ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue V May 2025

A STEM-Based Analysis of Farmers Attitude towards Organic Farming in India

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DOI: https://doi.org/10.51244/IJRSI.2025.120500133

Received: 23 May 2025; Accepted: 27 May 2025; Published: 16 June 2025

ABSTRACT

Agriculture is still the main occupation of majority of population in India. Nearly 55 % population is engaged in agriculture with 86% small and marginal farmers owning less than two acres of land. The concern for health and climate is aggravating. The plight of farmers in India and the increasing number of farmer suicide depicts a poor picture of the state of agriculture and the small and marginal farmers in India. Boost to organic farming is important for sustainable agriculture. Various factors like profitability, cost, consumers demand, impact on health, availability of fertile soil, community co-operation, government initiatives and support affect the adoption of organic farming practices. This research paper aims to analyse the factors which influence the inclination and adoption of organic farming by small and marginal farmers in India using STEM-based approach and ANOVA. 483 farmers comprising of fruit, cereal and vegetable growers have been taken for the survey and structured questionnaire has been used. The result may help the government/policy makers to take such decisions which will increase organic farming and long-term benefits in terms of good health and economic growth.

Keywords: Organic farming, sustainable, small and marginal farmers, agriculture, India.

INTRODUCTION

Increased awareness to health and sustainable environment has resulted in transition of conventional farming practices to organic farming which benefitted in triple bottom line- people, planet and profit to the farmers. This gradual shift to organic farming aiming at food security has helped in addressing the issues of reducing carbon foot-prints, providing gainful employment and raising the standard of living of small and marginal farmers and changed the landscape of modern Indian agriculture.

Agriculture and health sector have been specified as priority in India; agrarian economy. Government has announced many schemes for providing direct benefit to the farmers which will further result in benefits to the consumers and help us in attaining sustainable development goals. One such method is organic farming for the benefit of both agriculture and health sectors. The benefits of organic farming are known to everyone. The tech-savvy large farmers who want more profit, those who are engaged in agri-business or the small farmers, organic farming has given profits to every farmer. For the business minded large farmers, organic label on the agri-produce help them to get more profit and for the small and marginal farmers cost-effectiveness is the major influencing factor for keeping them engaged in organic farming practices. Increase in market size for organic produce has resulted in shifting of farmers to organic farm practices and other climate resilient methods.

With the launch of Paramparagat Krishi Vikas Yojana in the year 2015 which promoted organic farming in India also aimed at pollution control of the revered river Ganga. UP, Uttarakhand, Bihar and Jharkhand have been benefitted by this scheme. Thousands of clusters (32,000) have been formed and nearly 7 lakh hectares of agriculture land was covered. Another scheme of Bhartiya Prakratik Krishi Padhati (BPKP) also aimed at lowering the cost of cultivation, enhancing the income, ensuring healthy environment, soil and food thus promoting natural farming methods. More than 375 Farmer producer companies have been established under

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Mission Organic Value Chain Development in North East Region (MOVCDNER) for providing impetus to the organic products and farmers.

The above data show that efforts should be increased to raise the awareness level among farmers about the importance of organic farming and the future benefits to meet the targets of government.

Review of literature

Input- intensive mono-cropping system of farming has resulted in the loss of fertility and decline in the quality of yield (Samie et al., 2010). Organic farming systems have resulted in improvement in quality of soil and sustainable crop production (Ramesh P. et al. 2010).

Ramesh P. et al. 2010 conducted research which highlights that health of soil has improved and the availability of premium price on certified organic produce resulted in more profits to organic farmers. It also showed concern over the decline in the productivity and loss of yield.

Ramesh P. et al. 2015 pointed out that green revolution technologies had resulted initially in increased production per hectare but not now the benefits are declining. Therefore, organic farming can be considered as a vehicle for development in India and other developing countries.

The studies have indicated that organic farming is more beneficial in the regions of less rainfall and low soil quality. Studies show that low cost incurred in agriculture inputs have increased the profits of farmers so, the shift to organic farming now is more apparent and clearer. Several studies have advocated that structural change and tactical management of farms is necessary for supporting large scale transition to organic farming in India. Over 86% of farmers own less than 2 hectares of land therefore studies are required to address the challenges of organic farming to small and marginal farmers, to examine the status of organic farming for different production systems and situations of the country. It is also necessary to analyse the attitude of farmers towards organic farming in India so that strategies may be formulated and implemented for the benefit of society at large and development of the nation.

METHODS, RESULTS & DISCUSSIONS

A combination of organic farmers, partial organic farmers and inorganic farmers have been selected randomly for this analysis. Data was collected from 483 farmers using a structured questionnaire on five-point likert scale. STEM, Regression and ANOVA analysis have been used to understand the behaviour of farmers towards the organic farming.

The **STEM Model** (Social, Technological, Economic, and Managerial) for this analysis covers the following for in understanding the key drivers and challenges which affect farmers' attitudes towards organic farming in India:

Social Factors:

Beliefs of the farmers and the community, their perception towards organic farming, trends of consumers to buy organic products over the non-organic ones, awareness level and institutional efforts for promoting the organic farming are included in the social factors.

Technological Factors:

Availability of fertile, irrigated land, manure, biofertilizers and biopesticides, organic certification affect the adoption of organic farming. Consumers' demand for organic products and availability of market/e-market is also considered.

Economic Factors:

Actual cost incurred in adoption of organic farming, profitability of organic produce, availability of financial support, subsidies, and incentives from the government, impact on productivity, production and earnings in the long run are the economic factors in consideration.

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Managerial Factors:

The process and compliance for organic certification, concerns regarding supply chain and logistics management for the organic produce, and the support for organic farming and marketing play important role for considering the organic farming adoption.

A sample of 483 farmers has been taken and the results of the survey under each parameter are explained below to know about the farmers' attitude towards organic farming:

Social Factor	**% of Farmers Agreeing**	**Technological Factor**	**% of Farmers Agreeing**	**Economic Factor**	**% of Farmers Agreeing**	**Managerial Factor**	**% of Farmers Agreeing**
Aware of organic farming	95%	Have access to organic inputs	58%	High initial cost of organic transition	80%	Find organic certification process complex	70%
Believe organic farming is healthier	70%	Use biofertilizers and biopesticides	49%	Organic farming is more profitable	52%	Member of an organic farming cooperative	35%
Influenced by peer/community adoption	55%	Aware of organic certification process	35%	Receive government subsidies for organic farming	35%	Lack of training in organic farm management	63%
Believe organic farming is time-consuming	60%	Use digital platforms for organic markets	25%	Face difficulty in selling organic produce	55%	Willing to shift to organic if given financial support	82%

Thus, it is clear from the above collected data that although the level of awareness about organic farming is high their adoption rate is quite low. Farmers are willing to adopt organic farming but majority of them still find the certification process as difficult. As there is high initial cost involved in the process of organic transition, they are looking for some financial support. Profitability and access to market are of great concern for the farmers.

Correlation matrix

Factor	Social (%)	Technological (%)	Economic (%)	Managerial (%)
Social (%)	1.000	0.86 (Strong)	0.93 (Strong)	-0.01 (No correlation)
Technological (%)	0.86 (Strong)	1.000	0.64 (Moderate)	-0.47 (Negative)
Economic (%)	0.93 (Strong)	0.64 (Moderate)	1.000	0.23 (Weak)
Managerial (%)	-0.01(No correlation)	-0.47 (Negative)	0.23 (Weak)	1.000

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Thus, it is clear from the above analysis that there exists a high degree of positive correlation among social and economic factors (.93) and also among technological and social factors (.86). On the other hand, negative correlation is present among managerial and technological factors (-0.47). Socially aware farmers with access to organic inputs and biofertilizers seem interested to reap the economic benefits. Farmers who find difficulty in organic certification are not interested in the organic transition and training does not affect their decision.

Regression Equation:

Willingness to Shift=−28.84+(7.63×Social)+(−5.61×Technological)+(−3.76×Economic)

Thus, we can say that increase in social awareness may result in greater tendency to shift to organic farming and lack of access to organic inputs, financial constraints have negative impact on the farmers' willingness to shift to organic farming.

STEM Analysis:

A sample of 483 Farmers consisting of Fruits, Vegetables, and Cereal Growers and its analysis is given below:

Mean % by Category

Category	Social (%)	Technological (%)	Economic (%)	Managerial (%)
Cereals	70.15	49.62	59.88	45.99
Fruits	73.82	55.62	65.09	52.03
Vegetables	76.55	57.87	67.73	52.99

Vegetable growers:

Across all factors vegetable growers are showing highest agreement with more than 76% farmers knowing and recognizing the benefits of organic farming. More than 52 % vegetable growers are using biofertilizers and use digital platforms. They believe in organic profitability and subsidies and have moderate concerns about organic certification and training.

Cereal growers:

The perceived complexity among cereal growers has resulted in lower rate of adoption of organic farming. They are mostly affected by technological and managerial concerns. They also are looking for support from the government.

Fruit growers:

Profit-oriented fruit growers believe greater financial benefits of organic farming as nearly 65% of fruit growers agree with the economic factor.

ANOVA (at 5% level of significance)

Hypothesis: There is no significant difference between the three groups farmers' attitude towards organic farming.

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ANOVA table

Source	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Statistic	p-value
Category (Fruits, Vegetables, Cereals)	13427.5	2	6713.75	56.32	**6.66e-18**
Factor (Social, Technological, Economic, Managerial)	162342.8	3	54114.3	454.19	**3.15e-126**
Interaction (Category× Factor)	214.1	6	35.68	0.25	**0.9367**
Residual (Error)	57503.2	471	122.1	-	-
Total	233487.6	482	-	-	-

Interpretation of ANOVA Results

The above analysis aims to examine whether there is any significant impact on attitudes of farmers of different category (Fruits, Vegetables, Cereals) and STEM factors (Social, Technological, Economic, Managerial) significantly impact attitudes toward organic farming.

Category of farmers is statistically significant at p = 6.66e-18. It means that there is a significant difference in attitudes toward organic farming among fruit, vegetable, and cereal growers. Vegetable growers show the highest agreement across all factors, while cereal growers are less influenced.

STEM factors are statistically significant at p = 3.15e-126. Farmers decision to adopt organic farming is influenced by social, technological, economic, and managerial factors differently. Of them social and economic factors (awareness, profitability) are strongly affecting their decision while technological and managerial factors have low impact.

Interaction between category and factor is not statistically significant at p = 0.9367. this means that no significant variation in factor effects across different categories found. The manner and the extent to which social, technological, economic, and managerial factors influence attitudes does not vary significantly across categories (Fruits, Vegetables, Cereals). Farmers view the factors similar manner regardless of the category while taking decisions on organic farming.

CONCLUSION

The major drivers to the shift to the organic farming are social and economic factors. Profit-oriented farmers in all categories are less likely to adopt organic farming practices unless properly trained and sensitized about the positive impact of organic farming. Socio-economic condition of farmers affects farmers' decision to adopt the agriculture methods. Availability and cost of labour in case of natural and organic farming determines the size of land to be used for organic farming; which also results in partial adoption in many cases. Availability of manure and/ or livestock holding is another determining factor which may affect the adoption decision. Level of education, age, family income, non-farm income and training also influence the farmers' decision to a large extent. Proximity to the premium organic market play a significant role in deciding whether to go for organic farming or not. Concern for health and climate are related parameters often considered in connection with the decision for adoption of organic farming.

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