**Exploring the Association of Socio-Economic Factors with Knowledge of Eco-Friendly Farming Practices Among Vegetable Growers in Madhya Pradesh**

**Abstract**

Eco-friendly terms used to describe products and services that have minimal or no negative impact on the environment. Eco-friendly farming focuses on natural food production, avoiding the use of synthetic chemicals and genetically modified organisms. The goal of eco-friendly farming is to ensure zero environmental impact. This study was conducted in the Satna district of Madhya Pradesh, covering three blocks and twelve villages. A total of 240 vegetable farmers were selected for the study. The findings show that the majority of respondents (67.08%) had moderate knowledge of eco-friendly vegetable cultivation practices. The knowledge of various crop management practices was ranked based on their mean scores. Cultural pest management practices had the highest mean score (6.36), indicating strong effectiveness or preference, while seed treatment had the lowest score of 1.87, suggesting it was less favoured or effective compared to the other practices. The study also found that various factors, including age, education, farming experience, and extension participation, were significantly associated with farmers' knowledge of eco-friendly practices.

**Keywords:** Knowledge, association, awareness, Sustainable agriculture, Vegetable,

 Eco-friendly farming.

**1.0 Introduction**

Eco-friendly refers to products and services that are designed to reduce or eliminate harm to the environment. Eco-friendly farming is a method of growing food without using synthetic chemicals or genetically modified organisms (GMOs). The main goal is to work with nature to have no harmful impact on the environment. This approach aims for high crop yields while protecting the environment and the people involved. It reduces the use of synthetic fertilizers, growth regulators, and additives, and instead uses practices like crop rotation, animal manure, and natural pest control to keep the soil healthy and manage pests, diseases, and weeds.

It focuses on recycling waste back into the soil to restore nutrients lost during crop growth, promoting the growth of microorganisms that regulate nutrient release. This process helps maintain soil health by ensuring proper moisture and aeration while supporting fertility through the binding of nutrients into organic compounds. These practices not only contribute to ecosystem preservation but also improve soil fertility and foster long-term agricultural productivity, ensuring a sustainable farming system for the future.

Natural farming is a climate-resilient, low-input agricultural method that focuses on working in harmony with nature to produce healthy food and maintain soil health (Devi et al., 2023). In the natural farming approach, everything in nature is considered valuable and plays a role in the interconnected web of life. Often referred to as "Do Nothing Farming," this philosophy suggests that nature itself performs most of the work. The approach emphasizes low-input farming techniques that avoid synthetic chemical inputs, instead encouraging farmers to use affordable, locally available resources such as mulch, crop covers, symbiotic intercropping, and natural mixtures made from cow dung, cow urine, jaggery, and pulse flour to enhance soil microbial activity (Gupta et al., 2020).

Vegetables have been cultivated in India for thousands of years and have become an important agricultural enterprise both nationally and internationally. In recent years, vegetables have become a vital part of the daily diet due to their nutritional value, providing essential vitamins and minerals. In India, where vegetarianism has long been a cultural practice, the issues of under nutrition and malnutrition can be addressed through a balanced diet that includes vegetables. Vegetables play a crucial role in India's agriculture and nutritional security, offering benefits such as short growth cycles, high yields, nutritional richness, economic viability, and potential for creating employment. Following the Green Revolution, vegetable production in the country has significantly increased.

The widespread use of pesticides in agriculture causes health risks, higher healthcare costs, reduced productivity, and environmental damage. Farmers' perceptions of pesticide residues are important in addressing these issues. This study uses an ordered probit model to analyze the perceptions of 209 vegetable farmers in Punjab, Pakistan. Key factors influencing farmers' views include education, family labour, self-consumed food, health concerns, and involvement in Integrated Pest Management (IPM) training. Farmers' awareness and participation in IPM are the main indicators of their risk perception. (Patel et al., 2024). Developing countries use about 70% of pesticides, while developed countries use 30%. India’s pesticide uses increases by 2 to 5% per year, accounting for around 3% of global pesticide use. Over 67% of pesticides in India are used in agriculture. (Patel et al., 2024).

Few research studies have focused on exploring farmers' knowledge of eco-friendly management practices. To fill this gap, a study was conducted with the following objectives: 1. To assess the knowledge level of eco-friendly management practices among vegetable-growing farmers. 2. To examine the association between socio-economic factors and the knowledge level of these practices.

**2.0 Material and Methods**

The study was conducted in the Maiher, Sohawal, and Amarpatan blocks of Satna district, Madhya Pradesh. Four villages were purposively selected from each block, resulting in a total of twelve villages. A list of farmers who had been cultivating vegetables for three or more consecutive years was prepared with the help of the RHEO and AEO. Using simple random sampling, 20 farmers were selected from each village, making the total sample size 240. A structured interview schedule was created to collect data through personal interviews. Data was collected by interviewing randomly selected farmers in their homes, community spaces, or farms. To assess their knowledge of eco-friendly farming practices, a schedule with 28 vegetable cultivation practices was prepared, based on an extensive literature review and consultations with vegetable experts. Knowledge was measured on a three-point scale: full knowledge (2), partial knowledge (1), and no knowledge (0). The total score for each respondent was calculated by summing the scores, with a possible range from 0 to 56. Based on these scores, farmers were categorized into low, medium, and high adoption groups using the mean and standard deviation. Data analysis was performed using percentage, mean, standard deviation, mean score, and Chi-square tests to draw conclusions. The Chi-square test was used to explore the relationship between socio-economic variables and the knowledge level of eco-friendly management practices among the respondents.

**3.0 Results and Discussion**

An overview of the respondents was provided based on their knowledge level of eco-friendly management practices. This refers to the farmers' understanding of eco-friendly practices, with the farmers being categorized according to the scores they achieved in the knowledge assessment.

 **3.1 Frequency distribution of farmers based on their knowledge of eco-friendly management practices.**

**Table-1** Frequency distribution of farmers based on their knowledge of eco-friendly management practices.

|  |  |  |  |
| --- | --- | --- | --- |
| **SI. No.** | **Category**  | **Frequency** | **Percent** |
| 1. | Low (up to 20) | 43 | 17.92 |
| 2. | Medium (21 to 35) | 161 | 67.08 |
| 3. | High (above 35) | 36 | 15.00 |
|  | **Total** | **240** | **100.00** |
|  | **Mean** | **27.94** |
|  | **Standard deviation** | **7.52** |

Table-1 and Fig.-1 shows that the maximum of respondents, 67.08%, had a medium level of knowledge about vegetable cultivation, followed by 17.92% with a low level of knowledge and 15.00% of the respondents with a high level of knowledge towards vegetable cultivation. Thus, it may be concluded that the majority of vegetable growers had a medium to low level of knowledge about environmentally friendly methods of growing vegetables.

This result matches up with the results of Manjunath et al. (2018), DP Rai et al. (2020), Morya et al. (2020), Singh et al. (2021) and Singh et.al. (2023).

**Fig -1 Distribution of vegetable growers according to their overall knowledge**

 **towards vegetable cultivation.**

**3.2 Knowledge of vegetable growers towards of eco-friendly management practices of vegetable cultivation**

Knowledge is the fact or condition of being familiar with something through experience or association. Since knowledge enabled farmers to fully understand and appreciate the environmentally friendly methods of growing vegetables, it was crucial for the adoption of any innovation. The body of knowledge that the respondents understood and held regarding environmentally friendly methods of growing vegetables was operationalized as knowledge in the current study.

**Table-2** Rank-wise distribution of vegetable growers based on their knowledge level of

 eco-friendly management practices in vegetable cultivation.

|  |  |  |  |
| --- | --- | --- | --- |
| **SI. No.** | **Components** | **Mean score** | **Rank** |
| 1. | Cultural pest management practices | 6.36 | I |
| 2. | Mechanical Pest Management Practices | 2.26 | V |
| 3. | Biological Pest Control | 1.87 | VII |
| 4. | Weed Management Practices | 4.83 | IV |
| 5. | Fertilizer management | 5.77 | II |
| 6. | Irrigation management | 4.89 | III |
| 7, | Seed treatment | 1.96 | VI |
|  | **Overall mean** | **3.99** |  |

Table-2 presents ranking-wise knowledge of various crop management practices based on their mean scores. The highest-ranked practice is Cultural pest management practices, with a mean percent score of 6.36, indicating its strong effectiveness or preference. Following closely is Fertilizer management at 5.77, ranked second. The third rank is held by Irrigation management with a mean percent score of 4.89, while Weed Management Practices comes in fourth at 4.83. Mechanical Pest Management Practices and Seed Treatment rank fifth and sixth, with mean percent scores of 2.26 and 1.96, respectively. Finally, Biological Pest Control ranks seventh with the lowest mean score of 1.87, suggesting it may be less favoured or effective compared to the other practices.

**3.2.1 Cultural Pest Management Practices.**

Deep Ploughing in Summer, 71.25% of respondents were fully aware, while 25% had partial knowledge, and 3.75% were unaware. In contrast, only 6.25% were fully aware of pest and disease-resistant varieties of vegetables, 38.75% had partial knowledge, and 55% were unaware. Regarding trap crops in vegetables, 28.75% had full knowledge, 36.67% were partially knowledgeable, and 34.58% were unaware. Crop rotation was well known, with 64.58% fully aware, 32.5% partially knowledgeable, and only 2.92% unaware. Similarly, 62.92% were fully aware of intercropping, 35.83% had partial knowledge, and just 1.25% were unaware.

**3.2.2 Mechanical Pest Management Practices.**

Uprooting of Alternate Host Plants: A small percentage (5%) were fully aware, 27.5% had partial knowledge, while the majority (67.5%) were unaware. Regarding the collection and destruction of affected plant parts, 51.67% were fully aware, 40.83% had partial knowledge, and 7.5% were unaware. In terms of collecting and destroying egg masses or larvae, only 1.25% were fully aware, 24.58% had partial knowledge, and 74.17% were unaware. Similarly, 1.25% had full knowledge of using pheromone traps, 14.58% had partial knowledge, and 84.17% were unaware.

**3.2.3 Biological Pest Control.**

Only 10% of respondents were fully aware of using NPV/Bt to control larvae, 49.17% had partial knowledge, and 40.83% were unaware. Regarding the practice of using egg parasites and predators in vegetables, none were fully aware, 11.25% had partial knowledge, and 88.75% were unaware. As for spraying neem extract and its formulation, 26.67% had full knowledge, 62.5% had partial knowledge, and 10.83% were unaware.

**3.2.4 Weed Management Practices**

Timely Inter cultivation: 66.25% were fully aware, 24.58% had partial knowledge, and 9.17% were unaware. In terms of hand weeding or mechanical weeding, 74.58% were fully aware, 24.17% had partial knowledge, and 1.25% were unaware. Regarding bio-herbicides, only 1.25% had full knowledge, 5.42% had partial knowledge, and a large majority, 93.33%, were unaware. As for mulching to maintain soil moisture, 47.08% were fully aware, 50.83% had partial knowledge, and 2.08% were unaware.

 **3.2.4 Fertilizer Management:**

FYM (Farmyard Manure): 50% had full knowledge, 44.58% had partial knowledge, and 5.42% were unaware. Regarding green manure, 13.75% had full knowledge, 43.75% had partial knowledge, and 42.5% were unaware. When it comes to applying organic manure to increase crop production, 1.25% were fully aware, 50.83% had partial knowledge, and 47.92% were unaware. As for cow dung as a source of organic cultivation, 56.25% were fully aware, 41.25% had partial knowledge, and 2.5% were unaware. Finally, 55.83% had full knowledge of vermi-compost, 42.08% had partial knowledge, and 2.08% were unaware.

**3.2.5 Irrigation Management:**

Drip Irrigation for Vegetable Cultivation: 41.67% were fully aware, 52.92% had partial knowledge, and 5.42% were unaware. As for sprinkler irrigation, 85.83% were fully aware, 14.17% had partial knowledge, and none were unaware. Regarding the timing of irrigation, 51.67% were fully aware, 45.42% had partial knowledge, and 2.92% were unaware. In contrast, no respondents were fully aware of the fertigation system, 17.92% had partial knowledge, and 82.08% were unaware.

**3.2.6 Seed Treatment:**

Meaning of Seed Treatment: 17.92% were fully aware, 40.83% had partial knowledge, and 41.25% were unaware. Regarding Pseudomonas, 4.58% had full knowledge, 29.58% had partial knowledge, and 65.83% were unaware. As for seed treatment with Trichoderma, 6.25% were fully aware, 58.75% had partial knowledge, and 35% were unaware.

**Fig- 2 Rank-wise distribution of knowledge levels among vegetable growers based on their mean scores.**

**3.3 Association between socio-economic factors and the knowledge level of vegetable growers towards eco-friendly farming practices.**

Table-3. Association between socio-economic factor and knowledge level of vegetable growers towards eco-friendly management practices.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No.** | **Independent Variables** | **Calculated Chi-square Value** | **Degree of freedom** | **Nature of association** |
| 1. | Age | 26.99 | 4 | Significant |
| 2. | Education | 14.07 | 2 | Significant |
| 3. | Farming experiences | 10.03 | 4 | Significant |
| 4. | Family size | 8.22 | 4 | Non- Significant |
| 5. | Type of family | 1.54 | 2 | Non- Significant |
| 6. | Occupation | 2.97 | 2 | Non- Significant |
| 7. | Size of Land holding | 21.26 | 6 | Significant |
| 8. | Annual Family Income | 11.63 | 4 | Significant |
| 9. | Irrigation potential | 4.19 | 2 | Non- Significant |
| 10. | Farm power | 6.23 | 4 | Non- Significant |
| 11. | Extension participation | 18.27 | 4 | Significant |
| 12. | Mass media exposure | 11.21 | 4 | Significant |
| 13. | Social participation | 10.16 | 2 | Significant |
| 14. | Institutional participation | 11.08 | 2 | Significant |
| 15. | Scientific orientation | 15.80 | 4 | Significant |
| 16. | Achievement Motivation | 4.29 | 4 | Non-significant |
| 17. | Innovativeness | 13.00 | 4 | Significant |
| 18. | Risk orientation | 16.15 | 4 | Significant |

Table-3 shows the association between the attributes of vegetable growers and their knowledge of eco-friendly management practices in vegetable cultivation. The results indicate that several independent variables, including age, education, farming experience, size of land holding, annual family income, extension participation, mass media exposure, social participation, institutional participation, scientific orientation, innovativeness, and risk orientation, have a significant association with the knowledge level of vegetable growers regarding eco-friendly management practices. These relationships were significant at the 5 per cent level of significance. However, variables such as family size, type of family, occupation, irrigation potential, farm power, and achievement motivation do not show a significant association with their knowledge level. This finding is consistent with the results reported by Venuprasad et al. (2018), Morya et al. (2020), Karthiga (2021) and Singh et al. (2023).

**4.0 Conclusion**

Eco-friendly farming focuses on natural food production, avoiding the use of synthetic chemicals and genetically modified organisms. The goal of eco-friendly farming is to ensure zero environmental impact. The study on eco-friendly farming practices revealed that the majority of respondents (67.08%) had moderate knowledge of eco-friendly vegetable cultivation. Cultural pest management practices received the highest mean score (6.36), indicating their strong effectiveness or preference among farmers. In particular, 71.25% of respondents were fully aware of deep ploughing in summer, while awareness of practices like uprooting alternate host plants was significantly lower (only 5%). Knowledge of other practices such as timely inter-cultivation (66.25% full knowledge) and the use of farmyard manure (50% full knowledge) was relatively higher. However, practices like drip irrigation (41.67% fully aware) and seed treatment (17.92% fully aware) had lower levels of full knowledge. Various factors, including age, education, farming experience, landholding size, family income, and extension participation, were found to significantly influence the knowledge of eco-friendly management practices.

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