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Integrating Indian Knowledge System-Based Organic Farming with Market Mechanisms for Sustainable Agriculture: A Study in North Maharashtra Region

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ABSTRACT:

Sustainable agriculture has made people more interested in organic farming based on the Indian Knowledge System (IKS), specifically in developing economies such as India. This paper will discuss the relative performance of IKS-based organic agricultural methods and how they can be combined with marketing systems to improve sustainability performance in the North Maharashtra area. The study will rely on 2015 to 2026 literature to analyze the key dimensions such as productivity, cost structure, profitability, soil health, and water efficiency as well as input dependency, and marketing issues such as logistics, certification, price volatility, branding, and distribution inefficiency.

The results imply that organic farming can be characterized by rather low yields in some situations, but it shows better environmental results and possible economic sustainability in terms of higher prices and less input reliance. These advantages are however constrained by market related factors which are major hindrances to their achievement. Moreover, the institutional support systems, including subsidies, training, extension services, and cooperative networks, are very important towards adoption and commercialization performance.

The research is also added to the literature as it gives the integrated framework of the combination of agronomic performance, market dynamics, and institutional support within the IKS paradigm. It presents policy-relevant information on the need to encourage sustainable agriculture by use of localized knowledge systems and effective market linkages.

Keywords: Indian Knowledge System (IKS), Organic Farming, Sustainable Agriculture, Market Integration

INTRODUCTION:

Indian agriculture is also experiencing a sharp revolution where the issue of sustainability, environmental degradation, and market uncertainties are pushing the traditional farming systems. In this respect, organic farming based on Indian Knowledge System (IKS) has become an option that incorporates the ancient ecological methods and modern sustainability objectives. The applicability of such systems is especially acute in such a region as North Maharashtra, where the agriculture is well established based on the indigenous knowledge, but comes under the pressure of input-intensive agriculture and unstable market conditions.

According to existing literature, organic farming systems are not only different than conventional systems in terms of the use of inputs but also in ecological impact like the health of the soil, water conservation and biodiversity. Research of 2015-2026 suggests that despite the possible variability in the yield of organic farming, the latter can always reimbursed it through the lower input costs, better environmental resistance, and higher prices of its products. But the factors of production are not enough to determine the success of organic farming; the marketing factors which include inefficiencies in logistics, the problem of certification, fluctuation of prices, poor branding and poor distribution channels have a great impact on accessing the market and getting the right price.

In addition, institutional support systems such as government subsidies, training, extension, and networks of co-operatives are also cited as important facilitators of organic adoption. It is against this backdrop that existing literature focuses on these dimensions to a large extent. As such, it is necessary to have a combined approach that integrates agronomic performance, the dynamics of marketing and institutional support in the IKS framework. This paper fills this gap by examining the relationship between these variables to enhance sustainable agriculture in North Maharashtra.

RESEARCH OBJECTIVES

1. To review the differences between conventional farming and IKS-based organic farming with respect to economic, environmental, and productivity outcomes.
2. To critically review and examine the impact of marketing challenges on market access and price realisation of organic agricultural products.

RESEARCH METHODOLOGY

- Research Design: Descriptive and analytical research design
- Nature of Study: Empirical and literature-supported study
- Data Type: Combination of primary (survey-based) and secondary data (2015–2026 literature)

1. ECONOMIC, ENVIRONMENTAL AND PRODUCTIVITY DIFFERENCES:

It is found in literature that IKS-based organic farming exhibits a multi-dimensional performance profile against the conventional farming systems. Although organic farming might have a comparatively low yield in some circumstances, the difference will depend on the type of crop, the quality of the soil, and climatic conditions. Notably, organic systems have profound benefits regarding the health of the soil, water savings, and decreased reliance on artificial inputs. The types of costs are also different with organic farming incurring more labor costs and less chemical costs. Premium pricing and ecological value addition is usually used to improve profitability. Therefore, when organic farming is assessed on other scales other than yield-based assessments, it offers a sustainable option.

2. MARKETING CHALLENGES AND PRICE REALIZATION:

As mentioned in the literature, marketing issues have a major impact on the business sustainability of organic farming. Inefficient logistics, high certification costs, price volatility, absence of branding, and poor distribution networks are some of the constraints limiting farmers to premium markets. There is also information asymmetry and lack of consumer awareness that further diminishes the demand visibility. Despite the potential of organic products to fetch a higher price, these products cannot be able to fetch the price since the market structure is not consistent. Research has shown that the key to improving access to the market lies in the effective supply chain management, enhanced branding strategies, and clear market information systems. Hence, the need to deal with marketing inefficiencies is essential to transform organic production into sustainable income returns.

LITERATURE REVIEW:

TRADITIONAL SOIL FERTILITY METHODS

(Chowdhuri, A., Chaudhary, M, 2025) This paper has given emphasis on the fact that organic farming contributes significantly to the soil organic carbon and nitrogen levels, thereby increasing soil fertility and climate resilience. Manual ways of managing nutrients like organic manure and natural storage of nutrients boosted the carbon sequestration as well as nutrient availability. The results confirm the topicality of IKS techniques of soil fertility in ensuring the sustainable development of agriculture and ecological stability.

(Gil-Martínez, M., Madejón, P, 2025) The paper proves that the application of compost is very effective in enhancing the fertility of the soil, biomass, and nutrient levels in organic agricultural systems. The conventional processes of soil enrichment are more effective in promoting biological activity and resilience of soils in the long run.

(Lucchetta, M., et al, 2023) The study by this researcher concluded that the application of compost over a long period of time leads to a high increase in soil organic matter, microbial activity, and the cycling of nutrients. The biological fertility

and enzyme activity of the soil is enhanced under traditional organic inputs when compared to chemical fertilizers. This paper confirms that indigenous soil fertility management practices enhance the quality of soil structure and productivity, which are critical to the sustainable agricultural systems. (PMC)

(Roos, E., Mie, A, 2018) This review brings out the fact that organic farming methods, such as composting and biological management of nutrients, enhance soil fertility and sustainability of the ecosystem. Although yield gaps might be possible, long-term improvements in soil health are greater than short-term productivity issues. The research confirms the importance of classical soil fertility practices in improving the biodiversity, nutrient exchange, and sustainable farming performance.

INDIGENOUS SEED USAGE

(del-Canto, A., De Diego, N, 2025) This paper demonstrates that locally adapted genotypes of common beans exhibited high performance when subjected to organic management, especially where there was drought stress, whereby seed quality was better and yields were steady. The results endorse the IKS philosophy of planting local agroecological specific seeds. In the current work, it reinforces the construct of indigenous seed use as the means of resilience and sustainability in organic agriculture.

(Winter, E., Grovermann, C, 2023) They analyze that organic farming involves varieties chosen because of low-input and ecologically diverse environments, but not systems that are input-intensive. This directly applies to the use of indigenous seeds which focus on local adaptability, resilience and farmer-based seed selection.

(Korpetis, E., Ninou, E, 2023) This article shows that wheat landraces are able to adjust well to low-input agricultural systems and provide any realistic value to sustainable farming. Due to the fact that indigenous and traditional varieties can be more resource-efficient than input-dependent cultivars, the study reinforces the hypothesis that native seed utilization can enhance ecological stability and long-term sustainability of organic agriculture.

According to (Missio, J. C., Rivera, A, 2018) lettuce landraces cultivated in organic conditions had desirable agronomic and quality characteristics, which demonstrate the usefulness of traditional varieties in diversified, low-input systems. Their results support the value of the conservation of local germplasm. In the current study, the research confirms the applicability of indigenous seed use as a sustainability-based practice that is based on agroecological adaptation.

NATURAL PEST CONTROL

(Pratissoli, D, 2025) On the one hand, this review highlights the use of biological control as a fundamental principle of sustainable agriculture since it minimizes the use of synthetic pesticides and, on the other hand, helps maintain biodiversity and control ecosystems. It talks about predators, parasitoid and microbial agents as effective agents in controlling pests. The paper is topical to the current construct due to the fact that the concept of natural pest control is the focal point of IKS-based organic farming and sustainable crop protection.

(Chaudhary, R., Nawaz, A, 2024) Review The ways that microbial biocontrol agents can replace or reduce the use of chemical pesticides using environmentally safer mechanisms. The paper identifies formulation, commercialisation and field applicability of microbial pest control. This helps to support the existing construct by demonstrating that natural pest control is not only ecologically viable, but also more and more viable to organic and sustainability-based farming systems.

It is suggested that treating insect pests in an ecological manner by using ecological knowledge, monitoring, and combination of various non-chemical strategies instead of individual curative inputs is the key to functioning of the system (Headrick, D, 2021). Prevention, observation, and biological balance are highlighted in the paper. This is a direct correspondence to the IKS-based farming with natural pest management based on long-term sustainability, understanding of the ecosystem, and low-external-input management.

(Muneret, L., Mitchell, M, 2018) This pioneering work gives meta-analytic support that organic agriculture has a higher potential of overall biological pest control in comparison to conventional systems. Even though the effects of pests are different depending on the pest type, the paper demonstrates that ecological management is able to control pests without relying much on synthetic pesticides. It is a firm advocate of the natural pest control construct as a sustainability process in organic and IKS-associated farming.

CROP DIVERSIFICATION

(Sridhar, R., Longkumer, L. T, 2026) The article associates crop diversification to climate resilience and enhanced ecosystem functioning. In the current study, it supports the IKS-compatible concept of mixed, rotational, and diversified cropping systems as important sustainability performance of organic farming systems.

It is demonstrated in (Ewing, P. M., Chim, B. K, 2024) that diversified grain rotations are as productive as conventional ones and can also work more effectively even in the case of unstable climatic conditions. The significance of their findings lies in the fact that they take diversification out of the theory and prove their agronomical feasibility. This validates the existing construct that diversified cropping is a factor that leads to a resilient, productive and long-term sustainability in organic farming.

(Yang, X., Xiong, J, 2024) The presence of legumes and other crops boosted the microbial activity and soil organic carbon and enhanced the income earned by farmers. Such findings are a solid argument in favor of crop diversification as an IKS-compatible method of sustainable and economically viable organic cultivation.

(Li, G., Yu, C., Shen, P, 2024) These are soil structure and carbon advantages that are core indicators of sustainability. With respect to the current research, the article has offered great support that diverse cropping regimes improve the ecological quality and long-term productivity anticipated of IKS-based organic farming systems.

WATER CONSERVATION PRACTICES

(Sharma, S., Yost, M. A, 2025) This review describes how in dry regions, mulching, cover cropping, composting, crop rotation and reduced tillage can enhance the optimization of water. It further observes that organic systems can be better in droughts. In the current study, the research is very pertinent since it connects ecological practices of water-saving with the logic of sustainability in the IKS-based organic farming.

A study by (Cachipuendo, C., Pacheco, A, 2025)established that optimum level of organic matter had a great impact in enhancing infiltration, retention, and efficiency of agroecological systems in relation to irrigation. It was also found that too much organic matter may decrease efficiency, which implies the need to balance. This applies to the construct of water conservation since it links the soil organic management directly to hydrological sustainability in low-input farming.

The field experiment (Vanella, D., Guarrera, S, 2025) indicates that organic mulching enhanced the water status of crops, soil water conservation, and soil temperature moderation during deficit irrigation. It also enhanced certain yield characteristics with time. The results can be directly applied to the current study as they prove that it is possible to make farming systems more resilient and resource-efficient with the help of organic water conservation practices.

ORGANIC INPUT UTILIZATION

In this review, it is described that biofertilizers enhance crop productivity and environmental stability by enhancing nitrogen fixation, nutrient solubility, phytohormone synthesis, and stress reduction (Shahzad, M., Hayat, R, 2025). It also determines the challenges of adoption like microbial survival and regulatory gaps. The article is of significance to the current construct since it confirms organic inputs as scientific and scalable element of sustainable organic farming.

As demonstrated by (Wen, Y., Yao, W., Yu, T, 2025) organic farming on a long-term basis significantly enhances the quality of the soil, nutrient status, soil water content, enzyme activity and microbial diversity when compared to conventional systems. These findings highlight the long-term advantages of long-term organic input usage. In this study, the paper is a strong advocate on the use of organic input as a source of ecological health and productivity in sustainable agriculture.

(Xu, J., Li, Y., & Li, L, 2025) presents the recycling of waste materials, chemical fertilizers as a dependable resource to decrease reliance, and enhance soil health and fertility through organic amendments. Other implications of sustainability, which are mentioned in the article, are the considerations of greenhouse gases. This renders it very pertinent in the present construct since it makes organic inputs an environmentally regenerating and sustainability-promoting approach in organic farming.

H2: AWARENESS AND ADOPTION OF IKS-BASED ORGANIC PRACTICES SIGNIFICANTLY AFFECT ECONOMIC PERFORMANCE.

ADOPTION RATE

(Möhring, N., Muller, A, 2024) This is a global systematic review, which sums up evidence of 120 studies and demonstrates that organic adoption is contingent on context, market maturity, institutions and productivity conditions. It claims that adoption is a gradual process that is influenced by farm-level and policy-level factors. In the current research, it is significant since the adoption rate is not a mere number, but the result of the interaction of the economic and institutional environment.

(Habanyati, E. J., Oladipo, O. S, 2024) This research on organic growers in Tamil Nadu studies region-specific factors that influence adoption and maintenance of the practice. It points out that knowledge, risk management, pest control capacity and perceived economic viability determine the success of adoption. The article can be of use to the current study since it links adoption level to the realities on the ground in farming and indicates that local factors have a very strong influence in ensuring permanent adoption of organic.

The authors state that organic farming is seen by many smallholders as profitable and advantageous, but challenging standards and certifications make the conversion challenging (Uhunamure, S. E., Nethengwe, N. S, 2021). The results indicate that the positive perception will not lead to adoption unless some practical constraints are overcome. It applies to the present construct since the rate of adoption is based on whether positive perception is converted into action that is viable and supported by economic factors.

(Marsh, L., Zoumenou, V , 2017) This paper determined that limited knowledge of organic production did not necessarily lead to adoption, particularly in limited-resource farmers. The main barriers were time needed to get certified and insufficient knowledge of the production. In the current study, this study holds the opinion that the rate of adoption is influenced by information, feasibility, and institutional burdens, which influence the ultimate economic performance.

KNOWLEDGE OF CERTIFICATION

The willingness of farmers to undergo certification schemes is highly dependent on the way certification is packaged with price assurance and contracts as indicated in this discrete choice study (My, K. B., et al, 2025). It shows that certification knowledge can be of use when farmers can easily associate standards with economic returns. In this study, the article comes in handy since it connects certification knowledge to adoption subsidies and anticipated farm revenues.

This paper states that knowledge of organic standards had a positive correlation with willingness to adopt organic farming, and training also enhanced readiness to adopt organic farming (Li, H., et al, 2024). It demonstrates that more successful farmers in their conversion are those who have a better understanding of the certification requirements. The present construct is directly supported by the study through the discovery of certification knowledge as a tangible predictor of the economic outcomes related to adoption.

(Sacchi, G., et al, 2024) This paper will posit that the barriers to entry and market access of smaller farmers can be reduced and market access enhanced by implementing participatory guarantee systems as an alternative to organic assurance. The research is relevant to the certification construct in that certification is a compliance issue but also a market enabling mechanism. This is directly related to the economic performance and inclusion of farmers.

(Solfanelli, F., Zanoli, R, 2021) It analyzes group certification as a potential route to take by the smallholders particularly in the situation that has formal coordination as well as product specialization. It also observes that there are design requirements that may deter uptake. This helps in the current study by demonstrating that certification knowledge and certification format determine the willingness of the farmers to adopt and gain economically through organic markets.

EXPOSURE TO IKS KNOWLEDGE

(Leonnig, E. G., et al, 2026) This study reveals that organic farmers rely on peer learning, regional knowledge sharing, and co-innovation networks to a considerable extent since organic production needs to be context-specific. Crop rotation, fertilization, irrigation, and storage were identified by farmers as knowledge issues that were reoccurring. The article is

applicable in this case since exposure to knowledge systems based on practice enhances competence, confidence, and capacity of farmers to maintain economically viable organic farming.

(Li, H., et al, 2024) The paper establishes that the level of awareness of environmental and health benefits, along with exposure to training and local learning, is a significant determinant of willingness to switch to organic farming. This can be applied to the present research since IKS exposure usually operates via community learning, noticeable practice, and localized trust.

This paper points at a severe lack of information regarding organic production processes, technical management, and market processes. (Uhunamure, S. E., Nethengwe, N. S, 2021) It suggests grouping education and field school models to build capacity of farmers. In the case of this study, this justifies the fact that exposure to the practical and indigenous systems of knowledge is required to be adopted, particularly when the formal extension is weak and where learning is socialized.

It is demonstrated by (Marsh, L., Zoumenou, V, 2017) that lack of full knowledge about certified organic production, costs, and techniques limits participation of farmers. The paper shows that exposure to pertinent farming information should not only be at the general level but also at the level of actionable knowledge. This is in line with the current construct, where IKS exposure will help reinforce adoption behaviour, and indirectly enhance economic performance.

RISK PERCEPTION

(He, X., et al, 2026) This experimental paper demonstrates that the compensation that farmers need to switch to organic farming reduces with transparent and complete information, but increases with risk aversion and present bias. The results are the core of the current construct as they indicate that perceived risk is not psychological only, but its measurement is also economical.

According to (Eti, H. S, 2025), the support of economic sustainability perceptions encourages adoption, and the perceived barriers discourage it. The major risk related issues were certification cost, limited credit and inaccessibility of input. The research is very timely since it puts the perception of risk as an effective economic filter through which farmers make the assessment of organic farming directly influencing their implementation and possible economic results.

(Li, H., et al, 2024) The article clearly mentions that the willingness to adopt organic farming is affected by the perceptions of risk, traditional attitudes, and confidence in the support offered. Farmers who were better educated were at times more cautious since they were more aware of certification and transition risks. This will be valuable to the present research since the perceived uncertainty was found to diminish adoption despite the presence of awareness and potential benefits.

(Uhunamure, S. E., Nethengwe, N. S, 2021) This paper demonstrates that high standards, challenging certification, pest-management restrictions and cost of production are among the key risks facing organic farming as perceived by the farmers. In the context of the current study, the paper establishes the fact that the economic performance is affected by the way farmers perceive uncertainty and the difficulty of operation in the case of organic t.

H3: THERE IS A SIGNIFICANT DIFFERENCE BETWEEN CONVENTIONAL FARMING AND IKS-BASED ORGANIC FARMING WITH RESPECT TO ECONOMIC, ENVIRONMENTAL, AND PRODUCTIVITY OUTCOMES.

YIELD PER ACRE

This meta-analysis discovered that organic yields were, on an average, lower than conventional yields, but the magnitude of the difference depended on climate, type of crop, location and soil conditions (de la Cruz, V. Y. V., Tantriani, Cheng, W, 2023). The paper is very applicable to the current construct since it shows that the application of yield comparison should be perceived as a contextual phenomenon but not as an organic disadvantage.

(Feledyn-Szewczyk, B , 2024) The results of spring wheat in this long-term Polish field experiment showed a significant difference in yields between organic, integrated, and conventional systems, with the conventional and integrated systems having a better yield than the organic production. The research however also revealed that cultivar selection has the ability to reduce the yield gap. This helps to substantiate this current study to indicate that yield per acre is not only dependent on farming system but also on the suitability of a specific varietal.

The study by (Smith, O. M., Cohen, A. L, 2020) revealed that organic systems tended to be less productive than conventional systems, however, the difference depended on the context of the landscape and was not moving in the same direction as profitability and biodiversity results. This is significant to the existing construct since it will determine the comparative yield per acre with ecological and market conditions and not on its own.

(Fess, T. L., & Benedito, V. A, 2018) The review summarizes the comparative evidence on organic and conventional systems and claims that yield gaps are present and can be mitigated by diversification of crops, proper breeding, and improved design of the system. The research is helpful in the current study since the authors view yield per acre as a single one of the dimensions of sustainability instead of the performance standard.

COST OF CULTIVATION

(Rai, P., Gurung, T, 2025) This paper will compare the real farmer-level potato production in traditional and in-conversion organic systems and outline the critical differences in the cost structure, notably the labor and input structure. It has a direct connection to the current construct since it demonstrates that the cost of cultivation changes during organic transition and not merely increases or decreases across the board.

A comparison of conventional and organic durum wheat systems conducted by (Bux, C., Lombardi, M, 2022) indicated that, economic and environmental performances varied with the equilibrium between the cost of production, market environment, and system performances. The research is useful to the existing construct as it shows that cost of cultivation should be viewed alongside output price, externalities and long run sustainability.

Even though the study is oriented to multifunctional sustainability, the meta-analysis reports that cost-related profitability in organic systems is not consistent across local conditions and price arrangements (Smith, O. M., Cohen, A. L, 2020). Its applicability to cost of cultivation is that the cost of production can not be assessed without reference to the landscape, intensity of management, and actual premiums, all of which influence comparative farm performance.

According to (Fess, T. L., & Benedito, V. A, 2018), organic systems tend to have fewer synthetic inputs, but can be more labor intensive, specialized, and need transitioning to adaptation. This qualifies the cost of cultivation to be different to conventional agriculture. The present construct is supported by the study as it explains that the lower the purchased input cost is, the lower is not necessarily the total cost of cultivation.

PROFIT MARGIN

(Rai, P., Gurung, T, 2025) This paper shows that profit margins in the process of switching to organic systems are closely related to the stability of yields, labor consumption, and market realization, and not the cultivation philosophy itself. Specifically, it is instrumental to the current study since it demonstrates that the comparison of conventional and organic farming in terms of profitability should consider the economics of transition stage and crop margins.

(Bux, C., Lombardi, M, 2022) The paper demonstrates that organic and conventional systems may vary significantly in terms of economic return based on prices, input savings and environmental accounting. Its applicability to the present construct has been in illustrating the fact that yield is not a sufficient explanation of profit margin. Rather, the cost efficiency, the value realization associated with product sustainability is what determines profitability.

According to (Smith, O. M., Cohen, A. L, 2020) the profitability of organic farms was found to be more profitable than conventional farms when the yield was low, but the profitability difference varied with the landscape structure and the market environment. This is the main finding of the current construct since it demonstrates that profit margin may be in favor of organic systems in case premiums and ecological services counterproductivity differences.

SOIL HEALTH INDEX

According to (Ruis, S. J., Kovar, J. L, 2025), The research is very pertinent to the current construct since it demonstrates that underorganic systems can create soil health benefits in medium-term management horizons particularly in the form of perennials, manure, and disturbance reduction.

(Oliveira, E. M., Wittwer, R, 2024) The current construct is significant to the study as it proves that soil health is not just one-dimensional and refers to the physical structure and moisture retention as well as biological functioning but not nutrient content.

(Mihelič, R., Pintarič, S , 2024) This directly justifies the current construct as it gives evidence that the improvement of the soil health is a dynamic and measurable response to the conversion of conventional to the organic systems.

WATER USAGE EFFICIENCY

(Sharma, S., Yost, M. A, 2025) The review states that organic agriculture can enhance water optimization with the help of mulching, compost, cover crops, crop rotation, and reduced tillage, particularly in arid and semi-arid areas. It maintains that such practices increase infiltration, moisture retention and drought resilience. In the current research, it facilitates water use proficiency as a major comparative aspect in which organic systems can be more sustainable compared to conventional agriculture.

(Vanella, D., Guarrera, S, 2025) This field experiment discovered that organic mulching enhanced the water conservation of soil and water status of crops in deficit irrigation in orchards in Mediterranean. The findings show that moisture-management practices in the ecological environment can help in efficient use of water without necessarily relying on high irrigation intensity. The article is topical as it gives first-hand testimony that organic methods could reinforce water efficiency in opposition to more input-oriented conventional strategies.

(Kowalczyk, Z., Cupiał, M, 2022) The work is a comparison between the water footprint of the traditional and organic carrot production and demonstrates that the difference in the impact of water-use on two systems is significant when evaluated using the life-cycle methods. It is relevant to the current construct because it shows that the efficiency of water use in the present construct must be calculated beyond the amount of irrigation, and to include the intensity of resources and environmental impact in the comparison between organic and conventional farming.

INPUT DEPENDENCY

According to this comparative analysis (Hakimi, F., Nabil, M. K. M, 2025) it was found that the conventional farms are usually characterized by a greater dependency on chemicals, but the organic farms are more dependent on ecological processes, crop diversity, and recycling of resources. The authors state that reduced reliance on synthetic inputs enhances environmental resistance, despite the increased knowledge-intensive management. This directly applies to the current research since input dependency is one of the key differences between organic and conventional systems.

(Chmelíková, L., Wolfrum, S, 2024) This paper demonstrates that organic systems were more energy efficient than conventional systems in most matched farm comparisons. As energy consumption is an indicator of dependence on manufactured fertilizers, pesticides, and mechanized inputs, the results are an indirect, yet effective measure of input dependence. In the current study, the paper advocates the position that organic farming will decrease reliance on external inputs that are energy-intensive.

This paper presents the issue of lower organic yields that are commonly associated with the pressure of the weed and nutrient management restrictions that occur when synthetic fertilizers are not used. (Mukherjee, A., Kautz, T, 2020) Simultaneously, it points out that organic systems operate on the basis of entirely different input logic. This study can be applied to the current construct since it demonstrates that input dependency is an agronomic and structural difference between conventional and organic farming.

RESEARCH GAP

Though, the literature gives a lot of information on the organic and conventional farming systems, there are still a number of gaps. To begin with, the current literature focuses more on productivity, soil health, profitability, water efficiency, input dependency, marketing barriers and institutional support as independent themes as opposed to interrelated dimensions. Limited integrated studies have been conducted where economic, environmental and productivity results of traditional farming and organic farming based on the IKS are compared in one analytical framework.

Second, much of the literature is international and context-specific, centered on Europe or North America, or a generalized system of sustainable agriculture. These results could also not be directly applicable in the Indian agricultural context, where the farming decisions are grounded in local knowledge systems, fragmented landholdings, agro-climatic conditions, and culturally embedded practices. Specifically, research directly relating Indian Knowledge Systems (IKS) to quantifiable agricultural performance is limited.

Third, although literature covers certification, logistics, branding, distribution and market information, less literature has explored these marketing issues as a unit and determine how they influence market access and price realisation of organic products. The majority of studies concentrate on single marketing barriers, whereas there is a lack of empirical research that attempts to capture the joint constricting nature of such factors on commercialization of organic produce.

Fourth, institutional support has been extensively debated in terms of subsidies, training, extension, and finance, but few studies have evaluated these supports as an organized system of adoption. The role of government agencies as well as cooperatives, NGOs, certification agencies and extension mechanisms in encouraging long term organic adoption is under-researched.

Lastly, numerous articles are conceptual, policy-based, or experimental compared to fewer empirical studies that reflect the views of farmers and realities on the ground in fields using primary data. As a result, a complete empirical investigation that would explore the relative results of traditional and IKS-based organic agriculture, the commercialization obstacles of organic farming, and the institutional facilitating mechanisms affecting adoption, particularly in the Indian setting, is necessary. The current study attempts to fill this gap, providing a context-sensitive, hypothesis-driven, and integrated analysis.

DISCUSSION AND CONCLUSION:

The results of this research support the thesis that IKS-based organic farming is a holistic and sustainable model of agriculture when considered in the economic, environmental, and social aspects. The literature is categorical that organic systems can be challenged with regards to productivity especially in terms of yield per acre, but the challenges are contextually based and can be addressed by way of better agronomic practices and crop choice. More to the point, organic agriculture has proven to be quite strong in terms of improving soil health, water efficiency, and dependency on synthetic inputs, which eventually contributes to the ecological sustainability of the long-term.

Economically, production volume is not the only factor that determines profitability in organic farming but rather it is largely determined by market premiums, cost restructuring, and environmental value addition. The achievement of these advantages, however, is greatly limited by the marketing issues. Logistical inefficiencies, certification, branding and distribution constraints limit access to the market and limit the capacity of farmers to receive high prices. This demonstrates the importance of market integration in the commercial success of organic farming.

Moreover, institutional support turns out to be a major adoption and sustainability determinant. Government subsidies, training, extension services and networks of cooperatives are crucial in minimizing risks of transition and improving the capability of farmers. The combination of these support mechanisms and efficient market strategies can contribute to the organic farming ecosystem in a significant way.

To sum up, the paper highlights the importance of an integrated strategy that will see IKS-based agricultural activities coupled with strong marketing and institutional systems in order to attain sustainable agricultural growth in the North Maharashtra area.

REFERENCES

1. Uhunamure, S. E., Nethengwe, N. S. (2021). Perceptions of smallholder farmers towards organic farming in South Africa. Agriculture, 11(11), 1157., https://doi.org/10.3390/agriculture11111157https://www.mdpi.com/2077-0472/11/11/1157.
2. Basu, D., and colleagues. (2025). Comparing organic market strategies: Being certified vs. building brand loyalty in a nascent market. British Food Journal. Advance online publication.
3. Bonisoli, L., & Blacio Guañuna, R. A. (2023). Going green in Ecuador: Unpacking the motivations behind brand loyalty for organic products. Journal of Cleaner Production, 418, 138116, https://doi.org/10.1016/j.jclepro.2023.138116https://www.sciencedirect.com/science/article/abs/pii/S0959652623022746.

4. Bregolin, R., & colleagues. (2025). Beyond self-certification: Evaluating the constraints and opportunities of participatory guarantee systems for smallholders. Sustainability, 17(23), 10483, https://doi.org/10.3390/su172310483https://www.mdpi.com/2071-1050/17/23/10483.
5. Bux, C., Lombardi, M. (2022). Economic and environmental assessment of conventional versus organic durum wheat production in Southern Italy. Sustainability, 14(15), 9143., https://doi.org/10.3390/su14159143https://www.mdpi.com/2071-1050/14/15/9143.
6. Cachipuendo, C., Pacheco, A. (2025). Optimization of irrigation efficiency and water retention in agroecological systems through organic matter management. Water, 17(21), 3037., https://doi.org/10.3390/w17213037https://www.mdpi.com/2073-4441/17/21/3037.
7. Carter, J. (2022). Governing extension and extending governance for Pacific organic agriculture. Development Policy Review., https://doi.org/10.1111/1745-5871.12542 https://onlinelibrary.wiley.com/doi/full/10.1111/1745-5871.12542.
8. Chaudhary, R., Nawaz, A. (2024). (2024). Microbial bio-control agents: A comprehensive analysis on sustainable pest management in agriculture. Journal of Agriculture and Food Research, 18, 101421, https://doi.org/10.1016/j.jafr.2024.101421https://www.sciencedirect.com/science/article/pii/S2666154324004587.
9. Chmelíková, L., Wolfrum, S. (2024). Energy-use efficiency of organic and conventional plant production systems in Germany. Scientific Reports, 14, 1691., https://doi.org/10.1038/s41598-024-51768-3https://www.nature.com/articles/s41598-024-51768-3.
10. Chowdhuri, A., Chaudhary, M. (2025). Optimizing soil fertility and climate resilience: Superiority of organic farming in enhancing carbon sequestration and nitrogen supply. Journal Journal of Environmental Management, 370, 127131, https://doi.org/10.1016/j.jenvman.2025.127131https://www.sciencedirect.com/science/article/pii/S03014797253107X.
11. Codjoe, F. N. Y., & co-authors. (2025). Effectual behaviour and farmers' compliance with certification schemes. Agricultural and Food Economics., https://doi.org/10.1186/s40100-025-00362-w https://link.springer.com/article/10.1186/s40100-025-00362-w.
12. Daraboina, R., and colleagues. (2024). A revelation of purchase factors in organic food markets. Journal of Retailing and Consumer Services, 77, 103632., https://doi.org/10.1016/j.jretconser.2024.103632https://www.sciencedirect.com/science/article/abs/pii/S0969698924000067.
13. de la Cruz, V. Y. V., Tantriani, Cheng, W. (2023). Yield gap between organic and conventional farming systems across climate types and sub-types: A meta-analysis. Agricultural Systems, 211, 103732., https://doi.org/10.1016/j.agsy.2023.103732https://www.sciencedirect.com/science/article/abs/pii/S0308521X23001373.
14. del-Canto, A., De Diego, N. (2025). Organic management and local genotypes for elevating yield and seed quality to confront climate change challenges. European Journal of Agronomy, 168, 127613, https://doi.org/10.1016/j.eja.2025.127613 https://www.sciencedirect.com/science/article/pii/S1161030125001091.
15. Duong, C. D., and colleagues. (2024). Blockchain-based food traceability system and pro-environmental consumption: A moderated mediation model of technology anxiety and trust in organic food product. Journal of Innovation & Knowledge, 9(2), 100493., https://doi.org/10.1016/j.jik.2024.100493 https://www.sciencedirect.com/science/article/pii/S2666954424000231.

16. Eti, H. S. (2025). The effects of perceptions of economic sustainability and barriers on organic farming implementation. Sustainability, 17(2), 786., https://doi.org/10.3390/su17020786https://www.mdpi.com/2071-1050/17/2/786.

17. Ewing, P. M., Chim, B. K. (2024). Diversified grain rotations can be highly and reliably productive in unstable climates. Field Crops Research, 310, 109361., https://doi.org/10.1016/j.fcr.2024.109361 https://www.sciencedirect.com/science/article/pii/S037842902400114X.

18. Feledyn-Szewczyk, B . (2024). The effect of crop production systems and cultivars on spring wheat (Triticum aestivum L.) yield in a long-term experiment. Agriculture, 14(4), 625., https://doi.org/10.3390/agriculture14040625https://www.mdpi.com/2077-0472/14/4/625.

19. Fess, T. L., & Benedito, V. A. (2018). Organic versus conventional cropping sustainability: A comparative system analysis. Sustainability, 10(1), 272., https://doi.org/10.3390/su10010272https://www.mdpi.com/2071-1050/10/1/272.

20. Forero, Á., & co-authors. (2025). Adoption of agricultural innovations within the “Farm to Fork” framework. Sustainability, 17(21), 9493., https://doi.org/10.3390/su17219493 https://www.mdpi.com/2071-1050/17/21/9493.

21. Gil-Martínez, M., Madejón, P. (2025). Compost and vegetation cover drive soil fertility, microbial activity, and community in organic farming soils. Plant and Soil, https://doi.org/10.1007/s11104-025-07720-z https://link.springer.com/article/10.1007/s11104-025-07720-z.

22. Gu, B., Zhang, Z. (2024). Green agricultural technology extension strategies under contract farming and cooperative organization. Journal of Cleaner Production., https://doi.org/10.1016/j.jclepro.2024.143401https://www.sciencedirect.com/science/article/abs/pii/S0959652624034401.

23. Gu, B., Zhang, Z. (2024). Green agricultural technology extension strategies under contract farming and cooperative organization. Journal of Cleaner Production., https://doi.org/10.1016/j.jclepro.2024.143401https://www.sciencedirect.com/science/article/abs/pii/S0959652624034401.

24. Habanyati, E. J., Oladipo, O. S. (2024). Assessing organic farming adoption in selected districts of Tamil Nadu: Challenges, practices, and pathways for growth. Agronomy, 14(11), 2537., https://doi.org/10.3390/agronomy14112537https://www.mdpi.com/2073-4395/14/11/2537.

25. Hakimi, F., Nabil, M. K. M. (2025). Comparative analysis of organic and conventional farm management on production efficiency, environmental sustainability, and economic viability. Cogent Food & Agriculture, 11(1), 2463562., https://doi.org/10.1080/23311932.2025.2463562 https://www.tandfonline.com/doi/full/10.1080/23311932.2025.2463562.

26. Han, G., Arbuckle, J. G. (2021). Motivations, goals, and benefits associated with organic grain farming in the United States. Agricultural Systems, 193, 103253., https://doi.org/10.1016/j.agsy.2021.103253 https://www.sciencedirect.com/science/article/abs/pii/S0308521X21001281.

27. He, X., et al. (2026). Unlocking organic farming adoption: The role of information completeness and farmers’ individual preferences. Journal of Rural Studies., https://doi.org/10.1016/j.jrurstud.2026.104103https://www.sciencedirect.com/science/article/pii/S074301672600015X.

28. Headrick, D. (2021). The future of organic insect pest management: Be a better entomologist or pay for someone who is. Insects, 12(2), 140., https://doi.org/10.3390/insects12020140https://www.mdpi.com/2075-4450/12/2/140.

29. Horvath, C., Koning, M. (2023). Short food supply chains: The influence of outlet and accessibility on farmer and consumer preferences. Two discrete choice experiments. Food Policy, 128, 102763.,

https://doi.org/10.1016/j.foodpol.2024.102763https://www.sciencedirect.com/science/article/pii/S030691922400174X.

30. Jia, F., Li, Y., & colleagues. (2024). Promoting resilient and sustainable food systems: A systematic on short food supply chains. Journal of Cleaner Production, 434, 140507., https://doi.org/10.1016/j.jclepro.2023.140507https://www.sciencedirect.com/science/article/pii/S0959652623045225.

31. Kehinde, A. D., & co-authors. (2025). Leveraging agricultural cooperative membership to improve smallholder efficiency. Socio-Ecological Practice Research., https://doi.org/10.1016/j.sopex.2025.70011https://www.sciencedirect.com/science/article/pii/S2590291125007971.

32. Keubeng, I. G., and colleagues. (2025). Controlling agricultural product price volatility: An empirical analysis for sustainable food systems. Discover Food, 5, Article 23., https://doi.org/10.1007/s44187-025-00234-x https://www.sciencedirect.com/science/article/pii/S2666660X25000234.

33. Khatun, M. N., & co-authors. (2024). Climate resilience through adaptation among smallholders. Frontiers in Sustainable Food Systems., https://doi.org/10.1002/fes3.70147 https://onlinelibrary.wiley.com/doi/full/10.1002/fes3.70147.

34. Korpetis, E., Ninou, E. (2023). Bread wheat landraces adaptability to low-input agriculture. Plants, 12(13), 2561., https://doi.org/10.3390/plants12132561 https://www.mdpi.com/2223-7747/12/13/2561.

35. Kowalczyk, Z., Cupiał, M. (2022). Assessing the impact of water use in conventional and organic carrot production in Poland. Scientific Reports, 12, 3217., https://doi.org/10.1038/s41598-022-07531-7https://www.nature.com/articles/s41598-022-07531-7.

36. Kumar, L., and colleagues. (2026). Dynamic modeling of consumer behavior in sustainable food markets. Journal of Cleaner Production, 497, 145921., https://doi.org/10.1016/j.jclepro.2025.145921https://www.sciencedirect.com/science/article/abs/pii/S0959652625027180.

37. Leonnig, E. G., & co-authors. (2026). Knowledge and innovation exchanges in organic farmer groups. Organic Agriculture., https://doi.org/10.1007/s13165-025-00541-5 https://link.springer.com/article/10.1007/s13165-025-00541-5.

38. Li, F., & co-authors. (2025). Agricultural technology extension and farmers' income. Economies, 13(11), 331., https://doi.org/10.3390/economies13110331 https://www.mdpi.com/2227-7099/13/11/331.

39. Li, G., Yu, C., Shen, P. (2024). Crop diversification promotes soil aggregation and carbon accumulation in global agroecosystems: A meta-analysis. Journal of Environmental Management, 350, 119661, https://doi.org/10.1016/j.jenvman.2023.119661 https://www.sciencedirect.com/science/article/pii/S0301479723024490.

40. Li, H., Chen, Y., & co-authors. (2024). From conventional to organic agriculture: Influencing factors and reasons for tea farmers' adoption of organic farming in Pu'er City. Sustainability, 16(22), 10035, https://doi.org/10.3390/su162210035 https://www.mdpi.com/2071-1050/16/22/10035.

41. Lucchetta, M., et al. (2023). Compost application boosts soil restoration in highly disturbed vineyard soils. Agronomy, 13(12), 3056., https://doi.org/10.3390/agronomy13123056 https://pmc.ncbi.nlm.nih.gov/articles/PMC10702515/.

42. Marsh, L., Zoumenou, V . (2017). Organic farming: Knowledge, practices, and views of limited resource farmers and non-farmers on the Delmarva Peninsula. Organic Agriculture, 7, 125–132, https://doi.org/10.1007/s13165-016-0150-xhttps://link.springer.com/article/10.1007/s13165-016-0150-x.

43. Miao, Y., and colleagues. (2025). Bridging the quality-price gap: Unlocking consumer willingness to pay for high-quality agricultural products. Foods, 14(7), 1184., https://doi.org/10.3390/foods14071184 https://www.mdpi.com/2304-8158/14/7/1184.

44. Mihelič, R., Pintarič, S . (2024). Effects of transitioning from conventional to organic farming on soil organic carbon and microbial community: A comparison of long-term non-inversion minimum tillage and conventional tillage. Biology and Fertility of Soils, https://doi.org/10.1007/s00374-024-01796-yhttps://link.springer.com/article/10.1007/s00374-024-01796-y.

45. Milardo, R., & co-authors. (2025). The role of knowledge and innovation in organic farming systems. Sustainability, 17(14), 6563., https://doi.org/10.3390/su17146563https://www.mdpi.com/2071-1050/17/14/6563.

46. Missio, J. C., Rivera, A. (2018). A comparison of landraces vs. modern varieties of lettuce in organic farming during the winter in the Mediterranean area: An approach considering the viewpoints of breeders, consumers, and farmers. Frontiers in Plant Science9,1491, https://doi.org/10.3389/fpls.2018.01491 https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2018.01491/full.

47. Möhring, N., Muller, A. (2024). Farmers' adoption of organic agriculture—a systematic global literature review. European Review of Agricultural Economics, 51(4), 1012–1046., https://doi.org/10.1093/erae/jbae025https://academic.oup.com/erae/article/51/4/1012/7824160.

48. Mukherjee, A., Kautz, T. (2020). Impacts of organic and conventional management on the quality of a subtropical Indian Inceptisol. Sustainability, 12(21), 8965., https://doi.org/10.3390/su12218965https://www.mdpi.com/2071-1050/12/21/8965.

49. Muneret, L., Mitchell, M. (2018). Evidence that organic farming promotes pest control. Nature Sustainability, 1(7), 361–368., https://doi.org/10.1038/s41893-018-0102-4 https://www.nature.com/articles/s41893-018-0102-4.

50. My, K. B., and colleagues. (2025). Farmers' preferences toward organic certification scheme: Evidence from a discrete choice experiment in Northern Vietnam. Cleaner and Responsible Consumption, 16, 100205, https://doi.org/10.1016/j.clrc.2025.100205https://www.sciencedirect.com/science/article/pii/S2772655X25000035.

51. My, K. B., et al. (2025). Farmers' preferences toward organic certification scheme: Evidence from a discrete choice experiment in Northern Vietnam. Cleaner and Responsible Consumption, 16, 100205, https://doi.org/10.1016/j.clrc.2025.100205https://www.sciencedirect.com/science/article/pii/S2772655X25000035.

52. Nifatova, O., and colleagues. (2026). Rethinking organic food messaging: An experimental study of information sources and consumer response. Cleaner and Responsible Consumption, 20, 100266., https://doi.org/10.1016/j.clrc.2026.100266 https://www.sciencedirect.com/science/article/pii/S3050835526000185.

53. Nyamwero, N., & co-authors. (2026). Adoption patterns and determinants of climate-smart agricultural practices. Discover Agriculture., https://doi.org/10.1007/s44279-026-00503-9 https://link.springer.com/article/10.1007/s44279-026-00503-9.

54. Oliveira, E. M., Wittwer, R. (2024). Effects of conventional, organic and conservation agriculture on soil physical properties, root growth and microbial habitats in a long-term field experiment. Geoderma, 447, 116927., https://doi.org/10.1016/j.geoderma.2024.116927 https://www.sciencedirect.com/science/article/pii/S0016706124001563.

55. Paredes-Rodríguez, A. M. (2025). Design of a short fresh food supply chain considering risks and perishability in an emerging economy. Cleaner Logistics and Supply Chain, 12, 100188., https://doi.org/10.1016/j.clscn.2025.100188https://www.sciencedirect.com/science/article/pii/S2590123025041593.

56. Pratissoli, D. (2025). Biological pest control in agroecosystems. Agronomy, 15(7), 1739., https://doi.org/10.3390/agronomy15071739 https://www.mdpi.com/2073-4395/15/7/1739.

57. Rai, P., Gurung, T. (2025). Comparative economic analysis of potato production in Western Bhutan—conventional versus in-conversion to organic. Cogent Food & Agriculture, 11(1), 2493127., https://doi.org/10.1080/23311932.2025.2493127https://www.tandfonline.com/doi/full/10.1080/23311932.2025.2493127.

58. Rana, J., & Paul, J. (2017). Consumer behavior and purchase intention for organic food: A review and research agenda. Journal of Retailing and Consumer Services, 38, 157–165., https://doi.org/10.1016/j.jretconser.2017.06.004https://www.sciencedirect.com/science/article/abs/pii/S0969698917301323.

59. Roos, E., Mie, A. (2018). Risks and opportunities of increasing yields in organic farming: A review. Agronomy for Sustainable Development, 38(2), 14., https://doi.org/10.1007/s13593-018-0489-3 https://link.springer.com/article/10.1007/s13593-018-0489-3.

60. Rousseau, S. (2015). The role of information in organic food markets: Evidence for labeled organic food products. Food Policy, 53, 74–84., https://doi.org/10.1016/j.foodpol.2015.04.002https://www.sciencedirect.com/science/article/abs/pii/S0306919213000171.

61. Ruis, S. J., Kovar, J. L. (2025). Organic cropping systems enhance soil health indicators in a Mollisol of the US Corn Belt. Soil Science Society of America Journal, 89(1), e20795., https://doi.org/10.1002/saj2.20795https://acsess.onlinelibrary.wiley.com/doi/10.1002/saj2.20795.

62. Sacchi, G., et al. (2024). The future of organic certification: Potential impacts of the inclusion of Participatory Guarantee Systems in the European organic regulation. Agricultural and Food Economics, 12, 1, https://doi.org/10.1186/s40100-023-00294-3https://link.springer.com/article/10.1186/s40100-023-00294-3.

63. Sedghy, B. M., Sadeghi, M. (2024). Market dynamics between retail channels and short food supply chains: A case of organic fruits. Journal of Retailing and Consumer Services, 79, 103845, https://doi.org/10.1016/j.jretconser.2024.103845https://www.sciencedirect.com/science/article/pii/S0969698924000717.

64. Shahzad, M., Hayat, R. (2025). Biofertilizers in sustainable agriculture: Mechanisms, applications, and future prospects. Discover Agriculture, 3, 224., https://doi.org/10.1007/s44279-025-00318-0https://link.springer.com/article/10.1007/s44279-025-00318-0.

65. Sharma, S., Yost, M. A. (2025). Roles of organic agriculture for water optimization in arid and semi-arid regions. Sustainability, 17(12), 5452, https://doi.org/10.3390/su17125452 https://www.mdpi.com/2071-1050/17/12/5452.

66. Smith, O. M., Cohen, A. L. (2020). Landscape context affects the sustainability of organic farming systems. Proceedings of the National Academy of Sciences, 117(46), 28740–28748., https://doi.org/10.1073/pnas.1906909117https://www.pnas.org/doi/10.1073/pnas.1906909117.

67. Solfanelli, F., Zanoli, R. (2021). Potential outcomes and impacts of organic group certification in Italy: An evaluative case study. Journal of Environmental Management, 288, 112410, https://doi.org/10.1016/j.jenvman.2021.112410https://www.sciencedirect.com/science/article/abs/pii/S0921800921001658.

68. Solfanelli, F., Zanoli, R. (2021). Potential outcomes and impacts of organic group certification in Italy: An evaluative case study. Journal of Environmental Management, 288, 112410., https://doi.org/10.1016/j.jenvman.2021.112410https://www.sciencedirect.com/science/article/abs/pii/S0301479721001658.

69. Sridhar, R., Longkumer, L. T. (2026). Diverse fields for stronger yields: Crop diversification strategies for sustainable agriculture and climate-resilient ecosystems. Frontiers in Agronomy, 7, 1746895.,

https://doi.org/10.3389/fagro.2025.1746895https://www.frontiersin.org/journals/agronomy/articles/10.3389/fagro.2025.1746895/full.

70. Tennhardt, L. M. (2025). Mixed method evaluation of factors influencing the adoption of organic participatory guarantee system certification among Vietnamese vegetable farmers. Agriculture and Human Values., https://doi.org/10.1007/s10460-024-10643-7https://link.springer.com/article/10.1007/s10460-024-10643-7.
71. Uhunamure, S. E., Nethengwe, N. S. (2021). Perceptions of smallholder farmers towards organic farming in South Africa. Agriculture, 11(11), 1157., https://doi.org/10.3390/agriculture11111157https://www.mdpi.com/2077-0472/11/11/1157.
72. Ume, C. A., Mshenga, P. M. (2024). Policy support strategies for organic farming extensification in Africa. Organic Agriculture., https://doi.org/10.1007/s13165-024-00467-4 https://link.springer.com/article/10.1007/s13165-024-00467-4.
73. Vanella, D., Guarrera, S. (2025). Effects of organic mulching and regulated deficit irrigation on crop water status, soil and yield features in an orange orchard under Mediterranean climate. Science of the Total Environment, 958, 177528., https://doi.org/10.1016/j.scitotenv.2024.177528https://www.sciencedirect.com/science/article/pii/S004896972407685X.
74. Wen, Y., Yao, W., Yu, T. (2025). Long-term organic farming improves the red soil quality and microbial diversity in subtropics. Agriculture, Ecosystems & Environment, 381, 109410., https://doi.org/10.1016/j.agee.2024.109410https://www.sciencedirect.com/science/article/pii/S0167880924005280.
75. Winter, E., Grovermann, C. (2023). Assessing seed and breeding interventions for organic farming using a multiagent value chain approach. Agricultural and Food Economics, 11, 22., https://doi.org/10.1186/s40100-023-00262-xhttps://link.springer.com/article/10.1186/s40100-023-00262-x.
76. Xu, J., Li, Y., & Li, L. (2025). A comprehensive review of the effects of organic amendments on soil health and fertility: Mechanisms, greenhouse gas emissions, and implications for sustainable agriculture. Agronomy, 15(12), 2705., https://doi.org/10.3390/agronomy15122705https://www.mdpi.com/2073-4395/15/12/2705.
77. Yu, Y., He, Y., & Zhao, X. (2021). Impact of demand information sharing on organic farming adoption: An evolutionary game approach. Technological Forecasting and Social Change, 172, 121001., https://doi.org/10.1016/j.techfore.2021.121001 https://www.sciencedirect.com/science/article/abs/pii/S0040162521004339.