

Bridging the Gaps in Organic Farming: An Empirical Study through the Farmer 5A Framework in India

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Abstract

Climate change and socio-economic dynamics has heightened the need for urgent ecologically sound and socially equitable methods of farming. This study analyzes the 5A's of Farmer 5's framework, namely, Awareness, Adoption, Affordability, Accessibility, and Availability, and the practice of organic and sustainable farming in India. It examines the knowledge gaps, the willingness, and the capacity to adopt ecological agriculture and the economics and infrastructure towards organic farming. The work that has flowed against the continuum of organic agriculture might have a lot to do with price and data describing organic to the market. This research captures the PKVY or the Parampara at Krishi Vikas Yojana support for organic farming and also the Farmer Producer Organizations initiative that gives the backbone to improve gaps in the organic farming supply chains. It theorizes the principles involved in sustainable and organic farming and examines experiences of the farmers. The outcomes of research deliberated in this thesis aim to bridge gaps in organized dissemination of information, outreach support, and resource distribution to policy level decision makers and the agricultural community for transitions in farming practices to improve ecology and socio-economic wellbeing of farmers.

Keywords

Organic farming, Sustainable agriculture, Farmer awareness, Adoption behaviour, Affordability, Accessibility, Availability, 5A framework

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I. Introduction

The increasing problems of soil degradation, soil loss of fertility, water pollution, and loss of biodiversity due to overuse of chemical fertilizers and pesticides of conventional farming are a very significant threat to the Indian agricultural future (FAO, 2023). These issues have already emphasized the necessity of transitioning into the organic and sustainable farming methods that would save the environment and secure food and welfare of farmers. India has much potential to implement effectively these environmental friendly practices due to its diverse agro climate zones as well as its long farming history (NABARD, 2024).

Organic farming aims to preserve an ecological balance of the ecosystem through the use of green manure compost crop rotation biological pest control instead of fertilizers, insecticides or genetically modified seeds (IFOAM, 2022). The practices help in achieving a self-sufficient agricultural system through improving the soil structure, increasing the water holding capacity, and promoting the maintenance of the natural ecosystems. Sustainable agriculture is however, a broader concept that incorporates the ideas of environmental health, social justice, and economic viability to mean that the present day agricultural activities do not threaten the capacity of future generations to generate food (UNEP, 2023).

The agriculture practices of the Indians have been based on organic practices, e.g. traditional compost, cow dung manure, natural pest control. Nevertheless, the beginning of Green Revolution in the 1960s made Indian agriculture highly reliant on the use of chemical pesticides and fertilizers to have high yields (Singh & Mishra, 2021). The revolution boosted production and food security but also caused soil depletion, groundwater pollution, and rising prices of inputs, which put small and marginal producers in a vulnerable financial position (Chand et al., 2020). Another way to achieve agricultural resilience over the long term is the organic and sustainable agricultural methods which have been popularized as a solution to these increasing ecological and economic issues.

Organic farming remains unpopular among the Indian farmers despite the benefits that its practice might bring about. The Farmer 5 A model is one of the main causes of this discrepancy, name of which is Awareness,

Adoption, Affordability, Accessibility, and Availability (Kumar and Devi, 2021). Awareness is the level of awareness of farmers regarding organic methods, its advantages and their procedures. Adoption is a sign of the level of adopting the organic practices by these farmers in their farming operations.

Financial capabilities of smallholders can be referred to as affordability of organic inputs and infrastructure because the availability of training, extension services, and institutional support to farmers are aspects that define their accessibility. Organic farming requires the presence of organic seeds, biofertilizer, compost materials, and marketing channels to be viable and sustainable (Sharma et al., 2022).

Farmer access to expert service, insufficient awareness, and high price of organic inputs, as well as the absence of a stable market connection, remain some of the challenges that farmers in many rural areas of India still face. Organic certification can be expensive and complicated to small farms, and, therefore, these farmers are not going to adopt such practices (ICAR, 2023). Two of the main government programs or schemes that provide financial assistance, market promotion, and capacity-building are the Paramparagat Krishi Vikas Yojana (PKVY) and the Mission Organic Value Chain Development of the North Eastern Region (MOVCDNER), providing financial aid, market assistance, and capacity-building (Ministry of Agriculture, 2023). Nevertheless, there are other levels of the influence and reach of states and farmer groups.

Karnataka being a agriculturally more developed state of India through the efforts of the Department of Agriculture and the Karnataka State Organic Certification Agency is keen on sustainability practices. Nevertheless, several smallholder farmers in places such as Dakshina Kannada, Chikkamagaluru, and Udupi continue experiencing problems with the access to organic seeds, biofertilizers, and markets with sophisticated buyers (KSOCA, 2024).

Thus, organic and sustainable agriculture is a social and economic prospect to the farming community in India, besides being an environmental requirement. Some of its strengths include improved climate change resilience, reduced reliance on expensive artificial inputs, increased soil fertility, and possibly, entry into the domestic and foreign markets of organic goods (Brody et al., 2017).

This research aims, Organic and Sustainable Agriculture Practices: A Study on Farmer 5 As (Awareness, Adoption, Affordability, Accessibility, Availability) to determine the role of these 5 factors in the adoption of organic farming to Indian farmers. Through these characteristics, the study will be able to determine the major motivators to the adoption of sustainable practices by farmers.

This study eventually aims at supporting rural development and policies by providing knowledge that will empower the awareness campaigns, increase affordability via subsidies, improve market and input accessibility, and the availability of organic resources. The results will assist in bridging the divide between policy goals and reality to support a more sustainable, ecologically aware and profitable agricultural industry in India.

II. Review of Literature

Practice in organic and sustainable agriculture has also been perceived as one of the primary means of reversing the negative trend of environmental degradation and increasing agricultural output and feeding the population. Organic farming which minimizes the use of chemical substances of synthetic nature and emphasizes on the natural fertility of soils and biodiversity protection has its roots in ancient India and follows the conventional agricultural techniques. In different studies, it is stressed that India with its pluralistic agro-climatic diversity and native knowledge systems has immense potential to grow organic farming especially in the North-East, Rajasthan and Southern India (Soni et al., 2022). The economic viability of organic farming in reducing the dependency on costly chemical inputs makes it a viable option to small and marginal farmers especially when it comes to labour abounding rural India.

The most significant factor in the adoption of organic and sustainable agricultural practices has been documented to be the knowledge that farmers have on the same. Government schemes such as Parampara under Krishi Vikas Yojana (PKVY), extension organization and non governmental organizations have also helped in the growth of knowledge base among farmers. Unequal distribution of disparities continues to exist, whereby less accessible areas coupled with rural areas lag behind due to the lack of points of access to information and training centres. There is evidence that farmer consciousness levels are directly related to sustainable practices adoption, as well as socio-economic factors of schooling, farm size, and access to credit (Begho, 2022).

Even though organic farming has a positive impact on the environment and health, there are various difficulties that make the implementation of the practice slow. The shift between the traditional and organic practice is a transitional phase of decreased production levels in the short-run that creates fear on the part of farmers. Availability of quality organic inputs, market connections, and certification processes is a significant challenge and is particularly a problem to economically deprived small farmers. There are evidence records that cost matters are applicable and organic seeds, biofertilizers, and certification at some occasions hideously expensive to marginalized farmers. High prices are not yielding financial returns because of the low-quality market connections and ineffective infrastructure (Das et al., 2020).

The other major area of concern is market access and availability of resources. The grouped areas have a higher availability of organic inputs and capacity building measures whereas most farmers are limited to value chain fragmentation. The presence of FPOs and producer collective of farmer groups as a mechanism of demand aggregation and coordination of the procurement of inputs has been found to be a changing model to overcome such constraints. In addition, both local and export market avenue of organic crops would be an incentive to organic farming by farmers. Nevertheless, the majority of farmers have limited access to resources (such as organic seeds, water, and suitable land) due to climatic limitations (rainfall uncertainty and soil erosion) (CEEW, 2021).

Availability of inputs and natural resources is a necessary factor in the sustainability of organic farming. The fact that availability of resources like water, availability of good compost material and availability of biofertilizer directly affect consistency of organic practice is discovered. Availability will be promoted through encouraging the production of organic inputs on the local level and the introduction of new technologies like biofertilizers and precision agriculture. The government support programs are aimed at enhancing sustainable practices via subsidies, provision of skills, setting up of infrastructure that are needed to offset the resource shortages and long-term sustainability (NITI Aayog, 2021).

All in all, the current literature still is skewed towards a stronger concession on the benefits of organic and sustainable agriculture in the form of environmental pollution reduction, improved soil conditions, and increased rural livelihoods. It further points, but to the fact that an even more holistic approach that sums up the Farmer 5's creating awareness, causing adoption, making it affordable, improving access, and ensuring resource availability is required. Facilitating organic farming requires policy action, institutional capacity development, market creation, and community based initiatives to move the niche process of organic farming to mainstream agriculture in India. The challenges will necessitate more research and innovation to achieve the optimum of sustainable agriculture to benefit the farmers and the environment in the country.

III. Research Gap

A research gap in the study of the organic and sustainable agriculture, especially using Farmer 5's paradigm, is the paucity of empirical evidence on interactions between these five factors, Awareness, Adoption, Affordability, Accessibility, and Availability in diverse Indian farming settings. Their joint effect on the decision of farmers and their sustainability practices is also a little research, although many other studies are concentrated on the effect of each of these factors separately. Also, there is a lack of analysis of the region that considers the socioeconomic and climatic heterogeneity. More so, there is a lack of research on the effectiveness of government programs and farmer-producer associations to eliminate the barriers. Better investigations are required to find out the financial impacts of organic farming on small and marginal farmers, particularly in the transient period. The availability of study on market accessibility and its effect on long-term adoption is deficient. Shortly, the studies on the perception of farmers on the long-term benefits of the environment are very few. The use of technology to enhance availability of resources has not been well explored. Anyway, in this regard, more integrated, multidisciplinary studies are needed to provide practical knowledge to practice and policy.

IV. Statement of the Problem

Organic and sustainable farming is a viable alternative to the traditional farming techniques that have in most cases resulted in destruction of the environment, degradation of soil and health risks caused by chemical leftovers. Although it has clear advantages, the integration of organic farming methods by the Indian farmers is limited by several intertwined issues. Many farmers, especially in remote and resource-poor areas, are still not aware of the organic methods and their capital advantages in the long run. This ignorance has an impact on their confidence and readiness to embrace new practices. Also, the first conversion to organic agriculture may be economically hazardous because farmers may face the short-term reduction of the harvest and need to invest in the organic composition, certification, and labour-intensive operations without the guarantee of positive returns in the market.

Another factor hindrance is affordability, particularly to the small and marginal farmers who cannot access credit or subsidies that are fashioned to organic cultivation. The availability of key resources such as access to good organic seeds, biofertilizers and technical advice is not uniformly spread and therefore only very small regions or ones that are well supported can adopt sustainable practices. The natural resources such as water and organic matter are also not easily available thus making uniform implementation difficult. Together with uneven institutional support and the insufficient market infrastructure, farmers experience the challenges in achieving economic incentives, which would help them to justify transition to organic farming.

In addition, government policies and programs that aim to develop organic agriculture are usually not in a position to deal with these multifaceted barriers in a unified manner. The multifacetedness of the issue of ecological, economic, and social dimension demands a thorough grasp of the interaction at a ground level of such factors as Awareness, Adoption, Affordability, Accessibility, and Availability (Farmer 5s). This study aims at

closing this gap in knowledge by investigating these factors in details, their limitations, and proposing viable solutions to increase the implementation of organic and sustainable agriculture. In the absence of such integrated knowledge and behavior, the shift to sustainable agriculture is most likely to be slow and disjointed and restrict the wider Indian ambitions of environmental sustainability, rural development, and food security.

Objective of the Study

Two distinct goals of the research study:

1. To examine the degree of awareness, adoption, affordability, accessibility, and availability of organic and sustainable farming practices among Indian farmers and also establish the key obstacles that prevent the successful adoption of the same.
2. To determine the effect of government interventions, farmer producer organizations, and market mechanisms in the process of transitioning to organic farming and also propose the policy decisions to improve the sustainability and economic feasibility of organic production in India.

Research Design

This research employs a descriptive survey design to examine the implementation and perception of organic and sustainable agriculture practices among farmers, grounded in the 5A model (Awareness, Adoption, Affordability, Accessibility, and Availability). The goal of the study is to comprehensively capture the breadth of farmers' knowledge, the extent of adoption, and the practical realities faced during the transition toward organic agriculture, including both enabling factors and major obstacles.

The descriptive survey approach is chosen for its effectiveness in collecting quantifiable information from a large population and for facilitating a cross-sectional understanding of existing trends, attitudes, and behaviours at a specific point in time. The study requires the collection of primary data through a structured questionnaire that is thoughtfully designed with literature review, expert consultation, and the 5A conceptual framework. The items on the questionnaire consist of a combination of closed-ended, Likert scale and some open-ended question items providing the respondents opportunity to elaborate on challenges or successes with regard to a specific area.

Sampling Framework

The study population for this research is defined as farmers who are located within the region of the study and are either currently practicing, have adopted, or are interested in adoption of organic/sustainable agricultural practices. This study engages individuals from multiple levels of age, gender, education levels, and farming operations in order to more fully understand the factors that impacted the transition to organic farming.

For the purpose of gathering relevant and representative data, a purposive sampling technique was employed. This method allowed for the intentional selection of respondents who have direct experience or interest in organic and sustainable agriculture. A total of 140 farmers were selected for the survey, chosen to reflect major demographic variables such as age (ranging from less than 25 to above 45 years), gender, and level of engagement in organic farming.

Direct contact was made with participants in the agricultural settings in which they are engaged, and all reasonable efforts were made to include those who are involved in organic practices as well as those who were aware of organic practices, those who partially adopt organic practices, and those who intend to adopt organic practices. The sample size is suitable for statistical analysis, as well as to establish variability in responses related to topics of interest such as awareness, reasons to adopt, reasons not to adopt, economic consequences of organic, and participation in training.

Data Collection

The primary data for this study were gathered using a semi structured questionnaire administered face-to-face with farmers in the study area. The questionnaire had 20 basic questions which were connected to 5 A framework, together with the demographic variables.

In the case of the questionnaire, the respondents were sampled in a purposeful manner by choosing 140 respondents and the objective was to have diversity in the sample in terms of the age, sex and experience in organic farming. The surveys were pre-administered and explained to the participants in person, to allow the researchers the opportunity to clear up any misunderstandings and to maximize accuracy in responses. The survey was administered in local languages, when possible, to maximize understanding and produce authentic responses to the questions.

The questionnaire was piloted before actual data collection on a small sample of farmers to ensure clarity, relevance as well as reliability. Pilot feedback resulted in slight changes in both wording and order of questions. All of the answers were anonymous, and the participants were informed and respected.

The completed questionnaires were sorted and tabulated using a spreadsheet program and data analysed using Jamovi statistical software package. To summarize the findings and meaningfully interpret data aligned with the research aims, descriptive statistics and graphical analysis were undertaken.

V. Data Analysis and Interpretation

Table-1: Demographic Variables

Variables	Categories	No. of Respondents	%
Age Group	25 to 35	24	17.1
	36 to 45	44	31.4
	Less than 25	33	23.6
	More than 45	39	27.9
	Total	140	100.0
Gender	Male	97	69.3
	Female	39	27.9
	Prefer Not To Say	4	2.9
	Total	140	100.0
Awareness of Organic Farming Practices	Yes	133	95.0
	No	7	5.0
	Total	140	100.0
Adoption of Organic Sustainable Farming Methods	Yes, fully	53	37.9
	Partially adopted	67	47.9
	Planning to adopt	15	10.7
	Not adopted	5	3.6
	Total	140	100.0
Participation in Training or Workshops on Organic Farming	Yes	89	63.6
	No	51	36.4
	Total	140	100.0
Source of Awareness (among those aware)	Fellow Farmers	58	41.4
	Media (TV/Radio/Internet)	38	27.1
	Government Programs	22	15.7
	NGOs	19	13.6
	By Own	1	0.7
	Education	1	0.7
	Own Think	1	0.7
	Total	140	100.0

(Source: Primary Data)

The study surveyed a total of 140 respondents, whose demographic and professional characteristics were analysed across various variables. From Table-1 the interpretation of results is as follows.

Age Group Analysis

The survey sample consists of a variety of ages. The largest representation comes from respondents age 36 to 45, at 31.4 % of respondents. Of the respondents, age over 45 comes in second at 27.9 %. Under 25, and between 25-35 years of age came in at 23 % and 17%, respectively. This distribution is important for affirming that the results are not age-biased and potentially show generational differences in awareness and adoption of organic farming versus conventional. While younger farmers might be open to trying new methods, older (more experienced) farmers might have more ingrained perceptions or more hands-on experience with customary and organic farming.

Distribution of Gender

The sample consists of male farmers accounting for 69.3% of the total respondents, followed by female farmers (27.9%) and those who responded "Prefer Not To Say" making up a small proportion of the sample

(2.9%). While men make up nearly 70% of the respondents, the number of women is significant, as it reflects the growth, albeit still small, of women adopting organic agriculture and participating in agricultural decisions. This age structure is representative of rural agricultural communities in India.

Awareness of Organic Farming Practices

A notable 95% of the participants reported their awareness of organic agricultural practices, which shows that information has effectively moved throughout the research area. The fact that only 5% were unaware of organic agriculture shows how successful both peer information sharing and awareness initiatives have been in disseminating awareness and knowledge of organic agriculture practices and their benefits.

Adoption of Organic or Sustainable Farming Methods

Utilization of organic or sustainable farming practices The adoption information indicates that organic techniques are prevalent: 37.9% of the respondents have completely adopted sustainable or organic farming techniques (the highest percentage in any category). Further, 47.9% of the respondents have partially adopted these farming techniques. Only 3.6% of the respondents do not use this practice, and another 10.7% have said that they intend to use these techniques. Nearly 96% of all of the respondents are using or exploring using organic farming methods, showing significant community support and buy-in for policy and extension agencies to capitalize on. This is very good news.

Participation in Training or Workshops on Organic Farming

Among the respondents, 63.6% have taken part in workshops or training programs related to organic farming, while 36.4% have not. This relatively high level of awareness and practice likely has to do with this significantly high proportion of individuals who engaged in formal education. Expanding training outreach is still possible, nevertheless, particularly with regard to individuals who have not yet fully adopted or are preparing to do so.

Source of Awareness (among those aware)

The main source of information for people who are aware of organic farming is other farmers ("fellow farmers"), who account for 41.4% of the total. Media (TV, radio, and internet) come in second at 27.1%, government programs at 15.7%, non-governmental organizations at 13.6%, and a very small percentage report self-directed learning ("By Own", "Education", "Own Think"). Besides having media campaigns and institutional programs, this trend reveals the importance of peer-to-peer communication within the rural agricultural sector. Given the nature of social learning, encouraging organic practices through peer advocates, farmer field schools, or success stories from the local context may be especially effective.

Analysis: The demographics defends the conclusions of the study with a good mix of age and gender representation. If we also take into account the attendance at prior training and the usefulness of informal (peer) knowledge networks, the levels of awareness and adoption are remarkably high. Policies seeking to further spread organic practices should strengthen these diffusion channels and guarantee more specialized workshops for all age groups and genders, given the importance of social learning and the comparatively high workshop participation. As a result, these demographic and baseline statistics offer a positive view of the community's preparedness for the shift to more sustainable farming methods, along with recommendations for where future awareness-raising and capacity-building campaigns should concentrate.

Table-2: Readily available of Biofertilizers and organic pesticides

Biofertilizer and Organic Pesticides	Counts	% of Total	Cumulative %
Always available (1)	41	29.3%	29.3%
Sometimes available (2)	71	50.7%	80.0%
Rarely available (3)	23	16.4%	96.4%
Never available (4)	5	3.6%	100%

(Source: Primary Data)

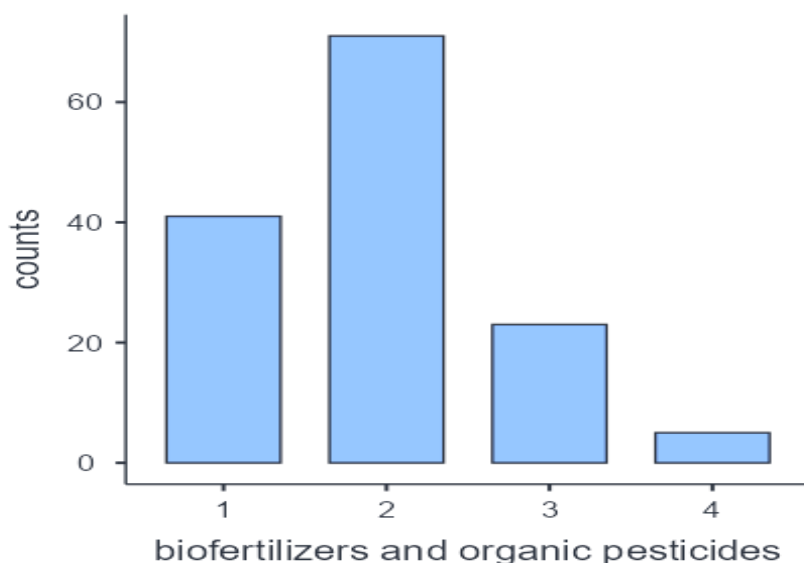


Chart-1: Readily available of Biofertilizer and organic Pesticides

Table 2 shows the responses of the farmers regarding the availability of organic pesticides and biofertilizers in their location. The results are clear in that adoption of organic inputs is largely determined by the availability. Most of the respondents (50.7) indicated that organic insecticides and biofertilizers are sometimes available and 29.3% indicated that they are always available. However, 16.4% of the respondents responded that they rarely are in their area, and 3.6% that they never are. Based on this trend, although in some instances there is more than 50% access to organic inputs by farmers, there is still common and frequent unavailability. The causes of the relatively low percentage of farmers who can have these items on hand are uneven distribution channels and limited retail availability of organic inputs in rural markets. Moreover, as per the study, seasonal supply might have to be relied upon by many farmers or they might have to travel long distances which could discourage its use. The high rate of the sometimes-available category shows that organic pesticide and biofertilizer supply chains are in the transformation process. This difference may be due to lack of good logistical support in the remote locations, ignorance among the local traders, or lack of adequate production infrastructure. This is indicated in the fact that only 3.6 percent of the respondents indicated that they were unable to locate any whatsoever and this shows that there are still those regions that do not have access to their required farm products which are organic. On the whole, the interpretation of this data points out that despite the raise in the organic input supply in comparison to the years gone by, better distribution channels, government intervention, and collaborative supply measures are necessary to ensure consistent supply. With the reinforcement of biofertilizers and organic pesticides supply via the agricultural extension centres, neighbourhood cooperatives and commercial partnerships, farmers will be able to effectively and more successfully conduct sustainable farming practices.

Table-3: Access organic seeds

Organic seeds	Counts	% of Total	Cumulative %
Not at all	10	7.1%	7.1%
With difficulty	21	15.0%	22.1%
Moderately easily	68	48.6%	70.7%
Very easily	41	29.3%	100.0%

The majority of responders can obtain organic seeds with considerable ease, according to the availability of these seeds. In particular, 48.6% of respondents said they can access organic seeds relatively easily, whilst 29.3% said they can get them extremely easily. This indicates that approximately, 77.9 percent of respondents do not face any significant challenges in an attempt to acquire seeds. A smaller proportion of respondents, however, do have the problems: 15% report a problem with getting seeds, and 7.1% report no seeds at all, a total of 22.1% or so who experience a problem with access. In general, the statistics show that most farmers access to organic seeds, but at the same time, there is a significant minority who cannot access them, making it necessary to improve the distribution channels and support.

Table-4: Organic inputs compared to conventional inputs

Affordability	Counts	% of Total	Cumulative %
Very affordable	44	31.4%	31.4%
Somewhat affordable	68	48.6%	80.0%
Expensive	24	17.1%	97.1%
Very expensive	4	2.9%	100%

The cost is not a major challenge to most farmers as is evident in the generally positive direction in the perception of the affordability of organic seeds among the respondents. Almost half, 48.6% felt that the seeds were moderate in terms of cost whereas a good number, 31.4% believed that the seeds were very cheap. These ratings took up 80 percent of the respondents together. Based on this, majority of farmers can use organic seeds in their agricultural activities without suffering any economic loss. The 20 percent of the respondents that are the rest feel that the seeds are expensive or very expensive; 2.9 percent feel that they are very expensive and 17.1 percent think they are expensive. This minority stresses that cost may also remain a barrier, particularly to the farmers with limited resources or farmers operating at the small scale. The research determined that availability, in general, and affordability are satisfactory to most farmers, yet targeted measures such as group buying, subsidies, or assistance would result in more farmers adopting organic seeds, which they consider costly. Moreover, the great proportion of the respondents who suppose the seeds to be affordable may facilitate further application of organic farming practices that may facilitate the growth of sustainable agriculture in the region.

Table-5: Adopting organic farming affect your crop yields

Organic farming affects your crop yields	Counts	% of total	Cumulative %
Decrease yields	12	8.6%	8.6%
No change	60	42.9%	51.4%
Increased yields	68	48.6%	100%

Respondents reported that the overall effect of organic farming on crop production is positive. Organic farming methods can also boost the output of numerous farmers since 48.6 percent of the respondents reported that their farm production improved upon applying them. Nevertheless, 42.9 percent of the respondents stated that there was no difference between the yields, which means that in the case of a large proportion of the population, the transition to organic farming did not cause any disruption to the stability of yields and did not negatively influence the yield. Only 8.6 percent of respondents said that yields were declining, which suggests that the decline of yields is quite uncommon. The research indicates that the majority of farmers benefit as a result of the application of organic farming, which in most cases favours either stable or better crop yields. This implies that organic agriculture practices can sustain agriculture and can maintain or even enhance productivity.

Table-6: Environmental benefit in your decision to adopt organic farming

Environmental benefit	Counts	% of total	Cumulative %
Not important	6	4.3%	4.3%
Somewhat important	58	41.4%	45.7%
Very important	76	54.3%	100%

The responses related to its benefits to the environment show a clear trend of high environmental awareness among organic farmers. It is evident that over half of farmers consciously consider the ecological implication of their agricultural practices during decision-making since 54.3% of participants in the survey rated the benefit of the environment as exceedingly high. According to another 41.4% of respondents who see environmental benefits as moderately significant, almost all farmers are aware of the role that organic farming plays in reducing chemical use, improving soil health, and reducing water use and increasing biodiversity. Only 4.3% of respondents feel that environmental benefits are insignificant, which indicates that environmental issues are not frequently neglected by the group of individuals under study. This level of consciousness regarding benefits to the environment is indicative of an increasing trend amongst farmers of integrating sustainability into their processes which enhances the long term sustainability of their farms and at the same time conserving natural resources. Also this knowledge can be disseminated and it can affect the local policy on agriculture, encourage the local farming community to adopt sustainable practices, and support the overall environmental conservation goal. Finally, the study focuses on highlighting that, besides the monetary and yield-related benefits of organic agriculture, there are environmental factors that also play an important role in motivating farmers to resort to such practices.

Table-7: Water scarcity issue affecting your farming

Water scarcity issue affecting your farming	Counts	% of total	Cumulative %
Rarely	18	12.9%	12.9%
Occasionally	55	39.3%	52.1%
Frequently	67	47.9%	100%

The data on the water scarcity reveals that numerous respondents consider it to be a significant challenge that impacts their agricultural activities. Water scarcity is an issue that is common and has been recurrent as observed by the 47.9 percent of respondents who indicated that water scarcity is a frequent issue in their farming. This means that a large proportion of farmers face occasional difficulties in accessing sufficient water to irrigate their product as revealed in the additional 39.3 percent who occasionally face a problem of water scarcity. Some minority seems to be somewhat resistant to this challenge, with only 12.9% of the respondents claiming that water scarcity has little impact on their agriculture. In general, the statistics indicate that water scarcity is a major problem that is facing the majority of farmers and this can influence the productivity of crops, agricultural decisions, and the introduction of sustainable farming practices like organic farming. Consequently, it could be important to consider managing water by using drought-tolerant plants, rainfall collection, or irrigation system upgrades to facilitate the resilience of farming in the region.

Table-8: Descriptives Analysis:

	Biofertilizers and organic pesticides	Organic seeds	Organic farming affected your crop yields	Environmental benefits	Water scarcity issues affecting your farming	Organic farming affected your income -
N	140	140	140	140	140	140
Missing	0	0	0	0	0	0
Mean	1.94	2.00	1.60	1.50	1.65	1.69
Median	2.00	2.00	2.00	1.00	2.00	2.00
Standard deviation	0.775	0.857	0.644	0.581	0.699	0.677
Minimum	1	1	1	1	1	1
Maximum	4	4	3	3	3	3

(Source: Primary Data)

Six factors that relate to the practice of organic farming are mentioned in this table and the descriptive analysis is done on the availability of organic seeds, biofertilizers and organic pesticides, the impact of organic farming on crop yield, benefits to the environment, the impact of organic farming on income and the effects of water scarcity on farming.

The sample size and sample completeness:

In all six categories, 140 farmers answered in details; there was no left out information. It means that the dataset is good and powerful, which can be used to make accurate deductions and analyze it descriptively.

Mean (Average):

Organic pesticides and biofertilizers (Mean = 1.94): According to the farmers, they are able to acquire these products occasionally, which implies that sometimes it is difficult to obtain sufficient and stable supplies of organic fertilizers and pesticides. The limitation of availability can create barriers towards adoption of the organic farming technique and can influence the crop production.

Organic Seeds (Mean = 2.00): The average score implies that access is also not equal despite the fact that seed availability is a bit higher than fertilizer availability. The moderate availability may be caused by the problem with the supply chain or unevenness of distribution.

Environmental benefits (mean = 1.50): The respondents are aware of the positive environmental benefits of organic farming, which include such benefits as a better soil fertility, reduced use of chemicals, and environmental sustainability. Nevertheless, the intermediate mean indicates that the benefits do exist but they might not be evident or felt directly.

Water Scarcity Issues Impacting Agriculture (Mean = 1.65): The issue of water scarcity is moderate in the case of organic agriculture. Due to the fact that the management of water is a delicate task in organic farming that cannot be accomplished without chemical fertilizers, poor irrigation or unpredictable rainfall can adversely affect the productivity of farm products.

Income Influenced by Organic Farming (Mean = 1.69): The farmers tend to believe that organic farming has a small impact on income in a negative way. It can be argued that organic practices can initially be not profitable by way of low yields or high input costs, and without incentives or support, such practices may not be adopted.

Median (Middle Value):

The median scores falling between 1.00 and 2.00 indicate that most of the farmers possess moderate rates of experience or perception. Indicatively, the majority of farmers believe that inputs are periodically present and do not actually influence the yields and revenues. Moreover, the median demonstrates that some of the farmers might be struggling, however, others can become more successful.

Standard Deviation:

These standard deviations range between 0.581 and 0.857. There is not much variance in the environmental benefits (SD = 0.581), which suggests that farmers are of the opinion that organic farming has a favorable ecological effect. Organic seeds have the least consistency (SD = 0.857) indicating that various farms or localities possess different seed supply. In spite of the slight differences, the middle range of the other variables indicates that the majority of farmers experience in similar ways in terms of yields, money, and water shortage.

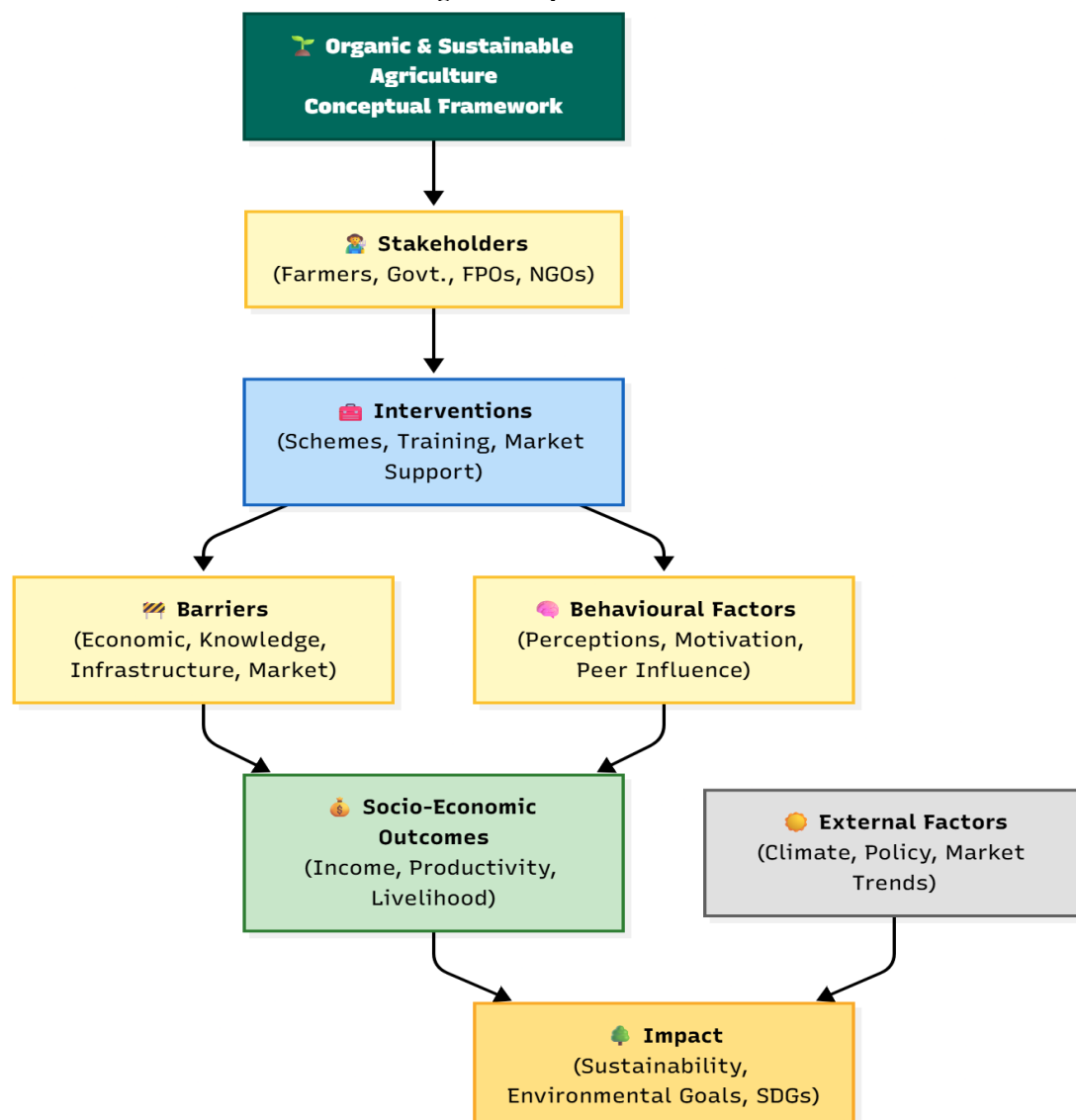
Minimum and Maximum:

The situation when each of the components has at least 1 severely restricts some farmers into the lack of inputs or adverse influence on production and revenue.

A three or four highest scores show how the improved availability of resources and knowledge could have positive outcomes, pointing to the fact that some farmers would have complete access to inputs or greater benefits.

Conceptual Framework

Fig-1 Conceptual Model



(Source: Primary)

The conceptual framework that focuses on the 5A model Awareness, Adoption, Availability, Affordability, and Accessibility graphically shows the interactions between the various factors that affect the adoption and adoption of organic and sustainable ways of farming among the Indian farmers. Organic farming techniques in India meet their effectiveness and sustainability due to a series of factors such as behaviour aspects, socioeconomic performance, hindrances, intervention by stakeholders and external factors. This model provides a structured perspective of these aspects.

The primary model guiding the study is the Organic and Sustainable Agriculture Conceptual Framework, which is placed on the top of the framework. It integrates both theoretical and practical perspectives regarding the way in which an ecosystem of various actors and factors can help, implement and facilitate organic and sustainable agriculture. The central hypothesis is that sustainable change in the agricultural industry requires a synergistic relationship among the stakeholders, institutional activities, attitude of farmers, and economic and environmental outcomes.

The second layer brings in the Stakeholder, that is, farmers and government agencies, Farmer Producer Organizations (FPOs) as well as Non-Governmental Organizations (NGOs). The key players in the ecosystem transformation in organic farming are these players. Organic techniques are actually practiced by farmers, although the government and the non-governmental organizations are the intermediaries because they provide them with financial resources, policy assistance, and technical assistance. The FPOs are necessary to unify the efforts of farmers, enhance market accessibility and group bargaining power. The stakeholders are involved in creating awareness (with the help of education and training) and accessibility (with the help of policy interventions and cooperative networks) as a part of the Farmer 5A Model.

The next component is Interventions, which is the tools of market support, training courses and programs that are aimed to support the application of sustainable and organic farming practices. Such interventions play a practical role of linking the formulation of policies and the implementation of the policies at the farmer level. The government initiatives such as the National Mission to Sustainable Agriculture (NMSA) and Paramparagat Krishi Vikas Yojana (PKVY) are fine examples of programs which focus on two primary obstacles to farmers adoption of organic practices namely availability (access to organic inputs and technology) and affordability (financial incentives). It depends on the layers of awareness and adoption level because farmers acquire more knowledge after the training sessions and seminars conducted by NGOs and FPOs.

The framework is divided into two parallel streams because it flows lower as it indicates the behavioral aspects and barriers.

Financial limitations, knowledge-based limitations, infrastructure limitations, and market-related limitations are the barriers which do not allow farmers to successfully apply the practice of organic farming. The economic challenges are low prices premium in the local markets, high cost of organic certification and the lack of subsidies. The primary causes of knowledge barriers are lack of technical expertise, hard access of extension services and misleading information on organic yields. Examples of infrastructure and market barriers include poor storage, poor supply chains, and limited access to organic markets. The combination of these factors affects both the Affordability and Availability dimensions of the 5A framework, which makes organic farming less viable as a business among small and marginal farmers.

Nevertheless, behavioral factors capture the attitudes of farmers, their motivation, peer influences as well as their willingness and readiness to adopt organic farming practices. These social and psychological factors define the awareness and adoption of organic approaches. The positive attitudes towards the conservation of the environment, the success stories of other farmers and inherent drive to maintain the land health encourage adoption. In contrast, the uncertainty regarding the income stability and productivity can act as discouraging factors. Thus, behavioral factors can overcome the awareness-to-action gap by influencing the readiness of farmers to experiment with sustainable methods.

The next layer is the Socio-Economic Outcomes which is impacted by both behavioral factors and barriers. These are the visible impacts of farmers adopting organic and sustainable methods of farming that can be seen in terms of earning more, productivity, and life security. Farmers that manage to break the barriers to adoption and align their incentives with their sustainability objectives often experience growth in levels of profitability due to the reduced cost of inputs and higher market prices. The biodiversity, enhancement of the soil fertility, and reduction of dependence on artificial fertilizers are also beneficial to long-term sustainability. When knowledge, accessibility and affordability intersect, farmers are in a better position to achieve a large financial payoff as this phase represents the practical implications of the 5A characteristics.

The other factor of importance is external factors, i.e. the market movements, legislative environments, and climate change. Even though these factors cannot be directly controlled by individual farmers, they significantly affect the organic farming ecosystem at large. Favourable climatic conditions, favourable governmental policies and increasing customer demands on organic food can also boost the advantages of sustainable practices. Conversely, unpredictable policies or volatile markets can hold back progress. The dynamic of external forces on the actions and socioeconomic consequences defines the sustainability path of the agriculture sector.

Impact is the final goal and is at the bottom of the framework. The impact includes sustainability, compliance with environmental goals, and promotion of Sustainable Development Goals (SDGs) of the UN, SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Besides improving the livelihoods of farmers, successful organic and sustainable farming system ensures that there is ecological balance, regeneration of soils, and safety of food to the future generations. It shows how socioeconomic and environmental change may be realized due to the combined effect of the 5A Model which is reached due to awareness, acceptance, availability, affordability and accessibility.

VI. Discussion

The present research indicates that even though farmers are highly aware of the issues of organic and sustainable farming practices, they are yet to implement them. The issues encountered in the marketing of organic produce, inability to predictable supply of biofertilizers and inconsistent supply of certified organic inputs are considered to be the key barriers present. The factors that influence the adoption include peer networks and training; farmers who attended peer learning or training had a better option to successfully adopt organic methods. Massive embracement is however curtailed by shortcomings such as uncertainty of initial yields, shortage of water, and the cost of inputs. Most farmers are motivated by benefits to the environment and the human health and many of them testify about high yields and enjoyment since they started the organic production. These findings confirm the need to have holistic interventions to tackle both financial and structural limitations in order to convert awareness into reality.

VII. Suggestions

The way forward to solve the existing problems is to ensure that the local agricultural bodies and legislators enhance the last-mile delivery of organic inputs, as well as increase the availability of farmer training programs. Organic farming may be made more affordable and attractive through group procurement schemes and subsidized input schemes particularly to farmers with a limited resource base. By enhancing access of rural populations to the government via procurement, online platforms and farmer producer organizations (FPOs), stable demand and enhanced price realization of organic products can be attained. Special extension courses in water management and demonstration projects with promising organic transitions are also needed. It is better to make the youth, women, and local leaders as the natural champions to enhance the information sharing and community support.

VIII. Conclusion

It concludes the study that, within the Indian context, the transition to organic and sustainable agriculture is thrilling and challenging. Farmers are feeling positive and are highly aware, which are good beginnings to grow, and the challenges of cost, access and market connectivity must be eliminated to achieve widespread acceptance. There is a need to have increased collaboration between the government, FPOs, NGOs and the agricultural community to overcome the logistical and motivational barriers. It will be required to have sustained capacity building, flexible policy frameworks and constant monitoring to ensure that the adoption of organic farming continues in the future. Ultimately, developing an ecosystem with sustainable agriculture will also have a significant positive impact on the national food security and environmental sustainability besides the improved lives of farmers.

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