



Scope and limitations of organic farming in India: A review

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Abstract

Organic farming in India has gained significant traction as a sustainable agricultural practice in response to the growing concerns of soil degradation, pesticide overuse, and environmental sustainability. The traditional farming system, which emphasizes the use of natural inputs and the conservation of ecological balance, presents numerous opportunities and challenges. This review article examines the scope and limitations of organic farming in India, considering its potential to enhance food security, promote environmental health, and reduce dependency on chemical fertilizers and pesticides, while also addressing the barriers to its widespread adoption.

Keywords: Organic farming, sustainable agriculture, green revolution, agroecological practices, certification challenges, paramparagat krishi vikas yojana (pkvy), zero budget natural farming (zbnf)

Introduction

After gaining independence in 1947, India faced significant challenges related to food security. The country experienced frequent famines, food shortages, and a rapidly growing population (Nelson *et al.*, 2019) [29]. Traditional farming methods, along with a lack of modern technology and infrastructure, contributed to very low agricultural productivity. Under the leadership of Prime Minister Jawaharlal Nehru, the Indian government initiated a series of Five-Year Plans focused on improving agricultural productivity. The First Five-Year Plan (1951-1956) emphasized the need for agricultural development and laid the groundwork for future reforms. The establishment of the Indian Council of Agricultural Research (ICAR) and agricultural universities in the 1960s also provided the foundation for scientific research and technological advancements that would later fuel the Green Revolution. The Green Revolution in India was strongly influenced by the work of Norman Borlaug, an American agronomist credited with developing high-yielding wheat varieties. Borlaug's research in Mexico in the 1940s and 1950s led to the development of disease-resistant, high-yielding wheat strains, which were later introduced in India in the 1960s (Somvanshi *et al.* 2020) [41].

Borlaug's work was supported by international organizations like the Ford Foundation and the Rockefeller Foundation, which played an essential role in funding agricultural research programs in India (Gulati and Sharma 2002) [18].

The introduction of HYV seeds of wheat and rice marked the start of the Green Revolution. These seeds, which were developed to resist pests and diseases while producing higher yields, were introduced to Indian farmers in the 1960s. These innovations enabled farmers to significantly increase their crop yields per acre compared to traditional varieties (Nelson *et al.* 2019) [29]. The first success was seen in wheat production, particularly in Punjab, Haryana, and Uttar Pradesh, where yields doubled and tripled compared to earlier levels (Swaminathan 1972) [42]. Along with the introduction of HYV seeds, the Green Revolution also promoted the use of chemical fertilizers (such as urea) and pesticides to enhance agricultural productivity (Brainard and

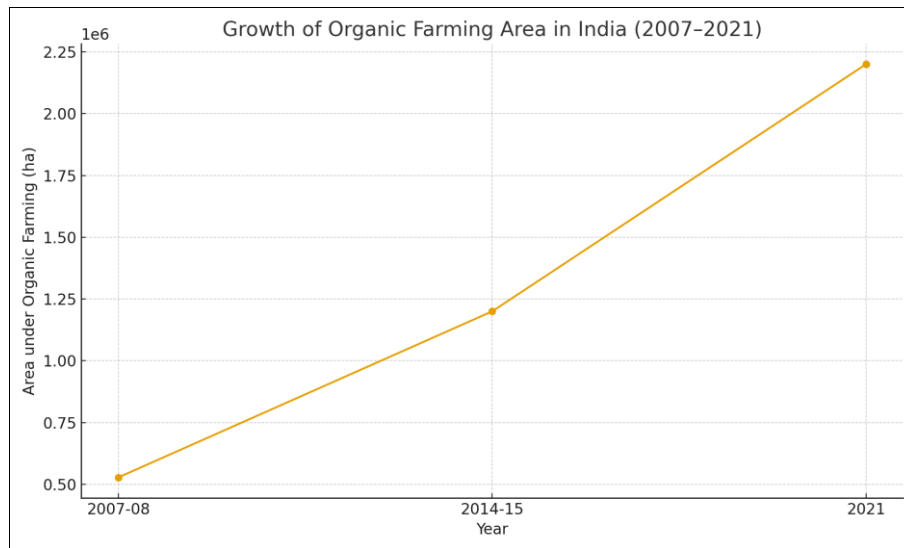
Menon 2014) [5]. The widespread adoption of these chemical inputs was vital in achieving the desired yields. Additionally, modern irrigation systems like canal irrigation and drip irrigation were introduced to ensure reliable water supply to crops, especially in areas with inconsistent rainfall (Swaminathan 1972) [42]. The Green Revolution, initiated in the 1960s, significantly increased food production by introducing high-yielding varieties, chemical fertilizers, and pesticides. While these advancements helped combat food shortages, they also resulted in negative environmental consequences, such as soil degradation, reduced biodiversity, and heavy reliance on chemical inputs (Nelson *et al.* 2019) [29]. This model was effective in the short term but led to the depletion of soil health, making it less sustainable in the long run. In response to the ecological issues associated with the Green Revolution, organic farming has emerged as a viable alternative. Organic farming is defined as the practice of growing crops without the use of synthetic pesticides, fertilizers, or genetically modified organisms (GMOs) (Geissen *et al.* 2021) [14]. The use of organic methods can help restore soil fertility, conserve biodiversity, and promote environmental sustainability. Over the past few decades, India has witnessed a surge in organic farming, driven by both domestic and global demands for organic products (Heena and Malik 2020) [19]. However, despite its increasing popularity, organic farming in India faces various challenges related to infrastructure, market access, and policy support (Bhaskar 2016, Ghosh and Saha 2017) [3, 16]. This article explores the scope of organic farming in India, its potential benefits, and the limitations that hinder its broader adoption.

Scope of Organic Farming in India

India's varied agro-climatic conditions allow for the cultivation of a wide range of organic crops. The country's northern states support crops like wheat, while the southern states grow rice, fruits, and spices. The fertile plains of the Himalayan foothills are ideal for temperate fruits, and coastal regions support tropical varieties, all of which can be cultivated organically (Kumar and Pathak 2024) [26]. This

agro-diversity provides immense opportunities for organic farming across the nation. As global demand for organic produce grows due to increasing consumer awareness of the harmful effects of chemical farming, India’s rich agricultural landscape places it in a prime position to increase organic farming practices. The economic potential

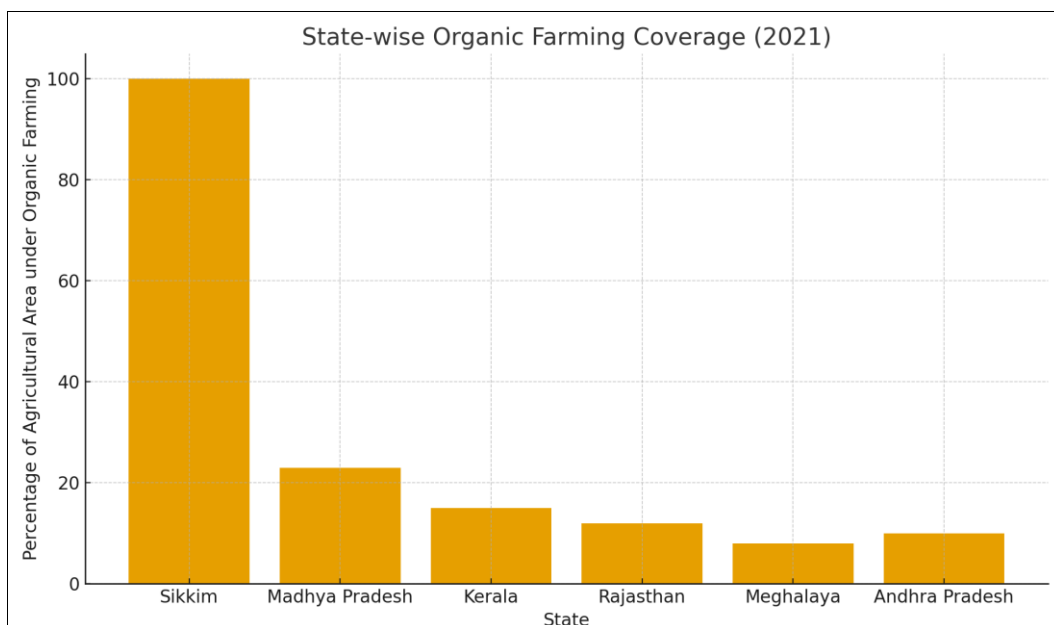
of organic farming is especially promising, as organic products tend to command higher prices in both domestic and international markets (Das *et al.*, 2020) [9]. There have been about a threefold increase from 5,28,171 ha in 2007-08 to 1.2 million ha of cultivable land in 2014-15 (Willer and Lernoud 2017) [43].



The graph shows the steady increase in organic farming area in India from 2007 to 2021.

In recent years, several states in India have adopted policies that promote organic farming. Sikkim became the first state to achieve 100% organic certification in 2016, setting a landmark in organic agricultural transformation. Other states, such as Kerala, Mizoram, Goa, Rajasthan, and Meghalaya, have followed suit, launching various organic farming programs to reduce dependency on chemicals and increase farm sustainability (Das *et al.* 2020) [9]. Furthermore, Zero Budget Natural Farming (ZBNF), a form of regenerative farming, has been widely promoted in Andhra Pradesh. ZBNF emphasizes using natural inputs and

reducing the cost of farming, which has been widely embraced by farmers due to its potential to improve soil health and cut costs (Sobhana *et al.* 2019) [40]. Chhattisgarh’s Godhan Nyay Yojana, which was launched in 2020, has encouraged cow rearing and organic manure production. This scheme allows farmers to sell cow dung to the government, which is then processed into organic fertilizers. This not only supports organic farming but also creates rural employment and boost sustainability (Pandey *et al.* 2023) [31].



This bar graph compares the extent of organic farming adoption across key Indian states.

Environmental Sustainability and Economic Benefits

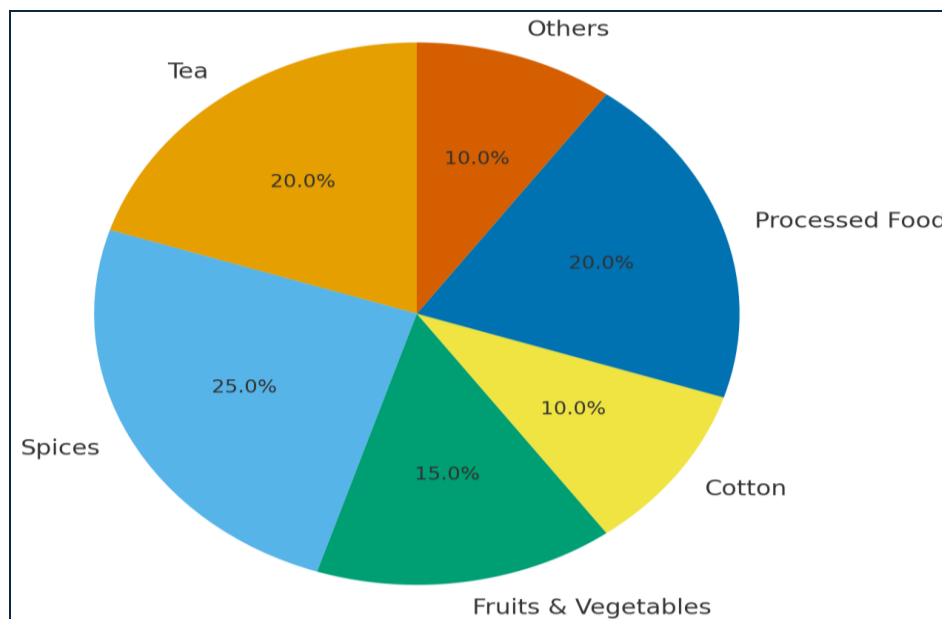
Organic farming offers several environmental advantages. By reducing the use of synthetic pesticides and fertilizers, organic farming improves soil fertility, reduces soil erosion, and enhances biodiversity. These benefits contribute to the long-term sustainability of farming, making it a more environmental friendly option compared to conventional farming methods (Yadav 2017) ^[44]. Moreover, organic farming can reduce carbon emissions, contributing to global climate change mitigation efforts (Holka *et al.* 2022) ^[22]. Organic practices such as crop rotation, green manure, composting, and reduced pesticide use help in building resilient ecosystems (Gamage *et al.* 2023) ^[12]. In India, where soil degradation and water scarcity are significant concerns, organic farming can play a vital role in reversing environmental damage (Ghosh and Saha 2017) ^[16].

Economically, organic farming offers the potential for increased income as organic products typically sell at higher prices due to their perceived health benefits, and this price premium provides an opportunity for farmers to earn more from their crops (Reddy *et al.* 2022) ^[35]. For example, farmers in Madhya Pradesh, after transitioning from conventional to organic cotton farming, have witnessed improvements in soil quality and higher profits over time despite initial yield reductions (Reddy *et al.* 2022) ^[35]. This

is a strong indication of the long-term benefits that organic farming can offer, both environmentally and economically.

Market Demand and Export Potential

The global demand for organic products has grown significantly in recent years, and India, with its vast agricultural base, has the potential to capitalize on this demand (Malik and Heena 2020, Heena *et al.* 2021a) ^[19, 20]. Organic products such as tea, spices, and fruits are already being exported to developed markets like the US, Europe, and Japan (Singh and Kumar 2020). India's organic farming sector is poised for expansion with increasing international interest in organic commodities. The total share of organic agricultural land to the total cropland is less than 3% in India (Helga *et al.* 2022) ^[21]. This land area can be increased to 10% by focusing on rainfed and the hilly regions (Seufert *et al.* 2012) ^[38]. The Union government has promoted organic agriculture under the Paramparagat Krishi Vikas Yojana (PKVY) scheme since 2015. Under this scheme, 29,859 certified organic clusters (comprising 2-3 villages) have formed across India, covering about 0.4% of cropped area by 2021 (Reddy *et al.* 2022) ^[35]. As a result, the demand for organic produce has increased by 20% per annum in India (Apeda 2020).



Economic Benefits for Farmers

Organic farming can offer economic benefits to farmers in the long run. While the initial transition period may involve higher costs and lower yields, organic farming tends to lower input costs, particularly in terms of fertilizers and pesticides (Reganold *et al.* 2016) ^[36]. This can result in more sustainable profits over time, particularly for smallholder farmers (Reddy *et al.* 2022) ^[35]. Additionally, organic certification offers farmers access to premium markets and higher prices for their produce, which can improve their financial stability (Khanghan 2020) ^[24]. Studies by Qiao *et al.* (2016) ^[32] compared organic and conventional tea farms in Wuyuan, China and Kandy, Sri Lanka. In both the instances, organic production performed better economically. They also emphasized the importance of location in the production organic farming.

Health Benefits and Food Security

Organic farming promotes the production of food free from harmful chemicals, offering consumers healthier food options. In India, where foodborne illnesses linked to pesticide residues are a growing concern, organic farming offers a safe alternative (Gamage *et al.* 2023) ^[12]. Organic foods have been found to have fewer pesticide residues, which contribute to better soil and human health (Bouhia *et al.* 2023) ^[4]. Furthermore, organic farming methods can enhance local food security by improving soil fertility, increasing biodiversity, and promoting agro-ecological resilience (Brevik *et al.* 2020) ^[6]. Research by Chaichi *et al.* (2018) ^[7] indicates that organic farming has a positive effect on enhancing food security, especially in rain-fed areas.

Government Support and Policy Initiatives

The Indian government has recognized the importance of organic farming and has launched several initiatives to promote it. Schemes like the 'National Mission on Sustainable Agriculture (NMSA)', 'Paramparagat Krishi Vikas Yojana (PKVY)', and 'Soil Health Management' are designed to support organic farming practices through subsidies, training programs, and certification assistance (Delhi P 2022) ^[10]. These initiatives provide a foundation for scaling organic agriculture in the country. Moreover, the 'National Organic Farming Research Institute' has been a key driver in supporting research and innovation in organic farming techniques (Ramanjaneyulu *et al.* 2020) ^[33].

Limitations of Organic Farming in India

One of the significant barriers to organic farming in India is the high initial investment required for transitioning from conventional to organic farming. The conversion process can take up to three years before the farm produces organic-certified crops, and during this time, farmers may face reduced yields and higher operational costs (Khurana and Kumar 2020) ^[25]. The lack of adequate financial support and insurance schemes for the transition period discourages many farmers from adopting organic practices (Sihi *et al.* 2012) ^[39]. According to Ghosh (2020) ^[17], the transition phase is a significant bottleneck for widespread adoption, as many farmers are not able to afford the initial capital required.

a. Limited Knowledge and Awareness

The lack of technical knowledge and awareness about organic farming practices is a major limitation. Many farmers, particularly in rural areas, have limited access to information about organic farming methods (Gamage *et al.* 2023) ^[12]. Traditional farming education focuses on conventional practices, and there is a significant knowledge gap about sustainable farming techniques (Reddy *et al.* 2022) ^[35]. Extension services, training programs, and awareness campaigns are crucial to bridging this gap and enabling farmers to transition successfully (Kaur and Toor 2015) ^[23].

b. Challenges of Certification

Organic certification, which is essential for marketing organic products, remains a costly and complex process in India. The lengthy and rigorous certification process, coupled with the fees involved, can be a deterrent for small-scale farmers (Garibay and Jyoti 2003) ^[13]. Furthermore, there is a lack of enough certification bodies in remote regions, making it difficult for farmers to obtain certification in a timely manner (Azam *et al.* 2019) ^[1]. The certification process often poses a challenge, particularly for farmers who cannot afford to bear the costs or meet the rigorous standards set by certification bodies (Khurana and Kumar 2020) ^[25].

c. Market Access and Price Volatility

Despite the growing demand for organic produce, market access remains a significant challenge for organic farmers. Small farmers often struggle to establish connections with organic markets and face challenges in logistics, packaging, and distribution (Meena 2010) ^[28]. Additionally, the price volatility of organic produce, influenced by factors such as weather conditions, market demand, and input availability,

can create financial instability for farmers. A lack of robust market infrastructure further exacerbates these issues (Azam *et al.* 2019) ^[1]. Azam and Shaheen (2019) ^[1] have pointed out that the absence of structured marketing channels for organic produce continues to be a major hurdle.

d. Soil and Climate Limitations

Organic farming may not be suitable for all types of soil and climatic conditions. Some regions in India, particularly in arid and semi-arid areas, face challenges related to water scarcity, soil erosion, and nutrient depletion (Ghanghas *et al.* 2021) ^[15]. While organic farming can help restore soil health, it requires proper management of local resources, which can be difficult in certain environments. In such regions, organic farming may not always yield the desired results without significant investment in soil restoration and water management techniques (Kumar *et al.* 2019) ^[27].

e. Limited Input Availability

Organic inputs, such as organic seeds, bio-fertilizers, and natural pest control agents, are not always readily available in all parts of India. The supply chain for organic inputs is underdeveloped, and farmers often face difficulties in sourcing quality organic inputs (Rohila *et al.* 2021). This scarcity further increases the cost of production and hampers the widespread adoption of organic farming practices (Babajani *et al.* 2023) ^[2]. Connor (2018) ^[8], and Nordhaus and Shah (2022) ^[30] noted that the limited availability of affordable organic inputs is a critical constraint in scaling organic farming practices.

Conclusion

Despite its significant potential, organic farming faces several challenges in India. Lower initial yields, limited access to organic inputs, and a lack of technical knowledge among farmers are some of the major barriers. Moreover, the certification process for organic farming can be expensive and cumbersome, especially for small-scale farmers. This discourages many from adopting organic practices, despite the potential benefits. Addressing these challenges will require comprehensive support from the government, including financial incentives, subsidies, and farmer education programs. Additionally, building better supply chains for organic inputs, such as organic fertilizers and seeds, will be essential to ensure that farmers have access to quality resources for organic cultivation.

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