



## Research Article

# STUDY ON MANAGEMENT OF ECO-FRIENDLY PRACTICES IN AGRICULTURE AMONG THE TRIBAL FARMERS OF BETUL DISTRICT OF MADHYA PRADESH

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**Abstract:** The present study was conducted in Sahapur and Bhimpur block were purposively selected based on tribal area of Betul district of M.P. The total sample was consisted 120 respondents for the study. Objective of study is to explore the relationship between profile of tribal farmers with their knowledge & adoption about eco-friendly practices; and study the level of knowledge and extent of adoption of tribal farmers about eco-friendly management practices. Majority of the respondents suggested making availability of pest resistant varieties, followed by three-fourth of respondents said organizing training on eco-friendly practices to minimise the ill effect of agrochemicals as perceived by farmers.

**Keywords:** Eco-Friendly Practices, Tribal Farmers

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## Introduction

The development of India is also depending on agriculture and it is engaging about 70 percent of its population directly or indirectly. It contributes nearly 37 percent of the net national product and account for a sizable share of total value of the country's export. The modern agriculture has been successful in meeting the increased food needs of alarmingly growing population. But the problem associated with modern agriculture like, the high cost of inorganic or chemical fertilizers and plant protection chemicals, stagnated yield level. The modern agriculture has been successful in meeting the increased food needs of alarmingly growing population. But the problem associated with modern agriculture like, the high cost of inorganic or chemical fertilizers and plant protection chemicals, stagnated yield level. The effect of prolonged and over usage of chemicals in crops production has resulted in human health hazards and pollution of environment and ground water. At present, the issue is whether to continue with the chemical inputs-based intensive technologies or to go back to the traditional environment friendly farming practices like organic farming for sustainable production, income and socio-economic development of the farming community. In this context that biological pesticides are being considered as environmentally safe, selective, biodegradable, economical and renewable alternative for use in organic farming system. Green research in the field of agriculture has identified several environmentally friendly technologies, of which mention can be made about eco-farming, eco-friendly nutrient management. Therefore, a study was conducted with the following objectives

### Objectives for the study

To study the profile of tribal farmers.

To study the level of knowledge and extent of adoption of tribal farmers about eco-friendly management practices.

To explore the relationship between profile of tribal farmers with their knowledge & adoption about eco-friendly practices.

To seek suggestive measure to minimize the ill effect of agrochemical as perceived by tribal farmers.

## Materials and Methods

The present study was conducted in Sahapur and Bhimpur block of Betul district of M.P. From Betul district, Sahapur and Bhimpur Blocks were purposively selected based on tribal area of the district. The selected blocks comprise of 295 villages. A combined list of villages of both selected blocks where tribal farmers were engaged in agriculture was prepared with help of extension officials. Out of these, 10 villages were selected randomly for the study. After the selection of the villages, a village wise list of tribal farmers was prepared and twelve tribal farmers were selected in each village by using simple random sampling method. Thus, the total sample was consisted 120 respondents for the study. The data were collected personally with the help of a pre-tested interview schedule. The interview schedule was designed for collecting the relevant information of selected variables. All the respondents had answered the questions fully, which was indicative of the fact that good rapport could be established between the investigator and respondents. After establishing rapport with the respondents, they were interviewed and their responses recorded in interview schedule, for analysis of data. Secondary data were collected from records & statistical office. Statistical tools like- mean, SD, percentage and Karl Pearson's coefficient of correlation and multiple regression analysis [1-9].

## Results and Discussion

The data in [Table-1] shows that maximum number of the respondents (48.33%) belonged to middle age group, followed by old age (20%). Higher percentage of the respondents (31.67%) were educated up to primary level followed by (24.17%) middle school level, whereas, 12.50 percent Illiterate, 20.83 percent high school and 10.83 percent of the respondents were above high school. Majority of the respondents (44.16%) belonged to medium size of family (5 to 8 members), followed by 34.16 percent respondents had large size of family (>8 members). Out of the total 120 tribal farmers, 25.83 percent respondents had low social participation; followed by 40.84 percent respondents had medium social participation. 41.67 percent respondents were marginal farmers, followed by 27.5 percent had small size of land holding, 15.83 percent respondents were from

Table-1 Socio-Economic profile of respondents

SN	Traits	Category	Frequency	Percentage	Mean	SD
1	Age	Young age (Below 35 years)	38	31.67		
		Middle age (35 to 50 years)	58	48.33		
		Old age (Above 50 years)	24	20		
2	Education	Illiterate	15	12.5		
		Primary school	38	31.67		
		Middle school	29	24.17		
		High School	25	20.83		
		Above high school	13	10.83		
3	Family Size	Small (<5 members)	26	21.67		
		Medium (5 to 8 members)	53	44.16		
		Large (>8 members)	41	34.17		
4	Social Participation	Low (up to 4 score)	31	25.83		
		Medium (5 to 9 score)	49	40.84		
		High (Above 9 score)	40	33.33		
5	Annual Income	Low(Up to Rs 50,000/-)	30	25		
		Medium (Rs. 50,001 to 1,00,000/-)	68	56.67		
		High (Above Rs. 1,00,000)	22	18.33		
6	Land Holding	Marginal farmers (< 1ha.)	50	41.67		
		Small farmers (1-2ha.)	33	27.5		
		Medium farmers (2.1- 5 ha.)	19	15.83		
		Large farmers (> 5 ha.)	18	15		
7	Credit Availability	Poor credit availability	43	35.84		
		Moderate credit availability	56	46.66		
		Good credit availability	21	17.5		
8	Occupation	Agriculture (1score)	31	25.84		
		Agriculture+ business (2 score)	69	57.5		
		Agriculture+ business +service/other (3 score)	20	16.66		
9	Source of Information	Low(< 1.4 score)	23	19.17	2.1	0.7
		Medium (between 1.4 to 2.8)	68	56.67		
		High(> 2.8)	29	24.16		
10	Material Possession	Low(< 1.26 score)	32	26.67	1.98	0.72
		Medium (between 1.26 to 2.70)	59	49.17		
		High(> 2.70)	29	24.16		
11	Extension Contact	Low (below 3 times in a season)	22	18.34		
		Medium (3 to 6 times in a season)	66	55		
		High(above 6 times in a season)	32	26.66		
12	Extension Participation	Low Extension participation	35	29.17		
		Medium Extension participation	57	47.5		
		High Extension participation	28	23.33		
13	Innovativeness	Low(< 1.288 score)	32	26.67	2.06	0.77
		Medium (between 1.288 to 2.828)	49	40.83		
		High(> 2.828)	39	32.5		
14	Distribution of respondents according to their knowledge	Low (< 23.064)	14	11.67	26	2.936
		Medium (23.064–28.936)	80	66.67		
		High (> 28.936)	26	21.66		

medium category, and 15.00 percent were in large category. Majority 56.67 percent respondents were having medium annual income while 25 percent of the respondents had low level annual income and 18.33 percent had high annual income. 46.66 percent respondents were in medium credit availability category, while 17.5 percent of the respondents were high level credit availability. The data showed that 57.50 percent of the respondents engaged in agriculture followed by 25.84 percent of the respondents engaged in agriculture and only 16.66 percent respondents engaged in agriculture+ business +service/other. Higher percentage of respondents (56.67%) was found in the medium Source of information category followed by 19.17 percent in the low category. It is apparent from the [Table-1] that majority (49.17%) of the tribal farmers possessed medium level of material possession, while 26.67 percent possessed low medium level of material possession.

It is evident from the [Table-1] that the majority 55.00 percent of respondents were from medium category of extension contact, while 18.34 percent of respondents were in low category of extension contact. It shows that out of total 120 respondent maximum 47.5 % respondent were found to be in the medium extension participation category, while 23.33 % respondent were in the high extension participation category. Majority of the respondent's 40.83 percent were in medium innovativeness category followed by 26.67 percent in low category and only 32.5 percent in high category of Innovativeness. As regard to the knowledge

of eco-friendly practices, majority (66.67%) of the respondents had medium, 21.66 percent high and 11.67 percent low level of knowledge about eco-friendly practices. Adequate knowledge of any improved practice is a pre-requisite for its adoption. Research studies established that knowledge of an innovation would lead to its eventual adoption. The result expressed by the respondents regarding knowledge about eco-friendly practices was medium.

#### Knowledge about eco-friendly practices

Knowledge is referred to the amount of information understood/ possessed by farmers about the environmental hazards (ill-effects of agricultural chemicals) and eco-friendly practices.

Information regarding the different aspects of environmental hazards (ill-effects of chemicals like their effect on human health, toxicity to animals, hazards to environment, non-target organisms, resistance developed by pests etc.) and eco-friendly practices (Integrated Pest Management and Integrated Nutrient Management) were collected from good number of relevant literature, books and consulting experts.

It is logical to derive from the above discussion that practices, which are complex and difficult to remember, are least known to farmers, on the other hand the practices which are simple and are being practices by forefathers are known to most of the farmers.

Table-2 Knowledge of farmers about eco-friendly practices

Practices	Knowledge level	
	Frequency	Percent
<b>Cultural control</b>		
Summer deep ploughing	120	100
Growing mustard/ marigold/ Rape seed as trap crop	77	64.17
Crop rotation with Agriculture crops	99	82.5
Intercrops in Agriculture	47	39.17
Seed treatment with chemicals	90	75
Disease resistant varieties/ hybrids in Agriculture crops	83	69.17
<b>Mechanical control</b>		
Hand picking of larvae	108	90
Monitoring of pest	120	100
Uprooting alternate host plants	56	46.67
Use of pheromone traps	12	10
Use of light traps	38	31.67
<b>Biological pest control</b>		
Conservation and encouraging of predators	7	5.83
Conservation and encouraging of parasitic wasps	5	4.17
Use of NPV and concentration of spray	41	34.17
Introduction of bio-control agents	8	6.67
<b>Use of bio-pesticides</b>		
Knowledge about neem seed kernel extract	17	59.17
Preparation of neem seed kernel extract	53	44.17
Concentration of neem seed kernel extract	57	47.5
Frequency of spraying neem seed kernel extract	61	50.83
<b>Application of organic manures</b>		
Farmyard manure/ green manure/ vermi compost	120	100
Press mud/ seed cake	58	48.33
<b>Use of inorganic fertilizers</b>		
Application of recommended dose	102	85
Time of application	112	93.33
Method of application	120	100

### Adoption of eco-friendly technologies by farmers

Table-3 Distribution of farmers according to their adoption behaviour of eco-friendly technologies

SN	Adoption category	Respondents (n=120)	
		Frequency	Percent
1	Low (< 19.368)	10	8.34
2	Medium (19.368 -25.312)	90	75
3	High (> 25.312)	20	16.66
Total		120	100
Mean		22.34	
SD		2.972	

It was observed from the data presented in [Table-3] that majority (75%) of the respondents belonged to medium adoption category, followed by, 8.34 percent of the respondents had low adoption and only 16.66 percent of the respondents had high adoption of eco-friendly technologies, respectively.

The plausible reason for medium adoption of eco-friendly technologies might be that it is relatively a new concept to many farmers and still in the stage of acceptance by farmers and hence they might have felt it was complex practice. This implies that farmers need to be educated regarding benefits and advantages of eco-friendly technologies for their adoption. Thus, it could be inferred that technologies involving low/no cost were adopted by majority of the respondents. Whereas, the technology involving knowledge, skill, high cost and inadequate availability of input were found to be adopted by relatively lesser proportion of the respondents.

### Extent of adoption of integrated pest management practices by farmers

In case of cultural practices, high majority of 91.67 percent of the farmers adopted deep ploughing in summer which is an important method of exposing the early stages of pest to sun for natural destruction and making the soil to a fine tilth for increasing the soil fertility and for good germination of seeds. Crop rotation in agriculture was also followed by 83.33 percent of the respondents. In case of practices such as, use of pest and disease resistant varieties, seed treatment with bio-fertilizers, trap cropping and use of intercropping 35.00, 15.00, 12.50 and 05.83 percent of the respondents, respectively were found in full adoption category and only 9.17 percent of the respondents were found in partial adoption

of trap cropping. About 44.17 percent of respondents fully adopted the practices like uprooting, alternate host plants, while, 41.67 and 40.00 percent of them were found in partially adoption category in case of monitoring of pests and collection and destruction of affected plant parts and shoots, respectively. Cent percent of the respondents were found in non adoption category regarding practices such as conservation and encouraging predators, parasitic wasps and introduction of bio-control agents. This might be due to farmer's resorted to indiscriminate use of insecticides for immediate and effective control. In case of bio-pesticides, majority of the respondents were found in non adoption category regarding use of neem seed kernel extract for worms and white flies (58.33%), use of neem cake to control nematodes/ root diseases (79.16%), use of cow dung slurry (65.83%) and application of ash (68.33%). It is noticed that cent percent of the respondents had fully adopted the practices like use of hand/ mechanical weeding in standing crop closely followed by keeping bunds free from weeds (91.67%).

### Extent of adoption of integrated nutrient management practices by farmer

About 66.67 percent of the respondents had partially adopted farm yard manure application, about 31.67 and 16.66 percent of the respondents had adopted crop rotation and inter cropping practices in agriculture. 91.67, 80.00 and 54.17 percent of the respondents never adopted the intercropping practices like maintaining of optimum soil moisture to avoid leaching and mobility of nutrients, incorporation of crop residues and timely weeding, respectively. In case of application of natural resources, only 08.33 percent of the respondents had fully adopted the practice of using tank silt/ forest litter (leaves) to their land, while, 85.84 percent of them did not apply. Majority of the respondents (70.00%) had not applied any bio-fertilizer for growing agriculture. In case of application of inorganic manures, higher percentage of the respondents partially adopted the practices like splitting dose of application (58.33%) and use of recommended dose of fertilizer (43.33%). While, 61.67 percent of them followed right method of application.

### Correlation studies between personal & socio-economic traits of tribal farmers with their knowledge

Pearson's coefficient of correlation was worked out to determine the relationship between farmer's background variables namely, age, education, family size, social participation, size of land holding, annual income, credit availability, irrigation availability, source of information, occupation, material possession, extension contact, extension participation, and innovativeness with their knowledge and adoption of eco-friendly practices and their estimates are presented in Table Table-4 Relationship between personal & socio-economic traits of tribal farmers with their knowledge about eco-friendly practices

Code no.	Characteristics	Correlation coefficient (r)
X <sub>1</sub>	Age	0.040 NS
X <sub>2</sub>	Education	0.494**
X <sub>3</sub>	Family size	0.090 NS
X <sub>4</sub>	Social participation	0.279**
X <sub>5</sub>	Size of land holding	0.247**
X <sub>6</sub>	Annual income	0.235**
X <sub>7</sub>	Credit availability	0.293**
X <sub>8</sub>	Occupation	0.297**
X <sub>9</sub>	Source of information	0.330**
X <sub>10</sub>	Material possession	0.236**
X <sub>11</sub>	Extension contact	0.539**
X <sub>12</sub>	Extension participation	0.475**
X <sub>13</sub>	Innovativeness	0.367**

\* Significant at p= 0.05, \*\* Significant at p = 0.01, NS -Non Significant

### Correlation studies between personal & socio-economic traits tribal farmers with their adoption behaviour

Variables like education, social participation, credit availability, extension participation, extension contact and innovativeness were positively and significantly correlated with adoption of eco-friendly practices at 1 percent level of significance. The variables like social participation, size of land holding, annual income, occupation, source of information, material possession was positively and significantly correlated with adoption of eco-friendly practices at 5 percent level of significance.

The variables like age and size of family were non-significantly correlated with adoption regarding eco-friendly practices.

Table-5 Relationship between personal, socio-economic traits of tribal farmers with their adoption of eco-friendly technologies

Code no.	Characteristics	Correlation coefficient (r)
X <sub>1</sub>	Age	0.031 NS
X <sub>2</sub>	Education	0.342**
X <sub>3</sub>	Family size	0.028 NS
X <sub>4</sub>	Social participation	0.232**
X <sub>5</sub>	Size of land holding	0.212*
X <sub>6</sub>	Annual income	0.203*
X <sub>7</sub>	Credit availability	0.225**
X <sub>8</sub>	Occupation	0.217*
X <sub>9</sub>	Source of information	0.210*
X <sub>10</sub>	Material possession	0.202*
X <sub>11</sub>	Extension contact	0.400**
X <sub>12</sub>	Extension participation	0.315**
X <sub>13</sub>	Innovativeness	0.233**

\* Significant at  $p = 0.05$ , \*\* Significant at  $p = 0.01$ , NS- Non Significant

### Measures to minimize the ill effects of agrochemicals

Table-6 Suggestive measure to minimise the ill effect of agrochemicals as perceived by farmers

Suggestions made	Frequency	Percent
Making available pest resistant varieties	105	87.50
Organizing training on eco-friendly practices	90	75.00
Encouraging farmers to grow organic Agriculture crops through subsidies, technical guidance etc.	83	69.17
Ensure strict quality control measures for pesticides	79	65.83
Use of bio-pesticides and bio-fertilizers must be increases	65	54.17
Use of bio-control agents in control of pests must be increased	59	49.17
Give premium price for organically growing Agriculture	42	35.00
Educate public and farmers about the environmental issues	56	46.67
Establishing a network of farmers adopting organic farming	35	29.17
Introducing environmental education at the secondary level	38	31.67

Majority of the respondents suggested making availability of pest resistant varieties (87.50%), followed by three-fourth of respondents said organizing training on eco-friendly practices (75.00%). Nearly two-third of respondents suggested encouraging farmers to grow organic Agriculture through subsidies, technical support etc. (69.17%) and ensure quality control measures for pesticides (65.83%). Use of bio-pesticides and bio-fertilizers must be increased was suggested by 54.17 percent of the respondents.

### Conclusion

The study revealed that variables like education, social participation, size of land holding, annual income, credit availability, occupation, source of information, material possession, extension contact, extension participation and innovativeness were positively and significantly correlated with knowledge about eco-friendly practices at 1 percent level of significance and education, social participation, credit availability, extension participation, extension contact and innovativeness were positively and significantly correlated with adoption of eco-friendly practices at 1 percent level of significance.

**Application of research:** Majority of the respondents suggested making availability of pest resistant varieties, followed by three-fourth of respondents said organizing training on eco-friendly practices to minimise the ill effect of agrochemicals as perceived by farmers.

**Research Category:** Agriculture Extension Education

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**Study area / Sample Collection:** Betul district of M.P.

**Cultivar / Variety / Breed name:** Nil

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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