Article

Role of Organic Farming in Enhancing Sustainable Agricultural Development: A Review of Indian Trends and Policy Implications

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Abstract

As global awareness of environmental issues increases, the importance of organic farming as a sustainable method of agriculture has also increased. It has gained significant attention as a viable alternative to conventional farming. This study examines previous research to assess how organic farming contributes to promoting sustainability. It also highlights the environmental, economic and social benefits, identifies barriers to adoption and proposes recommendations. The data related to organic farming and sustainable agricultural development were collected from various journals, periodicals, national programme of organic production, the Agricultural and Processed Food Products Export Development Authority and the International Federation of Organic Farming Movements (IFOAM). The study revealed that the dependence on conventional farming has led to severe challenges, including soil degradation, water scarcity, greenhouse gas emissions and declining biodiversity. These impacts threaten the sustainability of agricultural systems and the livelihoods of millions of farmers. Therefore, organic farming is the need of the hour for achieving the goal of sustainable agriculture development.

Keywords

Agriculture, organic farming, sustainable development

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Introduction

The issue of sustainable agriculture development has received worldwide attention. Sustainability stands for the successful management of resources without harming the environment and society. Sustainable agriculture development is a set of various types of farming activities that maintain agricultural productivity, efficiency and profitability in the long run without affecting the natural resources and environment. The adoption of local skills, least dependence on external inputs, crop rotation, etc., are the basic requirements for agricultural sustainability.

Sustainable agriculture means meeting the food and other related demands of society by using sustainable methods. It ensures that development must meet not only the requirements of the present without compromising the future requirements (Kher & Bhagat, 2003). Chemicals fertilizers and plant protection materials have been damaging the environment and the whole agriculture sector (Joshi, 2001). Sustainable agriculture is the successful management of natural resources along with manpower for agricultural development by sustaining or improving the quality of these resources (Sangwan, 2005). It is necessary to promote the economic viability of the Indian farmers. Sustainable agriculture development includes systems that maintain productivity, profitability and efficiency in the long term without affecting the environment and society.

Organic farming is practised in almost all countries. Globally, both the area under organic farming and the number of organic farmers are steadily increasing. Organic farming is a crop production method that respects the rules of nature. Commitment to nature protection is a prerequisite for practising organic farming. Organic farming contributes to the socio-economic and ecological sustainable development. Sustainable agriculture has the capacity for providing food to the people for a long time. The use of chemical fertilizers and pesticides increases the cost of cultivation. Continuous uses of these inputs cause adverse effects on the fertility of the soil and a decline in the farm produce. The unsustainable agricultural practices can adversely affect the farmers' health and their long-term income (Asokan & Murugan, 2018). So, there is a need to raise awareness among the farmers that organic farming practice can sustain Indian agriculture.

Organic farming is a safe and sustainable farming system which produces healthy and nutritious food without harming the environment and the productivity of the soil. It avoids the use of chemical fertilizers and pesticides. But, there is a common understanding that a large-scale conversion to organic farming would result in a reduction in the aggregate crop production. Organic farming is also criticized on the ground that organic inputs alone could not improve farm productivity and profitability. There is a debate on organic farming, such as can, through organic farming, we produce food for the continuously increasing population. Is food produced through organic farming qualitatively and superior from conventional farming? Is organic farming economically viable?

India has huge potential in the area of organic farming because of favourable agro-climatic conditions, cheap labour, use of traditional resources and farming practices and wide export market potential. Organic farming has been superior to inorganic farming because of factors such as lower cost of cultivation, higher

profits and less environmental degradation. The small and marginal farmers left out during the green revolution have good scope to improve food security for the country without using synthetic chemicals. After independence, producing adequate food for a growing population was one of the most important challenges for India. Hence, high-yielding varieties of seeds, chemical fertilizers and pesticides were used to increase agricultural production. But continuous usage of these chemical fertilizers and plant protection materials has resulted in adverse effects on human beings and the environment. To overcome the problem arising due to chemical fertilizers and pesticides-based farming, the use of organic farming has become essential for achieving sustainable agriculture.

Review of Literature

There is a vast literature available on organic farming and sustainable agriculture development in India as well as abroad. Some of the important and relevant studies have been reviewed here to support the conceptual framework and research methodology. Sahani et al. (2020) emphasize that organic farming does not mean shifting to traditional techniques of farming, but it includes sustainable means of agriculture and modern farming techniques of agriculture. It has been superior to inorganic farming because of lower cost of cultivation, higher market profits and less environmental degradation. This study suggested that India has great potential for organic farming, and organic products are commercially viable in India. Asokan and Murugan (2018) observed that organic farming practice is being adopted in India, and farmers are aware that it can sustain the agriculture sector. Such farming also improves the quality of life of the people by providing safe food and better health. It can contribute to the meaningful socio-economic and ecological development of a country. Hammas and Ahlem (2017) have conducted a study on organic farming: a path of sustainable development. The main objectives of the study were to theoretically and empirically test the three pillars of sustainability, that is, the development of society, the environment and the economy. The study observed that there was a positive impact on economic growth and the environment of organic farming.

Soumya (2015) examined the scope and importance of organic farming as an important and effective way to promote sustainable farming systems in our country. Sarkar (2015) observes that the main objective of organic farming is to create an integrated, humanitarian and sustainable production system. Organic farming promotes the use of renewable energy and local farm-based resources. It is also helpful in maintaining soil fertility and meeting food security. Yadav et al. (2013) conducted a study on organic farming for sustainable agriculture. They concluded that only the organic farming system has the capacity to produce quality food without causing any adverse effects on the health of soils and the environment. It is suggested that there is a need to identify suitable crops with international market demand. Uma et al. (2013) conducted a study on the cropping pattern and its impact on food security. They concluded that the youth of rural areas are getting attracted towards urban areas, and they are neglecting agricultural activities. The

study revealed that the changing cropping pattern has posed a threat to the production of food crops and food security in the future. Sudheer (2013) revealed that the increasing demand for food grains and fear of food security in India led to the increasing use of chemical fertilizers and pesticides. But the long-term use of chemical fertilizer leads to a reduction in crop yields and deterioration of soil fertility. Therefore, sustainable agriculture can be the best alternative to avoid the adverse effects on the environment. Dima and Odero (1997), in their study on organic farming for sustainable agricultural production, observed that modern agricultural production is not sustainable due to the high cost of chemical inputs. The study concluded that organic farming promotes sustainable agriculture, and it is cheaper than the application of chemical fertilizers.

Organic Farming in India: An Overview

India cultivates a diverse variety of crops, and while agriculture contributes around 15% to the GDP, it remains the main livelihood source for most of the rural population. Two-thirds of its population is engaged in agricultural activities. Due to the rapid population growth and expansion of industrial growth, the availability of land for agriculture is declining in India. With an average landholding size of just 1.1 hectares and a continuing downward trend, there are growing concerns about the food and livelihood security of millions (Pandey & Ranganathan, 2018).

In 2001, India started the National Programme for Organic Production (NPOP) to promote organic farming. It is adopted for the implementation of organic production in the country. NPOP lays guidelines for the production and exports of organic farming and deals with the accreditation and certification of bodies. The PGS-India programme was also launched for the local and domestic market to support farmer group-centred certification. Both programmes support organic farming. According to the World of Organic Agriculture Report 2018, India ranks first in the number of organic farms and ninth in area-wise. It produces about 30% of the total organic product in the world. Sikkim became the first fully organic state in India. The Ministry of Agriculture, Government of India, is promoting organic farming under the National Project on Organic Farming, National Horticulture Mission and Rashtriya Krishi Vikas Yojana. The area under organic farming in India has increased manifold in recent years.

Table 1 provides data on the area under organic farming systems in India, focusing on the years 2011–2012 to 2020–2021. It depicts information related to the area under cultivation, the number of farmers and total production under organic farming. The area under organic farming under NPOP fluctuated significantly over the years. It started at 5,550,405 hectares in 2011–2012 and decreased to 3,566,538 hectares in 2017–2018, followed by a slight recovery to 4,339,185 hectares in 2020–2021. The area certified under PGS-India was 6,064.14 hectares in 2013–2014. It was 222,369.55 hectares in 2019–2020. The NPOP system reported no data in the initial years. The number of farmers increased in 2020–2021, with 1,599,010 farmers under organic farming. Under PGS-India, the number of farmers was

Table 1. Area under Organic Farming System in India, 2011–2012 to 2020–2021.

		Area Under Organic Cultivation		Number of farmers		Organic Production (MT)	
Sl No.	Year	NPOP	PGS-India	NPOP	PGS-India	NPOP	PGS-India
1	2011–2012	5,550,405	0		0		0
2	2012–2013	5,211,141	0		0		0
3	2013–2014	4,719,816	6,064.14		5,809		23,612.42
4	2014–2015	5,690,000	9,249.39		11,118		1,079*
5	2015–2016	5,710,384	19,281.91		19,355		6,321,660.53
6	2016–2017	4,452,987	96,291.60		173,846		8,760,810.96
7	2017–2018	3,566,538	6,455.29		84,618		17,132,676.09
8	2018–2019	3,428,639	124,989.90		166,571		989,255.06
9	2019–2020	3,669,801	222,369.55		365,253		2,047,535.90
10	2020–2021	4,339,185	7,568.30	1,599,010	12,074	3,496,800.34	3,399,520.21

Source: PGS-India Portal.

Note: *As per year-wise certificate data available at PGS-India Portal.

consistently lower in 2013–2014. The highest farmer participation was in 2019–2020, with 365,253 farmers, but it dropped to 12,074 in 2020–2021. Organic production under NPOP felt wide fluctuations, starting from no data initially and reaching 17,132,676.09 MT in 2017–2018 before stabilizing at 3,496,800.34 MT in 2020–2021. Production data under PGS-India began in 2013–2014, with 6,064.14 MT, and showed variations; it was 8,760,810.96 MT in 2016–2017 and then decreased over the subsequent years to 3,399,520.21 MT in 2020–2021.

In India, during 2021–2022, about 1,618,464.46 hectares were certified as organic, contributing significantly to sustainable agricultural practices. An area of 3,108,250.27 hectares was under the conversion process, showing a strong trend towards transitioning to organic farming. The combined total area under organic and conversion farming was 4,726,714.74 hectares, reflecting the significant scale of organic agriculture adoption in these states (Government of India, Ministry of Agriculture and Farmers Welfare, 2022). Table 2 presents data on the top 10 states in India with the highest cultivated farm area under organic farming during the year 2021–2022. Madhya Pradesh shows the highest total cultivated area at 1,504,950.14 hectares, including the largest organic area and a significant conversion area. Maharashtra ranks second with 1,133,570.30 hectares. Sikkim, despite being a fully organic state, shows a relatively smaller total area (75,475.28 ha), as it has already achieved full organic status. Jharkhand has a negligible organic area (10.4 ha) but a considerable conversion area (58,859.74 ha), highlighting its transitional phase.

Table 3 provides data on organic and conversion production across various agricultural categories for the year 2021–2022. Fibre leads significantly with 1,440,603.39 MT, contributing nearly half of the total organic production. Other notable categories include oil seeds (464,818.47 MT), sugar (336,883.17 MT),

Table 2. States with the Highest Cultivated Farm Area for the Year 2021–2022.

Sl No.	State	Organic Area (in ha)	Conversion Area (in ha)	Total area (in ha)
1	Madhya Pradesh	618,080.48	886,869.66	1,504,950.14
2	Maharashtra	224,787.36	908,782.94	1,133,570.30
3	Gujarat	81,700.72	520,547.77	602,248.50
4	Rajasthan	204,871.08	284,033.68	488,904.77
5	Odisha	72,757.78	107,664.51	180,422.29
6	Karnataka	58,613.37	37,575.51	96,188.88
7	Uttarakhand	31,739.17	57,931.71	89,670.88
8	Sikkim	75,168.33	306.95	75,475.28
9	Uttar Pradesh	53,700.93	17,245.72	70,946.65
10	Jharkhand	10.40	58,859.74	58,870.14

Source: Govt of India, Department of Agriculture and Farmers Welfare (2022).

Table 3. Category-wise Production of Organic Commodities During Year 2021–2022.

Sl No.	Category	Organic Production (in MT)	Conversion Production (in MT)
1	Cereals and millets	242,416.93	534.826
2	Coffee	20,070.62	0
3	Dry fruits	14,459.13	9.386
4	Fibre	1,440,603.39	444,786.94
5	Flowers	7,329.65	0
6	Fodder	7,895.84	7,895.84
7	Fresh fruits and vegetables	85,548.01	6.40
8	Medicinal plant products	101,179.90	13.50
9	Miscellaneous	2	0
10	Oil seeds	464,818.47	13,349.11
11	Others	10,263.66	500
12	Processed food	6,268.73	0
13	Pulses	73,765.37	24.084
14	Spices and condiments	95,087.20	0
15	Sugar	336,883.17	50
16	Tea	42,844.94	0
17	Tuber products	1,483.78	0
Total		2,950,920.785	459,274.239

and cereals and millets (242,416.93 MT). Coffee, flowers, spices and condiments, tea, tuber products and processed food have production exclusively under the organic category, indicating these are well established in organic farming. The data reflect India's diversified approach to organic agriculture, with significant contributions from cereals, pulses and medicinal plants.

Organic Farming as a Driver of Sustainable Agricultural Development

Organic farming contributes towards the ecological and socio-economic development of a country. It encourages the use of local knowledge, local seeds and local-level manure. It is one of the important methods used to meet the aim of sustainable agricultural development in India. Sustainable agriculture is the practice of agriculture, which is based on the principles of safeguarding ecology and concentrates on the ability to provide food for the future (Asokan & Murugan, 2018). This type of agricultural activity conserves soil and water resources, improves agro-diversity, protects our climate, provides safe food and safeguards our livelihood. To ensure the farmer's viability as well as the protection of the environment, it is necessary to promote sustainable agriculture in India. It will also improve farm productivity, efficiency and long-run profitability.

As a driver of sustainability, organic farming addresses critical challenges like soil degradation, water pollution and loss of biodiversity. By prioritizing ecological integrity and resilience, organic farming supports long-term agricultural productivity without compromising natural resources. Economically, it offers farmers better market opportunities and income stability. Socially, it promotes healthier food systems and strengthens rural livelihoods. By balancing productivity with ecological conservation, organic farming provides a sustainable pathway to food security and environmental resilience.

Organic farming plays a pivotal role in promoting sustainable agricultural development by fostering environmental, economic and social sustainability. This cropping system relies on fertilizers that are safe and non-hazardous to crops. In India, where various crops are grown, it has become evident from various studies that modern agriculture needs to shift towards sustainable practices. Organic farming aims at maintaining an optimal nutrient balance and promoting the biological health of the soil. This approach is more beneficial for farmers and can create more job opportunities. By adopting organic farming, farmers can reduce the use of external inputs, while consumers gain access to healthier food. It also enhances soil productivity. As people become more aware of the advantages of organic food, they are more likely to pay a premium for eco-friendly products. Consequently, low-external-input agriculture can be particularly appealing to small-scale farmers in India.

Sustainable agriculture focuses on achieving an optimal nutrient balance and supporting the soil's biological health. This method of agriculture is more advantageous for farmers and can generate additional employment opportunities. By using organic farming, farmers can minimize the use of external inputs, allowing

consumers to enjoy healthier food. It also improves soil productivity. As awareness of the benefits of organic food increases, consumers are more inclined to pay higher prices for environmentally friendly products. Therefore, organic farming methods offer a sustainable alternative. They integrate traditional knowledge and scientific innovations to create resilient agricultural systems. It depends on ecosystem management rather than external methods for increasing agricultural production. It does not need a costly investment on farmland. Organic farming protects the environment and the community by excluding chemical fertilizers and pesticides. It requires less financial input and places more dependence on the natural and human resources available.

The main objective of organic farming is to maximize human welfare without any harm to the environment. The success of organic farming depends on the awareness of the health problems caused by the use of chemical fertilizers. Organic products carry high prices in the market as compared to inorganic products, which makes organic farmers more profitable. Organic farming can also contribute towards food security, the improvement of agricultural productivity, and the reduction of rural poverty by providing more employment (Soumya, 2015). Organic farming lays more importance on the use of local resources, which contributes towards the development of the rural community as well as farmers.

To overcome the losses in terms of environment, biodiversity, economic and social elements, farmers need to adopt organic farming at a large scale (Sikka et al., 2005). Despite the growing demand for organic products, organic farmers face several challenges, such as low crop prices, high certification costs, significant investments in resources during the conversion period, price fluctuations and marketing difficulties. The conversion to organic agriculture has been a slow process because it involves low farm yields and high-risk involvement. Organic farming is an integral component of sustainable agricultural development because it embodies principles and practices that prioritize environmental conservation, economic viability and social equity. By reducing the environmental footprint of agriculture, enhancing soil health, and providing economic opportunities for farmers, organic farming contributes to a more sustainable and resilient food system.

Environmental, Economic and Social Benefits of Organic Farming

The growing demand for organic produce opens new markets, both domestic and international. Organic farming emphasizes practices that minimize environmental impact. It relies significantly on fertilizers that are safe and non-toxic to crops. These practices include avoiding synthetic chemicals, promoting crop rotation, conserving water and maintaining biodiversity. Reducing the dependency on chemical fertilizers and pesticides lowers input costs. Over time, practices such as organic farming yield higher profits due to premium market prices for organic products.

Organic farming offers significant environmental advantages that contribute to sustainable agricultural development. This farming system improves soil structure and fertility through the use of organic matter such as compost, cover crops and animal manure. This leads to increased soil organic carbon levels, enhanced nutrient cycling and reduced soil erosion. Organic farming usually leads to more biodiversity on farms. This is because it avoids using synthetic pesticides and fertilizers, making the environment safer for many types of plants and animals. By not using chemical inputs and adopting methods like crop rotation and growing multiple crops together (polyculture), organic farming helps prevent water pollution. It also improves the soil's ability to hold water, which makes water use more efficient.

Organic farming can positively impact the economic sustainability of agriculture. The demand for organic products is growing globally, allowing farmers to achieve premium prices. This can increase profitability, particularly for smallholder farmers, although organic farming can require higher labour inputs, the reduction in chemical input costs can offset these expenses. Over time, improved soil health can lead to increased productivity and profitability. Organic farming practices can offer greater resilience against market and environmental shocks, such as volatile input prices and climate extremes, due to diversified cropping systems and reduced dependency on external inputs. Such a farming system reduces exposure to synthetic pesticides and fertilizers, potentially leading to healthier food products for consumers and safer working conditions for farmworkers. Organic farming can stimulate rural economies by creating jobs in farming, processing and distribution. It often supports small-scale and family-run farms, promoting rural community stability (IFOAM, 2020). Organic farming often involves community-based practices and knowledge exchange, fostering a culture of sustainability and increasing awareness of environmental and health issues (Gomiero et al., 2011).

Organic Farming Leads to Food Security

Agriculture is the backbone of rural economies worldwide. Achieving food security for all has been the central issue of India's agricultural policy since independence. Food security not only includes food but also nutritional security. It can be analysed through food availability, economic access, absorption and stability in food systems. It is the function of agriculture that holds together the biophysical and social aspects of production. In order to achieve food security, there is a need to promote ecologically sustainable methods of agriculture. For this purpose, an organic farming system can play an important role. It is the best economic and ecological alternative to avoid food insecurity in the long run. The organic farming system can produce sufficient food of a high quality. This system is also well-suited for hill areas that are currently most exposed to water shortages. This type of farming requires more labour, instead of machinery, and can contribute to local food security in several ways. For ensuring food security, organic farming is very useful because it has the capacity to maintain agricultural productivity, efficiency

and profitability. Organic farming can play a significant role in promoting food security, both at the global and local levels.

Constraints of Organic Farming to its Adoption

Organic farming avoids synthetic pesticides and fertilizers, reducing chemical contamination of soil, water and ecosystems. This protects biodiversity and minimizes harm to non-target species. Despite its benefits, organic farming faces challenges that need to be addressed to fully realize its potential in sustainable development. Organic farming can result in lower yields compared to conventional methods, particularly in the short term. This can be a barrier to its adoption, especially in regions with high food demand. The process of obtaining organic certification can be costly and time-consuming for farmers. Successful organic farming requires specific knowledge and skills.

A lack of technical expertise and awareness about the benefits of eco-friendly practices limits its adoption. Farmers often perceive these methods as risky compared to conventional practices. Organic farmers also face challenges such as limited access to premium markets, inadequate price support and competition with subsidized conventional farming products. Organic farming often uses efficient irrigation methods and practices that help conserve water resources. Organic farming typically produces fewer greenhouse gases per unit of agricultural output compared to conventional farming, mainly due to reduced synthetic fertilizer use. While the transition to organic farming can involve initial costs, over time, farmers often experience reduced input costs as they rely more on organic materials and biological pest control methods.

Conclusion and Recommendations

It may be concluded that excessive use of chemical fertilizers is harming not only agriculture but also the environment as a whole. Organic farming can provide a sustainable pathway to address these challenges faced by agriculture today. Organic farming enhances soil health, conserves natural resources and empowers rural communities, contributing to long-term sustainability. Various studies have shown that organic products are more profitable than inorganic products due to lower costs of production and high market prices of the organic products. Hence, it leads towards sustainable agriculture. Such farming often encourages crop diversification, reducing the risk of crop failure and providing farmers with multiple income streams. Organic farming can also contribute to rural development by creating jobs and fostering local economies. It often encourages small-scale and family farming. Organic products often fetch higher prices in the market due to consumer demand for organic and sustainably produced food.

Farmers should be encouraged towards organic farming, and training should be provided for the preparation of farmyard manure and green manure. If a farming system is adopted according to the local available resources, farming can

become self-dependent and economically viable. Organic farming system promotes sustainable food production that is less reliant on external inputs, making them more resilient in the face of resource constraints.

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