



**ADOPTION OF ORGANIC FARMING PRACTICES: A COMPREHENSIVE REVIEW OF
TRENDS, DETERMINANTS, AND CHALLENGES**

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To cite the article: Md Mahedi, Shabrin Jahan Shaili, Md Nurnobi, A Rahman Sakil, Arafatur Rahman Shihab (2025), *ADOPTION OF ORGANIC FARMING PRACTICES: A COMPREHENSIVE REVIEW OF TRENDS, DETERMINANTS, AND CHALLENGES*, *Journal of Agricultural and Rural Research*, 8(1): 26-45.

Link to this article:

<http://aiipub.com/journals/jarr-250319-10085/>

Article QR



Journal QR



ADOPTION OF ORGANIC FARMING PRACTICES: A COMPREHENSIVE REVIEW OF TRENDS, DETERMINANTS, AND CHALLENGES

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ARTICLE INFO

Article Type: Research

Received: 05, Jan. 2025.

Accepted: 23, Feb. 2025.

Published: 20, Mar. 2025.

Keywords:

Adoption, Organic Farming, Determinants, Comprehensive, Sustainable Agriculture, Food security.

ABSTRACT

Organic farming is a vital pathway to sustainable agriculture, addressing environmental, economic, and social challenges. This review synthesizes global trends, determinants, and barriers to adoption, analyzing data from international organizations, peer-reviewed studies, and policy frameworks. Despite significant growth—global organic farmland reached 74.9 million hectares (1.6% of total farmland) in 2021, with a market value of \$187 billion (projected 12.5% annual growth)—adoption remains uneven. While Europe leads (e.g., EU's 25% organic farmland target by 2030), developing regions like Bangladesh lag (0.1% adoption) due to economic constraints, weak institutions, and infrastructural gaps. Key drivers include economic incentives (price premiums, long-term profitability), social networks (peer learning), policy support (subsidies, certification), environmental benefits (soil health, biodiversity), and technological innovations (precision tools, blockchain). However, challenges persist: high transition costs, 3-year financial risks for smallholders, fragmented supply chains, certification complexities, and volatile markets. The study highlights the need for equitable policies—simplified certification, targeted subsidies, and investment in grassroots innovations. Future efforts must integrate gender inclusivity, climate resilience, and digital solutions (e.g., mobile apps, blockchain for traceability) to bridge adoption gaps in resource-limited contexts. Collaborative action among governments, NGOs, and the private sector is essential to align organic farming with the UN SDGs, fostering food systems that balance productivity, ecological stewardship, and socio-economic equity. By addressing systemic barriers and prioritizing marginalized voices, organic farming can transition from a niche practice to a global sustainability cornerstone, ensuring resilience in an era of escalating environmental and demographic pressures.

1. INTRODUCTION

Sustainable agriculture has gained significant attention as a means to ensure food security, environmental conservation, and economic viability. Among various sustainable farming practices, organic agriculture relies on ecological processes, biodiversity, and natural cycles rather than synthetic inputs. Organic farming promotes soil fertility, reduces environmental degradation, and enhances biodiversity while producing healthier food free from synthetic pesticides and fertilizers (Gamage *et al.*, 2023a). Despite its benefits, adopting organic farming remains limited, especially in developing countries where conventional farming dominates due to economic, institutional, and technological challenges (Sheikh *et al.*, 2021).

Historically, organic farming was the traditional method of cultivation before the rise of industrial agriculture. However, with the advent of the Green Revolution in the mid-20th century, global agriculture shifted towards high-yielding, chemically intensive conventional farming (Mesnage *et al.*, 2021). This transformation significantly increased food production and led to severe environmental consequences, including soil degradation, loss of biodiversity, and water contamination. The excessive use of synthetic fertilizers and pesticides has resulted in numerous health hazards, prompting a growing demand for sustainable alternatives (Islam *et al.*, 2013). In response, organic farming has seen gradual expansion, particularly in developed nations. According to the International Federation of Organic Agriculture Movements (IFOAM), the global organic agricultural area reached 71.5 million hectares in 2018, covering 1.4% of total agricultural land (Borsellino *et al.*, 2020). Regions such as Oceania, Europe, Latin America, and Asia have experienced substantial growth in organic farming (Ma & Joachim, 2006). However, despite this progress, organic agriculture remains a niche sector, particularly in developing countries like Bangladesh, where it accounts for only 0.1% of the total agricultural area (Lessmann *et al.*, 2022).

Despite the well-documented benefits of organic farming, its adoption is uneven and influenced by various economic, social, institutional, environmental, and technological factors. Many farmers remain hesitant to transition from conventional to organic methods due to economic constraints, such as high initial costs, lack of financial incentives, and uncertain market returns. Additionally, social and institutional factors, including limited technical knowledge, lack of training, and weak extension services, further hinder adoption. Environmental challenges, such as soil fertility management and pest control, also create barriers, while technological limitations restrict the efficiency and scalability of organic farming practices. Furthermore, government policies, certification programs, and market access play a crucial role in determining the feasibility of organic farming, particularly for smallholder farmers. Given the complexity of these factors, a comprehensive review is necessary to understand the key drivers and barriers to organic farming adoption.

The primary objective of this study is to conduct a systematic review of the determinants influencing organic farming adoption. Specifically, it aims to

- a) Analyze economic constraints and incentives.
- b) Examine social factors such as education and farmer networks.
- c) Investigate institutional influences including extension services and certification requirements.
- d) Assess environmental challenges related to soil health and climate adaptation.
- e) Explore market dynamics affecting organic product demand, and evaluate technological advancements in organic farming practices.

To achieve this, the study will address key research questions, including:

RQ 1: What are the global trends in organic farming adoption?

RQ 2: How do social and cultural factors influence farmers' decisions?

RQ 3: What role do institutional support and government policies play?

RQ 4: How do environmental conditions impact the transition to organic agriculture?

RQ 5: What market and technological challenges must be addressed to promote organic farming?

By answering these questions, the study will provide a holistic understanding of the complexities involved in organic farming adoption.

Understanding the factors influencing organic farming adoption is critical for policymakers, agricultural practitioners, and researchers. For policymakers, identifying key barriers can aid in designing targeted interventions such as financial incentives, training programs, and regulatory frameworks to promote organic farming. For farmers and agricultural practitioners, insights from this review can guide them in overcoming challenges and leveraging opportunities in organic agriculture. Researchers can also use this synthesis to identify gaps in existing studies and propose new directions for further exploration. The scope of this review encompasses global perspectives on organic farming adoption, with a particular focus on developing countries such as Bangladesh. It will analyze studies from the past two decades to capture recent trends, emerging challenges, and potential solutions.

In conclusion, organic farming represents a promising alternative to conventional agriculture, offering numerous environmental, economic, and health benefits. However, its adoption remains inconsistent across regions due to a range of interrelated factors. This study seeks to provide a comprehensive review of the determinants influencing organic farming adoption and offer valuable insights for enhancing the transition towards more sustainable agricultural systems. By critically examining these factors, this research will contribute to the broader discourse on sustainable agriculture and its role in achieving food security and environmental sustainability.

2. METHODS

The study relies exclusively on secondary data, ensuring a comprehensive and evidence-based analysis of the factors influencing organic farming adoption and its socio-economic and environmental impacts. By synthesizing data from diverse sources, the study aims to offer a holistic understanding of the current state of organic farming adoption, the barriers faced by farmers, and the potential pathways for scaling up sustainable agricultural practices.

2.1 Data Collection

This study utilizes secondary data from diverse credible sources, including national and regional agricultural departments (e.g., Ministry of Agriculture), international organizations (FAO, World Bank, IFAD), peer-reviewed journals, and NGO reports, to analyze the adoption of organic farming. The data encompass agricultural practices, crop yields, farmer demographics, policy frameworks, subsidies, certification processes, and institutional support, alongside global trends, socio-economic determinants, and environmental impacts of organic farming. By integrating qualitative insights (e.g., farmer challenges, community initiatives) and quantitative metrics (e.g., adoption rates, economic viability), the study identifies key drivers and barriers to organic farming, emphasizing the role of policy effectiveness, market dynamics, and environmental benefits in achieving sustainable agricultural development.

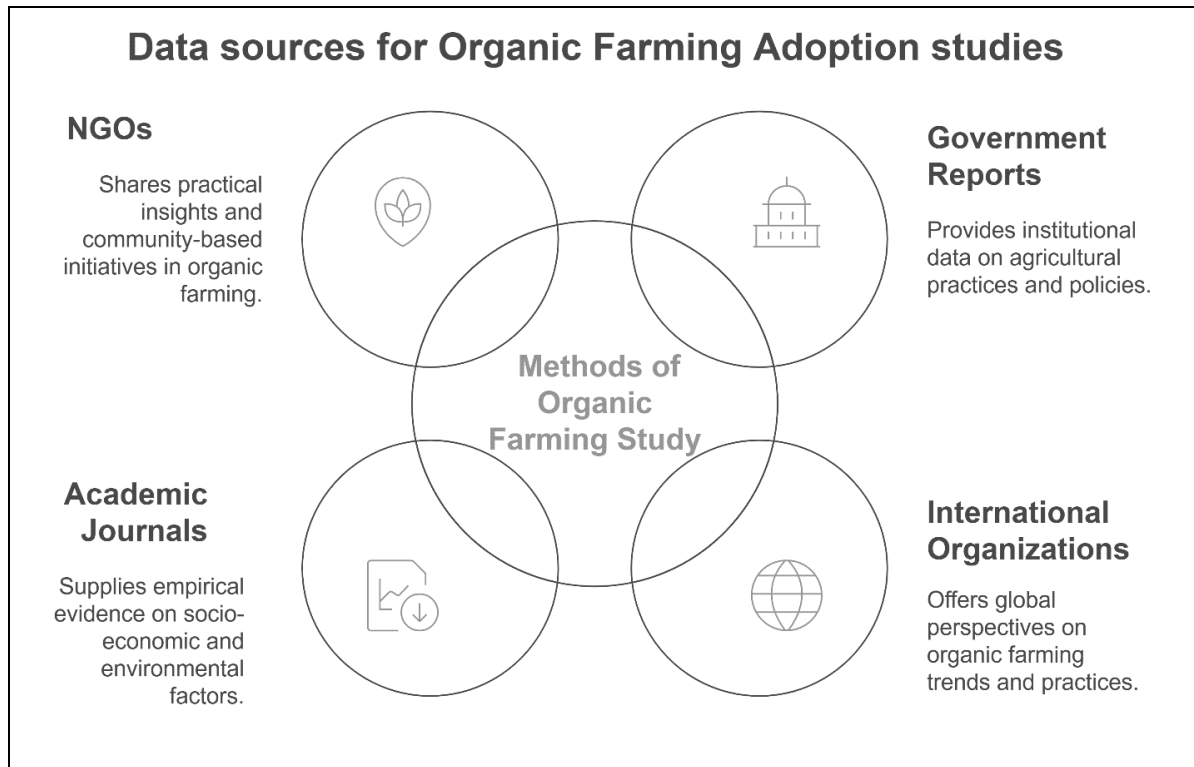


Figure 1. Methodology of the Study

2.2 Impact Assessment

This study evaluated the agro-economic and environmental impacts of organic farming adoption through a multi-dimensional analysis of key indicators, including adoption rates (influenced by access to information, organic inputs, education, and social networks), economic outcomes (income changes, cost-benefit comparisons, market access, and premium pricing), and environmental benefits (soil health improvement, biodiversity conservation, reduced chemical use, and climate resilience). It also assessed the role of policies, subsidies, certification programs, and institutional support in driving adoption, alongside challenges such as input availability, financial constraints, and policy implementation gaps. By integrating socio-economic and ecological metrics, the findings underscore organic farming's potential to enhance sustainability, farmer livelihoods, and environmental health, while emphasizing the need to address systemic barriers—such as limited infrastructure, knowledge gaps, and market integration—to scale adoption and achieve long-term agricultural resilience (Mahedi et al., 2024).

3. GLOBAL TRENDS

Organic farming has grown significantly worldwide, with global organic agricultural land reaching 74.9 million hectares in 2021, driven by consumer demand for health and sustainability, climate concerns, and supportive policies (Panday et al., 2024). The organic food market, valued at \$187 billion in 2021, is projected to grow at 12.5% annually, fueled by rising demand in both developed and developing nations (Ashokkumar et al., 2022). While Europe leads adoption—with the EU aiming for 25% organic farmland by 2030—North America, Asia, Latin America, and Africa are also expanding efforts (Bocean, 2025). Developing countries like India and China leverage organic farming to enhance food security and access premium markets, though challenges such as certification costs, technical gaps, and market access barriers persist (Meena et al., 2023). Despite progress,

organic farming represents just 1.6% of global farmland, underscoring untapped potential (Nicastro et al., 2024).

Adoption rates vary regionally, shaped by cultural, economic, and policy contexts. Europe's leadership stems from robust EU policies like the Common Agricultural Policy, while the U.S. and Canada face slower growth due to large-scale conventional farming dominance. Asia, led by India and China, focuses on export opportunities and food safety, though fragmented landholdings and infrastructure gaps hinder progress. Latin America prioritizes export crops like coffee, while Africa uses organic practices to boost food security, despite limited resources. Emerging trends include surging domestic demand in developing economies, technological innovations (e.g., blockchain for supply chains, precision agriculture), and climate resilience strategies (Md Shahriar Kabir et al., 2025). Organic farming's role in mitigating climate change aligns with global goals like the UN SDGs, emphasizing soil health and biodiversity (Wijerathna-Yapa & Pathirana, 2022).

The future of organic farming hinges on policy harmonization, technological integration, and market accessibility. Governments are expanding subsidies, certification programs, and research funding, while NGOs and private actors enhance training and infrastructure. However, high transition costs, uneven policy implementation, and consumer awareness gaps remain barriers. As climate pressures mount, organic farming's potential to balance productivity with sustainability positions it as a cornerstone of resilient food systems. Collaborative efforts to address systemic challenges—such as certification costs, infrastructure deficits, and equitable market access—will determine its scalability and impact in achieving global agricultural sustainability.

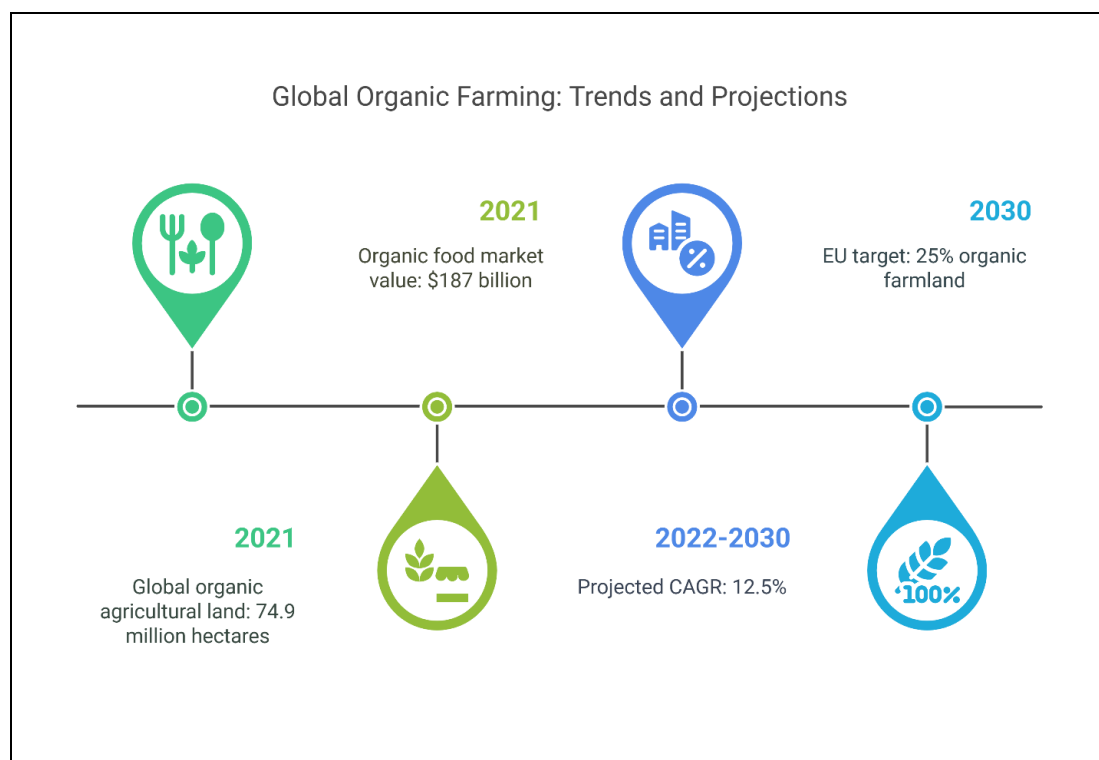


Figure 2. Global trends for Organic Farming studies

4. DETERMINANTS OF ORGANIC FARMING ADOPTION

4.1 Economic Determinants

The adoption of organic farming is significantly influenced by economic factors, particularly the costs associated with transitioning from conventional to organic practices. The initial investment required for organic farming can be substantial, as farmers must invest in organic seeds, natural fertilizers, and pest control methods (Gamage *et al.*, 2023b). Additionally, the transition period, which typically lasts three years, often results in lower yields and higher labor costs, as farmers must adhere to organic standards without the immediate benefit of price premiums. This period can be financially challenging, especially for smallholder farmers who may lack the resources to sustain themselves during the transition.

However, once the transition is complete, organic farming can offer long-term profitability. Studies have shown that organic farms can achieve comparable or even higher yields than conventional farms, particularly in developing countries. Moreover, organic products often command higher market prices, providing farmers with a premium that can offset the initial costs. The long-term profitability of organic farming is also supported by reduced dependency on external inputs, such as synthetic fertilizers and pesticides, which can lower production costs over time.

Financial incentives play a crucial role in encouraging farmers to adopt organic practices. Government subsidies and grants can help offset the initial costs of transitioning to organic farming. For instance, in some countries, governments provide financial support to farmers during the transition period, helping them manage the financial risks associated with lower yields and higher labor costs (Pervez, 2018).

Access to credit is another critical factor. Farmers who have access to affordable credit are more likely to invest in organic farming, as they can finance the necessary inputs and manage cash flow during the transition period. However, in many developing countries, smallholder farmers often face difficulties in accessing credit, which can be a significant barrier to adoption.

Market premiums for organic products also serve as a strong financial incentive. Organic products typically fetch higher prices in both domestic and international markets, providing farmers with an opportunity to increase their income (Sekaran *et al.*, 2021). However, the financial risks associated with organic farming, such as market volatility and the uncertainty of consumer demand, can deter farmers from adopting organic practices. Farmers must weigh the potential benefits against the financial risks, and those with a higher risk tolerance are more likely to adopt organic farming (Ado *et al.*, 2020).

4.2 Social Capital and Networks: Influence of Community Practices, Peer Learning, and Local Traditions

Social capital and networks play a significant role in the adoption of organic farming. Farmers are often influenced by the practices of their peers and the broader community. In communities where organic farming is already established, farmers are more likely to adopt organic practices, as they can learn from the experiences of their neighbors and benefit from shared knowledge and resources (Sapbamrer & Thammachai, 2021).

Peer learning is particularly important in the adoption of organic farming. Farmers who have successfully transitioned to organic farming can serve as role models and provide valuable insights and support to others who are considering the transition. This peer-to-peer learning can help reduce the perceived risks and uncertainties associated with organic farming.

Local traditions and cultural practices also influence the adoption of organic farming. In some regions, traditional farming practices align closely with organic principles, making the transition to organic farming more straightforward. In such cases, farmers may already be using organic inputs and

techniques, and the shift to certified organic farming may require minimal changes to their existing practices.

4.3 Institutional and Policy Determinants

Government policies play a crucial role in promoting the adoption of organic farming. Subsidies and financial incentives can help offset the initial costs of transitioning to organic practices, making it more accessible to farmers (Verburg et al., 2022a). In some countries, governments provide direct payments to farmers during the transition period, helping them manage the financial risks associated with lower yields and higher labor costs.

Regulatory frameworks and certification systems are also important. Clear and consistent regulations can provide farmers with the confidence that their efforts to adopt organic practices will be recognized and rewarded in the market. Certification systems, which verify that products meet organic standards, are essential for building consumer trust and ensuring that farmers receive the price premiums associated with organic products.

However, the complexity and cost of certification can be a barrier to adoption, particularly for smallholder farmers. Governments and institutions can play a role in simplifying the certification process and reducing the associated costs, making it more accessible to a broader range of farmers.

Institutional support is critical for the successful adoption of organic farming. Extension services, which provide farmers with technical assistance and information on organic farming practices, are essential for helping farmers navigate the transition process. Extension agents can provide training on organic techniques, help farmers access organic inputs, and offer guidance on managing pests and diseases without synthetic chemicals.

Training programs are another important form of institutional support. Farmers who participate in training programs on organic farming are more likely to adopt organic practices, as they gain the knowledge and skills needed to succeed. Training programs can also help farmers understand the economic and environmental benefits of organic farming, increasing their motivation to adopt these practices. Farmer organizations also play a key role in promoting organic farming. These organizations can provide a platform for farmers to share knowledge and experiences, access resources, and advocate for policies that support organic farming. By working together, farmers can overcome some of the challenges associated with organic farming, such as the high cost of certification and the difficulty of accessing organic markets.

4.4 Environmental and Agro-Ecological Determinants

The adoption of organic farming is heavily influenced by the availability and quality of natural resources, such as soil, water, and climate conditions. Organic farming relies on healthy, fertile soils to sustain crop production without synthetic fertilizers (Gamage et al., 2023c). Farmers with access to high-quality soils are more likely to adopt organic practices, as they can achieve good yields through natural soil management techniques like composting, crop rotation, and cover cropping. Conversely, farmers with degraded or nutrient-poor soils may find it challenging to transition to organic farming, as the initial effort and cost required to restore soil health can be prohibitive.

Water availability is another critical factor. Organic farming often requires efficient water management practices, as synthetic irrigation methods may not align with organic standards. Farmers with access to reliable water sources, such as rivers, lakes, or groundwater, are better positioned to adopt organic

practices. In contrast, regions facing water scarcity or irregular rainfall patterns may struggle to implement organic farming, as the lack of water can limit crop growth and increase the risk of crop failure.

Climate conditions also play a significant role in the adoption of organic farming. Organic farming tends to thrive in regions with stable and favorable climates, where crops are less susceptible to extreme weather events, pests, and diseases. For example, temperate climates with moderate rainfall and consistent temperatures are ideal for organic farming. In contrast, regions prone to droughts, floods, or extreme temperatures may pose challenges for organic farmers, as these conditions can increase the risk of crop losses and make it harder to maintain organic standards.

One of the primary motivations for adopting organic farming is its contribution to ecological balance and environmental sustainability. Organic farming practices, such as the use of natural fertilizers, crop rotation, and integrated pest management, help maintain soil health, reduce water pollution, and promote biodiversity. Farmers who prioritize environmental sustainability are more likely to adopt organic practices, as they align with their values and long-term goals for land stewardship.

Biodiversity conservation is a key benefit of organic farming. By avoiding synthetic pesticides and fertilizers, organic farming creates a more hospitable environment for beneficial insects, birds, and other wildlife (Costa *et al.*, 2023). Crop rotation and intercropping further enhance biodiversity by creating diverse habitats and reducing the risk of pest outbreaks. Farmers who recognize the importance of biodiversity in maintaining ecosystem resilience are more likely to adopt organic practices.

Resource efficiency is another significant advantage of organic farming. Organic practices often require fewer external inputs, such as synthetic fertilizers and pesticides, which can reduce production costs and minimize environmental impact. For example, organic farmers rely on natural processes, such as nitrogen fixation by legumes, to maintain soil fertility, reducing the need for chemical inputs. This resource-efficient approach appeals to farmers who are concerned about the long-term sustainability of their farming practices and the environmental impact of conventional agriculture.

4.5 Market and Consumer Demand Determinants

Table 1 provides a detailed analysis of the key determinants influencing the adoption of organic farming practices, with a focus on market and consumer demand factors. The table is organized into three columns: Determinant, Description, and Impact on Adoption. Each determinant represents a critical factor that affects farmers' decisions to transition to organic farming, ranging from market access and distribution channels to consumer awareness and export opportunities.

The Description column explains what each determinant entails, such as the availability of markets, the role of price premiums, or the importance of consumer trust in organic certifications. The Impact on Adoption column outlines how each factor either encourages or hinders the adoption of organic farming practices. For example, access to reliable markets and price premiums are strong motivators for farmers, while market volatility and complex certification processes can act as barriers. Overall, the table highlights the interplay between market dynamics, consumer behavior, and infrastructure in shaping the adoption of organic farming (Tran-Nam & Tiet, 2022). It underscores the importance of stable markets, consumer education, and efficient distribution systems in promoting organic practices, while also acknowledging challenges such as fluctuating demand and export complexities. This comprehensive overview serves as a valuable resource for understanding the economic and social drivers behind the growth of organic farming.

Table 1. Market and Consumer Demand Determinants of the Studies

Determinant	Description	Impact on Adoption
Market Access	The availability of markets where organic products can be sold, including local, regional, and international markets.	Farmers are more likely to adopt organic farming if they have access to reliable markets that offer price premiums for organic products. Limited market access can be a significant barrier to adoption.
Distribution Channels	The infrastructure and networks available for transporting and selling organic products to consumers.	Efficient distribution channels are essential for farmers to reach consumers and receive fair prices. Poor infrastructure can hinder the adoption of organic farming.
Price Premiums	The higher prices that organic products typically command compared to conventional products.	Price premiums provide a strong financial incentive for farmers to adopt organic farming. However, the availability of premiums can vary by region and market, affecting adoption rates.
Consumer Demand	The level of consumer interest in and demand for organic products is driven by health, environmental, and ethical concerns.	Increasing consumer demand for organic products encourages farmers to adopt organic practices to meet market needs and capitalize on higher prices.
Trust in Certifications	Consumer confidence in organic certifications, which verify that products meet organic standards.	Trust in certifications is crucial for building consumer confidence and ensuring that farmers receive price premiums. Lack of trust or complex certification processes can deter adoption.
Market Trends	The overall trends in the organic market include growth rates, consumer preferences, and emerging opportunities.	Positive market trends, such as increasing demand for organic products, encourage farmers to adopt organic practices. Farmers must stay informed about market trends to remain competitive.
Consumer Awareness	The level of consumer knowledge and awareness about the benefits of organic products, including health, environmental, and social impacts.	Higher consumer awareness drives demand for organic products, creating opportunities for farmers to adopt organic practices. Education campaigns can increase awareness and boost adoption rates.
Market Volatility	The degree of fluctuation in organic product prices and demand is influenced by factors such as economic conditions, competition, and supply chain disruptions.	Market volatility can create uncertainty for farmers, making them hesitant to adopt organic practices. Stable markets with consistent demand and prices are more conducive to adoption.
Export Opportunities	The potential for farmers to sell organic products in international markets, which increase the profitability of organic farming.	Access to export markets can significantly increase the profitability of organic farming.

Determinant	Description	Impact on Adoption
	often offer higher prices and greater demand.	encouraging adoption. However, export requirements and certifications can be challenging for smallholder farmers.
Local Market Development	The growth of local and regional markets for organic products, including farmers' markets, cooperatives, and direct-to-consumer sales.	Developing local markets can provide farmers with accessible outlets for their organic products, reducing dependency on distant markets and increasing adoption rates.

Consumer Demand for Organic Products, and Market Trends

Consumer behavior plays a significant role in the adoption of organic farming. The demand for organic products is driven by consumer preferences for healthy, environmentally friendly, and sustainably produced food. As consumer awareness of the benefits of organic products increases, so does the demand for these products, creating opportunities for farmers to adopt organic practices (Wojciechowska-Solis & Barska, 2021). Trust in certifications is also important. Consumers are more likely to purchase organic products if they trust that the products meet organic standards. Certification systems, which verify that products are produced according to organic principles, are essential for building consumer trust and ensuring that farmers receive the price premiums associated with organic products. Market trends can also influence the adoption of organic farming. As the organic market continues to grow, farmers are more likely to adopt organic practices to take advantage of the increasing demand for organic products. However, farmers must also be aware of market trends and consumer preferences, as these can change over time and impact the profitability of organic farming.

4.6 Technological and Knowledge Transfer Determinants

Access to information and knowledge is a critical determinant of organic farming adoption. Farmers need reliable and up-to-date information on organic farming practices, techniques, and market opportunities to make informed decisions (Miśniakiewicz et al., 2021). Research institutions play a vital role in generating and disseminating knowledge on organic farming, providing farmers with evidence-based recommendations and best practices. Extension services are another essential source of information for farmers. Extension agents can provide technical assistance, training, and guidance on organic farming practices, helping farmers navigate the transition process. For example, extension agents can teach farmers how to prepare organic fertilizers, manage pests using natural methods, and comply with organic certification standards. Regular interaction with extension services can increase farmers' confidence in adopting organic practices and reduce the perceived risks associated with the transition.

Training programs are also crucial for promoting organic farming adoption. Farmers who participate in training programs gain hands-on experience and practical knowledge, which can help them overcome the challenges of organic farming. Training programs can cover a wide range of topics, including soil health management, organic pest control, and marketing strategies for organic products. By equipping farmers with the necessary skills and knowledge, training programs can increase the likelihood of successful adoption.

The adoption of innovative technologies and practices is another important determinant of organic farming adoption. Digital tools, such as mobile apps, online platforms, and precision agriculture

technologies, can provide farmers with real-time information on weather conditions, market prices, and organic farming techniques. These tools can help farmers make informed decisions, optimize resource use, and improve farm management practices.

Farm management technologies, such as soil health monitoring systems and drone-based crop monitoring, can also support organic farming adoption. These technologies enable farmers to monitor soil conditions, detect pest infestations, and assess crop health without relying on synthetic inputs. By providing accurate and timely data, farm management technologies can help farmers implement organic practices more effectively and efficiently.

Modern agricultural practices, such as agroecology and integrated farming systems, are also important for the success of organic farming. Agroecological practices, such as agroforestry and polyculture, promote ecological balance and resource efficiency, making them well-suited for organic farming. Integrated farming systems, which combine crop production with livestock rearing, can enhance soil fertility and reduce the need for external inputs. Farmers who adopt these modern practices are more likely to succeed in organic farming and achieve long-term sustainability. In conclusion, environmental and agroecological factors, such as resource availability and sustainability benefits, play a significant role in the adoption of organic farming. Similarly, technological and knowledge transfer determinants, including access to information and innovative technologies, are critical for supporting farmers in their transition to organic practices. By addressing these determinants, policymakers, researchers, and extension services can promote the widespread adoption of organic farming and contribute to a more sustainable agricultural system.

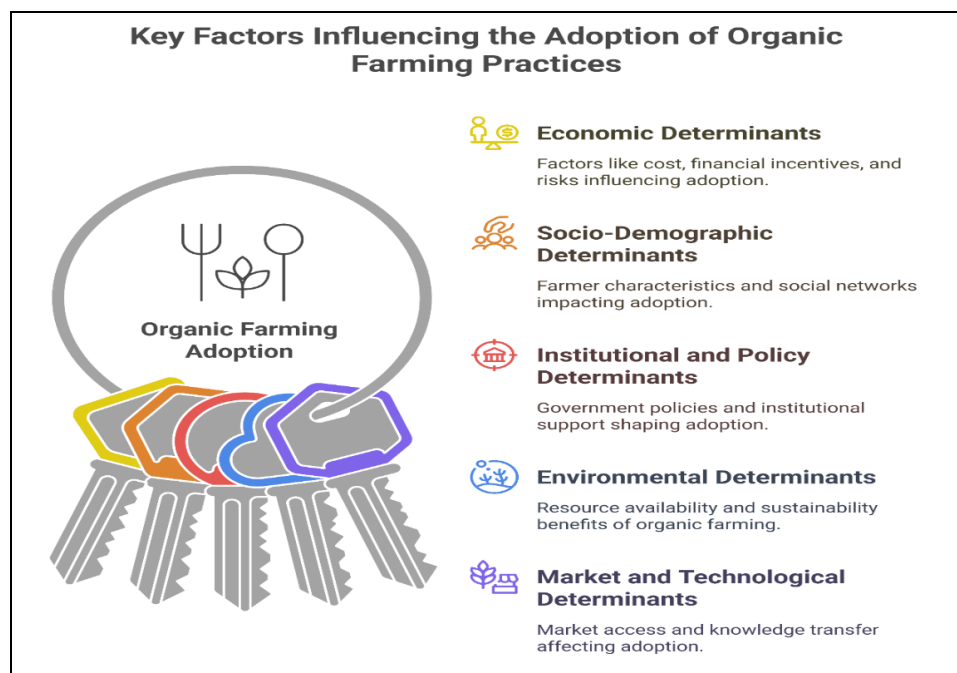


Figure 3. Determinants of Organic Farming Adoption

5. CHALLENGES IN ORGANIC FARMING ADOPTION

The transition to organic farming is often seen as a pathway to sustainable agriculture, offering environmental, health, and economic benefits (Verburg et al., 2022b). However, the adoption of organic

farming practices is not without significant challenges. These barriers are multifaceted and interconnected, ranging from financial constraints to societal perceptions. Addressing these challenges is essential to create an enabling environment for farmers to embrace organic farming and realize its full potential. The financial burden associated with transitioning to organic farming is one of the most formidable obstacles for farmers. Organic farming often requires significant upfront investments in organic inputs, such as biofertilizers, organic seeds, and natural pest control methods, which are typically more expensive than their conventional counterparts (Dou et al., 2025). Additionally, the transition period—usually two to three years—during which farmers must adhere to organic practices without being able to market their produce as organic, can lead to reduced yields and income. This period is particularly challenging for smallholder farmers, who often operate on thin profit margins and lack the financial resilience to withstand temporary losses.

Access to credit is another critical issue. Many financial institutions are hesitant to lend to farmers transitioning to organic farming due to perceived risks and uncertainties associated with the transition process. Even when credit is available, high interest rates and stringent repayment terms can deter farmers from taking loans. Furthermore, the lack of targeted financial incentives, such as subsidies or grants for organic farming, exacerbates the financial challenges. In contrast, conventional farming often benefits from government subsidies for synthetic fertilizers and pesticides, creating an uneven playing field. Without adequate financial support and risk mitigation mechanisms, many farmers are reluctant to adopt organic practices, despite their long-term benefits for soil health and environmental sustainability. The successful implementation of organic farming requires a deep understanding of agroecological principles, soil health management, and organic pest control methods. However, many farmers lack access to the technical knowledge and training needed to adopt these practices effectively. Conventional farming, which relies heavily on synthetic inputs, has been the dominant paradigm for decades, and farmers may be hesitant to shift to unfamiliar organic methods without sufficient guidance and support.

Extension services, which are critical for disseminating agricultural knowledge, are often underfunded and understaffed, particularly in developing countries. This limits their ability to provide the necessary training and support to farmers transitioning to organic farming. Moreover, the lack of localized research and development focused on organic farming means that farmers often have to rely on generic or imported practices that may not be well-suited to their specific agro-climatic conditions. This knowledge gap can lead to suboptimal implementation of organic farming techniques, resulting in lower yields and discouraging further adoption.

To address this challenge, there is a need for robust extension systems that provide tailored training and support to farmers. Collaborative efforts between governments, research institutions, and non-governmental organizations (NGOs) can help bridge the knowledge gap and promote the adoption of best practices in organic farming.

Marketing and supply chain inefficiencies pose significant challenges to the adoption of organic farming. Organic products often require separate handling, storage, and transportation to maintain their integrity and prevent contamination from conventional products. However, many regions lack the necessary infrastructure to support these requirements, leading to inefficiencies and increased costs. For instance, the absence of cold storage facilities and dedicated transportation networks can result in post-harvest losses, particularly for perishable organic produce.

Additionally, the market for organic products is often underdeveloped, with limited demand and price premiums that may not always compensate for the higher production costs. Farmers may also face

difficulties in accessing markets due to a lack of established distribution channels and networks. Smallholder farmers, in particular, may struggle to meet the volume and consistency requirements of larger buyers, further limiting their market access.

Consumer awareness and education play a crucial role in driving demand for organic products. In many regions, there is a lack of understanding of the benefits of organic farming, leading to low demand. Even when consumers are aware of these benefits, they may be unwilling to pay the higher prices often associated with organic products. This creates a vicious cycle where low demand discourages farmers from adopting organic practices, further limiting the availability of organic products in the market.

To overcome these challenges, there is a need for investment in infrastructure, such as cold storage facilities and transportation networks, as well as initiatives to raise consumer awareness and promote the benefits of organic products. Establishing farmer cooperatives and collective marketing initiatives can also help smallholder farmers access larger markets and negotiate better prices. Certification is a critical component of organic farming, as it provides assurance to consumers that products meet established organic standards. However, the certification process can be complex, time-consuming, and costly, posing a significant barrier for many farmers, particularly smallholders. The paperwork and administrative burden associated with certification can be overwhelming, and the cost of certification fees and regular inspections can be prohibitive for farmers with limited resources.

In addition to certification challenges, farmers may face regulatory hurdles related to the use of certain organic inputs and practices. In some cases, regulations may be overly restrictive or not well-aligned with local conditions, making it difficult for farmers to comply. For example, the use of certain natural pesticides or fertilizers may be restricted, even though they are essential for organic farming. Furthermore, the lack of harmonization of organic standards across different regions and countries can create additional barriers for farmers looking to export their organic products.

To address these challenges, there is a need for streamlined and farmer-friendly certification processes, as well as regulatory frameworks that are flexible and responsive to local conditions. Governments and certification bodies can also provide financial and technical support to help farmers navigate the certification process and comply with regulatory requirements.

Perception and attitude barriers are among the most deeply rooted challenges to the adoption of organic farming. Many farmers, particularly those who have been practicing conventional farming for generations, may be skeptical of the benefits of organic farming. They may perceive organic methods as being less effective or more labor-intensive than conventional methods, leading to resistance to change. This skepticism is often fueled by a lack of awareness and understanding of the long-term benefits of organic farming, such as improved soil health, reduced environmental impact, and enhanced resilience to climate change.

Consumer perceptions and attitudes also play a crucial role in shaping the adoption of organic farming. In some regions, there may be a lack of awareness or understanding of the benefits of organic products, leading to lower demand. Even when consumers are aware of the benefits, they may be unwilling to pay the higher prices often associated with organic products. This can create a vicious cycle where low demand discourages farmers from adopting organic practices, further limiting the availability of organic products in the market.

To overcome these barriers, there is a need for targeted awareness campaigns and educational initiatives to promote the benefits of organic farming among both farmers and consumers. Success stories and case studies of successful organic farming initiatives can help build trust and encourage more farmers to

adopt organic practices. Additionally, efforts to reduce the price gap between organic and conventional products, such as through subsidies or cost-sharing initiatives, can help make organic products more accessible to consumers.

The challenges to the adoption of organic farming are complex and interconnected, requiring a holistic and collaborative approach to address. Financial and investment barriers, lack of technical knowledge, marketing and supply chain inefficiencies, certification and regulatory hurdles, and perception and attitude barriers all play a significant role in hindering the widespread adoption of organic farming practices. Addressing these challenges requires concerted efforts from governments, research institutions, NGOs, and the private sector to provide financial support, technical training, infrastructure development, regulatory reform, and consumer education. By tackling these barriers, stakeholders can create an enabling environment that encourages the adoption of organic farming, ultimately contributing to a more sustainable and resilient agricultural system.

6. FUTURE DIRECTIONS AND RESEARCH GAPS

The adoption of organic farming practices has garnered significant attention in recent years due to its potential to address environmental, health, and socio-economic challenges (Fatima *et al.*, 2024). However, despite the growing body of literature on the subject, several gaps remain in understanding the complexities and dynamics of organic farming adoption. Identifying these gaps and suggesting future research directions is crucial for advancing knowledge and informing policy and practice. This section highlights the key gaps in existing literature and proposes areas for further research, including gender aspects, the influence of climate change, and the role of digital tools and precision agriculture in promoting organic farming adoption.

While numerous studies have explored the determinants and challenges of organic farming adoption, several critical gaps persist in the existing literature. First, much of the research has focused on developed countries, with limited attention given to developing regions where smallholder farmers dominate the agricultural landscape. This geographical bias limits the generalizability of findings and overlooks the unique socio-economic and environmental contexts of developing countries. Additionally, there is a lack of longitudinal studies that track the adoption process over time, making it difficult to assess the long-term impacts of organic farming on productivity, profitability, and sustainability.

Another significant gap is the limited exploration of the social and cultural dimensions of organic farming adoption. While economic and environmental factors have been extensively studied, the role of social networks, community norms, and cultural practices in shaping adoption decisions remains underexplored. Furthermore, there is a paucity of research on the interplay between policy frameworks and organic farming adoption. Although policies and regulations play a critical role in creating an enabling environment for organic farming, few studies have examined how different policy instruments influence adoption rates and outcomes.

Finally, the existing literature often treats organic farming as a homogeneous practice, failing to account for the diversity of organic systems and their varying impacts. For instance, the adoption of organic practices in crop production may differ significantly from that in livestock or aquaculture systems. Addressing these gaps requires a more nuanced and context-specific approach to research, as well as greater collaboration between researchers, policymakers, and practitioners. To address the gaps in existing literature, several areas warrant further investigation. One critical area is the role of gender in

organic farming adoption. Women play a vital role in agriculture, particularly in developing countries, yet their contributions and challenges in adopting organic practices are often overlooked (Vuciterna et al., 2024). Research is needed to understand how gender dynamics influence access to resources, decision-making processes, and the adoption of organic farming. For example, do women face additional barriers, such as limited access to land, credit, or extension services, that hinder their ability to adopt organic practices? How can gender-sensitive policies and programs be designed to promote equitable participation in organic farming? Addressing these questions can help ensure that the benefits of organic farming are accessible to all.

Another important area for future research is the influence of climate change on organic farming adoption. Climate change poses significant challenges to agriculture, including increased frequency of extreme weather events, shifting growing seasons, and heightened pest and disease pressures. Organic farming, with its emphasis on soil health, biodiversity, and resilience, has the potential to mitigate some of these challenges. However, there is limited research on how climate change affects the adoption and performance of organic farming systems. For instance, how do farmers perceive the resilience of organic practices in the face of climate change? What role can organic farming play in climate adaptation and mitigation strategies? Exploring these questions can provide valuable insights into the synergies between organic farming and climate resilience.

The role of digital tools and precision agriculture in promoting organic farming adoption is another promising area for research. Digital technologies, such as mobile apps, remote sensing, and blockchain, have the potential to address some of the key challenges associated with organic farming, including knowledge dissemination, certification, and market access. For example, mobile apps can provide farmers with real-time information on organic practices, while blockchain technology can enhance transparency and traceability in organic supply chains. Precision agriculture tools, such as soil sensors and drones, can help farmers optimize resource use and improve the efficiency of organic practices. However, the adoption of these technologies in organic farming remains underexplored. Research is needed to understand the barriers and opportunities for integrating digital tools into organic farming systems, particularly in resource-constrained settings.

Digital tools and precision agriculture have the potential to revolutionize organic farming by addressing some of its most pressing challenges (Karunathilake et al., 2023). One of the key barriers to organic farming adoption is the lack of technical knowledge and extension support. Digital tools, such as mobile apps and online platforms, can bridge this gap by providing farmers with access to information on organic practices, pest management, and soil health. For instance, mobile apps can offer step-by-step guidance on composting, crop rotation, and natural pest control, making it easier for farmers to adopt and implement organic practices.

Precision agriculture technologies, such as soil sensors, drones, and satellite imagery, can enhance the efficiency and effectiveness of organic farming. These tools enable farmers to monitor soil conditions, crop health, and pest infestations in real time, allowing for timely and targeted interventions. For example, soil sensors can provide data on nutrient levels and moisture content, helping farmers optimize the application of organic fertilizers and irrigation. Drones can be used to monitor crop health and detect early signs of pest infestations, reducing the need for chemical inputs. By improving resource use efficiency and reducing input costs, precision agriculture can make organic farming more economically viable for farmers.

Another promising application of digital tools is in the certification and traceability of organic products. Blockchain technology, for instance, can enhance transparency and accountability in organic supply chains by providing a tamper-proof record of production practices and transactions. This can help build consumer trust in organic products and facilitate market access for farmers. Additionally, digital platforms can connect organic farmers with buyers, reducing the inefficiencies and intermediaries in the supply chain.

Despite their potential, the adoption of digital tools and precision agriculture in organic farming faces several challenges. These include high upfront costs, limited digital literacy among farmers, and inadequate infrastructure in rural areas. Research is needed to understand how these barriers can be overcome and how digital tools can be tailored to the specific needs and contexts of organic farmers. Policymakers and stakeholders can play a critical role in promoting the adoption of these technologies by providing financial support, training, and infrastructure development.

The future of organic farming adoption lies in addressing the gaps in existing literature and exploring new research directions. By focusing on gender aspects, climate change, and the role of digital tools and precision agriculture, researchers can provide valuable insights into the barriers and opportunities for organic farming adoption. These efforts can inform the development of targeted policies and interventions that promote the widespread adoption of organic practices, contributing to a more sustainable and resilient agricultural system. As the global demand for organic products continues to grow, it is imperative to invest in research that advances our understanding of organic farming and supports its adoption by farmers worldwide.

7. CONCLUSIONS

Organic farming stands as a pivotal strategy for achieving sustainable agriculture, addressing pressing challenges such as environmental degradation, food security, and socio-economic inequities. This comprehensive review synthesizes global trends, determinants, and challenges in organic farming adoption, drawing on secondary data from diverse credible sources, including international organizations, peer-reviewed studies, and policy frameworks. The analysis reveals significant growth in organic practices, with global organic agricultural land reaching 74.9 million hectares (1.6% of total farmland) and the organic market valued at \$187 billion in 2021, projected to grow at 12.5% annually. However, adoption remains uneven, with disparities between high-income nations (e.g., EU's 25% organic farmland target by 2030) and developing regions like Bangladesh, where organic farming occupies a mere 0.1% of agricultural land.

Key determinants of adoption include economic factors (cost-benefit trade-offs, price premiums), social capital (peer networks, community practices), institutional support (subsidies, certification systems), environmental benefits (soil health, biodiversity), market dynamics (consumer demand, export opportunities), and technological innovations (precision tools, digital platforms). Despite these drivers, formidable challenges persist: high transition costs, knowledge gaps, market volatility, certification complexities, and entrenched perceptions favoring conventional methods. For instance, smallholders face financial risks during the 3-year transition period, while underfunded extension services and fragmented supply chains hinder scalability.

The study underscores the need for inclusive policies that balance efficiency and equity, such as targeted subsidies, simplified certification, and grassroots innovation funding. Future research must address gaps in gender-inclusive adoption strategies, climate resilience integration, and digital tool

accessibility to bridge socio-technical divides. Collaborative efforts among governments, NGOs, and the private sector are critical to fostering resilient food systems that align with the UN SDGs. By prioritizing participatory frameworks, amplifying marginalized voices, and harmonizing global standards, organic farming can transition from a niche practice to a mainstream solution, ensuring productivity, environmental stewardship, and equitable livelihoods in an era of escalating global stressors.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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