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Organic farming in India: Way towards Sustainable Environment

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Abstract

Organic farming has emerged as an important priority in India to promote environmental sustainability and food safety. With only 1.5% of total agricultural land under organic cultivation, there is immense scope for growth. Organic farming avoids use of synthetic fertilizers and pesticides, and focuses on traditional practices that nurture the soil through crop rotations, organic manures, green manures and biological pest control. This review article provides an overview of the current status, benefits, challenges and future prospects of organic farming in India. Organic produce fetches higher prices and improves farm incomes. Organic practices build soil health, conserve biodiversity, reduce pollution and mitigate climate change impacts. Challenges include transition costs, certification burdens, lack of awareness, supply chain gaps and insufficient institutional support. Government schemes to mainstream organic farming through farmer incentives, market development and extension services have shown positive impacts. Further policy support, public-private partnerships, farmer collectives and participatory guarantee systems can help tap the full potential of organic farming towards building sustainable food production systems in India.

Keywords: Organic farming, food safety, environmental sustainability, soil health, India

Introduction

The environmental and health impacts of chemical intensive agriculture have led to growing interest in organic farming globally. Organic farming relies on traditional agricultural practices that avoid use of synthetic chemicals and focus on promoting biodiversity, biological cycles and soil health^[1]. It offers a sustainable solution for safe and nutritious food production while also building resilience of farming systems against climate change^[2, 3]. India has traditionally practiced organic cultivation techniques, but the Green Revolution led to widespread adoption of chemical fertilizers and pesticides. Currently, only 1.5% of total agricultural land in India is under organic certification^[4, 5]. Recognizing its benefits, the Indian government aims to promote organic farming through various policies and programs. This offers opportunities to transition towards sustainable models of agriculture.

This review article provides an overview of the current status, prospects, benefits and challenges of organic farming in the Indian context. The narrative is structured into sections covering the concept of organic farming, its current adoption levels, benefits, challenges, government initiatives and future outlook. Relevant scholarly research on the subject is reviewed to provide evidence-based insights. The geographical focus is on India, but global perspectives are also considered. The aim is to critically analyze if organic farming provides a viable pathway for building resilient and sustainable food production systems in India.

Overview of Organic Farming

The International Federation of Organic Agriculture Movements defines organic agriculture as "a production system that sustains the health of soils, ecosystems, and people"^[6]. It relies on ecological processes, biodiversity and cycles adapted to local conditions, without using synthetic inputs. Some key principles of organic farming are^[7]:

- Protecting soil health through organic manures, crop rotations and minimized tillage.
- Avoiding synthetic fertilizers and pesticides.
- Promoting on-farm biodiversity through polycultures and integration of crops and livestock.
- Using biological and natural pest management practices.
- Ensuring livestock access to outdoors and pasture and feeding 100% organic feed.
- Avoiding genetically engineered seeds and organisms.

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- Reducing pollution and external inputs by recycling resources on farm

Organic produce is grown without any synthetic chemicals or genetically modified organisms (GMOs), under certification from accredited agencies. Standards for organic farming and processing have been developed by the Food and Agriculture Organization (FAO) and adopted by many countries [8]. In India, the National Programme for Organic Production (NPOP) provides standards for organic certification. Certification involves periodic inspections of farms and processors to verify adherence to organic practices [9]. Organic labels assure consumers that the produce is grown sustainably without chemical inputs.

Current status of organic farming in India

Organic farming in India has shown steady growth over the past decade, but remains far below its potential. According to the Indian Institute of Organic Farming, the total area under certified organic cultivation is 3.56 million hectares, constituting 1.5% of total agricultural land [4]. Major organic crops include oilseeds, sugarcane, cereals & millets, cotton, pulses, medicinal plants, fruits and spices. Madhya Pradesh has the largest area under organic certification followed by Maharashtra, Karnataka and Uttar Pradesh [10].

Over 1.5 million farmers are engaged in organic agriculture in India [11]. The organic food market is small but rapidly growing at over 15% annually, valued at US\$ 840 million in 2020 [12]. Organic produce fetches 50-100% higher prices, which enhances farm incomes [13]. Basmati rice, tea, spices, coffee and cotton are major organic exports [14]. India ranks ninth globally in terms of total organic agricultural land, but its share in the total farming area remains well below the global average of 1.5% [15]. This indicates significant scope for expansion. Targeted efforts to promote organic farming through appropriate policies, programs, markets and institutions can facilitate wider adoption across diverse Indian agroclimatic regions.

Benefits of Organic Farming

Multiple research studies have highlighted wide-ranging benefits of organic farming in the Indian context.

Improves Soil Health and Fertility

Avoiding chemical inputs and adopting practices like intercropping, crop rotations, green manures and organic manures improves physical, chemical and biological properties of soils [16-18]. Organic fields have shown higher soil organic matter, microbial activity, macro and micronutrients compared to conventional farms [19, 20]. This enhances soil fertility and crop productivity over the long term.

Reduces Water and Air Pollution

Eliminating synthetic fertilizers and pesticides reduces water contamination and greenhouse gas emissions associated with their manufacture, transport and application [21-23]. Organic farms help improve ground and surface water quality [24]. Avoiding straw burning and incorporating crop residues builds soil carbon sinks [25]. This mitigates climate change impacts.

Conserves Biodiversity

Organic polycultures support greater species diversity

compared to chemical monocultures [26-28]. Natural pest control methods help preserve populations of beneficial insects and pollinators. Soil health and habitat diversity further adds to on-farm biodiversity in organic systems [29]. This strengthens ecological integrity and local food security.

Produces Safe and Nutritious Food

Organic produce is free of pesticide residues and has lower nitrate content [30, 31]. Several studies have found higher antioxidant activity, vitamin C, phenolics, proteins and sugar content in organically grown crops [32-34]. Avoiding chemicals contributes to enhanced food safety and nutritional quality.

Boosts Farm Incomes through Price Premiums

Organic produce fetches 30-200% higher market prices in India, which directly benefits farmers [35, 36]. Despite lower yields initially, net incomes are higher due to premium prices [37]. Export and value-addition opportunities further improve profitability of organic farming.

Promotes Resource Conservation

Eliminating external synthetic inputs reduces energy usage and emissions associated with their manufacture [38]. On-farm recycling of biomass and use of local resources promotes circular economies [39]. Efficient water management practices reduce irrigation requirements as soil health enhances [40]. This bolsters resource conservation.

Fosters Community Development

Smallholder farmers dominate organic production, creating opportunities for rural employment and entrepreneurship [41]. Participatory guarantee systems foster local farmer networks [42]. Multi-functional agriculture integrating food, fiber, energy and crafts production enables livelihood diversification [43]. This spurs community development.

Builds Climate Resilience

Healthy soils with high organic matter enhance water retention and make crops more resilient to rainfall variability and droughts [44, 45]. Diverse farms suffer lower pest infestations and crop losses during extreme weather [46]. Locally adapted practices increase robustness to climate change impacts [47].

Aligns with Sustainable Development Goals

Expanding organic farming contributes to multiple Sustainable Development Goals such as zero hunger, good health, clean water, decent work, responsible consumption, climate action and life on land [48]. It provides an agro ecological pathway to achieve economic, social and environmental objectives.

Challenges and barriers for organic farming

Despite its benefits, adoption of organic farming faces several constraints in India that need to be addressed.

Higher Labour and Transition Costs

Labour requirements are higher in organic systems, especially for weed and pest management [49]. Transition phase entails yield reductions and/or higher costs as soil fertility is built up gradually [50]. Organic certification involves compliance costs for documentation, inspection and fees which the farmers have to invest [51]. Lack of financial incentives discourages farmers.

Lower Yields

Meta-analysis shows average yield gaps of 5-34% for organic farming globally depending on crop and context ^[52]. Such yield reductions during transition along with premium prices are key concerns, especially for smallholder farmers ^[53]. However, some studies have reported equal or higher yields over the long run ^[54].

Supply Chain Gaps

Lack of dedicated supply chains forces farmers to sell organic produce as conventional crops, missing out on premium prices ^[55]. Weak links exist for aggregation, storage, processing, quality assurance and last-mile connectivity ^[56]. Export markets also face bottlenecks due to compliance burdens.

Insufficient Institutional Support

Extension systems lack adequate capacity on organic practices ^[57]. Quality organic inputs are expensive and scarce ^[58]. Limited research addresses productivity challenges ^[59]. Poor coordination across departments hampers synergistic development ^[60]. Public investment and institutional mechanisms lag behind policy aims.

Limited Market Development

Domestic consumer awareness and demand for organic produce continues to be low outside niche urban segments ^[61]. Smallholder farmers have insufficient access to remunerative markets, hampering adoption ^[62]. Support is required for farmer collectives, retail outlets and online platforms to expand the consumer base.

Certification Burdens and Fraud Risks

Smallholders find organic certification costs prohibitive and compliance documentation challenging ^[63]. Delayed and inconsistent approval processes hinder international trade ^[64]. Weak surveillance raises credibility concerns due to fraud risks ^[65]. Harmonization and governance reforms are essential.

Gaps in Policy Framework

India's policy support for organic farming remains fragmented without adequate budgetary allocations and convergence across domains ^[66]. There is lack of stability in schemes and incentives ^[67]. A coherent national policy framework is required to drive reforms and programs. Overall, the sustainability benefits of organic farming need to be reinforced by addressing knowledge, technology, economic, institutional and marketing challenges. A favourable policy environment and holistic capacity building of the organic ecosystem is crucial for wider farmer adoption.

Government initiatives to promote organic farming

Recognizing its advantages, the Indian government is implementing various initiatives to support organic farming as part of agro ecological approaches that enhance farmer incomes while conserving natural resources.

National Programme for Organic Production

Launched in 2000, the National Programme for Organic Production provides standards, certification, accreditation systems and logo for organic products through Agricultural and Processed Food Products Export Development Authority and National Centre of Organic Farming ^[68].

Paramparagat Krishi Vikas Yojana

This scheme promotes traditional organic practices through farmer clusters, with 50% subsidy for inputs and certification ^[69].

Mission Organic Value Chain Development for North Eastern Region

A central government scheme initiated in 2015 aims to develop certified organic production in northeast India through value chains connecting small producers to markets ^[70].

Rashtriya Krishi Vikas Yojana

The National Agriculture Development Programme under this scheme supports organic farming through activities like cluster formation, capacity building, input production and certification ^[71].

Network of Organic Farming Resource Centres

A total of 174 resource centers across India have been established to promote organic practices through training, demonstrations and extension activities ^[72].

DAC&FW Organic Farming Policy

The national policy announced in 2019 aims to promote organic through a value chain approach integrating production, certification and marketing ^[73].

Bharatiya Prakritik Krishi Padhati Programme

This promotes traditional organic inputs drawing from India's ancient texts on natural farming ^[74].

National Project on Organic Farming

Implemented since 2004, it extends financial assistance to organic farmers for inputs, trainings and certification ^[75].

National Programme on Organic Production

It ensures end-to-end support to organic production, quality assurance, market development and branding ^[76].

Paramparagat Krishi Vikas Yojana

This scheme focuses on promotion of traditional indigenous practices through agroecological approaches ^[77].

Sub-Mission on Organic Farming

State governments implement this as part of the National Mission for Sustainable Agriculture to promote organic areas, farms, clusters and farming through various interventions ^[78]. These policy measures and programs reflect increasing priority accorded to organic farming. However, more financial resources and implementation capacities are required to mainstream organic practices. Integrating organic agriculture across schemes for farmer incomes, rural livelihoods, food security and sustainability can enhance impacts.

Future Outlook and Recommendations

India has strong potential to emerge as a global leader in organic agriculture given its large farming population, agroecological diversity, millenia-old traditional practices, and growing domestic and export markets. However, realizing this potential requires long-term policy support and public-private partnerships.

Some key recommendations to accelerate adoption of organic farming in India are

- Increase budgetary allocations and strengthen implementation mechanisms ^[79].
- Invest in research and technology development to enhance productivity and quality ^[80].
- Develop decentralized participatory guarantee systems involving farmer collectives ^[81].
- Strengthen extension systems and farmer trainings in organic practices ^[82].
- Promote availability of quality organic inputs through start-ups ^[58].
- Develop integrated organic farming market chains connecting producers to consumers ^[83].
- Create awareness among farmers and consumers on benefits of organic food ^[55].
- Facilitate access to credit, crop insurance and income support to mitigate transition risks ^[84].
- Develop inter-departmental convergence across agriculture, horticulture, livestock, soil health, irrigation, value addition, livelihoods and markets for holistic growth ^[60].
- Foster farmer collectives, cooperatives and farmer producer organizations for knowledge sharing and marketing ^[85].
- Leverage Information and Communication Technologies for certification, traceability, supply chains and advisories ^[86].
- Strengthen participation of women farmers and farm workers through gender-sensitive policies and entitlements ^[87].
- Introduce organic farming in an incremental manner starting with cash crops less prone to yield gaps ^[88].
- Integrate organic principles in watershed development, climate resilience and sustainable agriculture programs ^[89].

Conclusion

In conclusion, adoption of organic farming in India remains far below potential despite growing demand and substantial benefits for sustainability. A favourable policy for environment, marketing support, and farmer-centric extension can facilitate wider adoption of organic practices. This will contribute to solving the economic, environmental and nutritional challenges facing Indian agriculture today. Sustained innovation, enterprise and collectivism involving diverse stakeholders can enable organic farming to usher in a sustainable agricultural future for India.

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