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Review

Drivers for the behavioural receptiveness and non-receptiveness of farmers towards organic cultivation system

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ABSTRACT

Small, marginal, and large-scale farm production systems are common among farmers. According to popular belief, the upkeep of such farms necessitates the use of a chemical farming method in order to improve quantity and yields. Excessive chemical use is an inorganic food production approach, which has prompted health-conscious individuals to investigate and practice organic farming. The current study focuses on the acceptance and perspective deviations of farmers and consumers from farm level to final product marketing in terms of goals to ensure the future sustainability of their farms, incentive factors to make wise decisions, and personal views of farming preferences. Furthermore, it is critical for farmers to stand independently with self-interest and zeal in order to become "successful farmers" who follow the organic farming pattern, integration, and certification. On the other hand, social, cultural, psychological, economic, and personal variables have a negative impact on the consumer market, and organic food with improved quality and nutrition has seen a favorable trend. However, some shortcomings and impediments to switching to organic farming from conventional kinds of agricultural systems have been found, which farmers typically confront throughout the inter-conversion phase. With the correct solutions, agricultural farming hurdles could be overcome, restoring soil health, food quality, and sustainability. As a result, the current study examines the current state and future prospects of organic farming, underlining the challenges that must be overcome in adopting and investing sustainably. Organic system of farming calls for a sustainable future and Sustainable Development Goals (SDG'S) with ecological benefits and nutritious food. It can be further concluded that organic farming is the need of the hour which requires awareness, educational training and scientific Know how so that it reaches farmers with ecologically sound environment and economically sound returns.

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1. Introduction

The most commonly acknowledged definition of organic farming is to provide and promote holistic management, which further modifies agro-ecosystem, microclimatic conditions, preserve biodiversity, nutrient cycles, and enhance biological activities related to soil. Furthermore, it emphasizes on the use of ecofriendly strategies which utilizes the use of on and off-farm inputs, agronomic, biological and mechanical methods, thus excluding the vast burdens of chemical fertilizers and pesticides (FAO, 1999; Reddy, 2010). Organic farming has grown adequately in the mid-nineteen centuries with its importance and affects globally (Lockeretz, 2007). The popularity of organic foods flourished in the 1970s emphasizing the first certification procedures and standards related to natural, which was formulated in Europe and the United States. Furthermore, the progressive certification process, the count of the certifiers has reached to a total of 283 bodies functioning globally in 170 countries actively. According to the traditional aspect "Look to the Land" concept is not only based on organic inputs but also gives the idea of managing a farm as an integrated system (Slathia et al., 2013). Hence, the biological cultivation system is often advertised based on the multiple advantageous impacts; it is renowned for providing; nutritious food, an enhanced farming environment and, increasingly providing benefits both to the rural, as well as urban sectors. In terms of health benefits concerning some evidence "organic diet is beneficial in reducing the amount of toxic chemical ingestion, decrease the number of food additives and coloring, avoids GMOs" also it enhances the number of antioxidants, vitamins and healthy fatty acids (Horne et al., 2008). Despite hindered growth of the world economy, the overall organic enterprise and market revenue are continually and progressively elevating. Even though the biological model of farming is gaining attention and becoming popular worldwide, the highest demand for organic food emerges from Ocenia (45%) and Europe (25%). The accelerated growth demand drives to extremely targeted, large production, and promotes the supply more significant than the actual application. As a known fact, the excessive number of organic products already exists in European and Oceania markets, and the correlation between supply and demand will be disturbed in the long run (Peng, 2019). This review emphasizes the views of the farmers regarding organic farming. It is essential to perceive how farmers consider alternative means, to apprehend their terms of a reference system and further focuses on the following problems and finally their solutions related to diversions witnessed in terms of farmers behavior towards accepting and neglecting organic system of farming. This review highlights the sustainability of the farming system along with the respective judiciously choice for better development in agriculture system. This review article will show a way forward direction to researcher and policymakers for better understanding to establish a program and create a strategy for extending the process of organic farming in India, especially to emphasizing the small landholders (Pannerselvam et al., 2011; Basha and Lal, 2019) to empowerment the agriculture farming system.

2. Context literature

2.1. Advantages related to the eco-friendly organic strategies

2.1.1. Benefits related to human health

The most significant nutritional value analysis ever conducted in Europe (2007), highlighted the importance of organic milk that presented higher levels of nutreints and vitamin E (60–80%) in comparative analysis with the traditional milk of 68% higher total Omega-3 fatty acid has been reported in organic milk as compared to the non-organic one. Similarly, organic cabbage and spinach have more essential minerals than the conventional one. Furthermore, a recent study from America has shown that organic production increases the levels of antioxidants by 30% and in some cases, by up to 50% by an average which clearly indicates the ability of these organic products for management of high blood pressure problems, thus minimizing serious threats like cardiac stroke (Pannerselvam et al., 2011; Das et al., 2020).

2.1.2. Benefits about ecology and environment

Organic farming helps the battle against global warming through the capture and absorption of atmospheric CO_2 into soils-whereas traditional farming accelerates the effects produced by greenhouses gases by creating a net carbon emission into the atmosphere. In addition, Organic soils rich in organic matter are known to extract and utilize better carbon than the agricultural soils, which are maintained conventionally. Furthermore, one of the main benefits of organic food production is that farmers can reduce greenhouse gases, including methane and nitrous oxides, that farms release to the natural atmosphere (Havsteen, 2002; Museanescu, 2013; John et al., 2016).

2.1.3. Organic bio-fertilizers that could replace the chemical fertilizers in organic farming

Bio-fertilizers increases soil fertility by making use of different microbes. These are organic constituents which are recognized as inputs which poses no harm and assist in safeguard of soil texture and increases crop quality (Maeder et al., 2002, Mishra et al., 2021). These bio-fertilizers help in adding nutritional value via methods of fixation of nitrogen, phosphorus mixing as well as development promoting substance production to stimulate better growth of plants. These natural substances are accountable for nonstop nutrient availability and environment friendly. There are two major groups of microbes which can be used as microbial inoculants, (The symbiotic organization like *Rhizobium* spp., *Azolla* spp. &*Frankia* spp. as well as non-symbiotic organization like Azotobacter spp., blue green algae & Azospirillum spp.). Therefore bio-fertilizers comprise, nitrogen fixing bacteria in symbiotic conditions (*Rhizobium* spp.), free nitrogen fixing bacteria in asymbiotic conditions (*Azotobacter* spp.), biofertilizers comprising algae (BGA combining Azolla), PSB (Phosphate Solubilizing Bacteria) and mycorrhizae. In non-legume crop types like sugar beet and conifer species, N2-fixing Paenibacillus species in association with rhizosphere have been used increasingly (Pandey et al., 2018; Stolze and Lampkin, 2009). Mycorrhizae and its synergistic interaction (AMF (Arbuscular Mycorrhizal Fungi) and PSMs (Phosphate Solubilizing Micro-organisms) are few microbe-interaction involved in phosphorus acquisition functions as a bio-ameliorators and potentially enhancing the rhizospheric soil features significantly under both standard and stressed environments (Rabie and Almadini, 2005; Singh and Singh, 2011). The two greatly significant non-symbiotic nitrogen fixing bacteria are *Azotobacter* and *Azospirillum*in non-leguminous crops. In addition to their part in fixing of nitrogen, Azotobacter is capable of synthesizing and secreting significant quantities of biologically important constituents such as vitamins like Riboflavin & Thiamine (Revillas et al., 2000), nicotinic acid, pantothenic acid, biotin, heteroxins, gibberellins, ammonia discharge into the rhizosphere in presence of root exudates, which modifies the uptake of nutrients by the crops (Terziev et al., 2015).

Table 1
The following data represents the primary components associated with farmers' attitudes and opinions regarding Organic farming (Kallas et al., 2010).

The opinion of Farmers regarding Organic Farming (The Principal Component Analysis)		
Different variables	Quality analysis (Factor 1(a6)	Future viability (Factor 2 a7)
The organic price premium for increased production costs	0.183	0.809
Ensures farm's Economic viability	0.409	0.750
More risk due to yield fluctuation	0.433	−0.565
More flexible system than conventional	0.076	0.485
Cronbach's alpha: 0.595	Total Reported variance: 46.33%Barlett analysis: 152.19 (0.000)	
Olkin Test: 0.65		
Rotation method: Varimax		

2.1.4. Biological control as a natural weapon for disease control in organic farming

Strategies of natural bio-control which uses agents of biological nature for the eradication of pest are commonly characterised as biological control strategies (Thippeswany et al., 2013). Normally, this term denotes to the method of nurturing and liberating usual foes: parasitoids, predators and pathogens. Bio-control agents comprise a varied assortment of different forms of life, together with vertebrates, invertebrates, fungi and other different microorganisms. These valuable classes are shared in several natural groups and even if their existence is frequently overlooked, they aid to uphold the 'Natural Balance' by regulation of their host density or population of prey. Species of insects frequently convert to pests whenever the natural equilibrium is disordered by natural actions or human interference (Museanescu, 2013; Peigne et al., 2015; Bouttes et al., 2019).

2.2. A differential spectrum of organic and conventional farming

In recent decades, organic agriculture has led to controversy, primarily because it offers an opportunity to highlight the darker side of conventional chemical-intensive farming (Thatcher and Sharp, 2008). There is now strong evidence that organic agriculture is more eco-friendly: Organic production has more benefits as a result of improved soil health (Ding et al., 2019; Naguib, 2011), and fertility, organic matter and carbon content and biological activities; decreased frequency of soil erosion; reduced nutrient and pesticides pollution and improved biodiversity for plants and animals.The significant difference between organic and inorganic farming is the organic agricultural goods which are flavourful, nutritious and chemicals-free while inorganic food products are less nutritious, and can contain chemicals, toxic pesticide residues (Thippeswamy, 2013; Museanescu, 2013).

2.3. Barriers to organic farming: dual perspective of a single coin

2.3.1. Differential opinion of farmers towards organic farming system

The organic cultivation system is an amalgamated holistic approach which depends on active agro-ecosystem management having a food system which may be certified or noncertified. The studies conducted globally report that the factors like economic benefits, reduced input costs, premium price policies for the harvested produce, along with the non-economic factors like increased soil fertility, ecological protection factors, food security

Table 2
Statistical analysis of certified organic farmers based on perception (Philip and Sivaraj, 2018).

Different response of respondents towards utilization of Organic manures			
Statistical analysis of certified organic farmers based on perception (Philip and Sivaraj, 2018)	**Category**	**Number**	**Percent**
Scenario 1: Respondents distribution on eco-friendly activities according to their understanding.	Low	47	26
	Medium	42	23
	High	91	50
	Total	180	100
Scenario 2: Respondents distribution based on their perception of organic manures.	Low	26	15
	Medium	97	53
	High	56	31
	Total	1801	100
Scenario 3: Distribution of respondents on the profitability of organic manures.	Low	30	16
	Medium	104	59
	High	43	23
	Total	180	100

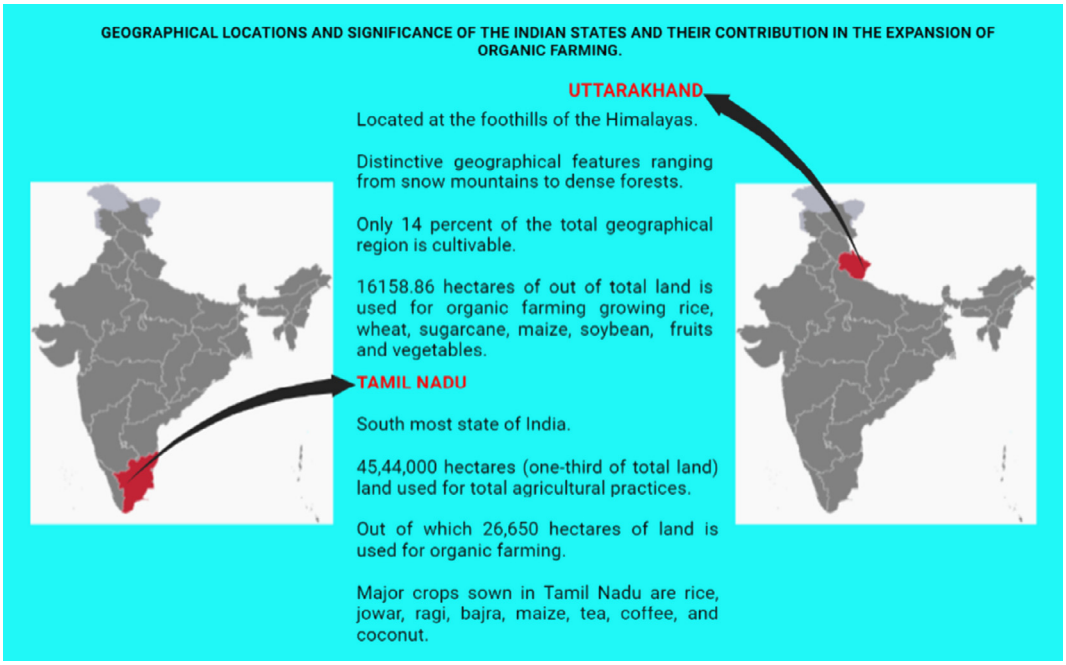

Fig. 1. Geographical Locations and significance of the Indian States and their Contribution in the Expansion of Organic Farming.

and quality and impacts on human health influenced the (Table 1) farmers to accept organic farming for a safe and economical alternative (Pannerselvam et al., 2011). On the other hand, buyers are immensely searching for products with the least chemicals, environment-friendly, foods rich in vitamins and minerals. The uprising economic emancipation with an increase in India's population is presently facing severe compression with resources available in India. Thus, the high tension of meeting food demand with confined agricultural cultivable land and products with toxin-free have gained importance in a country like ours to consider options such as conventional farming, the best farming approach encouraged by governments and agribusiness groups around the globe, an integrated production management method which is to support the environment, wellness and renewability (Maji et al., 2017).

3. Material and methodology

3.1. Case studies: farmer's perception of organic farming

3.1.1. Case 1: Tamil Nadu

The following study was recently conducted in three districts of Tamil Nadu, where 20 certified organic farmers were picked from each district, emphasizing their perception of organic practices (Table 2) **Scenario 1:** Presents that 50.55% of farmers certified under organic farming had a high level of perception of environment-friendly practices. Followed by low (26.11%) and medium of (23.34%). The reason may be since most of them had the right level of educational status with an average level of constant direction. **Scenario 2:** Depicts that 53.33% of organic farmers had a medium level of view on the utilization of organic manures with a high (31.67%) and low (15.00%) extent of perception on uses of organic manures. **Scenario 3:** Shows that (59.44%) a high number of organic farmers had an average amount of perception of organic farming leading to profits, with a high (23.89%) and low (16.67%) grade of perception in organic farming amounting to profits (Philip and Sivaraj, 2018) (Fig. 1).

3.1.2. Case 2: Uttarakhand

Uttarakhand, one of India's leading organic farming states, has predominance, along with relatively unpolluted habitats; of mostly conventional integral crop-livestock agriculture closed to the organic system. Agriculture is a small spatial land use but is the determination of local livings in Uttarakhand, the Himalayan state. It also predominates primarily conventional integrated crop ani-

Table 3
The SWOT analysis is consisting of the Weakness and Strength factors about the prospect of organic farming in Uttarakhand.

SWOT groups considered for analysis	Scaling (Priority of the different groups)	SWOT categories/factors	Consistency Ratio (CR)	Priorities of the factors within the SWOT group	Global priorities of the Factors
Factor 1: Weakness	0.189	W1: Comparatively productivity of organic crops at the lower hand	0.091	0.419	0.079
		W2: Unsatisfactory price premium for organic products		0.3623	0.069
		W3: Inefficient supply of organic amendments and inputs, skilled labours with high labour costs		0.145	0.027
		W4: Complex certification process		0.073	0.014
		λmax = 4.246CI = 0.082			
Factor 2: Strength	0.331	S1: Abundance of organic inputs	0.077	0.434	0.144
		S2: Community based provision of organic Certification		0.246	0.081
		S3: Rich indigenous knowledge of the local population regarding traditional organic amendments.		0.181	0.060
		S4: Self-reliant, low cost-effective, integrated farming system		0.092	0.030
		S5: Policies to promote the preservation of rich mountain biodiversity and discouraging the use of agrochemicals		0.047	0.015
		λmax = 5.348 = 0.087			

mal husbandry (Chander et al., 2013), along with minor and low yield farmers depending on the rainfall. The research was undertaken among the 240 farmers from eight blocks of four districts, presently involved in Organic farming in the hilly state of Uttarakhand. Organic farming prospects in Uttarakhand were visualized by factors below four dimensions, viz. Power, vulnerability, potential and danger centred on the prevailing situation at the field level faced by the state's organic farmers.

The geographical location of Tamil Nadu is between 8°5′ and 13°35′ latitude North and between 76°14′ and 80°21′ longitude East. Tamil Nadu falls in semi-arid to dry sub sticky weather. This geographical location supports advanced agricultural productivity under irrigation. The entire geographical region of Tamil Nadu is 130.33 Lakh Ha which constitutes 4 percent of the Nation's geographical zone (10th Largest State) with a shoreline of 1076 km. Tamil Nadu is one of the most water-starved States favored with just 3 percent of the Nation's water resources laying towering pressure on irrigation water accessibility and susceptible to seasonal oscillations causing dubiety in Agriculture yield. Still, the Tamil Nadu Government with its visionary programs and strategic perpetration of strategies overcame these difficulties and paved the route for the uninterrupted proliferation of food grains.

As per reported by the 10th Agriculture Census of the year 2015–16 (Interim), the sum of functional land proprietors in the State of Tamil Nadu is 79.38 Lakh, handling cultivable land of 59.73 Lakh Hectare. The State's mean periodic rain is around 921 mm which is lower than the national standard of mm. The amount of rain documented during winter (January-February), Summer (March-May), South-West Monsoon (June-September), and North-East Monsoon (October-December) is 3, 14, 35, and 48 individually. The per capita accessibility of water is 750 cubic meters per annum as equated to the all-India standard of cubic meters. Uttarakhand, located at the foothills of the Himalayas, is represented by distinctive geographical features categorizing from snow-packed mountain tops in the North to tropical forestlands in the South. It has been classified into two zones-the western zone-Garhwal Mandal and the eastern zone-Kumaon Mandal. It's divided into 13 different districts which comprise 95 blocks.

Out of an entire geographical region of 5.35 million ha in the state, 4.6 million ha (86) is a hilly region and 0.74 million ha (14) is a plain region. Just around 14 percent of the geographical region is cultivable which is substantially accredited to the geomorphology of the state. Due to its position and different weather, the State has some special upper hands for the expansion of horticulture, agro-processing industries, organic husbandry, off-season vegetable farming, and production of therapeutic and ornamental plants which can be profitably capitalized.

4. Results

4.1. Strength factor

Based on the quantitative significance to the overall future of organic dairy production among organic producers, "abundance of organic manure and water" with a universal preference of 0.144 was the most critical element under stress. Uttarakhand and Tamil Nadu though present different climatic variation like the former is lavish in forest coverage (64% of the total area), and water resources (the upper catchment of snow-fed Ganga and >1000 mm of annual rainfall), but the primary inputs and strategies thus remain similar for organic farming sustainability. Both case studies have abundant forest leaf litter which is primarily used as bedding material in livestock sheds and courtyards as well as litter-livestock excreta mixture as manure in farmyards. The second most significant aspect was the "Community based credential program along with other support services" (global priority score 0.081). The provision of a community-based certification system as follows by UOCB, the state's leading. Organic farming certification agency is beneficial, particularly for small and marginal farmers who predominate in the state. The next important factors were found to be "the rich. The base of indigenous knowledge of the local population" (score 0.060) and Self-reliant, low-cost adaptive crop-farming integrated agriculture (score 0.030).

4.2. Weakness factors

The essential factor regarded as weakness was "relatively lower organic crop productivity" with a global priority of 0.079. It is because of the prohibition of the use of synthetic chemical inputs along with a host of other restrictions in variety, irrigation and other activities that nit is always coupled with the loss of crop productivity. On average, organic farms yield 10–15 per cent less than conventional farms in maturity, which may be higher in the initial years of conversion. "Unsatisfactory premium prices for organic products" (score 0.069) and "insufficient availability of organic inputs and skilled labour" (score 0.027) were listed as the next two major deficiency factors. The domestic market consumes only about 8 per cent of the total organic product (Table 3). 95% of organic farmers faced the problem of lack of marketing knowledge, lack of an appropriate marketing network, lack of regular supply,

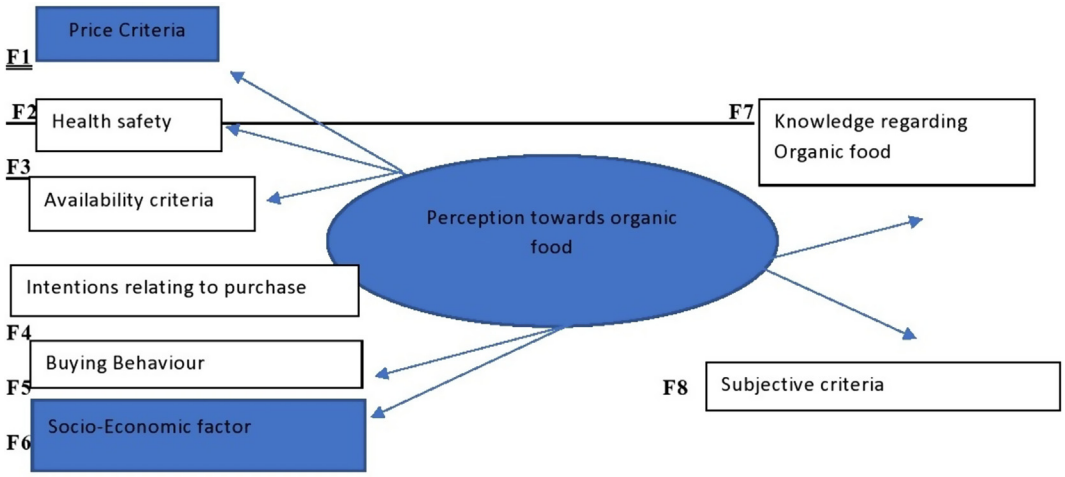

Fig. 2. Conceptual model on the perception of Indian consumers towards organic products (Singh and Verma, 2017).

unavailability of organic inputs such as bio-fertilizers and biopesticide. Eventually, the organic farmers considered "rigorous certification process and complex practices" (score 0.014) to be an essential factor in weakness. By this study, they concluded that Organic farming has a strong potential not only in Uttarakhand and Tamil Nadu, but also in different regions of India, particularly those that are relatively less involved in intensive organic farming dependent on high external inputs. With rich indigenous information, rich biodiversity, lower organic farming production costs and still undiscovered vast internal shift to organic production looks like a lucrative choice not only for Uttarakhand's and Tamil Nadu's certified organic and other conventional farmers but also for farmers across India.

5. Discussion

5.1. Preferences and perceptions of consumers towards choice of cultivation system

In a global circumstance where organic foods trending in the market by, 2018, have expanded substantially in markets, through stable and moderately fast progress being distinct, which are predominantly health, the surroundings and a better understanding of particular components present in foods produced organically. In this statement, the OECD (2002) marked out the increasing demand for organic products globally (Lernoud and Willer, 2019; Adl et al., 2011), and the relationship between a consumer choice for products with low levels of pollutants and natural greener products during the product manufacturing process (Niggli et al., 2017) (Fig. 2). This growing event indeed initiated an increase in the retail trade and the growth of organic products (Basha et al., 2019). Consumers are generally attracted to organic produce due to two main reasons. Firstly, the incline towards health care and quality (Nandi et al., 2015; Maji and Meena, 2017; Singh and Verma, 2017; Boobalan and Nachimuthu, 2019; Ferella et al., 2019), where customers believe that organic goods are better and safer due to the small quantities of contaminants, while the second reason is the issues related to environmental sustainability and safety and (Okolle et al., 2016; Yanakittkul and Aungvaravong, 2020).

According to a report by Tech. Sci, which recently pointed out in India, organic food was estimated to rise at a CAGR of over 25% during 2015–2020. In current scenario, there is tremendous demand for organic food for wellbeing. Additional factor such as income levels, better quality life, and convenient government initiatives adding impact in current organic farming systems with respect to new technical support & financial aid. The focus of the producers is diverted in reducing the prices due to widespread high market prices which hinders between differential prices of conventional and organic (Pandey et al., 2019) food products. Due to the hiking demand for organic products, it increases and resulting in hike in economy, decrease production cost, and eventually leading the growth of Indian organic food in the in near future (Kamath et al., 2021).

5.2. The considerations for the receptiveness of farmers towards organic farming

The attitude and readiness of farmers to adapt to organic farming are what matters even when the farmers are fully aware of the benefits of it. Farmers go through the stages of knowing and getting aware of organic agriculture and technology related to it. This leads to the formation of positive or negative views for organic farming and eventually elect whether to implement it or not. Several reported studies show that farmers have a positive attitude towards organic methods of agriculture (Alzaidi et al., 2013; Mohan and Helen, 2014; Dipeolu et al., 2006; Tratnik and Zutinic, 2009; Kashyap et al., 2017; Singh and George, 2012) with few of the farmers showing concerns regarding its long-term feasibility (Eyinadeand Akharume, 2018; Ulm et al., 2019; Yanakittkul et al., 2019). A study has reported that farmers have shown a healthy positive attitude and intent to accept organic agricultural methods in the coming five years (Issa and Hamm, 2017; Thakur, 2018). Also, as per a constructed framework, a farmer's behaviour and attitude towards organic farming are steered by five important considerations namely, familiarity with organic farming, associated cost, profits from organic farming, environmental features

Table 4
The conceptual structure is highlighting the ecological approach of farmers in three dimensions (Hansen et al., 2019).

S. No.	Decision-making context in which the farm exists	Decision-making process of individual farmers	Decision-making process itself
	Farm location	Demands and expectation by the consumers	Economic values
	Farm socio-demographics	Perceptions of demand and expectation by other supply chain actors	Adoption ease
	Influence of middle man and supply chain handlers	Ease of use and usefulness	Future adoption strategies
	Nature of practice		

Table 5
A Five stage model prediction to analyze the criteria related to choosing by the farmers (Sutherland et al., 2012).

Stage1: Directional dependence	This category of the five-stage model highlights the path dependence of the farmers, where they may be happy with their success rates and economic criteria related to the farming system and want to stick to that particular type of cultivation pattern, though this stage can proceed for an unspecified period.
Stage 2: A spark-off event	The shifting of farmer's interest in another farming system can be due to the urge to explore something new that can be more economical and ecologically sound. These events can be in the form of new and upgraded business incentives, death or injury, new management methods or technology being available.
Stage 3: Active and vibrant evaluation	The moment farmer decides to proceed with some new method; several choices would be tested utilizing a range of information sources.
Stage 4: Incorporation and Implementation stage	In the fourth stage of the model, the producers start implementing the new strategies
Stage 5: Stabilizing and Reinforcement stage	If the new strategy followed by the farmer is found useful, he/she will proceed for full conversion while shifting to stage 3 (Active evaluation), but in case it is reported as ineffective, then is the farmer opts to stat again with the first stage (Path dependency) (Sutherland et al., 2012).

and public influences (Mader et al., 2002; Reddy, 2010; Thakur et al., 2017).

Organic farming and its importance are realized effectively by a group of farmers around the world for a long time. Policymakers, intellectuals, practitioners and academicians have also mentioned and talked about its positive aspects from time (Willer and Lernoud, 2019) to time. However, the preparation and inclination shown by the farming groups are what is required for the active implementation of this organic farming culture amongst different farming groups (Barnes et al., 2013; Yazdanpanah et al., 2022; Dang et al., 2014; Sobhana et al., 2019). The Policies made by the government which are constructed on the public as well as private sector's need is responsible for incentivizing farmer groups for obeying or behaving as per the policies. Morone et al. (2019) confirmed that the guidelines (funds and organizations, small scale farming) are the main driving forces for the model of sustainable food security. Dang et al. (2014) considered the variables used as incentives for policies in promoting the growth of various plant species and the policies for supporting the buying of rich hedgerows, without affecting the farmer's intentions. The identification of needs by the farmer according to his/her suitability is known as self–identification towards farming behaviour. Van Dijk et al. (2016) acknowledged farming groups as the group of people who save the environment and found an impact on the aim of not accepting the aid provided like- subsidies Alzaidi et al., 2013; Mohan and Helen, 2014; Dipeolu et al., 2006; Tratnik and Zutinic, 2009; Singh and George, 2012) (Eyinade and Akharume, 2018; Thakur, 2018; Thakur and Kumari, 2021). A study has reported that farmers have shown a healthy positive attitude and intent to accept organic agricultural methods in the coming five years (Issa and Hamm, 2017).

5.3. An interest inclined shift/behaviour towards organic farming by farmer groups

Agriculture based on the use of chemicals and irresponsible irrigation methods have shown several limitations in recent years, and this has caused a high attention shift on organic farming. A significant fall in the agricultural yield in certain areas due to excessive use of chemicals which leads to the decrease in soil fertility (Lampkin et al., 1994; Janjhua et al., 2019). The farmer groups have understood the need to encourage and adopt the new organic farming techniques due to the knowledge that, it can provide sustainable production of high-quality food items and products with almost no harm to the environment and humanity. The current agricultural methods are proving to be incapable of achieving these goals, and hence there is a need to encourage organic farming which is capable of delivering efficiently Scofield (1986). A statistically significant relationship was found between the producer's views on an organic system of farming and the factors like- labour, profits, age and level of education. The farmer groups with good education and training showed highly effective association towards organic farming methods (Rana et al., 2017). It has been noted that the farmers deciding ability to adopt organic farming was mainly driven by several complex factors like- comparison between the advantages and disadvantages of new and old practices of farming, resources required, social and economic status, demographic factors and awareness of official services available for their help (Pinthukas, 2015). Other features like land occupancy and irrigation facilities also displayed a positive sign for the implementation of organic farming by different farmer groups. Studies have reported that awareness regarding organic agriculture also has a significant effect on embracing organic farming techniques (Ullah et al., 2015; Dessart et al., 2019; Lapple, 2010). Agro-environmental interventions, cognitive strategies, such as behavioural techniques, have also been used to determine the response of producers to new environmental policy design. Also, the Concept of Planned Behavior (TPB), which focuses on the evaluation of social intentions determinants, has been widely used to explain and forecast the possible actions of farmers concerning environmental protection measures (Menozzi et al., 2015; Ghaffari et al., 2019).

5.4. The integrated conceptual frame: decision making process followed by the farmers

The conceptual structure describes the ecological approach of farmers in three dimensions: i) the decision-making process of individual farmers; ii) the decision-making context in which the farm exists, and iii) the decision-making process itself. The decision-making process of individual farmers defined in the extended framework is considered to be influenced by the context in which the farm exists (Hansen et al., 2019) (Table 4). Alongside a large number of theories and models related to farmer behavioral change have been studied. Similarly, a five-stage model (Table 5) prediction for assessing the cascade of choice-making criteria of farmers was raised by Sutherland and his coworkers in 2012. The Behavioral component is judged by three criteria (1) The first component contributes to specific behavior corresponding to the individual's values and social views (2) The second component highlights the standards about cultural aspects, which studies the diversion of a specific behavior (Department of Agriculture (DoA), 2016) from the corresponding peer group, (3) The final component is the perceived behavioral control, which decides the degree of decision-making ability of an individual towards selecting an appropriate type (Rose, 2018; Tiraieyari et al., 2017; Assis and Mohd Is, 2011; Paull, 2011; Mohamed Haris, 2019).

5.4.1. Comparative efficiency of behavior

The comparative efficiency of behavior is a factor that the farmers will precede towards a farming practice that finally boosts yield and productivity. The study conducted by Aubert et al. (2012) stressed on the advantages of incorporating technologies related

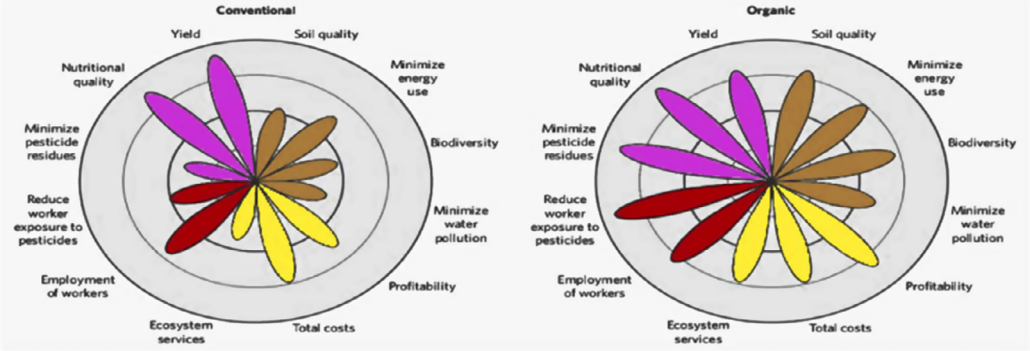

Fig. 3. A 12-petal diagram depicting the Comparative analysis of chemical and organic cultivation patterns based on 12 significant parameters and four zones of sustainable.

Table 6
The challenges and obstacles faced by the small land holders in India.

The Challenges and Hindrances Faced by Small Holder in India	Based on the survey conducted by NSS in 2003, there are several issues related to farmers having marginal and small production systems: Unsustainable or weak credit/ product markets resulting in lower values or poor economic decisions, Lack of transportationFacilities to capital markets, inefficient public excellent services Low human resources and lack of efficient extension services which generally lacks or restrict technological interventions in farming practices
Protection of rights for the various categories of social groups	Women are becoming more important in agriculture. The proportion of female rural farmers in 2004–05 amounted to around 83% compared with 67% of men population, indicating the significant fraction and importance of women in farming practices in rural areas. They are involved in soil preparation, selection of seeds, planting, land treatment with manure, pesticides and fertilizers, weed control, grafting, threshing, filtering and gathering etc. and also in animal, dairy farming and fish handling, etc. Protection of women's rights in land, improvement of women farmers' infrastructure and legal support of legislation will facilitate their recognition and access to loans, inputs and various extension services for women farmers.Among marginalized and small farmers, there is a high proportion (22%) of underprivileged groups (Scheduled Castes and Scheduled Tribes) than the medium and large farmers. Likewise, the ST population constitutes about 15–16% of smallholder farmers and about 14–15% of medium and large-scale farmers, respectively. The land ownership distribution between STs is better than that of SCs.
land conflicts: Security of land and property*: *loans and liabilities	For smallholder farmers, therefore, the security of tenancy is essential. Land dealings are highly complicated; this perplexity is significantly contributed to the problems faced by the actual farmers. Unregistered farmers, tenant farmers and tribal farmers face issues accessing institutional credit and another land-titled facility. The tribal' land rights should be protected in the agency areas. Further land redistribution is significant, especially if waste-uncultivable land is taken into account. The increased burden related to investment and consumption results in increased debt and unwillingness towards organic farming among the farmers.
Low formal schooling and qualifications	The increase in literacy rate is the need of the hour for keeping farmers equipped with latest technologies related to production, investment and productivity. A study regarding recording literacy rates of men and women focused on the skilled and educated population for marginalized farmers which was reported close to be 50–60% (men) and 20–30 (women) percent respectively.In contrast, for the medium and large landholders, it was reported around 60–70% men and 20–39% percent women population. Likewise, the reduced level of education of farmers restricts the awareness and public knowledge propagation regarding the utilization of biofertilizers, low aid prices, respectively.

to soil analysis for the suitable type of plant which has a strong influence on the perceived benefits of farmers leading to various technology applications. The previous literature also emphasized the selection Kirchmann et al. (2008) or acceptance of various environmental policies (Sattler and Nagel, 2010) by the farmers in terms of the risks associated with cost and time. Similarly, the urge for long-term benefits moved the farmer's interest in the utilization of renewable energy sources (The primary target of agriculture is to ensure food security with ecological safety. Further, the possible reasons for the reduction in organic yield were lower availability and efficient uptake of nutrients, weak weed and pest control and constraints related to methods to increase soil nutritional and health status (Warren et al., 2016; Yanakittkul and Aungvaravong, 2020). The ongoing debate with various views also showcases a probability regarding the inefficiency and inability of organic systems to feed the world successfully (e.g. Badgley and Perfecto, 2007; Cassman, 2007; O'Connor, 2008; Goulding et al., 2009). So, we need an extensive study of conventional system yields in order to state and predict the viability of organic methods and strategies to provide ample food in the future (De Ponti et al., 2012; Kirchmann et al., 2016). The studies also depict that a positive inclination is observed in the farmer's behavior, which shifts towards a more optimistic phase towards environment sustainability when continuing with organic farming in comparison to the farmers who are carrying out the traditional ways of farming. The reason for the increased positive attitude towards environment may be devoted to the organic values and utilizing natural resources judiciously (Lapple, 2012). However, in developed countries there are issues related to lower land- efficiency of organic agriculture so, the positive impact of organic farming is less notice-

able. The short and long lengths of 12 flower petals are known to relate the success rate of the different sustainability measures qualitatively. The four adjoining circles generally depict the zones relating to 25, 50, 75 and 100 per cent sustainability dimensions. The different colors depict different parameters (purple petals represent the areas of production whereas, the brown petals represent areas of environmental sustainability, yellow petals present areas of economic sustainability and red petals represent areas of well-being respectively. The Petal lengths indicate that the organic cultivation system generally fits into the four zones of sustainability (Fig. 3).

5.5. Innovative theories and their diffusions

The judgment cycle for innovation begins with the awareness level, where the person discovers and is finding information about an innovation. As per Rogers, three forms of wisdom emerge here, namely: (1) understanding, (2) knowledge, and (3) pure knowledge. The perception of awareness demonstrates the presence of the innovations, and this will inspire to learn more about the innovations and thus to implement them. The understanding of how-to and theory offers further detail about inventions and explains further the structure and purpose of how an invention works. A person will possess all the required skills, but that does not ensure that the adoption will take place (Haris, 2019).

5.6. The risks associated with organic farming

Organic farming has arisen as a response to agricultural industrialization and its related environmental and social problems. However, the question of whether organic farming offers comprehensive advantages over conventional agriculture is controversial. Some say organic farming systems are more efficient and environmentally friendly, while others challenge the role of organic farming in sustainable food systems in the future. Many studies stressed the need for significant changes in the world's food system: farming must tackle the dual challenge of feeding a rising population; (Seufert et al., 2012; Reddy, 2017). Recent and continuing market globalization processes, changes in policy infrastructure, systemic shifts in the industry, new and rapidly evolving technology demonstrate that globalization creates not only positive developments but also threats and risks like never before. Therefore, Agricultural production has significant problems, including: (i) Unfavourable weather situations (ii) unenriched and fewer varieties of crops (iii) inadequate management of crop practices (iv) bugs, insects and disease (v) Obstacles to technological adoption (vi) external (viii) Low and reducing soil fertility (Phiri et al., 2012; Darnhofer et al., 2005).Discussing the problems of globalization processes concerning the quality and protection of food and agricultural non-food products, the issues on secure production conditions and the prospects for international trade should be addressed taking into account the fact that there are higher risks (Table 6)and more significant benefits.

5.6.1. Risks and vulnerabilities

There is sufficient evidence to indicate the deprivation and insecurity of low-income families are at risk of several risks that can have a detrimental effect on their livelihoods and health for individuals, households, or entire communities. They are at a higher risk at both household and individual levels. Some are (a) health risks: including disease, injury, accidents and handicaps; (b) labour risk: much work in the public sector and a high risk of being jobless and dissatisfaction, inadequate amount of work; (c) risks of harvesting. Moreover, they have associated environmental risks such as cyclones, floods and droughts etc. All of these risks are vulnerable to small and marginal farmers. Most mechanisms for dealing with families include loans, asset sales; savings expenditures, family and government support, increased labour supplies, child labour, bonded labour, reduction in utilization, migration, etc. In order to manage, control and restrict the adverse effects due to risks and vulnerability, extensive social protection plans are required. There are many programs in India for social protection. In India, the current central schemes and policies for the sparse population are divided into four main categories: (i) Food channelization such as a public distribution system (PDS) and additional nutrition (ii) self-occupation (iii) salary work and (iv) Unorganized and non-effective workers' social security schemes. The visibility and extension of such programs should be enhanced to ensure that these programs also benefit small and marginal farmers.

5.7. Globalization and climatic challenges

The problems of small-scale farming have increased with globalization. Developed country policy on massive subsidies and policies of protection has adverse repercussions for small farmers in developing countries. If small farms are not supported, globalization can benefit large farmers. Trade liberalization has harmed agricultural economies in areas where crops like seeds, cotton and oilseed are essential. The efficiency issues become very important through liberalization in terms of competition faced by domestic production. The country needs to reduce various post-collection costs to compete in the world market and undertake appropriate reforms in order to increase the efficiency of domestic markets and systems of supply. The adverse effects on the farmers, which are generally encountered, are the low prices and output volatility for main cash crops.

The changing climatic patterns and the fluctuating weather conditions pose the biggest challenge to the rural population in terms of agriculture, environment, food safety and security. These Climate changes have been reported to adversely affect the living environment of the poor, food deficient small landholders due to the immediate risk of crop failure, loss of livestock and forest products. However, Adapting and mitigating agriculture may provide smallholder farmers with benefits.

The net zero green chemistry concepts drive in the major goals of sustainable energy sources and reduction in the emission rates of GHG'S (Green House Gases). The greatest challenge has been faced by the human race in terms of global warming and exceeding climatic turnovers and emissions. To achieve a net zero concept by 2050 we need to go for sustainable transformations in terms of transport, produce and energy. Organic farming can help in terms of systemic approach to reduce the GHG'S emission linked to consumption and food production strategies. Net zero strategies would help the Agri-sectors to adapt to the climate change keeping in view the parameters related to food security and finally to progress towards Sustainable Development Goals, keeping in view the protection and restoration of ecosystem and ecology (Northrup et al., 2021). A sole focus of using organic strategies is to overcome the obstacles like farmers livelihood and environmental trade-offs.

Table 7
Methods of agricultural policy related to organic farming (Kristiansen et al., 2006).

S. NO.	**Govt Grants/Agricultural Policies associated with organic Farming**
1.	Grants related to the regulatory framework associated with the examination process.
2.	Conversion subsidies and existing yield or progress goals.
3.	Facilitating the domestic as well as global markets.
4.	Funding related to research, expansion and education.
5.	Regional development funds.
6.	Policies related to Elimination of discouragement, e.g., inadequate labeling.

A sustainable farming system related to organic would reduce the cumulative greenhouse gas emissions from agriculture by 8–9% through increased carbon sequestration (5–6%) and further reduction in nitrogen fertilizer application rates. It would further reduce the emission patterns related to mineral and chemical fertilizers and would bring out sustainable benefits like improving biodiversity, a balanced system resilience, soil health and fertility, reduction in algal blooms/eutrophication, improvement in food safety and security sections and the most important improving the farmers sovereignty. Further the use of organic manures and local resources would reduce burdens on imported feed and hence would reduce the emissions linked to feed production and land use patterns (Leger et al., 2021; Billen et al., 2021).

5.8. Government organic farming programs and boosting schemes: the present and future scenario

Sikkim and Uttarakhand have been designated as organic states and ~five lakh ha land have been cultivated in the state of Maharashtra since 2003 (of 1,8 crore hectares of cultivable land). The organic sapota, coconut and banana production were more profitable in Gujarat, although crops had lower input and returns. 1513 ha were in organic farming certified in Karnataka and 4750 ha in organic agriculture non-certified by 2005. The main reasons behind the shift to organic farming include sustainable soil fertility, low farm costs, higher quality of products, long-term returns, easy input available and a reduction in pest and disease attacks. In 2004, the Karnataka government issued a government policy on organic farming. The majority of the area is for organic farming in the northeastern states. 3000 ha of Nagaland is organically cultivated. States such as Rajasthan, Himachal Pradesh, Gujarat, Madhya Pradesh, Kerala and Tamil Nadu vigorously promote organic farming (Reddy, 2010).

The various organizations, like "Chetna", have been established for the commercialization of organic products. Specific problems identified are failure to pay off high price value for those products due to the transition, lack of inventory facilities for stored products with paid cash. Therefore, it is essential to direct rural banks to simplify the credit process to provide a supporting hand to give organic farmers. It is argued that the intensive process of organic agriculture is, constrained mainly to the farmers of precious resources and the export market, is heavily dependent on external price support systems, market research (Table 7) and product certification among other things.

It is imperative to change methods to increase agricultural production in the country and meet the demands of the increasing population (Kristiansen et al., 2006). The national strategies are directed to encourage organic agriculture for crops with good market value such as fruit, spices, pulses, olive seeds, wheat and cotton, basmati, etc. Three key zones already happened to be identified as regards potential areas (Reddy, 2010).

The Government of Andhra Pradesh in combination with Agricultural and Horticultural Ministry has launched and implemented various organic farming programs. During 2008–09, the Agriculture Department of the AP had adopted several schematic measures with an Rs 18,29 crore expenditure to promote organic farming in the State. It has been observed that India lacks behind the adoption and acceptance of organic farming despite serious efforts by some NGOs. Specific issues require a severe makeover at the level of policymaking strategies by the Government to lay the groundwork for the extension of organic agriculture across the country. These include (a) consistent government financial support, essential for the promotion of organic agriculture; (b) market extension and development for organic production, which is the main factor to promote national sales; (c) Governmental support for the marketing of organic products in producer and consumer associations; (d) simplifying the certification process and (e) decreasing the cost of certification (Reddy, 2010). The National Agricultural Policy does not mention organic farming. Organic agriculture provides a convenient production method, which can be appropriately used for the benefit of some farmers. The governments of rocky mountains like Uttarakhand Mizoram and Sikkim have taken significant initiatives to practice organic on their land altogether. In Arunachal Pradesh Karnataka, Meghalaya, Madhya Pradesh, and Punjab state initiatives have also been taken in some form. Nevertheless, many studies have shown the productivity and sustainability nature of organic agriculture. Many people are supporting a selective conversion of farms to organic while endorsing organic farming, just so yield failures are taken into consideration as far as possible. At present, government subsidies or support are lacking to facilitate or reduce conversion to organic status. The questions of organic farm yield and economic viability are critical, and there is no Indian empirical study analyzing the economic returns of organic farms with non-organic farms. Organic agricultural policy has been neglected, so the government's aid to support organic farming is lower, since subsidies, agricultural extension and proper research are available on conventional agriculture. Given the right incentives, organic agriculture in India will make enormous progress (Reddy, 2010; Yanakittkul and Aungvaravong, 2018).

5.9. Economic benefits in adopting organic farming

One of the essential aspects of organic farming and which also encourages farming groups immensely are the economic benefits of this farming technique. One of the essential and impactful features of organic farming is the reduced cultivation cost that affects the decision-making process of farmers while adopting organic agricultural practices (Darnhofer et al., 2005; Landicho et al., 2014; Herath and Wijekoon, 2013). The reduction in borrowing and debt traps due to the availability of raw materials in their farm fields made them get higher profits from their harvested products in different markets (Surekha et al., 2011). Organic farming poses a slight risk and is high as compared to conventional farming practices (Grotti, 2015). Several factors significantly affect the decision of farmers regarding the adoption of organic farming namely, increased profits, reduced cost of raw materials and the prospect to get the most excellent price for the yield (Lyngboek et al., 2001; Mendoza, 2002; Gibbon and Bolwig, 2007; Lampkin et al., 1994).

5.10. A holistic law approach needs to be implemented for the farming system

The major loophole in the current farming system revolves around the marketing problems, Middle man inclusions, Minimum Support Price (MSP) and latest tech know-how. To resolve these major problems the three major bills in support of farming law was passed in by the Parliament in September 2020 which aims at.

1. Law 1/Bill 1: Promotion as well as Facilitation impacting the trade and commerce.
2. Law/Bill 2: Focus on protection and Empowerment of Farmers; the law highlights the important issues and Agreement related to MSP'S, Price Assurance and Farm Services
3. Law/Bill 3: Law focusing on upskilling farmers and improving their living standards

5.11. Drawback to implement the organic farming.

1. Drawback 1: The cost of organically Farmed Produce is at much higher grade.

2. Drawback 2: Technological know-how and well-Designed strategies/Methods are needed to compete with conventional Farming.
3. Drawback 3: A buffer zone corresponding to 7 m is needed to separate organic fields from the chemical fields and is basically more labor intensive in nature

6. Future perspectives

The Behavioral component is judged by three criteria, (i) The first component contributes to specific behavior corresponding to the individual's values and social views; (ii) The second component highlights the standards about cultural aspects, which studies the diversion of a specific behavior from the corresponding peer group and (iii) The final component is the perceived behavioral control, which decides the degree of decision-making ability of an individual towards selecting an appropriate type. The mentality of decision-makers is an essential component that allows organic agriculture to make a useful contribution to food security. Also, the farmers at their own cannot fix the price of the product, and it is ultimately the middlemen who decide the rates and price of the products taking away the main chunk of the profit, and as such, the suitable/effective price-fixing mechanism is required to be developed by the farmers in consultation with the government coordination. Today, many government policies embrace the statement that conventional agriculture is a problem and that organic farming offers many of these a viable solution. At present, government subsidies or support are lacking to facilitate or reduce conversion to organic status. The questions of organic farm yield and economic viability are critical, and there is no Indian empirical study analyzing the economic returns of organic farms with non-organic farms. Organic agricultural policy has been neglected, so the government's aid to support organic farming is lower, since subsidies, agricultural extension and proper research are available on conventional agriculture.

7. Conclusion

The behavioral spectrum of farmers is generally based on their interest, the type of economic returns, benefits and other livelihood related issues. Most of the population of farmers belongs to an illiterate group of active small and marginal landholders and are influenced by the peer pressure as they are unaware about the technical know-how and various technological innovations, lacking knowledge regarding the harmful aspect of chemical cultivation, excessive use of pesticides and the various harmful consequences related to conventional farming systems. The receptiveness of farmers to adapt to stages of knowing and getting aware of organic agriculture and technology related to it. This leads to the formation of positive or negative views for organic farming and eventually elect whether to implement it or not. The critical factors which are related to farmers differential behavior are the economic benefits, reduced input costs, premium price policies for the harvested produce, along with the non-economic factors like increased soil fertility, ecological protection factors, availability and identification of assured marketing for their produce, food security and quality and impacts on human health influenced the farmers to accept organic farming for a safe and economical alternative. About 95% of organic farmers faced the problem of lack of marketing knowledge, lack of an appropriate marketing network, lack of regular supply, unavailability of organic inputs such as bio-fertilizers and biopesticide (International Society for Horticultural Sciences, Padel). We need more sustainable and eco-friendly farming methods to complete our SDG'S (Sustainable Development goals). Organic system of farming calls for a sustainable future with ecological benefits and nutritious food. It is also confirmed from the various studies that organic yields can be easily equalized with the chemical produce in terms of productivity and healthy food. It can be further concluded that organic farming is the need of the hour which requires awareness, educational training and scientific Know how so that it reaches farmers with ecologically sound environment and economically sound returns.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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