AN EXPERIMENTAL STUDY OF FARMERS IN ADOPTING NEW AGRICULUTURAL TECHNOLOGY IN MADHYA PRADESH WITH SPECIAL REFERENCE TO UJJAIN DISTRICT

G.R.GANGLE

Abstract: Abolition of poverty and hunger is an essential scheme of the UN Millennium Project. Superior crop production to meet up the requirement of ever mounting population forms an integral part of this UN mission. The idea of this research work was to pull together information on socio-economic characteristics and agricultural practices that could affect approval of improved agricultural practices. This study scans how little farmers are facing with socioeconomic setbacks in adopting new agriculture technology. The research was conducted during harvesting season of Kharif (October 2013) for which 56 respondents were randomly chosen from three ecologically different villages of Nagda tehsil, Ujjain, Madhya Pradesh. The data for this work was gathered through face-to-face interviews through a pre prepared questionnaire. This investigation exposed that majority of the respondents was illiterate. Furthermore, most of them had insufficient amenities of purchasing agricultural equipments, fertilizers, sprays and storage facilities. The data on agricultural practices, equipment use, and natural resource characteristics associated with farming activities have been collected.

Most of the families belonged to less monthly income group and large families. This research work further disclosed that lack of proper expansion services of the agriculture department was another barrier in improving the productivity of small farmers in the study areas. This work also disclosed that lack of most modern information as well as non-accessibility of credit facilities were major troubles of the small farmers of the study area. There were no significant relationships between adoption of improved technologies and farmer age, income and cultivation methods. These factors are used to demonstrate the complication of agricultural systems and how certain aspects may affect and the role that certain farmer profiles may play in adoption/non-adoption of improved crop production strategies. It is concluded that there may be a lack of need and political will to develop strategies to improve crop production.

Keywords: Technology adoption, Ujjain, Socio-economic problems, small farmers.

Introduction: The growth of agriculture depends on the improvement of farming technology. Introduction of new agricultural technology seems to offer an opportunity to increase output and income significantly. For this reason adoption of technological innovations in agriculture has been drawing interest on development economists. Indian agriculture is still in traditional character. It is technological innovation and adoption that can change traditional agriculture into modern one. Technological change has been the major driving force for increasing agricultural productivity and promoting agriculture development. The policies for agriculture, trade, research and development, education, training and advice have been strong influences on the choice of technology, the level of agricultural production and farm practices since many years [1].

The collective efforts of both Central and State Governments and the farming community have succeeded in achieving record production of 244.78 million tonnes of food grains during 2010-11[2]. This record production has been accomplished through effective transfer of latest crop production technologies to farmers under various crop development schemes being implemented by the Department of Agriculture & Cooperation (DOAC) [3] backed by remunerative prices for various crops through enhanced minimum support

prices. During the 12th Five Year Plan, the government is focusing on supporting the current momentum by stabilizing food grain production to ensure food security and to maintain current levels of productivity. New technologies are needed to break yield barriers, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns. The DOAC (Department of Agriculture and Co operation) has many encouraging programs which are designed to conserve resources and to enhance the agricultural productivity. Most programs rely on voluntary means, such as technical assistance, education, demonstration and cost sharing, to induce the adoption of sustainable agricultural practices. Thus, the adoption of technologies for sustainable farming systems is a challenging and vibrant issue for farmers, extension services, agri-business and policy-makers.

The agricultural sector needs to employ a wide range of evolving technologies and farm practices across many different farming systems and structures to meet a variety of changing and heterogeneous demands from consumers and the public for food, fiber and other goods and services provided by agriculture, often with uncertain outcomes in terms of their effects on sustainability. Farmers have always looked to new technologies as a way to reduce costs. In addition, higher incomes, greater knowledge and improved channels of communication are leading consumers to demand low-cost food of higher quality increasingly produced. Enhanced crop production and irrigation practices form an integral part of the intervention proposals of the UN Millennium Project [4] developed to achieve improved crop production. The progress of improved agricultural practices, it is important that various local and international agencies as well as government agencies put on irrigation system and smallholder agricultural development necessitates to form a holistic approach for the recovery of this important agricultural sector in the country. But, because of their higher income, economic power, social status and links with local political leadership, large farmers, have more assured supply of modern inputs including credit facilities necessary for effectively utilizing the potential of new technology. The purpose of this paper was to point out the importance of farmer involvement in technology development as well as to collect information on socio-economic aspects and farming practices that could affect adoption of improved agricultural practices.

Methodology: The present investigation is based on both primary and secondary data. Information was also acquired from various web sites and articles addressing problems related to farmers. Additionally, many press notes have been evaluated on a regular basis. Conferences with subject experts and researchers have also been a useful source of information and have provided opportunities for exchanging views.

Study Area:Farmer surveys were conducted in three ecologically different areas of Nagda, Ujjain.M.P. Nagda is very close to tropic of cancer at 23'27 N and 75'25 and 517 meters above MSL. The survey was conducted in October, 2013 and involved questionnaires with farmers in three villages of Nagda tehsil in Ujjain District of Madhya Pradesh. These villages are Rupeta, Umarna and Bhatisuda. Surveys were conducted by the both the authors and assisted by research scholars. The number of farmers that participated was 28, 30 and 27 for the three villages respectively. The questionnaire was discussed individually with farmers and socio-economic data as well as data on farming systems were collected. The questionnaire which mostly focused largely on farmer views of government schemes, use of modern technology also addressed questions regarding the farmer's age and sources of income. The rest of the questionnaire focused on the crops planted, farming practices and seed availability. Information collected on cropping systems, and crop pests are not reported here and only socio-economic aspects that could affect adoption of improved practices are discussed in this paper.

Data analysis : The data obtained by the above methodology were summarized in Excel and for all questions asked during interviews. The percentages calculated were based on the total

number of farmers who responded to that particular question. The farmers that did not respond to a particular question were excluded from the calculation. Chi square (X2) tests were used to determine the significant relationships among various parameters if any.

RESULTS:A summary of results is provided in Table 1.

Table.1. Biographic data from survey in three villages of Nagda (Ujjain, M.P) (October, 2013).

Table.1.

Biographic information		**Village**		**Mean**
	Rupeta	**Umarna**	**Bhatisuda**	
Number of participants (Total: 85)	28	30	27	
	%	%	%	%
Male respondents	28.0	36	33.4	32.48
Female respondents	72.0	64	66.6	67.52
Age distribution categories (years)				
< 30	0.0	1	1	1.7
31-40	2	3	3	10.6
41-50	8	12	7	31.76
51-60	14	10	9	38.82
61 +	4	6	7	20.0
How long has respondent been actively farming? (years)				
< 5	33.6	33.0	35.1	33.9
5-10	14.0	27.0	18.9	19.96
11-15	16.8	15.0	16.2	16.0
16-20	19.6	18.0	18.9	18.83
21 +	16.0	7.0	11.31	11.43
What is the distance (km) between homestead and field?				
< 1	4.9	25.7	48.0	26.2
1-2	2.5	4.8	29.4	12.2
2-3	49.4	18.1	6.9	24.8
> 4	40.7	51.4	8.8	33.6
Field size (ha)				
< 0.5	7.14(2)	10.0(3)	11.11(3)	9.41
0.5-1.0	46.4(13)	50.0(15)	55.55(15)	50.63
> 1.0	46.4(13)	46.0(12)	33.33(9)	31.91

What is the main source of household income?	
Pension	21.0
Farming	58.0
Farming and pension	13.0
Farming and employment	9.0
Non-agricultural	9.0

Farming practices		Village			Mean
		Rupeta	Umarna	Bhatisuda	
Source of seed that is planted?					
Buy annually		58.1	57.4	55.9	54.84
Keep seed		41.9	42.6	51.0	45.16
Use of tractor cultivation?					
Total		100.0	91.4	97.1	96.2
1 x per season		51.9	31.7	36.3	40.0
2 x per season		48.1	53.3	52.9	51.4
3 x per season		0.0	1.0	8.8	3.3
How do farmers plant the seed?					
Hand planting		100.0	90.5	66.7	85.7
Mechanical planter		0.0	9.5	33.3	14.3
How many farmers apply fertilizer?		84.0	80.0	92.2	85.4

Table 2: Farm management practices in three villages in Nagda, (Ujjain, M.P, and October, 2013.

Seventy one percent of the respondents were female who also indicated that they were solely or largely responsible for farming activities. Seventy percent of the farmers were older than 51 years and a large proportion were older than 61 years (Table 1). Approximately 32% of farmers had less than five years experience in farming. The number of farmers that lived on-farm was low (0-7.8%). The farmhouses of between 41 and 51% of farmers were more than 4 km away from their fields (Table 1) except for the Rupeta village where 77% lived within 2 km from fields. Fields sizes were small with 54.5% of fields being smaller than 1 ha.

A large proportion of farmers indicated that they also kept grain of the harvested crop to be used

as seed during the following season. The majority of farmers made use of tractors for soil cultivation (Table 2). Mechanical cultivation of these fields was largely done in one process by a local contractor. Soil cultivation was then followed by hand-planting a few days after ploughing or with farmers walking behind the tractor. Between 8 and 20% of farmers did not use fertilizer

Approximately 78% of farmers practiced intercropping. cowpea, dry beans, and cucurbits were the most common intercrops with soybean.

Irrigation area: The results show that though the households were headed by males the majority of the farmers were female. Only 12.3% of farmers were younger than 40 years and 20% were older than 61 years. Majority of farmers lived within easy walking distance from their fields. Fifty eight percent depended solely on their farming activities for their income while 42% indicated that they received some form of off-farm income. As expected there was a significant ($p = 0.001$) relationship between age group and source of income. This is approved to the fact that a large proportion of farmers (20%) were older than 61 years (Table 2) and those older farmers also tended to seek off-farm sources of income. Adoption of new technology was significantly ($p = 0.041$) higher amongst farmers that relied only on farming as a source of income. Results also revealed that a small group of farmers were also employed outside of agriculture. Most of the farms were between 1 and 2 ha. Cultivation was largely done by means of tractor-drawn ploughs, although animal draught power and hand cultivation was also used (Table 2).

Mechanical soil cultivation was followed by hand-planting. There were no significant ($p>0.05$) relationships between adoption of improved cultivation technology (tractor cultivation) and farmer age or off-farm income. The majority of farmers bought hybrid seed from co-operative stores recommended by the government and a few planted seed saved from the previous harvest. Hybrid soybean JS-9305 was planted by most farmers in Kharif season. There were no significant ($p > 0.05$) relationships between age of farmers and adoption of improved technology in the form hybrid seed. Only 29.5% of farmers indicated that they practiced intercropping.

Discussion: Small farmers generally have low incomes and lack capital, and their attempts to market their products, is adversely affected by poor infrastructure and communication [5] .This study showed that the profile of farmers may affect adoption of new technologies. The level of experience and knowledge of farmers regarding technologies such as hybrid seed, fertilizer, and pest management strategies that have been available for decades and which are often taken for granted by scientists and extension services are low. Improved productivity on small scale farms will only possible if once the factors that could exclude adoption of improved agricultural practices are identified and understood. In order to improve small scale farm productivity, the above mentioned aspects need to be addressed effectively and strategies developed to overcome these constraints. It is essential to understand the interactions between system components when planning interventions such as introduction of new crop production strategies. Certain farming practices, demographics and aspects of village life may affect development and adoption of crop management technologies. While poor performance of smallholder irrigation schemes has been endorsed to socio-economic, political, climatic, edaphic and design factors [6] farmers who are on irrigation projects are more likely to be food secure than dry-land farmers [7]. Farm practices have however also contribute to poor performance and low yields on irrigation systems [8]. The study of Fanadzo et al., 2010 [9] also indicated that poor crop management practices compromised yields achieved in several different crops grown in an irrigation system. Main limiting factors were reported to be poor weed, fertiliser and water management, low plant populations, poor cultivar selection and late planting [9].

Results from these surveys show that the profile of farmers is such that adoption of new strategies will be slow or none at all. Lack of farming experience and managerial capacity could lead to poor compliance to specific requirements associated with cultivation of hybrid crops, resulting in farmers loosing the benefits of this new technology [10]. Furthermore, it has also been shown that older farmers tend to be more risk averse, which could

affect their decision-making on adoption of new technology which they may see as high-risk and older farmers have also been reported to be more risk adverse [11]. Off-farm income has also been shown to be an important factor affecting technology adoption in many countries. Besides, it was also observed that technology adoption may be relatively high in those farmers who have off-farm income sources. These findings are supported by the findings of Eastwood et al. [12] and Sasa [13]. The low level of dependence on own-farm income may contribute to low adoption rates of technologies that result in increased complexity of farming systems. Despite the fact that off-farm income has positive effect on farm productivity, the financing of the renting of tractors, for soil cultivation and harvesters. The lack of finances to pay for mechanization may have additional negative impacts on livelihoods of already poor farmers.

This study not only point out socio-economic factors that may affect adoption of new technologies, but also to the lack of efficient extension services in the region. It is advised for education, training of basic technologies used in modern farming. Extension programs aimed at increasing knowledge have potential to increase adoption of technology [13]. and increased frequency of extension visits to impart information could result in increased productivity and income generation[14]. Besides all these suggestions, the political will is very much essential to take on the responsibility to overcome these problems of poor farmers [15]. Because successes will ultimately be determined by political will to create an enabling environment for small scale farmers to improve productivity. Government initiatives need to focus on improvement of all aspects related to these farming systems in order to improve rural livelihoods [16].

Conclusions and recommendations

- Different technologies are needed in different environments. Hence farmers are educated and trained accordingly. So, Bring about synergy between technology and public policy and recommend measures for enhancing income and employment potential in rural areas through diversification, application of appropriate technology including IT for information on market, weather, credit facilities and e-commerce, training and market reforms. Attract and retain educated youth in farming and recommend for this purpose [17].
- They need to have a greater voice in the decisions made by the providers of technologies and rural services that affect them.
- Government should try to promote experimental adult education among farmers, (farmer field schools).
- English language speaking courses should be conducted to understand the technology.
- Awareness of the crop insurance, credit, skill, technological and marketing empowerment of women, taken into consideration.
- A series of training sections should be developed and delivered through various mechanisms including AIR and mass media, distance education providers, Village Knowledge Centers with the help of ICT.

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Examination controller, Vikram University, UjjainPG Department of Zoology, Government PG College, Ratlam, M.PEmail: gangle_1972@yahoo.com