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Aishwarya Udaya Sree Gandham
M.Sc. Student, Department of
Agronomy, Lovely Professional
University, Phagwara, Punjab,
India

Harshal Wadatkar
Assistant Professor, Department of
Agronomy, Lovely Professional
University, Phagwara, Punjab,
India

Saveri Renumala
M.Sc. Student, Department of
Agronomy, Lovely Professional
University, Phagwara, Punjab,
India

Rahul Salve
Assistant Professor, Department of
Food Technology, Lovely
Professional University, Phagwara,
Punjab, India

Corresponding Author:
Harshal Wadatkar
Assistant Professor, Department of
Agronomy, Lovely Professional
University, Phagwara, Punjab,
India

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A comprehensive review on problems and prospects in adopting organic farming

Aishwarya Udaya Sree Gandham, Harshal Wadatkar, Saveri Renumala and Rahul Salve

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Abstract

The use of pesticides and fertilizers in modern agriculture has a significant negative impact on the environment, primarily due to the accumulation of toxic residues in the food chain and animal feed. This contamination can lead to numerous health problems, posing risks to both human and animal well-being. As a result of these adverse effects, the farming community is becoming more aware of alternative agricultural systems, such as organic farming, which offer more sustainable and environmentally friendly practices. This review paper aims to explore the various challenges and opportunities associated with adopting organic farming. The consequences of the Green Revolution have motivated farmers to shift toward organic agricultural practices. This paper examines the global and Indian perspectives on organic farming, highlighting its status and future potential. In India, however, the certified organic farmland remains limited, covering only 2.8 million hectares. Positive and negative effects. In this review article we are going to learn about the organic farming has both the positive effects includes the sustainability, creating jobs to rural people, saving environment and providing good quality agricultural products the negative effects include the lack of knowledge, high pricing of agricultural products, low availability of organic manures and many more.

Keywords: Organic farming, green revolution, nutrient management

Introduction

According to Codex Alimentarius, organic agriculture is a holistic production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity (Thakur *et al*, 2022) ^[115]. Its primary goal is to optimize the health and productivity of interconnected communities, including soil life, plants, animals, and people. By fostering a balanced and sustainable ecosystem, organic agriculture ensures long-term agricultural viability while prioritizing environmental and human well-being (Farooq *et al*, 2024) ^[40]. Agriculture plays a vital role in the Indian economy, with the sector primarily consisting of smallholder farming systems (Mahendra Dev 2014) ^[66]. However, these farming systems face numerous challenges, including limited land availability, scarce resources, and declining soil quality, all of which hinder sustainable crop production and food security (Gomiero 2016) ^[41]. Additionally, the impacts of climate change, such as the increasing frequency of extreme weather events, further aggravate these issues, making it even more difficult for farmers to maintain stable agricultural output in organic farming (Giller *et al*, 2021) ^[43]. Organic farming is a sustainable agricultural practice that relies on natural processes and ecological balance rather than synthetic inputs like chemical fertilizers and pesticides (Soni *et al*, 2022) ^[108]. It aims to promote environmental health, biodiversity, and soil fertility while minimizing pollution and harmful residues in food (Gamage *et al*, 2023). Organic farming follows principles that prioritize sustainability, animal welfare, and the well-being of farmers and consumers (Alonso *et al*, 2020) ^[4].

Organic farming scenario in India

In earlier times, traditional organic farming was widely practiced and was considered far superior to modern agricultural methods (Morgan and Murdoch 2000) ^[64].

Given the current global scenario, it is important to recognize the contributions of British botanist Sir Albert Howard, who is often regarded as the father of modern organic agriculture. He extensively documented traditional Indian farming practices and highlighted their superiority over conventional agricultural techniques (Pandey and Singh 2012) ^[80]. The term "organic" refers to an ecological management production system that promotes and enhances biodiversity, biological cycles, and soil biological activity (Valenzuela 2023) ^[120]. It relies on minimal off-farm inputs and emphasizes management practices that restore, maintain, and enhance ecological harmony (Mehrotra 2025) ^[75]. Organic farming reflects society's concern for ecological balance and the relationship between humans and the earth (Gamage *et al*, 2023). It recognizes the direct connection between human health and the way food is produced (Montgomery *et al*, 2023) ^[69]. Artificial fertilizers are strictly banned, and farmers instead develop fertile soil through crop rotation, composting, and the use of manure and clover (Ali *et al*, 2019). This approach also considers potential environmental and social impacts by eliminating synthetic inputs such as

chemical fertilizers, pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives, and irradiation (Kwiatkowski *et al*, 2023) ^[56]. Instead, organic farming adopts site-specific management practices that maintain and improve long-term soil fertility while preventing pests and diseases naturally (Stockdale *et al*, 2019) ^[99]. India has a long history of practicing organic agriculture (Das *et al*, 2020) ^[26], but the adoption of modern farming techniques, particularly those introduced during the Green Revolution, has led to a significant increase in chemical usage (Sharma *et al*, 2022) ^[107]. In recent years, however, there has been a growing awareness of the limitations associated with these practices (Tscharntke *et al*, 2021) ^[114]. The National Program for Organic Production (NPOP) has implemented conformity assessment procedures to ensure accreditation standards align with those of countries like the United States (Mishra and Singh, 2023) ^[72]. As a result, Indian organic products certified by accredited certification bodies are now recognized and accepted by international markets (Soni *et al*, 2022) ^[108].

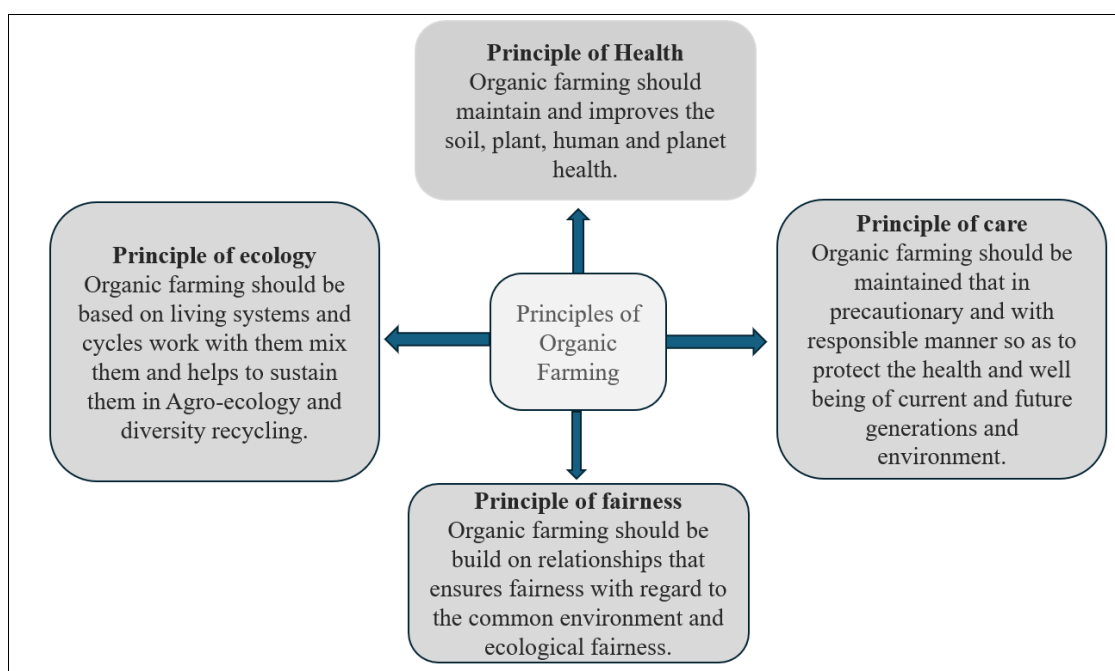


Fig 1: Depicting the principles of organic farming

Principle of health: Organic agriculture is a holistic approach that aims to sustain and enhance the health of the soil, plants, animals, humans, and the planet as an interconnected system (Gamage *et al*, 2023). It recognizes that the well-being of individuals and communities is deeply linked to the health of ecosystems healthy soils nurture healthy crops, which in turn support the health of animals and people. Health, in this context, goes beyond the mere absence of disease; it encompasses physical, mental, social, and ecological well-being, emphasizing immunity, resilience, and regeneration. Organic farming plays a crucial role in maintaining these aspects by promoting sustainable practices across farming, processing, distribution, and consumption (Gomiero *et al*, 2011) ^[42]. By fostering biodiversity, improving soil fertility, and avoiding synthetic chemicals, organic agriculture ensures the production of high-quality, nutritious food that supports preventive health care and overall well-being. To uphold this principle, it strictly avoids the use of synthetic fertilizers, pesticides, animal drugs, and food additives that may pose risks to human and environmental health

(Warra *et al*, 2020) ^[123]. Through these efforts, organic farming contributes to a balanced and self-sustaining ecosystem that benefits both present and future generations (Nitish Kumar *et al*, 2023) ^[127].

Principle of Ecology: Organic agriculture is deeply rooted in living ecological systems and cycles, striving to work with, emulate, and sustain them (Stojanovic 2019) ^[98]. It is based on ecological processes and recycling, ensuring that nourishment and well-being are derived from the specific environment in which production takes place. For crops, this means maintaining the health of living soil; for animals, it involves fostering a balanced farm ecosystem; and for aquatic organisms, it requires preserving the integrity of marine environments (Garcia *et al*, 2025). Organic farming, pastoral practices, and wild harvesting should align with nature's cycles and ecological balances, which, though universal, operate uniquely in different locations. Therefore, organic management must be tailored to local conditions, ecology, culture, and scale. Sustainable resource use

is a key principle, emphasizing the reduction of inputs through reuse, recycling, and efficient material and energy management to improve environmental quality and conserve natural resources (Chaturvedi *et al*, 2023) ^[25]. Achieving ecological balance requires thoughtful farming system design, habitat creation, and the preservation of genetic and agricultural diversity. Moreover, everyone involved in the organic food system producers, processors, traders, and consumers shares the responsibility of protecting and enhancing the common environment, including landscapes, climate, biodiversity, air, and water. By embracing these principles, organic agriculture ensures a sustainable future where human activities coexist harmoniously with nature.

Principle of Fairness: Organic agriculture is founded on the principle of fairness, ensuring equitable relationships with both the environment and all living beings (Gamage *et al*, 2023). Fairness embodies equity, respect, justice, and responsible stewardship of shared resources, fostering a system that benefits all participants farmers, workers, processors, distributors, traders, and consumers (Somasundaram *et al*, 2021) ^[104]. This approach promotes ethical human interactions at every level, ensuring fair wages, decent working conditions, and a good quality of life for everyone involved. Additionally, organic agriculture contributes to food sovereignty and poverty reduction by supporting sustainable livelihoods and ensuring an adequate supply of high-quality food and other products (Perfecto *et al*, 2019) ^[82]. Beyond human relationships, fairness extends to animal welfare, advocating for living conditions that align with their natural behaviour and well-being. Furthermore, the responsible management of natural and environmental resources is essential to maintaining ecological and social justice, preserving these resources for future generations. To uphold fairness, organic agriculture requires transparent and equitable systems of production, distribution, and trade that reflect the true environmental and social costs (Klassen *et al*, 2022). By embracing these values, organic agriculture not only sustains ecosystems but also cultivates a just and ethical food system for all.

Principle of Care: Organic agriculture must be managed with precaution and responsibility to safeguard the health and well-being of both present and future generations, as well as the environment (Gamage *et al*, 2022). As a dynamic and evolving system, organic agriculture adapts to internal and external conditions while striving to enhance efficiency and productivity. However, this progress should never come at the expense of ecological balance or human health. Therefore, new technologies must be carefully assessed, and existing methods continuously reviewed to ensure their sustainability and safety (Durham and Mizik 2021) ^[28]. Given the complexity of ecosystems and agriculture, a cautious approach is necessary in decision-making, development, and the adoption of new techniques (Shackelford *et al*, 2019) ^[97]. Science plays a crucial role in maintaining the health, safety, and ecological integrity of organic farming, yet it must be complemented by practical experience, traditional knowledge, and indigenous wisdom solutions that have been refined over generations. By integrating scientific advancements with time-tested practices, organic agriculture can remain resilient, ethical, and sustainable for future generations.

Components of Organic farming

Organic farming is a sustainable agricultural approach that relies on natural processes, biodiversity, and ecological balance rather

than synthetic inputs. The key components of organic farming include

Soil management

- Enhancing soil fertility through organic matter like compost, green manure, and crop rotation.
- Avoiding synthetic fertilizers and using natural alternatives like bio-fertilizers and vermicompost.

Crop rotation and poly culture

- Growing different crops in succession to maintain soil health and prevent pest and disease buildup.
- Practicing intercropping (growing multiple crops together) to enhance biodiversity and improve yields.

Organic fertilizers and Manure

- Using compost, farmyard manure, green manure, and bio-fertilizers instead of chemical fertilizers.
- Improving soil organic matter and microbial activity to boost plant growth.

Biological pest and weed control

- Using natural predators, beneficial insects, and microbial pesticides instead of chemical pesticides.
- Employing methods like crop rotation, mulching, and manual weeding to manage weeds naturally.

Using of organic seed and planting material

- Using non-GMO, untreated seeds and plants adapted to local conditions.
- Promoting indigenous and disease-resistant crop varieties.

Water management

- Adopting water conservation techniques like drip irrigation, rainwater harvesting, and mulching.
- Preventing contamination of water sources with synthetic chemicals.

Livestock integration

- Raising animals in natural, humane conditions with organic feed and without synthetic hormones or antibiotics.
- Using livestock manure to enhance soil fertility and integrating animals into the farming system.

Agroforestry and biodiversity conservation

- Growing trees and shrubs alongside crops to promote ecological balance.
- Encouraging the presence of beneficial organisms and maintaining natural habitats.

Using of no synthetic chemicals

- Avoiding artificial fertilizers, pesticides, herbicides, and genetically modified organisms (GMOs).
- Using eco-friendly, biodegradable alternatives for soil and crop protection.

Certification and Compliance

- Following organic farming standards and getting certification from recognized agencies.
- Maintaining proper documentation and records to ensure traceability and compliance with organic farming guidelines (Balogun *et al*, 2016) ^[11].

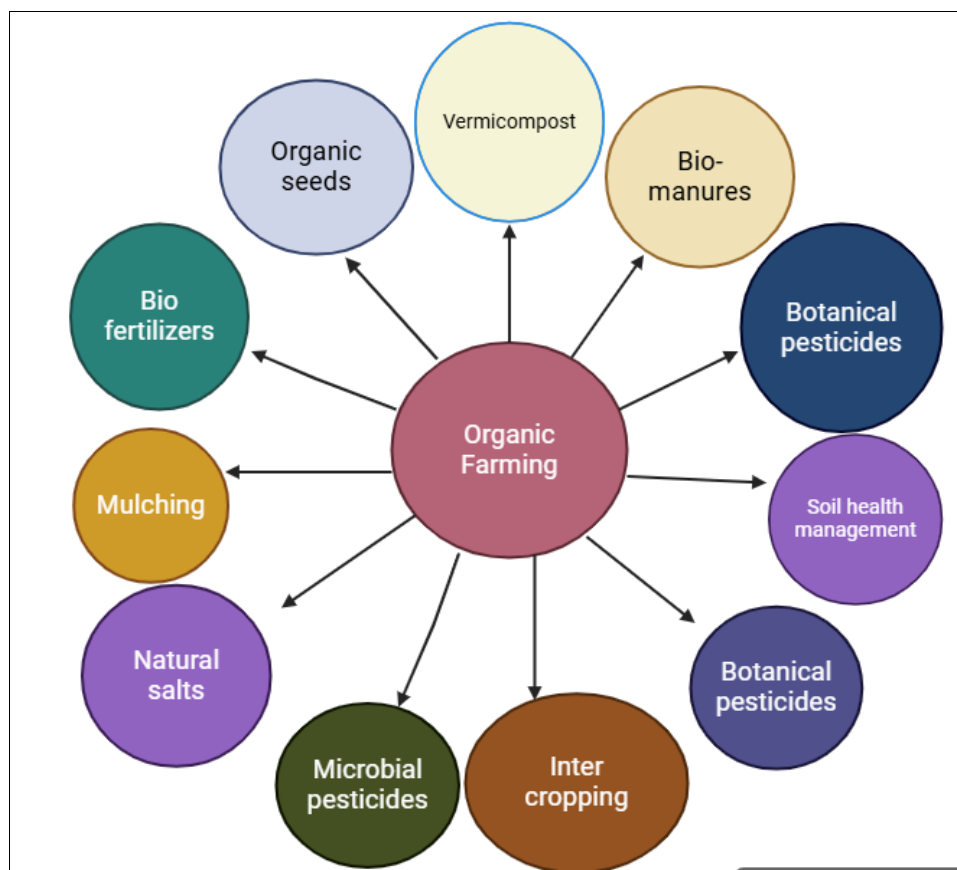


Fig 2: Indicating the components of Organic farming

Table 1: Containing the list of organic amendments and their nutrient content in percentage.

S. No	Organic Amendment	N (%)	P (%)	K (%)	Other Nutrients	Reference
1	Compost (General)	1.0 -3.0	0.5 - 1.5	1.0 -2.0	Contains micronutrients, improves soil structure	Siedt <i>et al</i> , 2021 ^[106] .
2	Manure (Cow)	0.5 - 1.5	0.2 - 0.5	0.5 - 1.5	High in organic matter, slow release	Duan <i>et al</i> , 2021. ^[27]
3	Manure (Poultry)	2.0 - 4.0	2.0 - 4.0	1.2 - 2.0	Rich in phosphorus, fast-acting	Luneva <i>et al</i> , 2022 ^[63] .
4	Manure (Horse)	0.5 - 1.5	0.3 - 0.8	0.5 - 1.5	Good for soil structure, moderate nutrients	Gashua <i>et al</i> , 2022 ^[44]
5	Manure (Sheep/Goat)	.5 - 3.0	0.5 - 1.0	1.0 - 2.0	Well-balanced nutrients, good for gardens	Rana and Roy, 2024 ^[91] .
6	Worm Castings	1.5 - 2.0	1.0 - 2.0	1.0 - 2.0	Rich in microbial life, enhances soil health	Bottinelli <i>et al</i> , 2020 ^[17] .
7	Bone Meal	3.0 - 4.0	15.0 - 27.0	0.0 - 0.3	High in phosphorus for root growth	Molosag <i>et al</i> , 2023.
8	Blood Meal	12.0 - 15.0	1.0 - 2.0	0.6 - 0.8	Quick nitrogen source	Yunta <i>et al</i> , 2013 ^[126] .
9	Fish Meal	5.0 - 10.0	3.0 - 6.0	0.0 - 1.0	High protein, boosts microbial activity	Fuchs <i>et al</i> , 2015 ^[36] .
10	Fish Emulsion	2.0 - 5.0	1.0 - 2.0	1.0 - 2.0	Fast-release, liquid fertilizer	Larco 2010 ^[58] .
11	Alfalfa Meal	2.5 - 4.5	0.5 - 1.0	1.5 - 2.5	Contains growth hormones for plants	El-Hakim <i>et al</i> , 2009 ^[32] .
12	Cottonseed Meal	4.0 - 6.0	1.0 - 2.0	1.0 - 2.0	Slightly acidic, good for acid-loving plants	Rosen and Eliason 2005 ^[85] .
13	Kelp Meal	1.0 - 2.0	0.1 - 0.5	2.0 - 5.0	Rich in trace minerals and growth hormones	Page <i>et al</i> , 2008 ^[79] .
14	Greensand	0.0 - 1.5	0.0 - 0.5	3.0 - 7.0	Slow-release potassium and minerals	Smaill 2015 ^[96] .
15	Rock Phosphate	0.0 - 1.0	20.0 - 30.0	0.0 - 0.2	Long-lasting phosphorus source	Fayiga and Nwoke 2016. ^[37]
16	Wood Ash	0.0 - 2.0	1.0 - 2.0	4.0 - 10.0	High in potassium, raises soil pH	Ohno and Erich 1009 ^[77] .
17	Feather Meal	12.0 - 15.0	0.0 - 1.0	0.0 - 0.5	Slow-release nitrogen	Morris 2020 ^[67] .

Problems of organic farming

Low yield: The biggest challenge hindering the progress of organic farming is the lack of a firm commitment from policymakers to actively promote it (Luczka and Kalinowski, 2020). Without a clear and decisive direction, supported by both financial and technical assistance at all levels from the central government to local Panchayats regulatory measures alone will be ineffective in driving meaningful change (Singh 2006). A large-scale shift to organic farming could result in a 40% reduction in crop yields worldwide. This significant decline in food production would equate to a loss substantial enough to feed approximately 2.5 billion people (Rahmann *et al*, 2017)^[87]. As a result, they caution that such a transition could trigger a severe global famine, posing a critical threat to food security on a massive scale (Kirchmann *et al*, 2008)^[51]. The agricultural practices around the year 1900 were like organic farming, relying on low external inputs and supporting a population of only about three billion (Barton 2018)^[12]. Today, with a global population more than twice that size, the demand for food has significantly increased. Additionally, advancements in agriculture have led to considerable improvements in diets and a substantial rise in daily calorie intake, highlighting the challenges of reverting to low-input farming methods on a large scale (Aune 2011)^[1]. Although the issue of lower yields in organic farming remains debatable rather than a universal phenomenon, extensive research has been conducted on the topic (Agrimonti *et al*, 2021)^[6]. A comparative study analysing 362 published reports on organic and conventional farming systems found that organic yields are approximately 80% of those in conventional agriculture. Conducted at the field level, the study revealed even larger yield gaps, primarily due to challenges in effectively managing soil nutrients (Wilbois *et al*, 2019)^[122]. A comprehensive meta-analysis of 66 studies by Seufert *et al*. (2012)^[95] found that, on average, organic farming yields are 25% lower than those of conventional systems. The study also revealed that organic farming performance declines by approximately 43% in developing countries and 20% in developed countries (Durham and Mizik 2021)^[28]. Similarly, Kirchmann *et al*. (2008)^[51] argue that scientific studies indicate organic farming yields worldwide are 25% to 50% lower than those of conventional systems. Low yield in organic farming is a crucial factor in determining its potential to enhance food security (Liliane *et al*, 2020)^[60]. However, increasing yield alone is not a definitive solution to food insecurity, as the issue is influenced by various social, political, and economic factors (Ponisio *et al*, 2015)^[92]. Murphy *et al*. (2007)^[65] observed that comparisons between conventional and organic yields in certain studies are often inaccurate and biased in favour of higher yields in conventional systems. This bias arises because the crop species and varieties used in these studies were specifically adapted for conventional high-input agricultural systems, rather than being suited for organic farming conditions. It is important to recognize that approximately 95% of current organic production relies on conventional crop varieties and animal breeds. This highlights the need to develop and introduce new, well-suited varieties specifically designed for low-input organic farming systems (Van Bueren *et al*, 2011)^[118]. Producing sufficient manure on a farm is not feasible without access to extensive pasture (Ndambi *et al*, 2019)^[76].

Nutrient Management

The health of the soil is closely connected to the growth of crops (Fu *et al*, 2021). In general, soil management practices based on agroecological principles contribute to strengthening a plant's

resistance to pests and diseases (Vikas and Ranjan, 2024)^[121]. Conversely, nutrient-deficient soils result in low crop yields, which can, in turn, worsen hunger and poverty (Mulungu *et al*, 2023)^[73]. Therefore, healthy soil is vital for sustaining farm productivity. Since organic farms prohibit the use of synthetic inputs, maintaining a balanced nutrient cycle in the soil is critically important (Aulakh *et al*, 2022)^[8]. The leguminous cover crops can supply sufficient nitrogen to maintain soil fertility, others disagree with this perspective (Blesh *et al*, 2019)^[14]. The production of organic nutrient supplies requires additional resources such as land, labour, nutrients, and water, which are often scarce in many regions (Wang 2022)^[125]. Nutrient management in organic systems presents several challenges that can impact productivity and sustainability (Timsina 2018)^[110]. The organic manure is limited in availability, organic farming relies on natural nutrient sources such as compost, manure, green manure, and cover crops (Singh *et al*, 2020). In many regions, these organic inputs are not available in sufficient quantities to meet crop nutrient demands (Barbieri *et al*, 2021)^[18]. Imbalance of nutrient supply and demand also there, maintaining a proper balance between nutrient input and output is difficult in organic farming (Shaji *et al*, 2021)^[103]. Crops remove nutrients from the soil, and if they are not replenished adequately, soil fertility declines over time (Mosier *et al*, 2021)^[68]. Unlike synthetic fertilizers, which provide precise nutrient levels, organic sources release nutrients slowly and may not meet crop requirements at critical growth stages (Asadu *et al*, 2024)^[9]. Organic fertilizers are bulk in nature and also contain very low or negligible nutrients (Chatzistathis *et al*, 2021)^[23]. Organic fertilizers such as compost and manure have lower nutrient concentrations compared to synthetic fertilizers (Thomas *et al*, 2019)^[111]. This means larger quantities of organic inputs are needed to provide the same level of nutrients, which increases labour and transportation costs (Bergstrand 2022)^[19]. Organic fertilizers also have varying nutrient compositions, making it difficult to ensure a consistent supply (Shaji *et al*, 2021)^[103]. Leguminous cover crops can fix nitrogen, but they may not provide enough for high-yielding crops (Elhakeem *et al*, 2021)^[35]. The timing of nitrogen release from organic matter may not always align with plant needs, leading to deficiencies (Panday *et al*, 2024)^[93]. The organic farming struggles to supply adequate nitrogen, while others believe leguminous cover crops can fulfil this requirement (Kumar *et al*, 2020)^[52]. Organic farms often face deficiencies in essential nutrients such as phosphorus (P), potassium (K), and micronutrients like zinc and iron (Deshkar *et al*, 2024)^[30]. Unlike conventional systems that use synthetic fertilizers to correct deficiencies quickly, organic farmers rely on rock phosphate, potassium-rich minerals, and compost, which release nutrients slowly (El gayer 2021). Continuous cropping without sufficient nutrient replenishment can lead to soil depletion and reduced yields over time (Alemineu and Alemayehu 2020)^[5]. Manure is a key nutrient source in organic farming, but producing enough on-farm manure requires access to livestock and pastureland (Matthews 2023)^[70]. Farms without livestock must source manure externally, which may be expensive or unavailable. Transporting manure over long distances increases costs and carbon footprint, reducing the sustainability of organic farming (Holka *et al*, 2022)^[49]. Organic certification standards prohibit or limit the use of synthetic fertilizers and other external inputs. This restricts farmers from quickly addressing nutrient deficiencies using conventional methods. Instead, they must rely on slow-releasing organic amendments, crop rotation, and natural soil-building techniques.

Organic nutrient sources, such as manure and compost, release nutrients slowly, but improper application can still lead to losses (Chaudhary *et al*, 2020) ^[22]. Nutrients may leach into groundwater or be lost through runoff, especially if organic fertilizers are applied in excess (Craswell 2021) ^[24]. Organic nutrient management often requires more labour for composting, manure application, crop rotation, and cover cropping (Khan *et al*, 2024) ^[57]. Additional costs may arise from purchasing organic fertilizers or transporting manure (Sarauski *et al*, 2021). Small-scale farmers may find it difficult to afford these extra inputs and labour. Nutrient management in organic farming is a complex challenge due to limited organic inputs, slow nutrient release, soil imbalances, and resource constraints (Verma *et al*, 2020) ^[119]. While organic practices promote long-term soil health and sustainability, they require careful planning, diversified cropping systems, and efficient nutrient recycling to ensure productivity.

Certification and Marketing of organic products

In general, there are two distinct systems of organic farming. The first is certified production, which comes with a premium price and is primarily intended for organic markets in developed countries. The second is non-certified production, which is mainly geared toward local markets in developing countries. It is important to note that in developing countries, certified organic products are largely produced for export rather than domestic consumption (Rundgren and Parrott 2006) ^[86]. Certification of organic products is expensive because it requires infrastructure for monitoring and documenting producers (Gamage *et al*, 2023). As a result, many small-scale and resource-limited farmers are unable to afford the costs associated with certification (Eyinate 2019) ^[33]. Moreover, it is important to note that certification offers little to no benefit for subsistence farmers or those living in regions without a reliable organic market (Kamau *et al*, 2022) ^[54]. Certified organic products are often less profitable than non-certified ones. For instance, a study conducted over a decade on 327 organic, fair trade, and conventional coffee producers in Nicaragua found that, despite higher farm-gate prices for certified coffee, lower productivity led organic producers to become poorer compared to their conventional counterparts. The premium prices for organic and organic-fair trade certified coffee were only 8% and 11% higher than those of conventional coffee, respectively. This premium, approximately \$0.20 per kilogram, was insufficient to cover the additional costs associated with extra labour and land requirements. Since organic farming demands more labour, many farmers had to hire workers, as family labour alone was not enough to meet the increased workload (Beuchelt and Zeller 2011) ^[10]. Studies indicate that labour costs in organic farming are 7-13% higher than in conventional systems. However, the overall profitability of organic farming largely depends on the price premiums applied to organic products, which typically range between 29% and 32% (Crowder and Reganold 2015) ^[21]. However, organic certification has not shown a significant positive impact on farmers' livelihoods. In contrast, fair-trade certification has been found to improve household living standards by 30% and reduce farmers' vulnerability (Chiputwa *et al*, 2015) ^[20].

Overcoming the problems of organic farming

Low yields compared to organic farming

Solution

- Use high-yield organic seed varieties (Rempelos *et al*, 2023) ^[90].

- Practice crop rotation and intercropping to maintain soil fertility.
- Implement biofertilizers and organic compost to enhance soil nutrients (Singh *et al*, 2020).

Pest and Disease management

Solution: Use natural predators (e.g., ladybugs for aphids) (Aguilera *et al*, 2021) ^[7].

- Apply organic pesticides such as neem oil or garlic spray (Kurian *et al*, 2023) ^[55].
- Rotate crops to break pest and disease cycles (Shah *et al*, 2021) ^[105].

Soil fertility management

Solution

- Regularly apply compost, manure, and green manure (Iderawumi and Kamal 2022) ^[50].
- Use cover crops to prevent soil erosion and retain moisture (Lopez-Vicente *et al*, 2020).
- Adopt agroforestry techniques to enhance biodiversity (Rosati *et al*, 2021) ^[88].

High production costs

Solution

- Reduce dependency on expensive organic inputs by making compost and bio-pesticides on the farm (Yadav *et al*, 2021).
- Form cooperatives to share resources and reduce costs (Candemir *et al*, 2021).
- Seek government subsidies and grants for organic farming (Sapbamrer *et al*, 2021) ^[102].

Market access and price fluctuations

Solution

- Establish direct-to-consumer channels such as farmers' markets and online sale (Pesci *et al*, 2023) ^[84].
- Obtain organic certification to access premium markets (Tankam and Djimeu 2020) ^[112].
- Join organic farming cooperatives to negotiate better prices (Baron and Dimitri 2019) ^[13].

Weed management

Solution

- Practice mulching to suppress weed growth (Mwangi *et al*, 2024) ^[74].
- Use mechanical weeding tools like hand hoes and weeders (Tiwari *et al*, 2022) ^[116].
- Introduce cover crops that outcompete weeds (Blesh *et al*, 2019) ^[14].

Limited Availability of Organic Seeds and Inputs

Solution

- Save and exchange organic seeds with other farmers (Bliss *et al*, 2019) ^[15].
- Develop compost and organic fertilizers on the farm (Singh *et al*, 2020).
- Encourage local production of organic farming inputs (Gamage *et al*, 2023).

Lack of technical knowledge

Solution

- Attend organic farming workshops and training (Alotaibi *et al*, 2019) ^[2].
- Join farming networks and online forums (Rust *et al*, 2022) ^[89].

- Collaborate with agricultural extension services (Krishnan *et al*, 2021)^[53].

Prospects of organic farming

Organic farming is gaining traction worldwide as a sustainable alternative to conventional agriculture (Gamage *et al*, 2023). It focuses on natural processes, biodiversity, and soil health, avoiding synthetic fertilizers, pesticides, and genetically modified organisms (GMOs) (Singh and Kumar 2023). The prospects of organic farming are promising due to growing consumer awareness, environmental concerns, and policy support (Ferdous *et al*, 2021)^[39]. The market demand for organic agricultural products is increasing day by day (Das *et al*, 2020)^[26]. Increasing consumer preference for organic food due to health benefits (Hurtado-Barroso *et al*, 2019)^[48]. Expansion of organic food markets globally, with strong demand in developed and developing nations (Lian and Yoong 2019)^[59]. The organic agricultural products have more export opportunities than the conventional agricultural products due to its high quality (Ostapenko *et al*, 2020)^[78]. Countries like the USA, Europe, and Japan have a high demand for organic produce, offering export potential for organic farmers (Bazaluk *et al*, 2020)^[16]. Organic certification for agricultural products opens doors for international markets, enhancing profitability (Peng 2019)^[81]. Organic farming is labour dependent farming so it can create more job or work opportunity to the working groups (Watson 2020). It involves diverse sectors like organic food processing, marketing, and certification services (Bazaluk *et al*, 2020)^[16]. Organic farming has very good impact on environment (Gamage *et al*, 2023). Soil Health and Fertility Organic farming improves soil structure, organic matter, and microbial activity. Enhances water retention capacity, reducing soil erosion and degradation (Usharani *et al*, 2019)^[117]. Supports diverse ecosystems by avoiding chemical pesticides and synthetic fertilizers and supports to biodiversity conservation (Diyaulu and Folarin 2024)^[31]. It Encourages the growth of beneficial insects, pollinators, and native plant species (Torok *et al*, 2021). Reduces greenhouse gas emissions compared to conventional farming. Increases carbon sequestration in the soil through organic matter enrichment (Datta *et al*, 2022)^[29]. Involves in new inventions like development of bio-fertilizers, organic pesticides, and sustainable crop management techniques. Use of composting, vermiculture, and green manure to enhance soil fertility (Gammatantrawet *et al*, 2023)^[46]. It also involves in continuous research on organic pest control, disease management, and crop breeding. Development of high-yielding organic crop varieties suited to different climatic conditions (Aulakh *et al*, 2022)^[8]. Organic farming holds great promise for sustainable agriculture, economic growth, and environmental conservation (Patle *et al*, 2020)^[83]. While challenges exist, the increasing consumer demand, technological advancements, and government support make organic farming a viable and lucrative option for the future. Investing in research, innovation, and policy reforms can further enhance its prospects, ensuring food security and ecological balance.

Conclusion

Organic farming is a promising approach to sustainable agriculture, offering numerous benefits for human health, the environment, and the economy. However, it also faces significant challenges that must be addressed for its widespread adoption and success. On the problematic side, organic farming requires a higher initial investment, as farmers need to transition from conventional methods, often leading to lower yields during

the conversion period. Additionally, the limited availability of organic seeds, natural fertilizers, and biopesticides can hinder productivity. Certification processes are complex and costly, making it difficult for small-scale farmers to enter organic markets. Furthermore, organic farming is labour-intensive and demands specialized knowledge, which many farmers lack due to insufficient training and support. the prospects of organic farming remain strong. The growing global demand for organic food, driven by health-conscious consumers and environmental concerns, presents a significant opportunity for farmers. Governments and international organizations are increasingly supporting organic farming through subsidies, incentives, and policy initiatives. Technological advancements in organic farming, such as precision agriculture, AI-driven monitoring, and sustainable bio-inputs, are helping to improve productivity and efficiency. Research and development in organic crop breeding, soil health management, and natural pest control further contribute to its viability. Environmental benefits such as improved soil fertility, reduced pollution, biodiversity conservation, and climate change mitigation make organic farming an essential component of sustainable agriculture. The potential for export markets and premium pricing for organic products enhances its economic feasibility, making it an attractive option for farmers willing to invest in long-term sustainability

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