MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
ISSN: 1053-7899
Vol. 36 Issue 1s, 2026, Pages: 1597-1599

Role of Demand ratio to improve Organic Farming Adoption in Bilaspur District of Chhattisgarh

G. R. Madhulika[1],
Ph.D Scholar, Dept. of Rural Technology,
Dr. C. V. Raman University, Bilaspur CG
Anupam Kumar Tiwari[2],
Associate Professor & Head, Dept. of Rural Technology,
Dr. C. V. Raman University, Bilaspur CG
Kamal Kumar Sen[3*]
Assistant Professor, Dept. of Rural Technology,
Dr. C. V. Raman University, Bilaspur CG, Email: kamalagril@gmail.com

Abstract:
Organic farming ensures the usage of organic plant protection and nutrient systems and avoids chemical-based farm inputs. It is work with environmental, socio-economic and sustainability objectivity. About 170 countries come under the organic agriculture coverage, where 43.1 million ha. are cultivated in India by 2 million farmers. The consumers health consciousness is a major factor in organic food, which demands those who are willing to pay a high price for organic products. This paper aimed to analyse organic food demand factors affecting the organic agriculture adoption among those farmers. It highlights the major constraints for the adoption process. The Spearman's rank correlation formula was used to analyse 350 farmers opinions in the Bilaspur district of Chhattisgarh. The result found ρ=0.9993, under the p-value at the 0.05 significance level. It indicates a very strong association between increasing demand for organic produce and the motivation of farmers to adopt organic farming.

Keywords: Organic Farming, Agriculture, Demand, Bilaspur, Spearman rank correlation.

INTRODUCTION

Agriculture is the backbone of the Indian economy, contributing 16.5% to India's gross domestic product (GDP) [1]. The 66% of the Indian population lives in rural areas, which makes largest rural economy in the world and agriculture is the mainstay for that population [2]. Nowadays, the agriculture sector is encountering various challenges, viz., exploitation of natural resources, agricultural land used for industry and residential purposes, climate change, food scarcity, etc. Those challenges need a sustainable solution that is ecologically and economically beneficial to living beings [3]. Advanced technology and innovation-based farming approach may overcome the current challenges, wherein included high yielding variety (HYV), chemical fertilizers and pesticides, irrigation and crop management techniques [4]. However, the overexploitation of natural resources and excessive use of chemical fertilizers and pesticides have exceeded the safe environmental level. Due to these issues, production and productivity decrease rapidly, soils are contaminated, and synthetic chemical pollutant traces are induced in foods and vegetables. The cost of cultivation has changed and continuously increases. Need to be an alternative, safer method for effective solution of those issues that can be economically feasible and ecologically sustainable [5]. Only organic farming has all the characteristics that make it the best alternative to conventional farming. It is easy to practice and economically feasible for farmers. Various innovative technologies combined with them help to minimize the challenges of organic farming.As defined by the United States Department of Agriculture (USDA), "Organic farming is a system which avoids and largely excludes the use of artificial inputs (i.e., Fertilizers, synthetic pesticides, hormones, feed additives, etc.)" On the other hand, under organic farming, farmers collectively practiced crop rotation, plant and animal-based manures, both on farm and off farm organic waste, cultural practices upon crops, optimum plant protection and a natural system of nutrient fixation on soil. Organic farming is able to restore soil health, conserve plant nutrients, farmers income, socio-economic conditions etc. The conventional farming method resulted in soil erosion, soil nutrient depletion, excessive greenhouse gases, human health hazards etc. This farming method is primarily recognized as commercial farming. But at the same time, organic farming advocates a sustainable farming method. More than 96 million hectares of farmland are organically cultivated by the 4.5 million farmers from 188 countries. It produced 135 billion euros from organic food and drinks up to 2022 globally and it shared 1% to the world's agricultural area. At present, it is considered as fasted-growing agriculture sectors [6]. Historically, the Asian countries have evidence that organic farming was doing by farmers from early 20th century. Sri Lanka export their organic rice to various countries since ancient times.

The International Year of Millets 2023 (IYoM23) was launched and boosted the organic sector in India. The Government of India (GoI) runs various organic farming supportive programmes and policies, viz., Paramparagat Krishi Vikas Yojna (PKVY), National Programme for Organic Production (NPOP), Mission Organic Value Chain Development for the North-eastern Regions (MOVCD), etc. Those policies have the potential to foster organic agriculture in India [6]. The 10th Five-Year Plan under the govt. of India emphasized encouraging organic farming adaptation through organic waste management, integrated pest management (IPM) and integrated nutrient management (INM). Likewise, the previous 9th Five-Year Plan has been dedicated to encouraging organic farming under the plantation, spices and condiments sections with the help of various organic-based farm inputs. Now, various ministries, government and non-government agencies collectively work with a common goal to promote organic farming [7]. There is an intensive process needed to achieve organic farming certification, which is difficult to reach among the small and marginal farmers. Those farmers do not have enough land and input resources to maintain the minimum requirement for organic farming. Hence, the scope and socio-economic coverage are restricted [8]. A common question raised for the scientific community can organic farming is sustainable and capable of feeding the world? Even though conventional farming used chemical fertilizers and pesticides, it encountered productivity issues. When farmers perceptions shifted to organic farming from conventional methods, a drastic loss occurred in production [9]. Instead of various issues, this farming method advocates futuristic and sustainable agriculture with fulfilment of income, livelihood and food security. This paper aimed to analyse the impact of motivation and demand to improve organic farming adoption upon farmers. It highlights the major constraints for the adoption process.

DEMANDS OF ORGANIC PRODUCTS

According to the Organic Trade Association, the organic food product sales reached $35.1 billion in 2013. This dramatical changes in organic food demands occurred in recent decades. These changes accelerate organic food demands due to the peoples are much concerned about the adverse effects of chemical fertilizers, pesticides and their residues presence upon the plants [10]. Awareness towards environmental protection played a significant role in increasing this sector. The organic market recorded 22.3% growth worth 14.99 billion EUR during the Corona global pandemic, which share 6.4% on food market [11]. Simultaneously, the increasing demand for organic products resulted in a hike in gross cultivated area up to 60 million hectares, an increase of 20 million hectares in 2022 [6]. According to the report, 3.7 million producers recorded by 2022 globally cultivated 78.1 million hectares of land and generated 125.2 billion euros in revenue [12]. During the financial year 2019-20, 6.389 lakh MT of organic products were worth $689 million and exported to various countries. Madhya Pradesh state is recognized as a major organic producer among several states in India [13]. Under the Indian agriculture, 4.5 million hectares of land got certified under organic farming. It reflects the demand of this farming system. Since 2016, the Sikkim state entitled organic state presented as a model for the remaining regions. The Indian market of organic products faced many challenges and opportunities. Their premium pricing encourages farmers to engage more. Although organic certification is found to be much harder for Indian farmers. Due to the limited income of small and marginal farmers, they do not have to bear the certification and maintenance costs [14].

MATERIAL AND METHODS

Study Area

This study was conducted in the Bilaspur district of Chhattisgarh, India. This region falls into the Chhattisgarh plain, where the agricultural practices are a major livelihood, along with 381581 ha. Cultivated land (Agriculture Census 2010-11). Paddy is a major crop for both kharif and rabi seasons, with 580.44 and 5.46 (000 metric tonne) production recorded, respectively, during 2022- 23.

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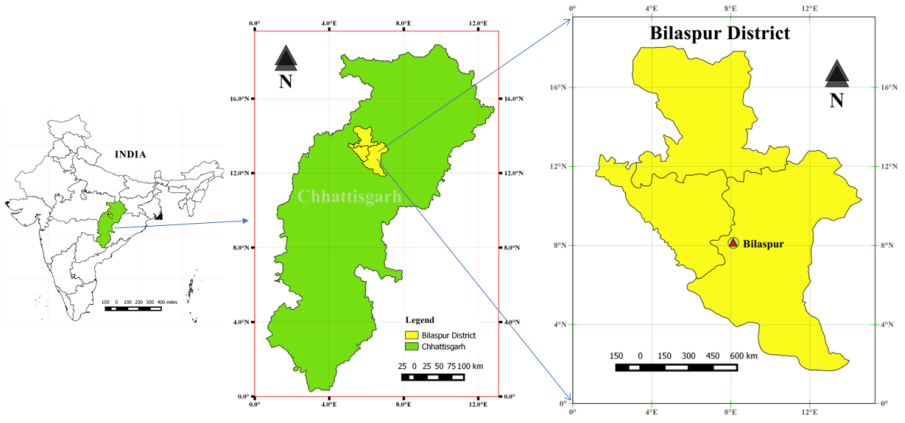

Figure 1 Study Area

STUDY SAMPLE

A total of 350 farmers were selected according to Cochran's formula throughout the Bilaspur district. The sample was categorised into two equal major parts, viz., Organic farmers and Conventional farmers. 175 farmers who belong to organic farming were selected from a list who enrolled in such farming at 25 villages. Another 175 conventional farmers were selected randomly from the same villages. The following formula was for sample size determination [15]:

$$n_0 = \frac{Z^2 \cdot p \cdot (1-p)}{E^2} \quad (1)$$

Where:

N_0 = Initial sample size for large population,

Z = z-value (e.g. 1.96 for 95% confidence level),

p = Estimated population proportion (use 0.5 if unknow),

E = Margin of error (0.05)

$$n_{adj} = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \quad (2)$$

Where:

n_{adj} = adjusted sample size,

n_0 = Initial sample size from Cochran's formula,

N = total population size

Data Collection Method

Primary Data: Primary data was obtained through the pre-structured interview schedule. This tool was designed for the respondents who engaged in organic and conventional farming in the studied area. Various variables were used to extract data during the survey of households.

Secondary Data: Government official websites, published government reports, various research publications, and thesis, institutional publications etc., were used to collect secondary data on organic farming. To validate the findings, these data sources were used as supplementary documents.

Statistical Analysis tools

Descriptive statistics: The farmers profiles and demography were estimated through the Frequencies, Percentages, Mean, Standard Deviation (SD) and Cross-tabulation methods.

Inferential Statistics: To assess the effect demand on organic farming motivation using the Spearman's rank correlation formula,

$$\rho = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

RESULT

Demography

Table 1 Demographic data

Variable	Category	Organic Farmers	Conventional Farmers	Total	%	Mean	SD
Age	18-30	20	44	64	18.29	32	24.46
	31-55	63	60	123	35.14	61.5	
	56-70	92	71	163	46.57	81.5	
Education Level	Illiterate	10	16	26	7.43	13	52.65
	Schooling	110	135	245	70.00	122.5	
	Graduation	55	24	79	22.57	39.5	
Family size	Nuclear	115	101	216	61.71	108	25.01
	Joint	60	74	134	38.29	67	
Landholding Size	<1 ha	106	88	194	55.43	97	32.59
	1-3 ha	45	57	102	29.14	51	
	>3 ha	24	30	54	15.43	27	
Farming Experience	<3 Y	40	35	75	21.43	37.5	18.07
	3-10 Y	75	60	135	38.57	67.5	
	>10 Y	60	80	140	40.00	70	

Table 1 presents the age-wise distribution of organic and conventional farmers in the study area. It reveals that the majority of the respondents belong to the age group of 56–70 years, accounting for 46.57 per cent of the total sample. The youngest age group of 18–30 years represents only 18.29 per cent of the total sample. This data indicated that organic farming is more prevalent among older farmers. Similarly, higher engagement was also observed in the older age group for conventional farming. The mean value (81.5) collectively reflects the older-aged respondents preferred agriculture practices for their livelihood. Education plays a major role in understanding and adopting new

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technology and innovation. As observed, field data accounting for 70 per cent of the respondents school level education that advocated, they are capable of grasping new information and using it accordingly. Organic farming includes various cultural practices that need to be attentive set of minds to understand their causes and effects. In light of this fact, an educated respondent has to do so in a precise manner. The socio-economic characteristic was estimated through family size and land holding. This research is evident that 61.71 and 38.29 per cent of farmers fall into the nuclear and joint family, respectively. Likewise, 55.43 and 29.14 per cent of farmers possess up to 1 hectare and 1-3 hectares of cultivated land, respectively. Among 55.43 per cent, 106 and 88 are organic and conventional farmers, respectively, indicating that small and marginal farmers are more inclined towards organic farming. Farming experience is another way to measure decision-making ability and the flow of work. The data set shows the highest proportion of farmers (40 per cent) having more than 10 years of farming experience, where 60 and 80 farmers belong to organic and conventional farming, respectively. Overall, the data set indicates that moderate experience is found under the organic farmers, while conventional farming is largely practiced by those with long-term farming experience.

Demand on organic farming adaptation

To examine the relationship between the increasing demand for organic produce and the motivation of farmers to adopt organic farming, Spearman's rank correlation coefficient was applied. The responses were classified into five categories, and ranks were assigned to both variables. The differences between the paired ranks (D) were computed and squared to obtain $\Sigma d2=640$.

Table 2 Spearman's rank correlation

Response	Score	X	Y	Rx	Ry	D	d2	R
Very Low	1	26	19	2	1	7	49	0.999283
Low	2	36	25	3	2	11	121	
Medium	3	50	60	5	5	-10	100	
High	4	20	37	1	4	-17	289	
Very High	5	43	34	4	3	9	81	

Since the computed value shows a very high magnitude $\rho=0.9993$, the p-value is 0.05 at the significant level. It indicates a very strong association between increasing demand for organic produce and the motivation of farmers to adopt organic farming. This implies that the increasing demand for organic produce has a significant and positive influence on farmers motivation to adopt organic farming. This result clearly indicated that market demand acts as an important driving force for the expansion of organic farming in the studied area.

DISCUSSION

Organic farming needs technical knowledge to maintain all components. The Government of India initiated various extension programmes on organic farming. Educated farmers grab all those innovations and technologies while farming results in impactful output. Still, a chunk of farmers have no minimum level of education, who can not understand the application of organic farming, and it compromising production efficacy. Overall, farmers may demotivate with this method. On the other hand, demand for organic products with a premium price has provided new market opportunities to the cultivators. The organic food market is still under development, where only elite societal groups may afford these products. To penetrate a large market, it needs to improve its marketing strategies and expand into food companies. So, the demand concerning the farmers motivation to adopt this cultivation. High pricing of organic products may definitely encourage new farmers, but it is hard to attract new customers.

CONCLUSION

The result of the study on the demand for organic products significantly influenced the local farmers in the Bilaspur district of Chhattisgarh. The conventional producers are concerned about the production losses while shifting to organic cultivation. It is reported as a major constraint to reaching new farmers. However, organic farmers are very concerned with soil health, environmental effects, production factors and yield benefits. The study concludes that market demand for organic products plays a significant role in the coverage of organic farming. Meanwhile, a strategic plan and different institutional support are needed to boost the educate famers. During the conversion period, farmers required information, training, and institutional support also encouraged to be small and marginal farmers.

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