



Enhancement of Land and Water Productivity through Participatory Rural Appraisal

PAWAN JEET^{1*}, BHUPENDRA M GHODKI², DOLAMANI AMAT³, ANUJA AR⁴,
REKHA BALODI⁵ AND A UPADHYAYA⁶



Received on : 15/09/2020
Accepted on : 25/11/2020
Published online : 10/12/2020



ABSTRACT

Participatory rural appraisal (PRA) is a technique which gives more emphasis on indigenous knowledge enable locals to do their own appraisal, analysis and planning in the participatory mode. In this study, for the problem identification, problem-solution and preparation of village development plan SWOT analysis and PRA tools was used at Bhargawan village of Satna district, India. The rank-based quotient (RBQ) was calculated in order to prioritize the identified problems and their solution was given using problem-solution tree technique. Findings indicated low land and water productivity, unavailability of irrigation water, *aira partha*, Soil sickness with *Fusarium*, mismanagement of animal waste and crop residue as constraints faced by the farmers of village. Constraints identified were categorized as problems arising out of gaps in research/extension activities in various agriculture and allied sectors. Based on the results and necessity of the villagers, scope for research/extension and village agriculture development programme/policy implications was made. Village agriculture development plan (VADP) of Bhargawan village will help the policymaker/NGOs/State govt. in the planning and management of soil, water and agriculture resources.

KEYWORDS

Water scarcity, PRA, RBQ, VADP, SWOT analysis.

INTRODUCTION

Agriculture is the essential pillar contributing to the livelihood security of rural India. Contribution of agriculture and allied sectors to the Gross Domestic Product (GDP) is declining steadily with the country broad-based economic growth (Singh *et al.*, 2020). Water scarcity along with pest and diseases in the crops are major limiting factors for land and water productivity (Upadhyaya and Singh, 2019). Bhargawan village has very less area under horticultural crops. It is facing problems of regular occurrence of terminal droughts, declining water level, dry spells, terminal heat stress and frost etc. Canal irrigation is negligible and groundwater is the only a major source of irrigation, which is approximately 75 % of total irrigation in the district (CGWB, 2013). Under such circumstances, in this village there is a huge scope for adoption of water advance technology, on-farm water management technology, artificial groundwater recharge technology and so on. The Livestock population faces fodder as well as water shortage during drought years, prevalence of local breeds is a major limiting factor affecting system productivity. In Bhargawan village, Satna district *Aira Pratha* is majorly prevalent during non-monsoon season, in which animals are left loose for open grazing resulting in crop loss, soil degradation, social conflicts, inbreeding in animals and spread of diseases. Further, wild animals like wild boar and nilgai cause problems in the farms. The overall agricultural productivity of the area can be enhanced by use of drought tolerant varieties and management of the pest and diseases. The village has potential for growing horticultural crops like seasonal vegetables, fruits like mango, guava, aonla and medicinal plants like satavar, ashawgandha, etc. The villagers can generate income from animals by breed improvement and fodder management. There is also potential for income generation from non-farm activities like phenyl making, surf making etc.

There is abundance of labor but constructive employment opportunities are lacking. Despite of sufficient natural resources, abundance of minerals, forest & agricultural produce, and livestock in this area, no any proper planning and management strategies adopted for the optimum utilization of these resources for the village development plan (Anonymous, 2014-15). By considering above such problem, village agriculture development programme is planned using Participatory Rural Appraisal (PRA) technique. Participatory Rural Appraisal is an approach to development planning and as a method of investigation evolved from many different sources to be utilized in a participatory mode (Abedo, 2000; Meena *et al.*, 2018). It is essential for providing basic information, identifying and assessing problems, appraising, designing, implementing, monitoring, and evaluation programs and projects, developing and transferring appropriate technologies, hypothesis generation, providing guidelines for survey designs and assessing the applicability of programme, and interpreting the results obtained through different methods (Reddy *et al.*, 2016). In this study various PRA tools were used for the identification of problems, ranking of problems, and for the preparation of problem-solution tree of major identified problems of Bhargawan village of Satna district of Madhya Pradesh.

1Scientist, ICAR-Research Complex for Eastern Region, Patna, Bihar, India

2Scientist, ICAR-Central Institute of Post-harvest Engg. & Tech., Ludhiana, Punjab, India

3Scientist, ICAR- Indian Institute of Soil Science, Bhopal, Madhya Pradesh, India

4Scientist, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India

5Scientist, ICAR- National Research Centre for Integrated Pest Management, New Delhi, India

6Head and Principal Scientist, ICAR-Research Complex for Eastern Region, Patna, Bihar, India

*Corresponding author email : pawan.btag@gmail.com

MATERIALS AND METHODS

Study area

The study was conducted at Bhargawan village, which is situated between latitude 24° 55' and 25° 12' N and longitude 80° 21' and 81° 23' E in mid northern part of Madhya Pradesh with an altitude of 395 m above mean sea level (Fig. 1). The Bhargawan village has a population of 529 (in which 277 males and 252 females) with 112 households. Population of children with age group 0-6 is 77, which make up 15 percent of total population of village. In Bhargawan village, out of total population, 282 were engaged in work activities. 55.67 per cent of workers describe their work as main work (Employment or Earning more than 6 Months) while 44.33 per cent were involved in marginal activity providing livelihood for less than 6 months. Of 282 workers engaged in main work, 42 were cultivators with (owner or co-owner) while 80 were agricultural labourers (Census of India, 2011). About 80% of the farmers of the village come under marginal and small category with average size of land holding is 0.5-1 ha. The major crops of the village are wheat, mustard, gram, paddy and jowar etc. Paddy-wheat is the major follow cropping system in this region.

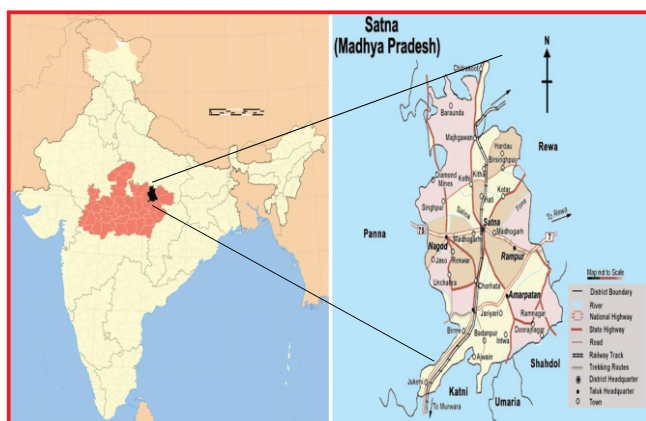


Fig. 1: Location of the study area

Report Building

Interaction was made with line department officers, progressive farmers of villages and KVK staff, thus facilitating information collection. The primary data was collected through reconnaissance survey method using interview schedules (structured and semi structured), focused group discussion and observation as major tools. The Agriculture Development Officer, Deputy Director Agriculture, Deputy Director Veterinary, Deputy Director Horticulture, Deputy Director Fisheries, Soil conservation officer, In charge Agricultural Technology Management Agency, Asst. Veterinary Surgeon, Deen Dayal Research Institute, Chitrakoot; Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Primary School Bhargawan, Krishna Devi Vanvasi Balika Aawasiya Vidyalaya, Majhgawan and KVK farm visited and consulted for selection and collection of primary and secondary data. The interaction with stakeholders helped us to understand the multidimensional agricultural problems from different perspectives. The principle and methodology of Participatory Rural Appraisal (PRA) was applied and conducted with full

cooperation of selected farmers' and facilitators for gathering information of villages.

PRA Tools used

The PRA tools were used include general transect, agro-ecological mapping, mobility mapping, social mapping, resource mapping, venn diagram, seasonal calendar, seasonal analysis, technology mapping, timeline, matrix ranking and problem-solution tree etc. (Adebo, 2000).

Five members of different discipline of ICAR research team and staffs of KVK, Majhgawan made general transect of the village accompanied by several local informants who knew about the natural resource issues. Local informants were selected on the basis of land holding size, education level, source of income, engagement in agriculture activity and so on. Observations were made on different micro-ecological niches and discussed issues of mutual interest. Data were collected to assess the land topography, soil characteristics, land use land cover pattern, availability of water resources, major crops and cropping seasons, cropping pattern, livestock scenarios, technologies and scheme adopted, information about agriculture and allied sectors like horticulture, sericulture, animal husbandry issues related to natural resources like land, water, solar energy, flora and fauna, socio-economic & cultural settings and issues related to input management like seed, fertilizer, irrigation etc. Based on the observations of general transect, agro-ecological data and resource availability were compiled depicting the climatic and environmental conditions, and availability of resources in relation to agricultural practices prevalent in the village.

SWOT analysis and Problem Identification

SWOT (Strength, Weakness, Opportunities and Threat) analysis of village was carried out for the identification and categorization of problems/issues. The identified problems were prioritized for the preparation of village development action plan. The major problems identified in the village Bhargawan was listed and Rank Based Quotient (RBQ) value method of the problems were estimated based on the ranking by 40 farmers of the village. Rank Based Quotient was calculated using following formula is given in equation (1) (Shanthy *et al.*, 2013; Mukherjee, 2016).

$$RBQ = \sum \frac{f_i (n+1-i) \times 100}{N \times n} \quad [Eq.1]$$

Where, i refers to concerned ranks, N refers to numbers of farmers, n refers to numbers of ranks and f_i refers to frequency of farmers for i^{th} rank of the technological need.

Problem-Solution Tree

Based on identification and ranking of problems, a problem-solution tree was constructed to highlight the possibilities to overcome the identified problems. During SWOT analysis of villages, following discussions were made regarding the causes of problem at various levels. Solution tree was made by indicating the point of interventions in the Bhargawan village of district Satna, India, which can be formulated to mitigate the problem.

RESULTS AND DISCUSSION

SWOT analysis

SWOT analysis of Bhargawan village was done for the identification of village problems and preparation of village development plan.

Strength

- Rich endowment of labour and unity among villagers
- Learning capacity and adaptability of villagers to innovative ideas and technology
- Abundance of livestock, land and solar energy source
- Good rapport of farmers with government organizations and NGOs

Weakness

- Gender inequality, low living standard and unhygienic lifestyle of villagers
- Lack of skilled human resources, Alcoholism, Parda system
- Youth migration, late adopters, poor management skills, female illiteracy, Dowry
- Water scarcity, poor on-farm water management practices and poor adoption of modern irrigation practices, low nutrients status and water holding capacity of soil
- Continuation of traditional practices like *Airapratha* and attack of wild animals in the field crops
- Low participation in co-operative and self-help group, poor operation of veterinary facilities, regulation of gram pahnchyats, poor schooling and lack of primary, secondary and higher education
- Unavailability of seed procurement unit, poor postharvest activities and farm equipments at village level, small farm land holding, low income of farmers, poor access to financial services and poor marketing linkage

Opportunities

- Reduction in labor migration
- Improving education level of children
- Construction and renovation of on-farm water harvesting structures, artificial groundwater recharge structures and adoption of high water use efficiency technology like micro-irrigation technology
- Introducing fencing for protection from wild animals
- Increasing land and water productivity and livestock by changing cropping pattern and breed improvement; promotion of drought tolerant varieties
- Production of lac, resin, dye, and other forest produces from medicinal and wild plants
- Mushroom cultivation, apiculture, sericulture, value addition of dairy and animal husbandry produces; promotions of horticultural crops
- Agri-residue management for biogas production and vermi-composting; promotion of organic farming
- Promotion of small agro-based industries
- Operation of basic financial infrastructure like bank and post office.

Threats

- Health issues of villagers
- Migration of youths towards cities and towns for employment and debts
- Natural disasters like drought, frost, land degradation, erosion, etc.; loss of standing crops by wild animals, higher incidence of pest and diseases in crop and livestock, poor quality and scarcity of groundwater and surface water resources
- Health hazard and environmental pollution by using dung cakes as fuel
- Migration of agricultural workforce, high interest by money lenders, risk of crop failure, high risk on success of new investment, skewed distribution of benefits of schemes

Village Transect

The Bhargawan village is an average annual rainfall is approximately 817 mm, about 87 % annual rainfall occurs during monsoon season. This village covered the total area of about 125.25 acres (Census, 2011). Out of this, cultivated land is 90 acres. This village is having a total Irrigated land of 60 acres. Rainfed land is about 30 acres and fallow land is about 10 acres. The major source of irrigation is pond, open well and bore well. The cropping intensity of the village is 155%. The major soil type is red soil with sandy loam texture. Livestock serves as an important source of livelihood for villagers. Livestock population mainly consist of cow, ox, buffalo and goat. Livestock is mainly used for milk, manure and meat products. The productivity is low due to prevalence of local breeds and unscientific animal husbandry practices. They follow *Aira Pratha* during lean periods, which is a big problem for agriculture and allied sectors. Major diseases in livestock are foot and mouth disease, haemorrhagic septicaemia, dysentery. There is no veterinary hospital in the village and no trained para-vet facility is available, which limited the scope of income generation and employment in livestock activity. Details of village transect is shown in table 1.

Agro-ecological mapping

The area falls under semi-arid climatic conditions. Teak (*Tectona grandis*) is common in the region. Bamboo is found in all the ranges. Other trees that occur in the district are saja (*Terminalia tomentosa*), salai (*Boswellia serrata*), tendu (*Diospyros tomentosa*), Woodfordia floribunda, Khair (*Acacia catechu*) etc. Only one profitable crop is possible due to low soil fertility and water holding capacity. In the second crop, yield is reduced to 30% in the same field. In *rabi* season, farmers are facing severe problem of Fusarium Wilt of Chick Pea, due to which they are forced to stop the cultivation. Crop yield is considerably affected by changing climate. They follow mixed cropping of wheat and mustard along with monocropping. 50-60 percent of the households are having kitchen garden growing vegetables like Potato, Onion, Tomato, Raddish, Cauliflower, Cabbage, Bottle gourd, Pumpkin etc. Generally, zaid crop is not recommendable by farmers of village due to *Aira Pratha* and water availability problems or poor water harvesting infrastructure and so on. Horticulture is not a major agricultural activity in the village. In the village, commercial cultivation of fruit crops is not

Table 1: General transects analysis of Bhargawan village.

Particulars	
Soil type	Red Soil
Soil texture	Sandy loam and loam
Altitude	395 m above mean sea level
Water resource	Tubewell, open well and pond
Land use Pattern	Household, crops, animals
Crops	Wheat, Mustard, Pea, Lentil, Sorghum, Arhar, Sesame, Black gram (Urad), Green gram (Moong), Gram, Paddy
Fruits	Mango, Bel, Guava
Vegetables	Potato, Onion, Tomato, Reddish
Trees & shrubs	Neem, Eucalyptus, Bamboo
Weed	<i>Lantana camara</i> , <i>Pisum</i> spp. (wild pea)
Livestock's (Animal)	Cow, Goat, Buffalo, Ox
Drinking water	Groundwater (Tubewell and well)
Problems	
Agriculture & Livestock	Water deficiency, Soil sickness with <i>Fusarium</i> , Pest and diseases, poor crop productivity, Lack of efficient forward/backward market linkages, Lack of awareness regarding crop residue management, Land fragmentation (Bhumi chakbandi), Frost injury, hailstorm, weed infestation, Poor farm mechanization, Small size land holding, Deficiency of bio fertilizer, Adoption of traditional practices like <i>Aira pratha</i>
Opportunities	
Agriculture & Livestock	Crop diversification, Quality seed production, Rain water harvesting, Up-gradation of livestock, Improved agronomic practices, Biogas production, Biofertilizer utilization, Improvement in the animal husbandry practices, Farm mechanization, Farmer Producer organization

undertaken; they are having few in number mango, pomegranate, bel, ber, jack fruit trees in the village. A few farmers are doing vegetable cultivation for subsistence (onion, potato, tomato, chilli, brinjal, bottle gourd, cucumber etc.). The village has potential for cultivation of horticulture crops like pomegranate, aonla, papaya, mango bamboo, medicinal plants, moringa which can improve farmer's income and risk bearing capacity.

Social mapping

During PRA, we came to know that there is no bank, post office, higher education and health care facilities in the village (located at a distance of 15 km from district headquarters). Almost 85 percent families are below poverty line. Gender disparity is prevalent in wages; women are getting around Rs. 120-150 per day while men get Rs 250/ day. Although 70

percent population of village is literate, employability and skill level for income generation is lacking. A fodder bank in the unutilised common land under participatory mode between KVK and SHG (women) can be an alternative solution to this traditional menace. This can also help villagers to cultivate profitable vegetables/ other crops during summer season. Poultry and piggery is not practiced in the village due to social taboos.

Resource mapping

Land: Land fragmentation, low soil fertility, low water holding capacity of soil, soil erosion, and poor soil structure.

Water: Erratic rainfall, declining groundwater table (which is about 40-60 m), poor ground water quality, more sulphur and calcium content in water.

Solar energy: Solar energy is harnessed for generation of electricity for lighting street lamps, this can be done at extensive scale. Further, solar energy can be utilised for agricultural practices like solar drying, water pumping etc.

Flora and fauna: Forest trees like palash, tendu can be utilised for producing dye, resin etc. They have Indigenous Traditional Knowledge (ITK) regarding medicinal properties of some forest tree species. Preservation of germplasm and traditional knowledge of tribes can be an area of productive intervention. *Lantana camera*, *Ipoemea spp.*, *Parthenium spp.* are the major invasive weed species found in the region. *Lantana camera* is a highly invasive species which may replace native flora in future. Thus, this is a serious threat to bio diversity of the region. The weed causes decrease in water table further aggravating water scarcity in the area. The villagers used to grow Eucalyptus tree for timber purpose. This also reduced water table due to high evapotranspiration.

Rank Based Quotient and Problem-solution Tree

Based on farmers' response the rank of problem was calculated using Rank Based Quotient (RBQ) (Table 2). The information collected by the villagers was further validated by the Agriculture Development Officer, Deputy Director Agriculture, and Deputy Director Horticulture, Satna. In spite

Table 3: Categorization of identified problems in Bhargawan village

Researchable issues	Rank
Impact of labor migration in village economy	VIII
Identification of suitable bio-control agent	VII
Studies to improve soil health by microbial intervention	IV
Development of biogas plant: optimization of animal waste and crop residue	V
Feasibility of micro-financing and formation of women SHGs	X
Feasibility of farmer producer cooperative societies in village	VI
Understanding population structure of <i>Fusarium oxysporium fsp. Ciceris</i> in the area and optimization of IPM module for wilt management	III
Design of water harvesting structure to improve water use efficiency and groundwater recharge potential	I
Impact analysis of <i>aira pratha</i> on agricultural productivity and village economy	II
Integrated Pest Management (IPM) module for wilt	IX

Table 2: RBQ of the identified problem in the village

Problems	Ranks											RBQ Value
	1	2	3	4	5	6	7	8	9	10	11	
Water scarcity	25	10	5	-	-	-	-	-	-	-	-	95.45
Aira Pratha	20	15	3	2	-	-	-	-	-	-	-	93.86
Pest and disease in crops	14	10	8	8	-	-	-	-	-	-	-	88.63
Deterioration of soil health	13	10	9	8								88.18
Under-utilization of agri-waste	8	12	10	10								85.91

of being a progressive village, there are some problems such as water scarcity for crops, erratic rainfall, low ground water table, poor ground water quality, land fragmentation, low soil fertility, *aira pratha*, fluctuating market price, demanding of high wages by agricultural labourers, pest and diseases problems, frequent droughts (Table 3). The possible solution for water scarcity problem is given in problem-solution tree.

Problem and solution tree

Water scarcity for crops

Water scarcity is the major identified problem in the Bhargawan village of Satna district. Availability of water is the

very essential input for crop production and village development and in upcoming days it will become a major key concerned for irrigation of crops (Fig. 2).

Village Agriculture Development Plan/policy

Village Agricultural Development Plan (VADP) is a very important document, which can aid and direct the developmental process of a village. The VADP for Bhargawan village document is prepared with detailed analysis of ground level situations and by drawing meaningful conclusions. In the VADP, experiences gained through Focused Group Discussions and other PRA tools are incorporated to get gainful insights into the expectations and aspirations of farmers and other stakeholders. Based on SWOT analysis, village survey and mapping, problems of village were identified. It was observed that the water scarcity or water availability during non-monsoon season was very limited to crop production and proposed a comprehensive village agriculture development plan (VADP) or policy as shown in Table 4.

Adoption of appropriate technology in villages, identified problems can be resolved by making appropriate recommendations to policymakers/NGO/SAU/State agriculture department. Water harvesting structure like construction or renovation of pond, delineation of catchment boundary, check dam, design of appropriate groundwater recharge structure, adoption of advance water saving technology like drip and sprinkler irrigation etc. can increase water availability in villages by 5-10 % and increase the cultural command areas upto 20%. Through, the application of bio-composting of agriwaste, crop residue and mulching like rice straw, in farmers fields, soil moisture content of fields can be improved by 10-20%. Adoption of appropriate developed technology and government schemes in villages, system productivity can be increased by 5-10% and also can reduce cost of cultivation by 25-30%.

CONCLUSIONS

The PRA tool general transect, agro-ecological mapping, mobility mapping, social mapping, resource mapping, matrix ranking and problem-solution tree used in the present study enabled the researchers to understand the resources available, cropping profile, identify location-specific problems and researchable issues and ultimately to come up with tangible possible solutions drawn as an action plan in Bhargawan

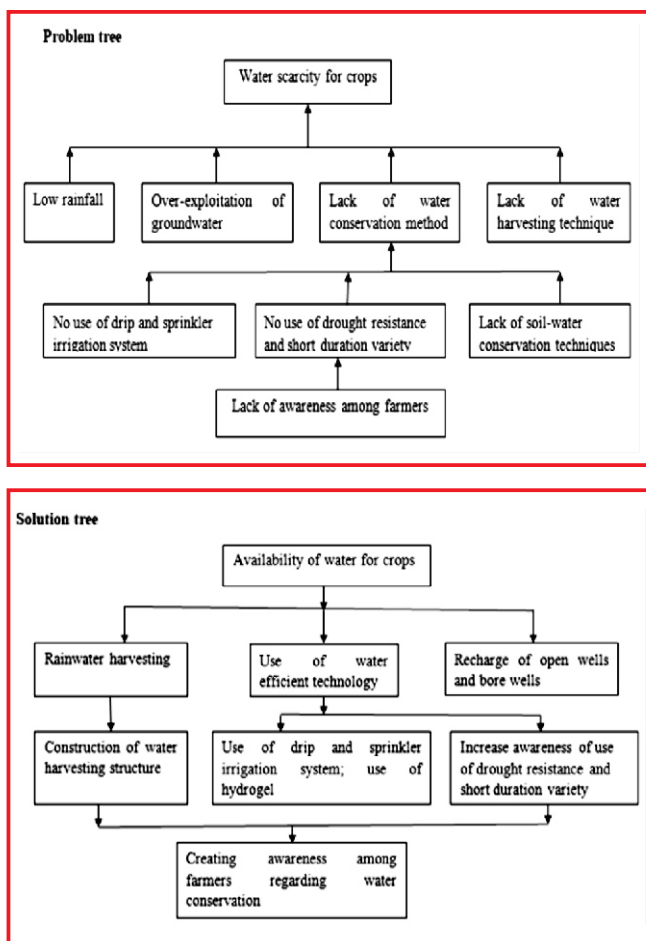


Fig. 2: Problem-solution tree for water scarcity for crops

Table 4: Comprehensive village agriculture development plan

Sector	Activities	Expected output
Agriculture	<ul style="list-style-type: none"> Awareness about various flagship programs like PMFBY, PMKSY, PKY and KCC etc. 	<ul style="list-style-type: none"> Increase in crop productivity by 5-10 percent Reduction in cost of cultivation by 25-30 percent
Horticulture	<ul style="list-style-type: none"> Crop diversification 	<ul style="list-style-type: none"> Increase in farmers' income by crop diversification
Animal Husbandry	<ul style="list-style-type: none"> Integrated farming 	<ul style="list-style-type: none"> Increase in income of farmers through integrated farming system
Watershed development	<ul style="list-style-type: none"> Conjunctive use of surface and ground water Extension of canal system Construction of groundwater recharge structure Construction of rainwater harvesting structure Afforestation 	<ul style="list-style-type: none"> Increase in water level (5-10%) Increase in culturable command areas (Upto 20%)
Agricultural processing	<ul style="list-style-type: none"> Introduction of biogas plant Increase in silage production by establishing silage production unit Bio-composting of agriwaste, crop residue and mulching 	<ul style="list-style-type: none"> Number of biogas plant by 40%, utilization of biogas as cooking and electrifying the village 50% Soil health improvement by 10% Reduction on fodder cost by 20% Improvement in soil moisture content by 10-20%
Agricultural marketing	<ul style="list-style-type: none"> Formation of FPO, cooperatives, SHGs Improving efficiency of backward market linkages Real time market information using platform of e -NAM, improved access to agricultural credit 	<ul style="list-style-type: none"> Establishment of farmers producer organization (FPO) Reduction in marketing inefficiencies by 20-30%

village of Satna district, Madhya Pradesh. Water is the major essence for the overall development of water scarcity is major identified problems in the region. Village Agricultural Development Plan is a very important document, which can aid and direct the developmental process of a village. This helps in detailed analysis of ground level situations and by drawing meaningful conclusions. In the VADP, Focused Group Discussions and PRA tools helps in the expectations and aspirations of farmers and other stakeholders of village and can also be helpful for resource utilization of village. This action plan will help in improve the land and water productivity, resource availability, sources for income and employment generation in the region.

ACKNOWLEDGEMENT

The authors thankfully acknowledge all the support provided by the Dr. R.S. Negi (local FET Coordinator), Program Coordinator, Krishi Vigyan Kendra (KVK)-Satna, Dr. V.P. Singh (Subject Matter Specialist, Extension), Mr. Ashok (SMS), Mr. Vinod Tiwari (SMS, Agronomy), Ms. Varsha (Scientist, Home Science), Mr. Himanshu (SRF) and Mrs. Rita Singh (Supporting staff) for their effective coordination, constructive suggestions and courteous hospitality and for helping us in identifying the village and getting support from the farmers during our Field Experience Training (FET). We are also grateful to anonymous reviewers for their valuable suggestions that helped to improve the manuscript.

REFERENCES

- Adebo S. 2000. Participatory rural appraisal (PRA): Analysis of experience. *Training Manual Chambers*. **22** (9): 1253– 1268.
- Anonymous. 2015. AHP – Action on Hunger and Poverty Foundation Annual Report: 2014-2015. <https://ahp.org.in/publications/our-journey-through-one-year-annual-report/>.
- Census.2011. <http://www.census2011.co.in/data/village/463266-bhargawan-madhya-pradesh.html>.
- Central Ground Water Board. 2013. District ground water information booklet. Ministry of water resources. North Central region, GoI.
- Meena M, Sahu P, Joshi A and Mawlong, I. 2018. Identification and Prioritization of Problems in Integrated Agriculture for Community Development: A Case of Amba Village in Sub-humid Region of Western India. *Asian Journal of Agricultural Extension, Economics & Sociology* 1-12.
- Mukherjee A.2016. Prioritization of problems in integrated agriculture: a case of Rampur village in sub humid region of Eastern India. *Indian Research Journal of Extension Education* **15**(1): 53-59.
- Reddy KS, Pankaj PK, Reddy NN and Raju NS. 2016. Participatory Rural Appraisal in Drylands: A Holistic Approach for Getting Insight into an Agro-Ecosystem Analysis. *Journal of Rural Development* **35**(4): 555-580.
- Shanthi TR, Monika S, Nisha S, Rajkumar MB, Raj SGS, Kalyan D and Ramachandran S. 2013. Participatory Rural Appraisal: a holistic approach for getting insight into an agro-ecosystem analysis. *Indian Research Journal of Extension Education* **13**(2): 1-9.
- Singh AK, Upadhyaya A, Kumari S, Sundaram PK and Jeet Pawan. 2020. Role of agriculture in making India \$5 trillion economy under corona pandemic circumstance. *Journal of AgriSearch* **7**(2): 54-58.
- Upadhyaya A and Singh AK. 2019. Land and Water Management Strategies for Improving Agricultural Productivity of Farmers. *Journal of AgriSearch* **6** (Spl): 1-3.

Citation:

jeet P, Ghodki BM, Amat D, Anuja AR, Balodi R and Upadhyaya A.2020.Enhancement of land and water productivity through participatory rural appraisal. *Journal of AgriSearch* **7**(4):234-240