International
Journal of Agriculture Innovations
and Cutting-Edge Research

Soil, Society, and Supply Chains: Organic Farming and Food Systems in Transition Toward Rural Resilience in the Cilento Bio-District

Shahroz Hassan[1](Corresponding Author), Imad Ali[2], Aleena Khalid[3], Misbah-Ud-Din Ahmed[4]

[1] Department of Agriculture, Master's in Sustainable Food System, University of Naples Federico II, Italy, shahrozkhattar123@gmail.com, https://orcid.org/0009-0005-0338-5094
[2] Institute of Soil and Environmental Sciences, PMAS Arid Agriculture University, Rawalpindi, Pakistan, iamimad52@gmail.com, https://orcid.org/0009-0001-9159-0012
[3] Department of Horticulture, Faculty of Agriculture, PMAS-Arid Agriculture University, P.O. Box 47610, Rawalpindi, Pakistan, aleenakhalid630@gmail.com, https://orcid.org/0009-0005-5581-0558
[4] Institute of Soil and Environmental Sciences, PMAS Arid Agriculture University, Rawalpindi, Pakistan, misbahahmed5253@gmail.com, https://orcid.org/0009-0004-0029-101X

Abstract

Organic farming is widely promoted to improve environmental protection and rural sustainability. In Europe, Bio-Districts connect organic agriculture with territorial governance, cultural heritage, and local development. This review assesses how organic farming contributes to environmental, economic, social, and territorial sustainability in the Cilento Bio-District in southern Italy. We used a structured, literature-based approach to examine peer-reviewed studies, academic books, institutional reports, and policy-oriented publications identified through academic databases and relevant institutional resources. The literature published between 2005 and 2024, supplemented by selected 2025–2026 studies on Bio-District governance and rural vitality, was synthesized thematically across four dimensions: environmental integrity, economic viability, social and territorial sustainability, and institutional governance. The reviewed literature associates organic farming with soil conservation, biodiversity protection, reduced reliance on synthetic inputs, local market development, farmer cooperation, and the preservation of traditional agricultural practices. It also indicates that these outcomes depend on enabling conditions, including territorial coordination, market access, institutional collaboration, and policy support. Challenges reported in the literature include certification and compliance costs, administrative burdens, climate variability, and limitations in market access. The review's contribution is an integrated analytical perspective that considers these sustainability dimensions together rather than treating them separately. Because this is a secondary-literature assessment, the findings represent a synthesis of published evidence and do not constitute independent field measurements of sustainability outcomes in the Cilento Bio-District. Further empirical and comparative research is needed to assess long-term outcomes and determine which approaches are transferable to other territories.

Keywords: organic; farming; sustainability; bio-district; Cilento; rural development

CrossRef. DOI:	10.67244/jai.bwo-researches.v4i4.a265
Journal Link:	https://jai.bwo-researches.com/index.php/jwr/index
Paper Link:	https://jai.bwo-researches.com/index.php/jwr/article/view/265
Video Overview TeLink:	https://youtu.be/e73SaMaO8IE
Publication Process	Received: 05 August 2026/ Revised: 03 October 2026/ Accepted: 31 October 2026/ Published: 02 November 2026
ISSN:	Online [3007-0929], Print [3007-0910]
Copyright:	© 2025 by the first author. This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (Attribution-ShareAlike 4.0 International (CC BY-SA 4.0)).
Indexing:	Academia.edu, DRJI, Google Scholar, INDEX COPERNICUS INTERNATIONAL, Crossref

Joint Publishers: BWO Research Pvt. Ltd., Islamabad, and BWO International, Ontario, Canada https://www.bwo-researches.com

1. Introduction

In the present era, the rapid growth of pollution has become one of the major obstacles to environmental sustainability (Arora et al., 2018). Almost every aspect of human life is affected by pollution, largely driven by changing lifestyles, increased consumption, and growing demands for food and resources. Among these, agriculture plays a crucial role. Modern agricultural practices, especially the excessive use of synthetic fertilizers, pesticides, and chemical inputs to maximize crop yields, have significantly contributed to environmental degradation (Tripathi et al., 2020). Over time, these practices disturb the natural nutrient balance of the soil, leading to declining soil fertility, water contamination, and loss of biodiversity (Tudi et al., 2021).

As concerns about environmental deterioration, climate change, and human health continue to rise, the need for sustainable agricultural systems has become more urgent than ever. Conventional farming systems, though productive in the short term, often create long-term problems such as soil degradation, greenhouse gas emissions, and pollution of air and water resources (Singh & Singh, 2017). These challenges have encouraged scientists, policymakers, and farmers to explore alternative farming approaches that can support both food production and environmental protection (Garibaldi et al., 2017).

Organic farming has emerged as one of the most promising solutions in this context. It is an environmentally friendly agricultural system that focuses on maintaining soil health, reducing chemical inputs, conserving biodiversity, and using natural methods for pest and nutrient management (Dhiman, 2020). Organic farming not only helps protect the environment but also ensures yield stability, improves soil fertility, and provides safe and healthy food (Verma et al., 2019). By minimizing the use of synthetic fertilizers and pesticides, organic agriculture reduces environmental pollution and supports ecological balance. Although organic farming is often viewed as a modern innovation, its roots go back thousands of years, when farming systems relied on natural cycles and local resources (Stefanovic & Agbolosoo-Mensah, 2023). The historical development of organic farming practices is illustrated in Figure 1.

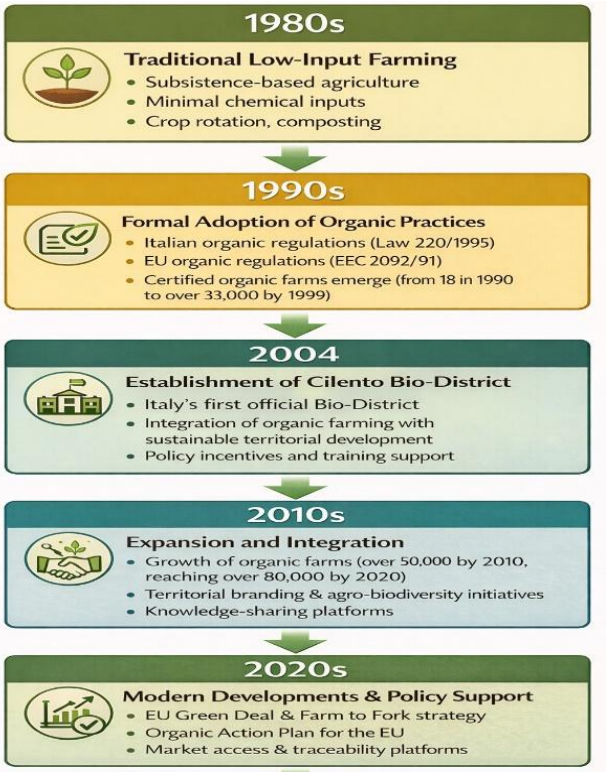


Figure 1. Historical Development of Organic Farming in Cilento Bio-District

In recent years, sustainable agriculture has gained global attention due to increasing awareness of biodiversity loss, climate change, and the decline of rural livelihoods (Das & Ansari, 2021). Beyond its environmental benefits, organic farming also contributes to social and economic sustainability. It supports rural employment, strengthens local economies, enhances farmers' income, and meets the growing consumer demand for high-

quality and chemical-free food products (Arora et al., 2024).

In Europe, an innovative approach known as Bio-Districts has been developed to promote sustainable agriculture at the territorial level further. Bio-Districts integrate organic farming with local governance, tourism, education, and cultural heritage (Packer, 2025; Packer et al., 2026). This model encourages cooperation among farmers, local authorities, consumers, and other stakeholders to achieve sustainable development (Florini & Pauli, 2018). Italy has played a leading role in establishing Bio-Districts, with the Cilento Bio-District being one of the largest and best-established examples (Sturla et al., 2024; Zanasi et al., 2024).

The Cilento Bio-District is located within the Cilento, Vallo di Diano, and Alburni National Park in the Campania region of southern Italy (Stefanovic & Agbolosoo-Mensah, 2023). This region is internationally recognized for its rich biodiversity, traditional agricultural systems, and strong connection to the Mediterranean diet. Organic farming forms the backbone of the district's strategy, helping to protect natural resources while supporting local livelihoods and cultural traditions (Stefanovic & Agbolosoo-Mensah, 2023). Although organic farming and Bio-Districts are becoming more popular, little research has looked at how they affect sustainability at the local district level. The purpose of this study is to assess how organic farming might improve the Cilento Bio-District in Italy. Although recent studies have examined different aspects of the Cilento Bio-District, including rural revitalization, territorial governance, food systems, and social sustainability (Stefanovic & Agbolosoo-Mensah, 2023; Kraljevic & Zanasi, 2023; Di Veroli et al., 2024; Packer et al., 2026), the available literature remains distributed across separate environmental, economic, social, and institutional perspectives. A more integrated assessment is therefore useful for understanding how organic farming interacts with these dimensions within a single territorial framework. The present review does not claim that Cilento has received limited scholarly attention; rather, it brings together existing evidence to examine the sustainability contribution of organic farming through an integrated environmental, economic, social, and governance perspective. This approach provides a focused basis for identifying the main benefits, constraints, and policy implications associated with the Bio-District model.

1.1 Objectives and Research Questions

The main objective of this review is to assess the contribution of organic farming to territorial sustainability within the Cilento Bio-District. Specifically, the review examines: (i) the environmental outcomes associated with organic farming, including soil health, biodiversity conservation, and reduction of chemical inputs; (ii) the economic outcomes related to farm income, market access, certification, diversification, and local value chains; (iii) the social and territorial outcomes associated with farmer cooperation, community participation, cultural heritage, and rural development; and (iv) the role of Bio-District governance, institutional coordination, and policy support in strengthening these sustainability outcomes.

The review addresses the following research questions:

1. How does organic farming contribute to environmental sustainability in the Cilento Bio-District?
2. What economic benefits and constraints are associated with organic farming within the Bio-District?
3. How does organic farming contribute to

social, cultural, and territorial sustainability?

4. What governance mechanisms and policy conditions influence the sustainability outcomes of the Cilento Bio-District?
5. What major challenges and future research needs emerge from the existing literature?

2. Study Area: Cilento Bio-District, Italy

The Cilento Bio-District is located in the Campania region of southern Italy within the Cilento, Vallo di Diano, and Alburni National Park, a UNESCO-recognized protected area (Fratianni & Acquaotta, 2017) (Figure 2; Ahmed et al., 2026). The region experiences a Mediterranean climate with mild winters and warm, dry summers and exhibits diverse landscapes, including coastal zones, hills, and mountainous areas, which contribute to high agricultural and ecological diversity (Guida & Valente, 2019).

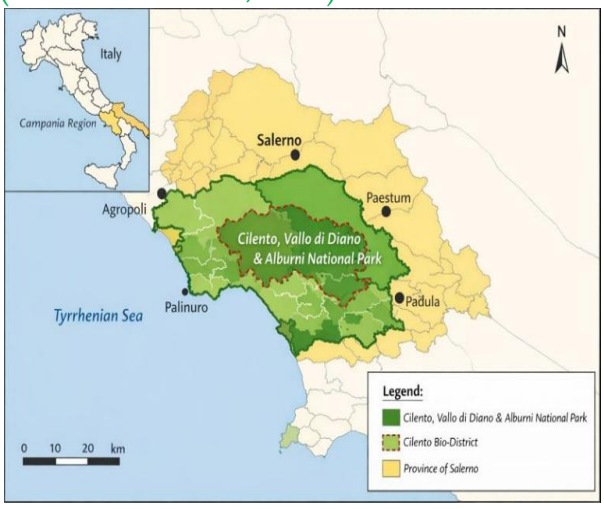


Figure 2. Map of the Cilento, Vallo di Diano and Alburni National Park, Campania, Italy (Ahmed et al., 2026)

Agriculture in the region is dominated by small-scale, family-run farms, producing olives, fruits, vegetables, cereals, and legumes, often under organic or traditional low-input systems (Cerrato et al., 2023). The Bio-District framework promotes organic farming as a strategy to integrate environmental conservation, rural development, and cultural heritage preservation through coordinated territorial governance (Table 1).

Table 1: Key Characteristics of Cilento Bio-District

Parameter	Description
Location	Campania Region, Southern Italy
Protected Status	Cilento, Vallo di Diano and Alburni National Park (UNESCO)
Climate	Mediterranean (mild winter, warm, dry summer)
Dominant Farm Type	Small-scale and family-based farms
Major Crops	Olives, Vegetables, Fruits, Cereals, Legumes
Farming Systems	Organic traditional low-input agriculture
Institutional Framework	Bio-District governance involving farmers, local authorities, and cooperatives
Sustainability Focus	Environmental conservation, rural development, and cultural heritage

3. Materials and Methods

3.1 Review Approach

This study adopts a structured literature-based review and secondary data approach to synthesize existing evidence on organic farming and territorial sustainability in the Cilento Bio-District. The review follows a thematic synthesis rather than a formal systematic review with statistical meta-analysis. The approach was selected because the available literature includes different types of evidence, including empirical studies, case studies, institutional reports, policy documents, and conceptual contributions addressing environmental, economic, social, and governance dimensions. The review therefore focuses on identifying recurring themes, relationships, benefits, constraints, and governance mechanisms reported across the literature. The analysis is organized around four interconnected sustainability dimensions: environmental integrity, economic viability, social and territorial sustainability, and institutional governance.

3.2 Review Protocol and Search Strategy

The literature for this review was identified through a structured search of peer-reviewed journal articles, edited books, institutional reports, and policy-oriented publications addressing organic agriculture, agroecology, rural development, territorial sustainability, and Bio-District governance. Major academic databases, including Scopus, Web of Science, and Google Scholar, were considered alongside institutional resources from the Food and Agriculture Organization (FAO) and European Union policy repositories.

The search strategy used combinations of the following keywords: "Bio-District," "organic farming sustainability," "Cilento organic model," "territorial governance," "rural development Italy," "organic agriculture Italy," and "climate resilience in organic systems." Boolean operators such as AND and OR were used to combine terms and refine the search. Additional relevant publications were identified through examination of references cited in key studies addressing Bio-Districts and the Cilento case.

The literature covered the period from 2005 to 2024 (Table 2). This period was selected to capture the development of contemporary European organic agriculture and territorial sustainability approaches while also allowing sufficient coverage of the emergence and institutional development of Bio-Districts and subsequent research on the Cilento model. More recent studies were given particular attention where they provided direct evidence on governance, rural development, sustainability, or the development of Italian Bio-Districts. Selected 2025–2026 publications were added during manuscript revision to reflect recent empirical work on multi-actor governance and rural vitality in Bio-Districts, empirical assessments of organic food-system transitions, food-system and territorial indicators, public procurement and short food supply chains, and measurable social and economic outcomes of Bio-District governance.

Studies were considered relevant when they addressed at least one of the following areas: organic farming and environmental sustainability; economic or rural development outcomes; social and territorial sustainability; Bio-District governance; or the Cilento and comparable Italian or European organic territorial models. Peer-reviewed research articles, empirical case studies, institutional reports, policy documents, and relevant academic books or book chapters were included. Duplicate records, opinion-based material without supporting evidence, and publications that were not relevant to organic territorial governance or sustainability were excluded.

Because this study was designed as a structured literature-based thematic review rather than a formal systematic review, a PRISMA-style numerical screening count was not generated. Instead, the selected literature was assessed for relevance to the research questions and synthesized thematically. Particular attention was given to studies providing empirical findings, case-specific evidence, or established conceptual and policy frameworks relevant to the Cilento Bio-District. The resulting evidence was then organized according to the environmental, economic, social and territorial, and governance dimensions of sustainability.

Table 2: Time Frame of Selected Literature (2005–2024)

Period	Focus of Literature	Relevance to Study	Key Supporting References
2005–2010	Early development of organic farming	Establishes foundational concepts of organic	Pugliese & Antonelli (2015);

	policies and sustainability discourse in Europe	agriculture and rural sustainability	Garibaldi et al. (2017)
2011–2015	Expansion of agroecology and territorial governance approaches	Highlights the transition from farm-level sustainability to integrated regional models	Bavec & Bavec (2015); García-Orenes et al. (2016)
2016–2020	Emergence and institutional strengthening of Bio-District frameworks	Provides empirical and governance-based insights into district-level sustainability	Florini & Pauli (2018); Poponi et al. (2021)
2021–2024	Climate resilience, circular economy, and social sustainability in organic systems	Reflects contemporary policy debates and climate adaptation strategies	Hariram et al. (2023); Stefanovic & Agbolosoo-Mensah (2023); Sturla et al. (2024)

The 2005–2024 timeframe was selected to provide sufficient historical coverage of the development of contemporary organic agriculture and territorial sustainability approaches while capturing the emergence, institutional development, and subsequent evaluation of Bio-District models. The period also allows the review to connect foundational literature with more recent research addressing climate resilience, circular economy, governance, and social sustainability.

3.3 Data Analysis

The selected literature was analyzed through thematic synthesis. Findings were organized according to four analytical dimensions: environmental integrity, economic viability, social and territorial sustainability, and institutional governance. Environmental factors included soil health, biodiversity, and chemical input reduction; economic factors included farm income stability, market access, price premiums, certification, and diversification; social and territorial factors included community engagement, farmer cooperation, knowledge sharing, cultural heritage, and rural development; and governance factors included institutional coordination, certification systems, territorial branding, and policy support. The synthesis focused on identifying recurring findings, reported benefits, constraints, and relationships among these dimensions rather than calculating a pooled quantitative effect.

The analytical framework was developed from the reviewed literature and was used to organize evidence consistently across the selected studies. Where evidence was directly related to the Cilento Bio-District, it was interpreted as case-specific evidence. Findings derived from broader Mediterranean, Italian, or European organic farming literature were used as contextual evidence rather than being presented as direct measurements of the Cilento Bio-District.

The selection of variables in the conceptual framework is grounded in the four pillars of sustainability: environmental integrity, economic viability, social inclusion, and institutional governance. Environmental variables include soil health, biodiversity conservation, and chemical input reduction. Economic variables encompass farm income stability, market access, price premiums, and diversification through agri-tourism. Social variables involve farmer cooperation, community participation, and preservation of traditional agricultural knowledge. Governance variables refer to institutional coordination, certification systems, and policy support mechanisms.

These variables interact dynamically within the Bio-District model. Governance structures facilitate organic certification adoption; certification improves market access and price premiums; improved income strengthens rural retention and social cohesion; and environmental stewardship enhances territorial branding and long-term resilience. This integrated interaction forms the analytical foundation of the study. Figure 3 presents a conceptual framework that demonstrates how the Cilento Bio-District's environmental, economic, and social sustainability is enhanced by organic agricultural techniques, which are backed by local government and Bio-District regulations.

3.4 Research Gap and Analytical Framework

The existing literature provides substantial evidence on individual aspects of organic agriculture and Bio-District development, including environmental conservation, rural development, governance, food systems, and social sustainability. However, these dimensions are frequently examined separately. A specific analytical gap remains in bringing these dimensions together to assess how organic farming contributes to territorial sustainability within the Cilento Bio-District.

Accordingly, this review uses an integrated analytical framework linking organic farming practices with four sustainability dimensions: environmental integrity, economic viability, social and territorial sustainability, and institutional governance. Organic farming practices, including reduced synthetic inputs, crop diversification, traditional farming practices, organic certification, and local value-chain development, are considered drivers that can influence sustainability outcomes. Governance mechanisms, including cooperation among farmers, local authorities, cooperatives, certification bodies, and other stakeholders, are treated as enabling conditions that can strengthen or constrain these outcomes.

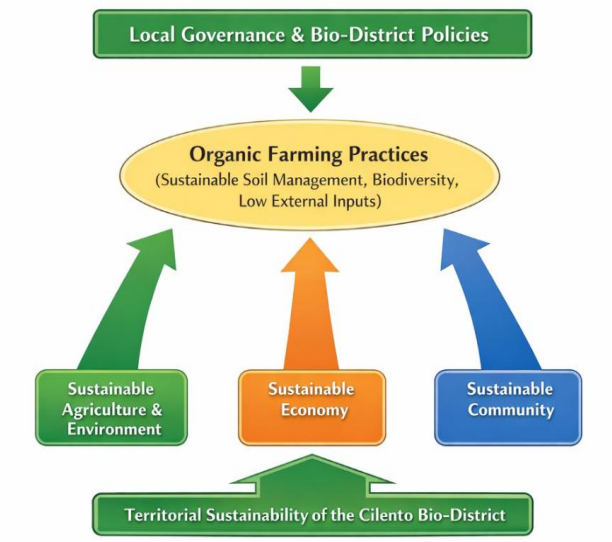


Figure 3: Conceptual Framework Illustrating the Role of Organic Farming in Enhancing Sustainability within the Cilento Bio-District (Ahmed et al., 2026)

The framework assumes that these dimensions are interconnected rather than independent. For example, environmental stewardship can support territorial identity and market value, while governance and collective action can improve access to certification, markets, knowledge, and policy support. The framework therefore provides the analytical basis for interpreting the literature and avoids treating environmental, economic, social, and governance outcomes as isolated effects.

The 2005–2024 timeframe was selected to provide sufficient historical coverage of the development of contemporary organic agriculture and territorial sustainability approaches while capturing the emergence, institutional development, and subsequent evaluation of Bio-District models. The period also allows the review to connect foundational literature with more recent research addressing climate resilience, circular economy, governance, and social

sustainability

4. Results and Discussion

The results of this literature-based assessment indicate that organic farming plays a central role in enhancing environmental, economic, and social sustainability within the Cilento Bio-District. By integrating organic agricultural practices with territorial governance, the Bio-District model strengthens sustainable rural development while preserving ecological and cultural resources (Packer et al., 2026). A synthesis of key organic farming practices, sustainability benefits, and constraints identified from the literature is presented in Table 3, which provides an integrated overview of sustainability outcomes in the Cilento Bio-District.

Table 3: Integrated Role of Organic Farming in Enhancing Sustainability of the Cilento Bio-District (Literature-Based Synthesis)

Sustainability Dimension	Organic Farming Practices / Drivers	Positive Sustainability Outcomes	Key Constraints	Supporting Literature
Environmental	Composting, cover cropping, and reduced chemical inputs	Improved soil fertility and soil organic matter	Climate variability, drought stress	Hariram et al., 2023
Environmental	Crop diversification, traditional mixed farming	Enhanced agro-biodiversity and ecosystem resilience	Land fragmentation	Hariram et al., 2023
Environmental	Avoidance of synthetic pesticides and fertilizers	Reduced soil and water contamination	Limited climate-adaptive inputs	Hariram et al., 2023
Economic	Organic certification and labeling	Price premiums and improved income stability	High certification and compliance costs	Dias et al., 2021
Economic	Short food supply chains and local markets	Improved market access and value retention	Limited access to large-scale markets	Dias et al., 2021
Economic	Integration with agri-tourism and value addition	Diversified farm income sources	Seasonal demand variability	Dias et al., 2021
Social	Farmer cooperatives and Bio-District networks	Strengthened social capital and cooperation	Aging farming population	Hariram et al., 2023
Social	Knowledge sharing and traditional practices	Preservation of cultural heritage	Limited formal training opportunities	Dias et al., 2021
Territorial	Territorial branding and governance support	Enhanced regional identity and rural development	Administrative complexity	Hariram et al., 2023

4.1 Environmental Sustainability Outcomes

As summarized in Table 3, the reviewed literature consistently highlights significant environmental benefits associated with organic farming in the Cilento Bio-District. Organic management practices, including reduced use of synthetic fertilizers and pesticides, contribute to improving soil health and ecological balance (Tripathi et al., 2020). Studies indicate that Mediterranean organic systems have higher soil organic matter, improved soil structure, and enhanced microbial activity compared to conventional systems (García-Orenes et al., 2016). These improvements

are particularly relevant in the Cilento region, where soil conservation is essential due to hilly terrain and erosion risks (Beni et al., 2021).

Biodiversity conservation is another major environmental outcome linked to organic farming practices (Table 3). Organic farming systems are reported to support diverse plant species, beneficial insects, and pollinators due to habitat heterogeneity and reduced chemical pressure (Bavec & Bavec, 2015; Garibaldi et al., 2017), and these mechanisms are considered relevant to organic farms in the Bio-District. The presence of traditional crop varieties and mixed farming systems further enhances agrobiodiversity, a key characteristic of the Cilento landscape and Mediterranean agroecosystems (Packer et al., 2026). Additionally, organic farming contributes to reduced environmental runoff and protects water resources within the UNESCO-protected national park area (Bavec & Bavec, 2015). Overall, the environmental results suggest that organic farming aligns strongly with the conservation objectives of Cilento Bio-District and supports long-term ecosystem resilience.

4.2 Economic Sustainability Outcomes

From an economic perspective, the literature indicates that organic farming contributes to farm income stability and rural economic viability in the Cilento Bio-District (Table 3). Organic products, particularly olives, fruits, and vegetables, benefit from price premiums and growing consumer demand for certified organic and local products. These market advantages help small-scale and family-run farms maintain profitability despite limited land holdings (Pugliese & Antonelli,2015).

Participation in the Bio-District framework further strengthens economic sustainability by facilitating access to local markets, short food supply chains, agri-tourism, and collective marketing initiatives (Dias et al., 2021). The integration of organic farming with cultural heritage and the Mediterranean diet enhances the territorial identity of Cilento products, increasing their market value. However, Table 3 also highlights that those persistent economic constraints, including high certification costs, administrative requirements, and limited access to large-scale markets, pose challenges, particularly for small farmers. Evidence from Cilento school canteens shows that the collaborative nature of the Bio-District supports access to organic public school food procurement, whereas high prices and insufficient volumes of local organic production constrain it (Kraljevic & Zanasi, 2023). While the Bio-District model helps mitigate some of these barriers through cooperation and shared governance, economic sustainability remains moderate rather than uniformly high (Poponi et al., 2021). These findings suggest that continued financial incentives and policy support are necessary to strengthen the economic resilience of organic farmers in the region.

Additionally, diversified crop systems and reduced chemical input use contribute to measurable improvements in soil organic matter and biodiversity indicators reported in Mediterranean organic farming literature (García-Orenes et al., 2016; Garibaldi et al., 2017).

4.3 Social and Territorial Sustainability Outcomes

Social and territorial sustainability outcomes are strongly linked to community participation and governance structures within the Cilento Bio-District. As shown in Table 3, organic farming fosters cooperation among farmers, local authorities, cooperatives, and civil society organizations. The literature emphasizes that Bio-District initiatives encourage

collective decision-making, knowledge exchange, and farmer networking, which enhance social capital and community cohesion (Poponi et al., 2021). A recent comparative case study of Cilento and Sweden, based on 30 semi-structured interviews, identified governance, place-based cultural practices, and structural constraints as interconnected dimensions shaping rural vitality (Packer et al., 2026), and indicators for assessing the social sustainability of Bio-Districts have been proposed (Packer & Zanasi, 2023).

Organic farming also plays a crucial role in preserving traditional agricultural practices and cultural heritage. Many organic farms in Cilento rely on locally adapted crop varieties, traditional olive groves, and low-input farming knowledge passed down through generations. This preservation of traditional practices contributes to cultural continuity and strengthens the territorial identity of the Bio-District (Stefanovic & Agbolosoo-Mensah, 2023). In the Cilento Bio-District, household food waste was found to be lower than national data, which has been linked to an embedded culture of waste avoidance (Stefanovic & Agbolosoo-Mensah, 2023).

In terms of rural employment, organic farming supports labor-intensive practices and diversified activities such as agri-tourism, on-farm processing, and direct sales. Although employment generation is reported as moderate, it remains an important contribution to reducing rural outmigration and maintaining vibrant rural communities (Dhivya & Monika, 2024).

4.4 Integrated Sustainability and Governance Implications

The results presented in Table 3 highlight that the sustainability impacts of organic farming in the Cilento Bio-District are strongly influenced by governance and policy integration. The Bio-District framework acts as an enabling mechanism that connects environmental conservation, economic development, and social cohesion. Organic farming alone provides sustainability benefits; however, its effectiveness is significantly enhanced when supported by local governance, institutional collaboration, and territorial planning (Packer et al., 2026).

Despite positive outcomes, challenges such as climate variability, market uncertainty, and certification barriers remain. Comparative evidence from five case territories in Europe and North Africa likewise identifies entry points, barriers, and drivers for transformation toward sustainable organic food systems (Góralska-Walczak et al., 2025), and a Delphi survey indicates that the definition, governance models, and market-related functions of Italian Bio-Districts remain debated (Sturla et al., 2024). Recent work has also analysed sustainability and resilience indicators together in a Bio-District (Kakaei et al., 2026). Addressing these issues requires integrated policy interventions, including technical support, climate-resilient farming strategies, and strengthened organic value chains. Overall, the findings demonstrate that organic farming, when embedded within a Bio-District governance model, contributes substantially to territorial sustainability. The Cilento Bio-District may serve as a transferable example for other Mediterranean regions seeking to promote sustainable agri-food systems through organic and agroecological approaches.

In comparative terms, Cilento is described as one of the largest and best-established Italian Bio-Districts (Sturla et al., 2024; Zanasi et al., 2024), and its location within a UNESCO-recognized national park is interpreted here as reinforcing biodiversity conservation and landscape

protection objectives (Stefanovic & Agbolosoo-Mensah, 2023). Relative to conventional farming systems in southern Italy, the literature associates the Bio-District with stronger territorial coordination, reduced dependence on synthetic inputs, and closer integration with tourism and cultural heritage (Poponi et al., 2021; Stefanovic & Agbolosoo-Mensah, 2023). Comparative evidence across Bio-Districts is, however, limited and largely qualitative. A Delphi survey of Italian Bio-Districts indicates that their definition, governance models, and market-related functions remain debated (Sturla et al., 2024), while comparative case studies of Cilento and Sweden (Packer et al., 2026) and of five territories in Europe and North Africa (Góralska-Walczak et al., 2025) emphasize context-specific governance, place-based, and structural conditions. No like-for-like quantitative comparison between Cilento, other Italian Bio-Districts, and conventional farming systems was identified in the reviewed literature. The contrasts described above should therefore be read as tendencies reported in the literature rather than as measured differences, and cross-district comparative research remains a priority (Section 6).

The findings presented in this section should be interpreted as a synthesis of evidence reported in the reviewed literature rather than as measurements generated through primary field research. Where the literature provides direct evidence from Cilento, the findings are discussed in relation to the Bio-District specifically; where evidence comes from broader Mediterranean or Italian organic farming systems, it is used to provide contextual support for interpreting potential sustainability mechanisms. This distinction is important because the present study does not independently measure environmental, economic, or social outcomes in the Cilento Bio-District. Statements describing interaction pathways among governance, certification, income, and territorial branding (Section 3.3) represent the interpretation of the reviewed evidence by the authors rather than findings reported directly by individual studies.

5. Policy Implications

To strengthen the long-term sustainability of the Cilento Bio-District model, targeted policy interventions are necessary. Regional governments should provide financial incentives and subsidies to offset organic certification and compliance costs for small-scale farmers. Simplification of administrative procedures would reduce bureaucratic burdens and encourage broader participation. Climate adaptation strategies, including water-efficient irrigation systems, soil conservation programs, and support for climate-resilient crop varieties, are essential to address Mediterranean climate variability. Furthermore, investment in short supply chains, territorial branding, and rural youth entrepreneurship programs would enhance economic resilience and generational renewal in the agricultural sector. Evidence from rural Pakistan on the socioeconomic impacts of sustainable agricultural practices (Abro et al., 2025) points to the value of assessing economic and social outcomes alongside environmental ones when designing such measures. Such policy measures would improve the scalability and replicability of the Bio-District governance model in other Mediterranean regions.

5.1 Limitations

This study has several limitations that should be considered when interpreting its findings. First, the assessment is based entirely on published literature,

institutional reports, and secondary sources and therefore does not provide primary field measurements from farms or other stakeholders in the Cilento Bio-District. Second, the available literature differs in research design, geographical scale, indicators, and methodological approaches, which limits direct quantitative comparison across studies. Third, some findings used in the discussion are derived from broader Mediterranean, Italian, or European organic farming research rather than from Cilento-specific empirical studies. Such evidence was included to provide contextual understanding of the sustainability mechanisms relevant to the Bio-District, but it should not be interpreted as direct measurement of Cilento outcomes. Finally, the review primarily covers literature published up to 2024, supplemented by a limited set of 2025–2026 studies added to reflect recent Bio-District research, and therefore may not capture all evidence that has emerged since. These limitations highlight the need for longitudinal, field-based, and comparative research to validate the sustainability outcomes identified through the literature synthesis.

6. Conclusion

This literature-based assessment demonstrates that organic farming, when integrated within a Bio-District governance framework, can substantially contribute to environmental, economic, and social sustainability at the territorial level. In the Cilento Bio-District, organic practices support soil conservation, biodiversity protection, rural livelihoods, and cultural heritage preservation. While challenges such as certification costs and market access persist, the Bio-District model offers a viable and transferable approach for sustainable rural development in Mediterranean regions. Future research should focus on empirical evaluation and comparative analysis across different Bio-Districts to further strengthen evidence-based policy design.

Future research should prioritize longitudinal impact assessments to evaluate long-term environmental, socio-economic, and governance outcomes of the Bio-District model. Multi-year empirical studies examining soil quality trends, biodiversity indices, farm income stability, and rural demographic changes would strengthen the evidence base.

The findings of this review should therefore be understood as a synthesis of existing evidence rather than as a direct empirical assessment of sustainability performance in the Cilento Bio-District. Nevertheless, the consistency of themes across the reviewed literature supports the value of considering organic farming, territorial governance, and local development as interconnected components of Bio-District sustainability.

Cross-district comparative analyses between the Cilento Bio-District and other European Bio-Districts are recommended to identify best governance practices and transferable sustainability strategies. Additionally, climate adaptation research should assess drought resilience, carbon sequestration potential, and adaptive cropping systems under projected Mediterranean climate scenarios.

Acknowledgment

The author sincerely acknowledges the researchers and institutions whose published studies and reports contributed to the development of this review. Special appreciation is extended to the scholars and practitioners involved in the Cilento Bio-District for making relevant information and documentation publicly accessible. The author also thanks academic colleagues for their informal discussions and constructive insights, which helped refine the conceptual framing

of this study.

Author Contributions

Aleena Khalid: Literature review, analysis, interpretation, and original draft preparation. Shahroz Hassan: Conceptualization, supervision of the manuscript development, and review and editing. Imad Ali: Critical review and editing. Misbah-Ud-Din Ahmed: Critical review and editing. All authors read and approved the final manuscript.

References:

Abro, A. F., Soomro, S. A., Abro, A. A., Abro, G. F., & Chattha, S. H. (2025). Analyzing socioeconomic impacts of sustainable agricultural practices in rural Pakistan. International Journal of Agriculture Innovations and Cutting-Edge Research, 3(3), 79–94.

Ahmed, M.-U.-D., Amed, N., Iqbal, S., Khalid, A., & Hassan, S. (2026). From niche organic to territorial governance: A longitudinal synthesis of the Cilento Bio-District as a global prototype for rural resilience (2004–2026). Indus Journal of Bioscience Research, 4(3), 184–189. https://doi.org/10.70749/ijbr.v4i3.3041

Arora, M., Gupta, S., & Mittal, A. (2024). Qualitative insights into harvesting sustainability: The role of organic agriculture in advancing sustainable development goals. In The Emerald handbook of tourism economics and sustainable development (pp. 41–62). Emerald Publishing Limited.

Arora, N. K., Fatima, T., Mishra, I., Verma, M., Mishra, J., & Mishra, V. (2018). Environmental sustainability: Challenges and viable solutions. Environmental Sustainability, 1(4), 309–340.

Bavec, M., & Bavec, F. (2015). Impact of organic farming on biodiversity. In Y.-H. Lo, J. A. Blanco, & S. Roy (Eds.), Biodiversity in ecosystems: Linking structure and function (pp. 185–201). InTech.

Beni, C., Neri, U., Papetti, P., & Altimari, A. (2021). Natural horticultural systems in organic farming as a tool for resilience: Improvement of economic performance and prevention of soil erosion. Agroecology and Sustainable Food Systems, 45(9), 1375–1398.

Cerrato, M., Benincasa, G., Iasi, A., & Pergola, M. (2023). Animal husbandry in the Cilento, Vallo di Diano and Alburni National Park: An economic-structural analysis for the protection and enhancement of the territory and local resources. Sustainability, 15(10), 7863. https://doi.org/10.3390/su15107863

Das, U., & Ansari, M. A. (2021). The nexus of climate change, sustainable agriculture and farm livelihood. Climate Research, 84, 23–40.

Dhiman, V. (2020). Organic farming for sustainable environment: Review of existing policies and suggestions for improvement. International Journal of Research and Review, 7(2), 22–31.

Di Veroli, J. N., Peronti, B., Scognamiglio, U., Baiamonte, I., Paoletti, F., Stefanovic, L., Bügel, S. G., Aboussaleh, Y., Średnicka-Tober, D., & Rossi, L. (2024). Food waste behaviors of the families of the Cilento Bio-District in comparison with the national data: Elements for policy actions. Frontiers in Sustainable Food Systems, 8, 1385700. https://doi.org/10.3389/fsufs.2024.1385700

Dias, R. S., Costa, D. V., Correia, H. E., & Costa, C. A. (2021). Building bio-districts or eco-regions: Participative processes supported by focal groups. Agriculture, 11(6), 511. https://doi.org/10.3390/agriculture11060511

Florini, A., & Pauli, M. (2018). Collaborative governance for the Sustainable Development Goals. Asia & the Pacific Policy Studies, 5(3), 583–598.

Fratianni, S., & Acquaotta, F. (2017). The climate of Italy. In M. Soldati & M. Marchetti (Eds.), Landscapes and landforms of Italy (pp. 29–38). Springer International Publishing.

García-Orenes, F., Roldán, A., Morugán-Coronado, A., Linares, C., Cerdà, A., & Caravaca, F. (2016). Organic fertilization in traditional Mediterranean grapevine orchards mediates changes in soil microbial community structure and enhances soil fertility. Land Degradation & Development, 27(6), 1622–1628.

Garibaldi, L. A., Gemmill-Herren, B., D'Annolfo, R., Graeub, B. E., Cunningham, S. A., & Breeze, T. D. (2017). Farming approaches for greater biodiversity, livelihoods, and food security. Trends in Ecology & Evolution, 32(1), 68–80.

Góralska-Walczak, R., Stefanovic, L., Kopczyńska, K., Kazimierczak, R., Bügel, S. G., Strassner, C., Peronti, B., Lafram, A., El Bilali, H., & Średnicka-Tober, D. (2025). Entry points, barriers, and drivers of transformation toward sustainable organic food systems in five case territories in Europe and North Africa. Nutrients, 17(3), 445. https://doi.org/10.3390/nu17030445

Guida, D., & Valente, A. (2019). Terrestrial and marine landforms along the Cilento coastland (Southern Italy): A framework for landslide

hazard assessment and environmental conservation. Water, 11(12), 2618.

Hariram, N. P., Mekha, K. B., Suganthan, V., & Sudhakar, K. (2023). Sustainalism: An integrated socio-economic-environmental model to address sustainable development and sustainability. Sustainability, 15(13), 10682.

Kakaei, E., Zanasi, C., & Rota, C. (2026). Analysis of the mutual influence of sustainability on resilience in a biodistrict. Environmental and Sustainability Indicators, 31, 101338. https://doi.org/10.1016/j.indic.2026.101338

Kraljevic, B., & Zanasi, C. (2023). Drivers affecting the relation between biodistricts and school meals initiatives: Evidence from the Cilento biodistrict. Frontiers in Sustainable Food Systems, 7, 1235871. https://doi.org/10.3389/fsufs.2023.1235871

Packer, G. (2025). The role of bio-districts in shaping rural development: A social sustainability perspective [Doctoral dissertation, Alma Mater Studiorum – University of Bologna].

Packer, G., & Zanasi, C. (2023). Comparing social sustainability assessment indicators and tools for bio-districts: Building an analytical framework. Frontiers in Sustainable Food Systems, 7, 1229505. https://doi.org/10.3389/fsufs.2023.1229505

Packer, G., Zanasi, C., & Rota, C. (2026). Bio-districts and rural vitality: Governance, place-based practices, and structural constraints in Italy and Sweden. Frontiers in Sustainable Food Systems, 10, 1872987. https://doi.org/10.3389/fsufs.2026.1872987

Poponi, S., Arcese, G., Mosconi, E. M., Pacchera, F., Martucci, O., & Elmo, G. C. (2021). Multi-actor governance for a circular economy in the agri-food sector: Bio-districts. Sustainability, 13(9), 4718. https://doi.org/10.3390/su13094718

Pugliese, P., & Antonelli, A. (2015). Full case study report: Bio-Distretto Cilento–Italy. Archived at http://orgprints.org/29252

Singh, R., & Singh, G. S. (2017). Traditional agriculture: A climate-smart approach for sustainable food production. Energy, Ecology and Environment, 2(5), 296–316.

Stefanovic, L., & Agbolosoo-Mensah, O. A. (2023). Biodistricts as a tool to revitalize rural territories and communities: Insights from the Biodistrict Cilento. Frontiers in Sustainable Food Systems, 7, 1267985. https://doi.org/10.3389/fsufs.2023.1267985

Sturla, A., Viganò, L., Vassallo, M., & Belliggiano, A. (2024). Mission, self-perception, and role in localized food systems of Italian biodistricts: Insights from a Delphi survey. Frontiers in Sustainable Food Systems, 8, 1433261. https://doi.org/10.3389/fsufs.2024.1433261

Tripathi, S., Srivastava, P., Devi, R. S., & Bhadouria, R. (2020). Influence of synthetic fertilizers and pesticides on soil health and soil microbiology. In M. N. V. Prasad (Ed.), Agrochemicals: Detection, treatment and remediation (pp. 25–54). Butterworth-Heinemann.

Tudi, M., Ruan, H. D., Wang, L., Lyu, J., Sadler, R., Connell, D., Chu, C., & Phung, D. T. (2021). Agricultural development, pesticide application, and its impact on the environment. International Journal of Environmental Research and Public Health, 18(3), 1112. https://doi.org/10.3390/ijerph18031112

Verma, B. C., Pramanik, P., & Bhaduri, D. (2019). Organic fertilizers for sustainable soil and environmental management. In R. Datta, S. Meena, & C. Pathan (Eds.), Nutrient dynamics for sustainable crop production (pp. 289–313). Springer.

Zanasi, C., Stefanovic, L., & Strassner, C. (2024). Editorial: Biodistricts: A concrete example of sustainable food systems. Frontiers in Sustainable Food Systems, 8, 1455713. https://doi.org/10.3389/fsufs.2024.1455713