

## A Geographical Analysis of Organic Fertilizers Application in Shirpur Tehsil of Maharashtra (MS), India

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### Abstract

Dhule district of Maharashtra state comprises four tehsils viz. Dhule, Shirpur, Sakri, and Shindkheda. The soil quality and productivity are being affected badly in the southern parts of Shirpur tehsil. It is necessary to evaluate the adverse impacts of chemical fertilizers in the Shirpur tehsil. The present study is organized in order to find out the farmers attitude towards organic fertilizer application in the Shirpur. 598 farmers from 12 villages of four tehsils were questioned for their perspective towards organic and chemical fertilizer application in the farm. The research outcome reveals different attitudes for organic fertilizer application and benefits in different groups i.e. education levels of farmers, farm size, and villages. The large farm size farmers and educated farmers are more in numbers compared to small size farmers and illiterate farmers. Therefore an attempt has been made to find out the attitude of farmers towards utilization of organic fertilizer in the farms for sustainable farming.

### Keywords:

Agriculture;  
Fertilizers;  
Organic;  
Productivity;  
Soil;  
farm size etc.

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### 1. Introduction

The soil quality and productivity are being badly affected by the overconsumption of chemical fertilizers in the southern part of Shirpur tehsil. The soil and environment protection are one of the basic principles of the organic farming and it advocates the natural ways of improvement in the environment. In the organic farming the synthetic fertilizers, herbicides, and medicines are hardly applied [12]. The concept of organic agriculture builds on the efficient use of locally available resources, and the use of technologies like soil fertility management, the closing of nutrient cycles, control of pests and diseases by means of natural antagonists.

From the mixed farming point of view, it is necessary to investigate the opportunities and limitations of stockless organic farming with regard to both agro-ecological, economic stability, and sustainability of farming systems [2]. The mixed farming concept opens up new ways of achieving sustainable development [11]. The share of corn, sunflower, and rape in crop mix the investment in precision farming is paid off after six years under Hungarian conditions [4]. The implementation of precision farming promotes the rational application of chemicals but requires capital investment. According to K. Takács-György, the reduction of

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chemical use and environmental load in agriculture is increasingly desired. Developed countries promote the minimum use of pesticides and farmers have to change traditional practices accordingly. Organic agriculture has the potential to improve the soil fertility, biodiversity conservation, and sustainable agricultural production. It also improves agronomic and economic performance to yield more stable tropical ecosystems, especially in risk-prone tropical ecosystems. Organic farming is having good potential to achieve better food quality and food security [5]. Chemical farming or conventional agriculture often creates an unstable ecosystem in which the potential for maximum yield is inevitably associated with risks due to ecosystem instability [10].

Farmers' groups are increasingly adopting organic techniques as a method of improving productivity and food security in these systems. However, no systematic attempt has hitherto been made to track the extent to which these approaches are being employed, or their effectiveness compared to other approaches, in meeting economic, social and environmental objectives [8], [11]. An important issue with the development of organic farming is tillage, tillage intensity in particular. Despite the suggestions of mentors of the organic farming theory and of farmers associations to reduce tillage intensity, the majority of organic farmers still apply deep inversion tillage with a plough [3],[6], [9].

#### 1.1 Location and Extent of Study Region

Shirpur tehsil is located in Dhule district of the northern part of Maharashtra state. Dhule district comprises four tehsils. The Shirpur tehsil has covered an area of 804.02 sq. km. Shirpur tehsil is lying between  $21^{\circ}11'$  north and  $21^{\circ}38'$  north latitudes and  $74^{\circ}41'$  east and  $75^{\circ}11'$  east longitudes.

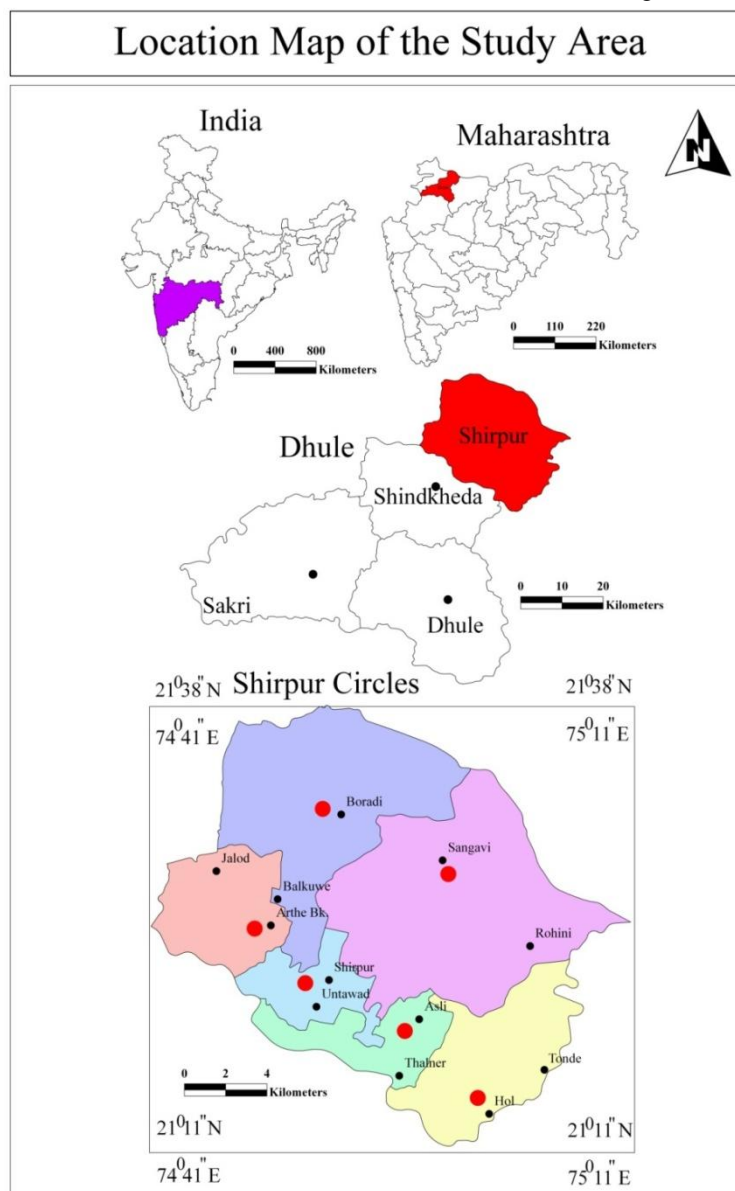


Figure 1 Location Map

## 2. Research Method

### 2.1 Source of Data

The relevant primary data are obtained from the respondents (farmers) by administering a well-structured interview schedule. The researcher has made a visit to each and every household and relevant data are obtained from them by establishing a good rapport with them.

The interview questionnaire covers topics such as irrigation, use of inorganic, organic inputs, attitudes of the farmers and their awareness on sustainable development practices. In addition, Focus Group Discussions was held with the farmers to gain insights and obtain more qualitative data. Official statistical data were obtained through secondary sources such as official records and census reports.

### 2.2 Data Analysis

The important independent variable for the analysis of the data is farm size, respondent's education level and size of the village. The collected data are classified and tabulated. The chi-square test is applied to examine the association between socioeconomic status of farmers and their awareness and adoption of organic farming practices. Further percentages and averages are applied depending on the requirement of the situation.

### 2.3 Methodology

The primary data was collected through questionnaire and interactions with farmers (respondents) of four villages in Shirpur tehsil. The data was processed for estimation of organic fertilizer application level in the study area. Then Chi-square test has been used to find out the correlation of organic fertilizers application to farm size and education level of farmers.

### 2.4 Sampling Locations

Shirpur tehsil of Dhule district is focused on the present study. The tehsil is predominantly an agrarian region. Agricultural is done in all villages of the tehsil. Shirpur tehsil has six circles Arthe, Shirpur, Thalner, and Holnanthe are agriculturally developed in terms of yield potential and irrigational facilities. Boradi and Sangavi are agriculturally backward because most of the areas of it consist by Satpura mountain ranges.

The size of the study sample is limited to two villages of each circle the tehsil and ten percent of the farmers from the sample villages. The study sample villages and the respondents (farmers) were drawn by adopting Multi-Stage Stratified Random Sampling Technique to represent marginal, small, medium and large farmers. Accordingly, a survey of twelve villages in Shirpur tahsil named Boradi, Balkuwe, Sangavi, Rohini, Arthe Bk, Jalod, Shirpur, Untawad, Thalner, Asli, Hol, and Tonde was undertaken and a total of 598 farmers were studied.

### 2.5 Sampling Procedure

In the first phase, the researcher has selected one developed village one backward village from each circle of the study region.

According to the Table. 1 in the second phase is the selection of sample villages from each circle. There are six blocks or revenue circles in Shirpur tehsil. Shirpur tehsil has 147 revenue villages. Thus, a total of 12 villages are selected from six blocks representing 10% of the farmers in each village.

Tables and Figures are presented center, as shown below and cited in the manuscript.

Table 1. In the third stage involves the selection of farmers from study villages.

Sr. No.	Circle / Block	Sampling Village	No. of farmers	10 % Selected Farmers
01	Boradi	Boradi	611	61
		Balkuwe	528	53
02	Sangavi	Sangavi	749	75
		Rohini	688	69
03	Arthe	Arthe	376	38
		Jalod	274	27
04	Shirpur	Shirpur	1034	103
		Untawad	236	24
05	Thalner	Thalner	699	70
		Asli	356	36
06	Holnanthe	Hol	165	17
		Tonde	251	25
<b>Total</b>			<b>5967</b>	<b>598</b>

Source: Collected and Tabulated by Researcher

From each village 10% of the farmers are selected as sample, thus totally 598 farmers are selected from six blocks of Shirpur tehsil.

### 3. Results and Analysis

#### 3.1 Application Level of Organic Fertilizers

The application of organic inputs (fertilizers) is discussed in relation to use of green manure, compost, ash and animal dung. Data presented in Table. 2 indicate the farm size wise respondent's application of organic fertilizers.

It is noticed that out of the total 598 respondents 11.37% farmers used bio-fertilizers for cultivation. More than 70 % of the respondents of Arthe, Thalner, Hol and Tonde Village apply cow dung and ash as bio-fertilizer for cultivation. Out of 598 respondents, 23.58 % of them use chemical fertilizer for cultivation. 65.05% farmers in the Shirpur tehsil are utilizing both bio and chemical fertilizers. This level of application is prominent among the farmers of Shirpur, Boradi, Hol, Asli, Jalod and Balkuwe villages.

Table 2. Village wise number of consumers of organic fertilizers and chemical fertilizer

Villages	Bio-fertilizers	Chemical Fertilizers	Both	Total
Boradi	4 (6.56)	17 (27.87)	40 (65.57)	61
Balkuwe	5 (9.43)	15 (28.30)	33 (62.27)	53
Sangavi	11 (14.67)	16 (21.33)	48 (64.00)	75
Rohini	11 (15.94)	14 (20.29)	44 (63.77)	69
Arthe	5 (13.16)	6 (15.79)	27 (71.05)	38
Jalod	3 (11.11)	7 (25.93)	17 (62.96)	27
Shirpur	11 (10.68)	31 (30.10)	61 (59.22)	103
Untawad	3 (12.50)	5 (20.83)	16 (66.67)	24
Thalner	6 (8.57)	14 (20.00)	50 (71.43)	70
Asli	5 (13.89)	8 (22.22)	23 (63.89)	36
Hol	1 (5.88)	4 (23.53)	12 (70.59)	17
Tonde	3 (12.00)	4 (16.00)	18 (72.00)	25
<b>Total</b>	<b>68</b> <b>(11.37)</b>	<b>141</b> <b>(23.58)</b>	<b>389</b> <b>(65.05)</b>	<b>598</b>

Source: Collected and Tabulated by Researcher

Chi square value = 12\*

df =22

\* = Significant at 5 percent level= 33.92

The chi-square test is applied for to verify the significance. The computed chi-square value is 12 which is smaller than its tabulated value at 5 percent (33.92) level of significance. Hence, there is a significant difference among the farmers of different villages with respect to their choice of crop cultivation. It implies a homogeneous trend among the farmers of the study villages. Most of the farmers in Shirpur tahsil used organic as well as chemical fertilizers because of bio fertilizers like oil cake, green manure, compost, ashes and animal dung easily available in villages.

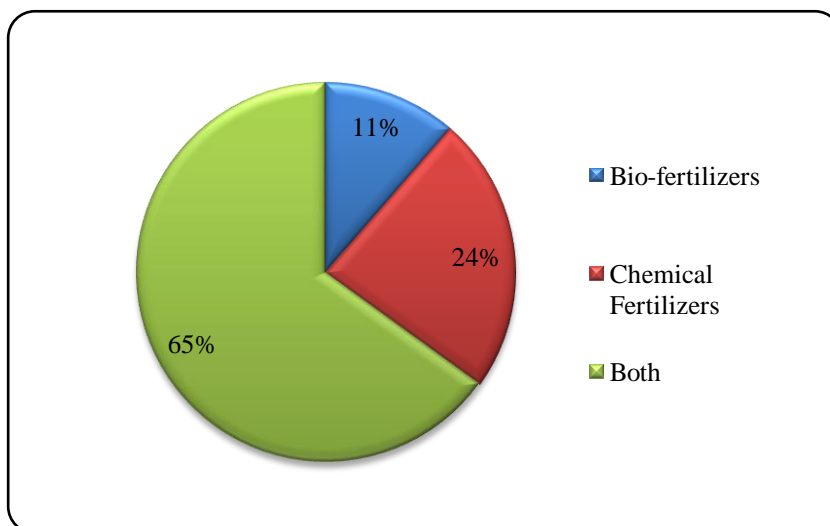


Figure 2 Village wise numbers of consumers of organic fertilizer and chemical fertilizer

Moreover, 65.05 percent of the farmers apply bio-fertilizer as well as chemical fertilizers for cultivation. This level of mixed application of fertilizers is reported by more than a half of the respondents of all sampled villages.

Table 3. Farm size wise Respondents' Application Level of Organic Fertilizers

Farm Size	Bio-fertilizers	Chemical Fertilizers	Both	Total
Marginal	31 (40.79)	18 (23.68)	27 (35.53)	76
Small	25 (9.47)	87 (32.95)	152 (57.58)	264
Medium	8 (4.23)	27 (14.29)	154 (81.48)	189
Large	4 (5.80)	9 (13.04)	56 (81.16)	69
<b>Total</b>	<b>68</b> <b>(11.37)</b>	<b>141</b> <b>(23.58)</b>	<b>389</b> <b>(65.05)</b>	<b>598</b>

Source: Collected and Tabulated by Researcher

Chi-square value = 112

df = 6

\* = Significant at 1 percent level = 16.81

Table 3 presents data on the farm size wise respondents' application level of bio-fertilizers for crop cultivation. A half of the large and medium farmers (50%) apply mixed fertilizers for cultivation. A more than half of the small farmers (57.58%) also used mix fertilizer and 40.79 % of marginal farmers giving preference to the use of biofertilizer.

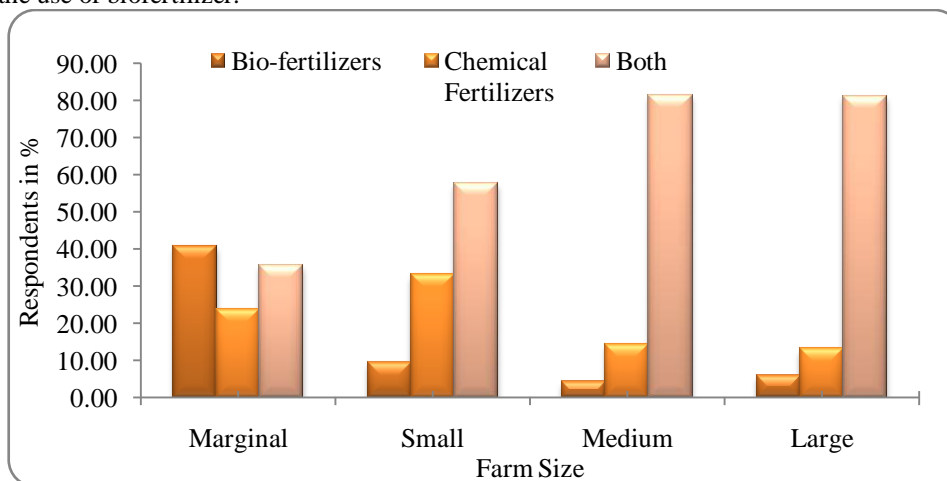


Figure 3 Farm size wise Respondents' Application Level of Organic Fertilizers

The data analysis from this study shows, the bio-fertilizers are mostly used by the medium and small-scale farmers and the multiple fertilizers is the applied by the medium and large farmers in the study region.

The chi-square test reveals positive association. The computed chi-square value is 112 which is greater than the tabulated value (16.81) at 1 percent level of significance. Hence, the difference in farm size is statistically significant with respect to farmers' application level of cow dung and ash as bio-fertilizer. A similar result has been observed with respect to the application of oil cake as bio-fertilizer and also green manure and compost as bio-fertilizer.

The marginal farmers apply more quantity of cow dung and ash as bio-fertilizer per hectare cropped area than others. This is due to easy availability in their farms as bio-waste. The medium farmers and large farmers apply more quantity of oil cake and green manure as bio-fertilizer compared to others.

Table 4. Education wise Respondents Application Level of Organic Fertilizers

Education	Bio-fertilizers	Chemical Fertilizers	Both	Total
Illiterate	27 (17.76)	49 (32.24)	76 (50.00)	152
Primary	20 (11.05)	50 (27.62)	111 (61.33)	181
Secondary	10 (5.35)	26 (13.90)	151 (80.75)	187
Degree	11 (14.10)	16 (20.51)	51 (65.38)	78
<b>Total</b>	<b>68</b> <b>(11.37)</b>	<b>141</b> <b>(23.58)</b>	<b>389</b> <b>(65.05)</b>	<b>598</b>

Source: Collected and Tabulated by Researcher

Chi-square value = 39\*

df = 6

\* = Significant at 1 percent level= 16.81

The computed chi-square value for table 4 is 39 which is greater than its tabulated value (16.81) at 1 percent level of significance. Hence, the difference in educational status is statistically identified as significant with respect to farmers' choice of fertilizers selection.

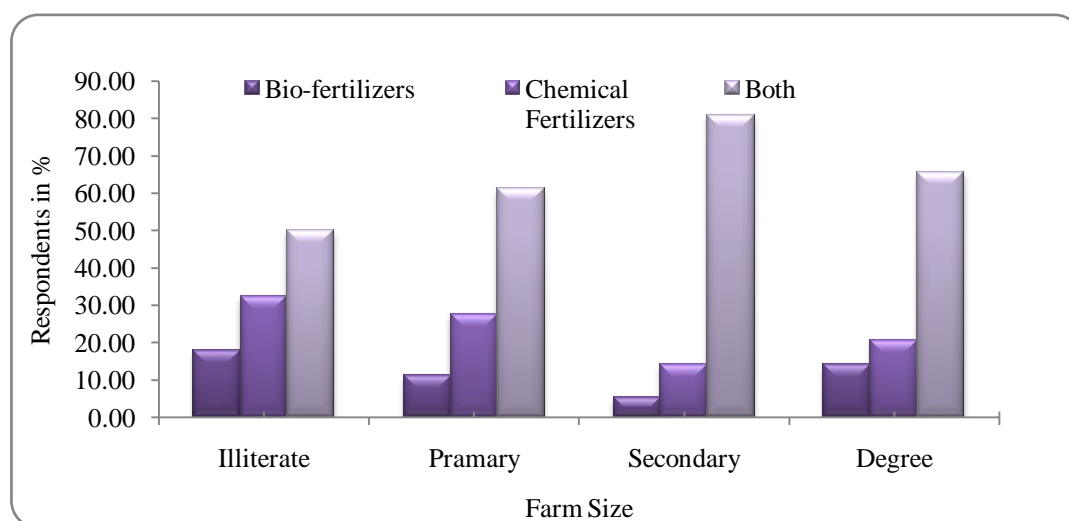


Figure 4 Education wise Respondents Application Level of Organic Fertilizers

Table 5. Village Wise Respondents' Views on Advantages of Bio-fertilizers

Village	Advantages of Bio-fertilizers				Total
	Production of Nutritious food	Free from disease	Eco-friendly method	All	
Boradi	23 (52.27)	3 (6.82)	4 (9.09)	14 (31.82)	44
Balkuwe	16 (42.11)	3 (7.89)	4 (10.53)	15 (39.47)	38
Sangavi	25 (42.37)	8 (13.57)	5 (8.47)	21 (35.59)	59
Rohini	25 (45.45)	4 (7.28)	3 (5.45)	23 (41.82)	55
Arthe	16 (50.00)	3 (9.38)	4 (12.50)	9 (28.12)	32
Jalod	11 (55.00)	2 (10.00)	1 (5.00)	6 (30.00)	20
Shirpur	25 (34.72)	10 (13.89)	8 (11.11)	29 (40.28)	72
Untawad	12 (63.16)	1 (5.26)	2 (10.53)	4 (21.05)	19
Thalner	17 (30.36)	7 (12.50)	9 (16.07)	23 (41.07)	56
Asli	13 (46.43)	3 (10.71)	2 (7.14)	10 (35.72)	28
Hol	6 (46.15)	2 (15.38)	1 (7.69)	4 (30.77)	13
Tonde	11 (52.38)	3 (14.29)	2 (9.52)	5 (23.81)	21
<b>Total</b>	<b>200</b> <b>(43.76)</b>	<b>49</b> <b>(10.72)</b>	<b>45</b> <b>(9.85)</b>	<b>163</b> <b>(35.67)</b>	<b>457</b>

Source: Collected and Tabulated by Researcher

Chi-square value = 20\*

df = 33

\* = Significant at 1 percent level = 16.81

The degree of freedom is more than 30, therefore, the significance of chi-square value is 20 which is greater than the calculated value (16.81) 1 percent level of significance. Hence, the difference among the villages is statistically identified as significant with respect to respondents' views on advantages of the use of bio-fertilizers for cultivation and maintenance the fertility of the land.

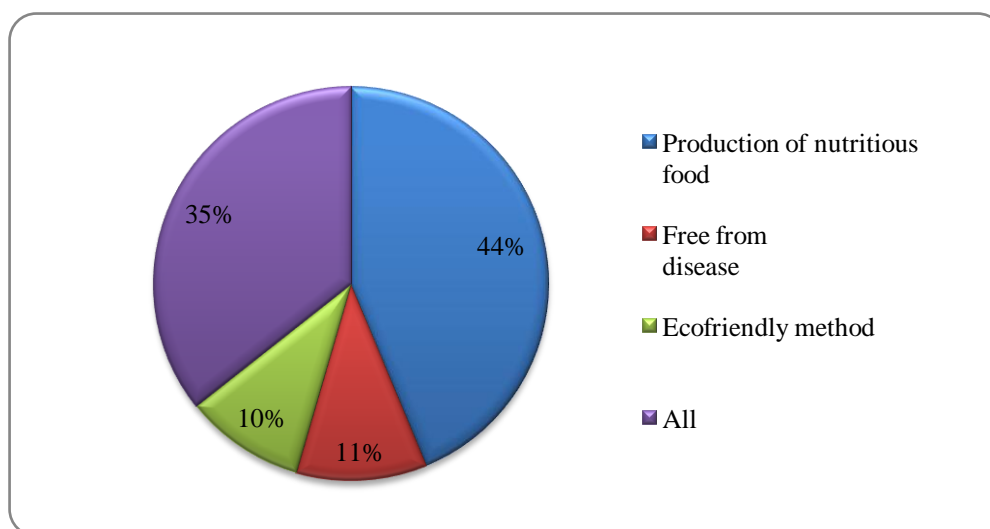


Figure 5 Village Wise Respondents' Views on Advantages of Bio-fertilizers



### 3.2 Views on Bio-fertilizers

Data presented in Table 5 reveals the village-wise respondents' views on advantages of applying bio-fertilizers. Out of total respondents, 457 respondents having a positive view on advantages of bio-fertilizer application for crop cultivation. Out of total respondents (457), some are used only organic fertilizers for cultivation while some are used mixed fertilizers (organic and chemical).

Out of the total 457 respondents, 43.76 % of them hold the view that through the application of bio-fertilizers, they can produce food with high nutritious value. More than 52 % respondents from Untawad, Jalod, Boradi, and Tonde believe that the application of bio-fertilizer leads high crop yield with good nutrition values.

10.72 % of total and 15.38 % respondents of the Hol village think that bio-fertilizers can produce disease-free food.

9.85 % of the total and more than 11% of Thalner, Arthe and Shirpur villagers feel the advantage of applying bio-fertilizers in terms of eco-friendly method of cultivation than other advantages.

Moreover, 35.67% of the respondents believe the multiple advantages of applying bio-fertilizers, such as the production of production of disease-free food, food raised through bio-fertilizers give more strength and stamina to consumers. The majority of the respondents of Rohini village (41.52%) Thalner village (41.07%) Shirpur village (40.28%), Balkuwe village (39.47%) and Asli village (35.72%) prefer all multiple advantages of applying bio-fertilizers to raise their crops.

Table 6. Farm size wise Respondents' Views on Advantages of Bio-fertilizers

Farm Size	Advantages of Bio-fertilizers				Total
	Production of nutritious food	Free from disease	Eco-friendly method	All	
Marginal	41 (70.69)	4 (6.90)	7 (12.07)	6 (10.34)	58
Small	91 (51.41)	32 (18.08)	15 (8.47)	39 (22.03)	177
Medium	51 (31.48)	8 (4.94)	16 (9.88)	87 (53.70)	162
Large	17 (28.33)	5 (8.33)	7 (11.67)	31 (51.67)	60
<b>Total</b>	<b>200</b> <b>(43.76)</b>	<b>49</b> <b>(10.72)</b>	<b>45</b> <b>(9.85)</b>	<b>163</b> <b>(35.67)</b>	<b>457</b>

Source: Collected and Tabulated by Researcher

Chi-square value = 75\*

df = 9

= Significant at 1 percent level=21.66

Data presented in Table 6 indicates the farm size wise respondents views on advantages of applying bio-fertilizers to raise their crops. It could be noted that a considerable majority of the marginal farmers (70.69 %) prefer the advantage of applying bio-fertilizers in terms of possession more strength and stamina by consuming food raised through bio-fertilizers and 18.08% of the small farmers say it as the production of disease-free food. A considerable majority of the medium farmers (53.70 %) and large farmers (51.67 %) opine the multiple advantages of applying bio-fertilizer to raise their crops, such as production of nutritious food, disease-free food, food raised through bio-fertilizers gives more strength and stamina to consuming human beings and animals and it is an eco-friendly method.



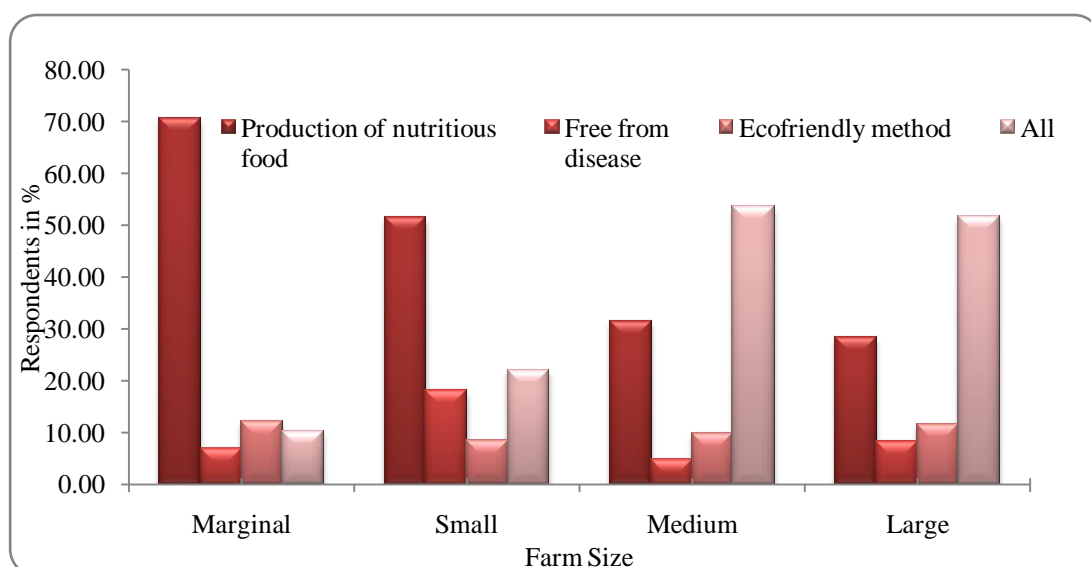


Figure 5 Farm size wise Respondents' Views on Advantages of Bio-fertilizers

The computed chi-square value for table 6 is 75 which is greater than its tabulated value at 1 percent (21.66) level of significance. Hence, the difference in farm size is statistically found to be significant with respect to respondents' views on advantages of applying bio-fertilizers to raise their crops. A similar result has been observed with respect to the application of chemical fertilizers. It is obvious from the above analysis that the medium and large farmers mainly refer the multiple advantages of applying bio-fertilizers and chemical fertilizers. Whereas the majority of the small farmers and marginal farmers highlight the individual advantage of applying bio-fertilizers and also chemical fertilizers.

Table 7. Education-wise Respondents' Views on Advantages of Bio-fertilizers

Education	Advantages of Bio-fertilizers				Total
	Production of Nutritious food	Free from disease	Eco-friendly method	All	
Illiterate	73 (70.87)	9 (8.74)	7 (6.80)	14 (13.59)	103
Primary	81 (61.83)	19 (14.50)	6 (4.58)	25 (19.08)	131
Secondary	28 (17.39)	17 (10.56)	26 (16.15)	90 (55.90)	161
Degree	18 (29.03)	4 (6.45)	6 (9.68)	34 (54.84)	62
<b>Total</b>	<b>200</b> <b>(43.76)</b>	<b>49</b> <b>(10.72)</b>	<b>45</b> <b>(9.85)</b>	<b>163</b> <b>(35.67)</b>	<b>457</b>

Source: Collected and Tabulated by Researcher

Chi-square value = 199\*

df = 9

\* = Significant at 1 percent level= 21.66

Table 7 presents data on the education level and respondents' views on advantages of applying bio-fertilizers and chemical fertilizers. It is noted that the majority of the illiterate respondents prefer the bio-fertilizers for advantages of high-quality food for humans and animals. According to primary educated respondents group, the bio-fertilized food and crops are more nutritious.

The majority of the (16.15 %) secondary level educated farmers prefer bio-fertilizer due to its eco-friendly nature.

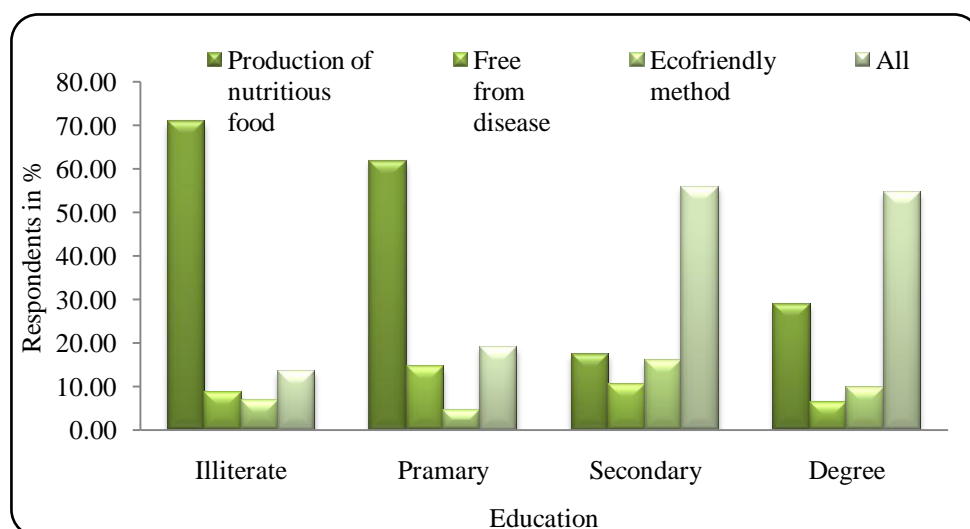


Figure 7 Education-wise Respondents' Views on Advantages of Bio-fertilizers

More than a half of the degree (54.84 %) and secondary (55.90 %) level educated farmers to feel that the multiple advantages of applying bio-fertilizers, such as the production of nutritious food, disease-free food production, food that gives more strength and stamina and as an eco-friendly method.

The computed chi-square value for table 7 is 199 which is greater than its tabulated value at 1 percent level (21.66) of significance. Hence, the difference in educational status is found to be statistically identified as significant with respect to respondents' views on advantages of applying bio-fertilizers to raise their crops. A similar result has been observed with respect to the application of chemical fertilizers.

The above analysis reveals that degree level educated farmers to realize more on multiple advantages of applying bio-fertilizers rather than an individual advantage. It is pointed out that the majority of the illiterate and primary level educated farmers to perceive mainly on the individual advantage of either applying bio-fertilizers or chemical fertilizers to raise the crops.

### 3.3 Discussion

Many researchers have highlighted the importance of the application of bio-fertilizers in cultivation. They have realized the problems associated with the application of chemical fertilizers particularly it affects the health of the soil and human beings. Hence, there is a need to review works in this regard [7]. have pointed out the implications of integrated nutrient management in terms of organic manures, green manures, crop inoculates. They have reported that this type of nutrient management in agriculture reduces pollution and maintains soil productivity and agricultural output [1]. have analyzed the components of the agricultural system and identified the conflict between organic and chemical agriculture. Further, they came to a conclusion that application of composting as the best strategy to increase the agricultural production. Food and fertilizer technology center (1995) has identified the evils of application of weedicides to destroy the weeds in the cropped area. Application of bio-fertilizers good for soil health and better way for deduction of input cost of cultivation. Government and NGO's should be promoted and motivate framers for use of bio-fertilizers.

### 4. Conclusion

From the complete analysis, it can be concluded that there are different attitudes regarding the use of organic fertilizers and benefits of its application according to farm size and education level of farmers. Large farm size farmers and educated farmers used more organic fertilizers compared to small size farmers and illiterate farmers. Some educated large and medium land size holding farmers adopted both fertilizers but small land size holding farmers mostly used chemical fertilizers because they trying for maximum production from a small piece of land. Bio-fertilizers and chemical fertilizers both are highly used by educated medium farm size farmers. The degree level educated farmers are more conscious about multiple advantages of applying bio-fertilizers rather than a single advantage. Small farm size farmers focus on maximum production from available small agricultural land and hence they do not pay any attention to the benefits of bio-fertilizers. The education wise result reveals that the degree level educated farmers are more aware of the multiple advantages of applying bio-fertilizers and the negative impacts of chemical fertilizers. The majority of the illiterate and primary level educated farmers to concentrate mainly on the individual advantage of either bio-fertilizers or chemical fertilizers application.

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