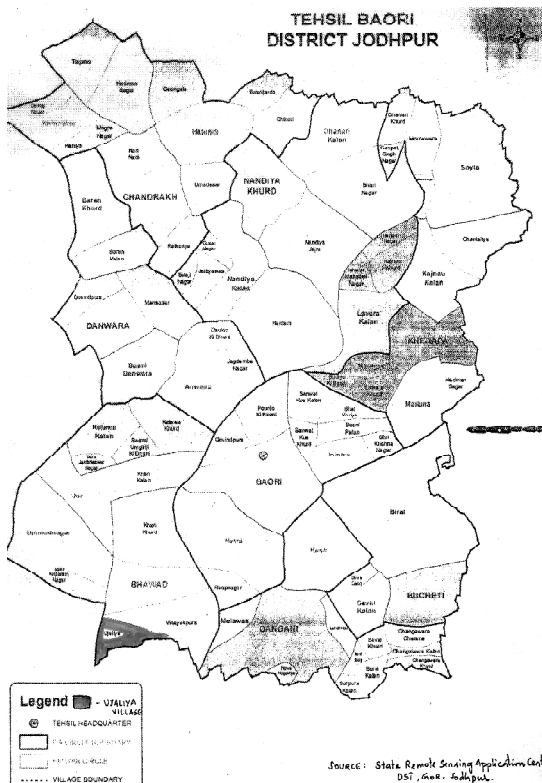

Fig. 2 : Agro-ecosystem transect walk

temperature ranges from 49^0C during summer to 0^0C in winter. The northern side have higher elevation, bordered with hills and reserve forest areas while sloping towards south (Fig.2). Rain and tube well are the major source of irrigation. The transect information is presented below in Table 1.

Social & Resource Map

Participatory mapping is one of the versatile tools and is powerful in generating pictures from the villagers' imagination on any aspect. But these maps cannot be compared with the real geographical maps. Initially the villagers prepared (Fig. 3 & 4) the village profile on the floor with available colours, sticks, flowers, toys, etc. The maps also provided the detailed information about village boundaries, existing social institutions, soil types, cropping pattern, fields, community halls, common infrastructure facilities, water storage tanks, settlement pattern etc. The area is dominated by Rajputs followed by Meghwal, Bheel and Muslim families. The village has two middle schools (up to

Fig. 1 : Baori tahsil

Table 1. Village Transect

Parameters	Particulars of the village	
Topography	Plain land (70%)	High land (30%)
Productivity	Low	Barren uncultivable land
Soil type	Vertisol with sandyloam	Vertisol with alkalinity
Crops	Bajra, Moong, Guar, Sesame, Cotton, Wheat, Mustard	Uncultivable
Vegetables	Chilly, Onion, Garlic, Carrot, Cabbage	Barren rocks
Livestock	Cow + Buffalo + Goat	Sheep
Water resources	Tube well	Pond
Fodder crop	Bajra + Jowar + Perennial grasses	Perennial grasses
Tree	Neem, khejri, babool, kumut, hingota, rohida&kair.	Khejri, babool, kumut, hingota, rohida&kair.
Fruit trees	Mango &Ber	-
Soil water conservation	Field bunding& pond	Pond
Employment	Agriculture + animal husbandry + Labour	-
Govt. Infrastructure	Middle school + Primary school	-
Problems	Pest and diseases, marketing, electricity	Barren uncultivable
Opportunities	Suitable crop improved varieties, diversification, crop rotation & fruit trees plantation	To bring certain areas into cultivable.

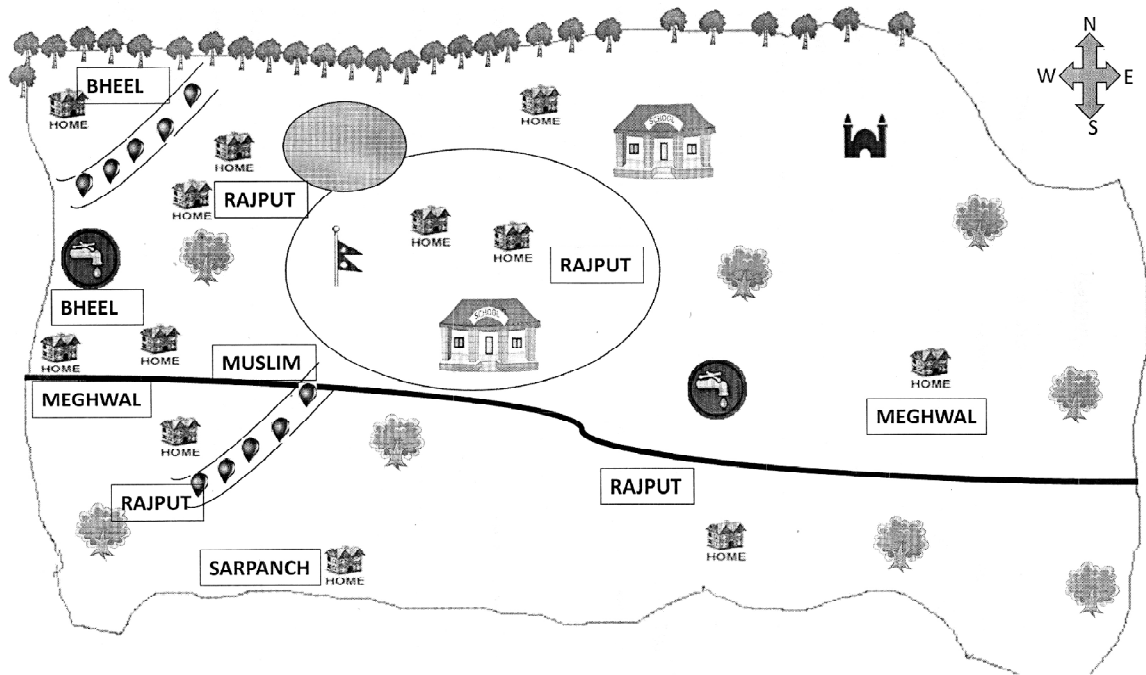**Fig. 3 : Social map**

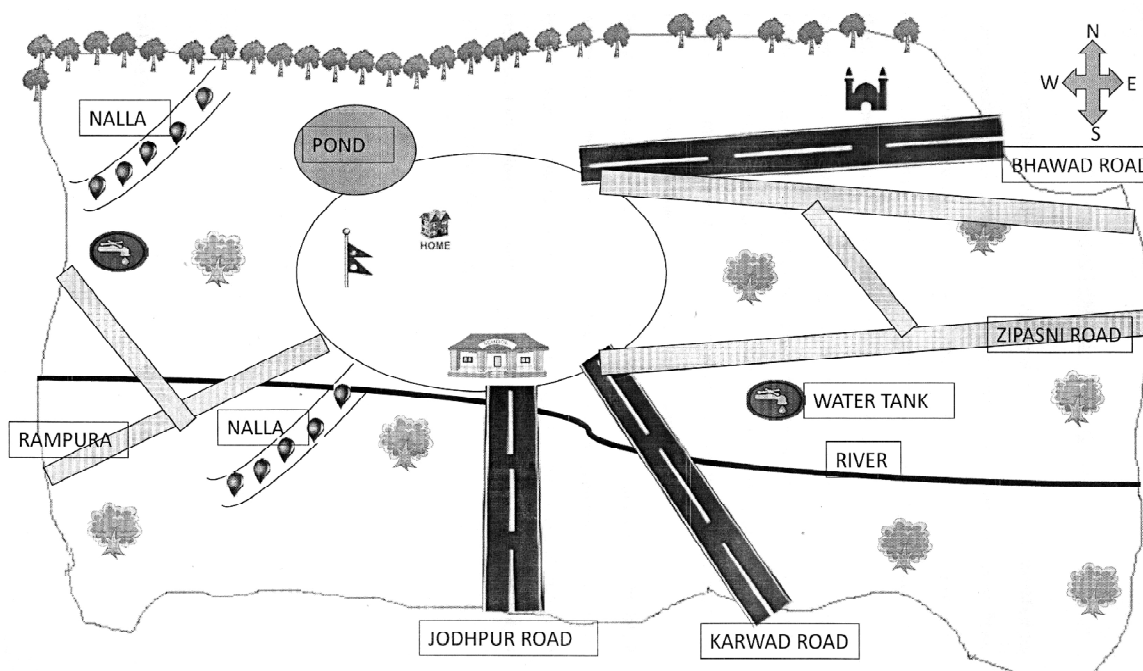**Fig. 4 : Resource map**

8th) and one primary school. Farmers of the village can be categorized as marginal (<1 ha.), small farmers (1-2 ha.), medium (2-5 ha.) and big farmers (>5.0 ha.). Out of the total area of 1316.55 ha the net sown area were 861.03 ha. with bajra and wheat are the main crops during kharif and rabi. The soil type is aridisol with sandy loan and the tube well in the main source of irrigation.

Time line

The elderly villagers or the informants narrated the information regarding the important changes that have taken place in the village chronologically, pertaining to agriculture, animal husbandry and horticulture. The time line for different agricultural related activities are given in Table. 2.

Trend Analysis

The trend analysis gives insight on various facts such as changes in land-use and cropping pattern. This method clearly exhibited the changes / fluctuations that have occurred over a period of time. Though the new varieties released every year in bajra and wheat crops, the constantly reducing water table and decreasing rainfall is a major drawback observed in arid agriculture. The trend over the years reflected bajra and wheat are the important food crops and the cropping system is almost stable over the last two to three decades. Unavailability of improved varieties along with pest and diseases in agricultural and horticultural crops is a serious concern observed during this analysis.

Seasonal analysis (SA)

Seasonal analysis is one of the popular PRA methods that determines month or season patterns and trends throughout the year in the village. It is also called seasonal calendar, seasonal activity and seasonal diagram. This analysis revealed that the villagers receive major rainfall during *kharif* (July–September) season, while summer it is almost nil and during the *rabi* they use pressurized irrigation (tube wells) to save their standing crops. SA also helped us to identify the period which are critical in respect of the growing different crops, fodder shortages and animal diseases occurrence. Dairy, goat and sheep rearing are the most practiced enterprises in animal husbandry.

Table 2. Time Line of Agriculture Related Activities at Ujaliya

Sl. No	Particulars	Years
1.	Domestication of cow, goat, sheep & camel	1400
2.	Ujjwal ji Purohit made the first village Ujaliya	1572
3.	Cultivation of desi bajra, guar, moth, moong, til, etc.	1900
4.	Camel &ox were used as traditional means of farming	1972
5.	Introduction of hybrid bajra 1, 2,3, 4 & vegetable cultivation	1975
6.	Village was faced by severe drought	1975-80
7.	Tractor (Escort made) introduced and used for ploughing	1977
8.	Usage of farm instruments & first electricity connection was given in village	1980
9.	Tube well was introduced for water upliftment in village	1985
10.	Severe drought reoccurred	1987
11.	Introduction of HHB-67 bajra & dual purpose varieties came in prominence	1995
12.	Introduction of bajra seeds released by private companies	1998
13.	Introduction of PUSA 444 (MH 444) Bajra&Thresher	2000
14.	Introduction of Proagro 9444	2005
15.	Introduction of Bajra 7680 (MH 795)	2010
16.	Introduction of Proagro 9555	2012
17.	Introduction of RHB – 177	2014

Crop Calendar

Crop calendar is a schedule of the crops growing season from the fallow period and land preparation to crop establishment, maintenance, harvest and storage. It provides information for the extension workers to decide the appropriate crop interventions before implementing any programme focused on crop production. The villagers were enthusiastic and involved themselves in revealing the seasonality of various crops grown and agricultural operations carried throughout the year. The calendar indicated that sowing of bajra& moong was taken during the month of June & July while the harvesting was done on September for both crops. Wheat sowing is taken up during November - December and the harvest is done during the month of March - April.

The major pest identified during this interaction were termites, which affects most of the important crops viz., bajra, moong & wheat. In case of diseases, green ear head, blast and ergot attacks bajra, while root rot, yellowing, yellow mosaic & cercospora leaf spot are the major diseases in moong. In wheat the black smut disease and nematode infestations are more during the *rabi* season.

Matrix Ranking

The matrix ranking was done in a village to analyse the options of multiple criteria. It gives a clear cut idea about the preference and attitude of the villagers towards a particular topic of interest / things. During the discussion with the farmers it was inferred that cultivating bajra is more economical and beneficial because of its dual purpose (consumption and fodder) usage (Table. 3). Whereas between moong and wheat, moong being a pulse crop and contains more protein, it is consumed more in home as well as gets more mileage due to its high price in market. Even though, moong is more proned to attack by pest and diseases it easily survive in the less rainfall with less expenditure compare to growing wheat.

Livelihood analysis

The livelihood analysis was conducted within the village in the context to identify the villagers' primary and secondary occupation. It was found that these

villagers have been practicing agriculture for many years and in the last decade, there has been an increasing shift towards growing horticulture. Their economic network and the level of social participation is very weak. Even though, majority of them are big farmers and live near to the district headquarter their standard of living was found to be very low. The spent mainly for their food. Inspite of depleting ground water level observed these days they practice intensive agriculture using pressurized irrigation system. Efforts are being made to identify the best method for disposing the farm product from the village.

Table 3. Matrix Ranking

Particulars	Crops		
	Bajra	Wheat	Moong
Variety	New	New	New
Seeds availability	1	1	1
Weeds	2	3	2
Water requirement	2	3	2
Labour requirement	3	2	2
Expenditure	1	3	2
Pest	2	2	3
Diseases	2	2	3
Yield	1	2	3
Profit	1	2	3

1= Low, 2 = Moderate, 3 = High

Gender Analysis

According to information by the informants, women of all castes invariable engaged in households activities viz., cooking, child rearing, cleaning and washing. Regarding the agricultural activities they are mostly involved in sowing, hand weeding and harvesting operations, whereas their counterparts involved in major physical work namely, field preparation, manuring, intercultural operations viz., earthing up, thinning, irrigation, spraying of pesticides and fungicides, harvesting and marketing operations (Table.4). It was also observed that in all categories regardless of income, women supports the male counterparts in animal husbandry and households chores.

Table 4. Gender Analysis

Farm operations	Participation	
	Men (%)	Women (%)
Field preparation	90	10
Seed Treatment	100	-
Herbicide application	100	-
Sowing	30	70
Hand weeding	10	90
Thinning	100	-
Manuring	100	-
Irrigation	100	-
Plant protection	100	-
Harvesting	40	60

Venn diagram

Venn diagram aims to get the villagers perspective in identifying the existing institutions and individuals, their relationship and influence in decision making process (Fig. 5). The knowledge of the available institutions in nearby vicinity will encourage the
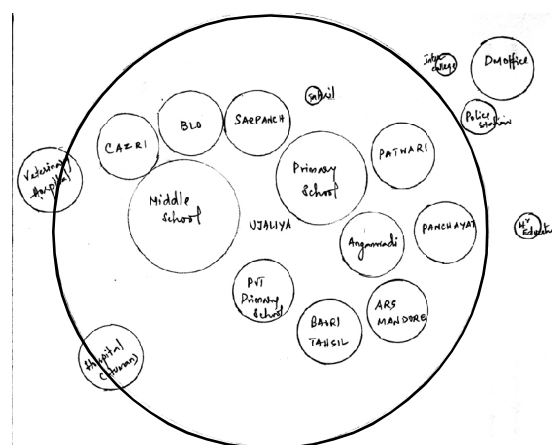

Fig. 5 : Venn diagram

villagers in establish relationship among the identified institutions in the development process of the village. The villagers of Ujaliya identified Agricultural Research Station (ARS), Mandore, ICAR- Central Arid Zone Research Institute and other state government organizations are the agencies where they approach to get information in agriculture and allied disciplines as and when required. In this process it was also revealed that school occupies an important position in the village and the villagers

showed a positive response in enrolling their wards to get the education up to middle level. Further as there is no high / higher secondary school near to the village, the children need for higher education is still unanswered.

Problem Prioritization

Based on the various methods of PRA viz., agro-ecosystem / transect analysis, livelihood analysis, mapping, trend & seasonal analysis, matrix ranking and focused group discussion with the villagers, various problems were identified and prioritized according to their importance in relation to pearl millet. Further, during the interaction with the villagers, the factors behind the low yield of pearl millet were also found. The various factors inhibiting on- farm pearl millet production were soil fertility status, unavailability of improved seeds, production techniques, production potential of the land and the level of market integration etc. Salinization of both land and water due to excessive drilling is now seen as a very serious threat to the health of the living beings of the village. Decreasing water table and increasing pest and disease problems further reduced the yield. Unavailability of required inputs on time and lack of information about scientific cultivation practices are also the probable reasons for the low productivity of pearl millet.

Proposed Action plan

The goal of the proposed action plan is to prepare a comprehensive frame work to maximize profit with reduced inputs for improving the productivity of pearl millet by identifying location specific, high yielding, drought and saline tolerant suitable improved varieties. Farmers should be taught initially about the benefits of soil testing, economic usage of fertilizer and better soil management practices. It is also equally important to make the villagers to understand the application of right kind of fertilizer at right time at right place and at right quantity to get higher profit. On farm participatory research should be taken at farmers' field to emphasize the importance of good cultivation practices right from selection of improved dual purpose variety, seed treatment, manuring, pre-emergence herbicides application, importance of line sowing, maintaining optimum plant population, integrated pest and disease management

and appropriate harvesting time are vital for increasing production and productivity of pearl millet. Further consistent capacity building programmes namely short-term and long-term training and education programmes on pearl millet, method demonstrations, field days, small group meetings and goshties must be organized to showcase and promote change in knowledge, skill and attitude of the farmers. Apart from the above, efforts should be made for formation of groups and farmer-based organisations (FBO) in enhancing their role in input procurement and output marketing.

CONCLUSION

PRA is a methodology comprises of various tools and techniques to identify critically the existing problem at village level, with a clear cut objective in which the villagers feel comfortable and committed to find out the successful solution with in the available resources. This reorientation is the major strength in finding out the real dimensions and lay emphasis on empowering local people to assume an active role as analyzers. The study clearly narrated the the reasons for low productivity in bajra cultivation. Steps are being taken and collaborative on farm participatory trials are being carried out in farmers field by ICAR-CAZRI scientists to exhibit the importance of good cultivation practices in various crops in general and bajra in particular.

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