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THE ROLE OF BIO-DISTRICTS IN SHAPING RURAL DEVELOPMENT: A SOCIAL SUSTAINABILITY PERSPECTIVE

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Abstract

Rural areas in many regions face significant socio-economic challenges, including depopulation, economic vulnerability, and reduced access to essential services. These issues have intensified calls for innovative governance models that foster sustainable territorial development. In this context, bio-districts have emerged as place-based social innovation initiatives that integrate organic farming, participatory decision-making, and local value chains to promote environmental, economic, and social sustainability. A bio-district involves collaboration between farmers, public authorities, civil society, and businesses to manage local resources sustainably while enhancing rural vitality and cultural identity. However, while the environmental and economic contributions have received considerable attention, the social dimension remains underexplored. This thesis addresses this gap by developing a comprehensive framework for assessing the social sustainability of bio-districts. The research follows a structured approach divided into three core chapters. The first chapter provides a literature review of social sustainability and territorial governance, highlighting existing evaluation frameworks such as the Sustainability Assessment of Food and Agriculture Systems (SAFA) and Social Life Cycle Assessment (S-LCA). The review identifies key gaps related to the inclusion of participatory processes and the need for qualitative indicators that capture subjective dimensions of well-being, such as sense of belonging, trust, and fairness. The second chapter applies empirical research to case studies of bio-districts in Italy and Sweden. This chapter examines how governance structures, stakeholder collaboration, and cultural identity shape social sustainability outcomes. The case study findings reveal positive aspects, such as robust community networks and effective policy support, as well as barriers, such as resource constraints, stakeholder imbalances, and limited youth participation. The analysis underscores the importance of fostering collaboration, innovation, and inclusion to counter rural marginalization and enhance resilience. The third chapter presents the methodological design based on an adapted Multi-Actor Multi-Criteria Analysis (MAMCA) approach. This chapter explains the process of stakeholder identification, the construction of a decision tree that organizes social sustainability into individual and community perspectives, and the operationalization of themes and sub-themes, such as decent livelihood, responsible practices, and cultural diversity. The qualitative nature of the indicators, gathered through interviews and literature ensures that the framework captures local actors' perceptions and experiences, providing a deeper understanding of social dynamics within bio-districts. The outcomes of this thesis demonstrate that bio-districts can serve as effective models for sustainable rural development by embedding social sustainability principles into governance and

decision-making processes. However, the findings also highlight challenges, such as the subjectivity of qualitative data, the resource-intensive nature of participatory assessments, and difficulties in establishing causal relationships between interventions and outcomes. To address these limitations, the study proposes integrating mixed-method approaches, conducting longitudinal assessments, and utilizing digital tools to facilitate stakeholder engagement.

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"Ovunque tu vada, non troverai il lieto vivere, perché hai cambiato cielo, non animo." (Seneca, Lettere a Lucilio, 28, 1)

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List of Acronyms

AFN: Alternative Food Network

CSA: Community-Supported Agriculture

EU: European Union

FAO: Food and Agriculture Organization

GAOD: Global Alliance for Organic Districts

HORECA: Hotel, Restaurant, and Catering

IN.N.E.R.: International Network of Eco-Regions

MAMCA: Multi-Actor Multi-Criteria Analysis

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SAFA: Sustainability Assessment of Food and Agriculture Systems

S-LCA: Social Life Cycle Assessment

SDG: Sustainable Development Goals

SFSC: Short Food Supply Chain

VTFN: Values-Based Territorial Food Network

Chapter 1. Introduction

Rural Areas. Problems and Solutions

State of the art

Rural areas across Europe are increasingly confronting a multifaceted crisis of marginalization, shaped by long-standing structural inequalities and amplified by contemporary socio-economic shifts (Bock, 2016). Depopulation, driven by the exodus of younger generations seeking better education, employment, and lifestyle opportunities in urban centers, has led to demographic imbalances, with many rural communities now characterized by aging populations and shrinking workforces (Carr and Kefalas, 2009; Dax and Fischer, 2018; Li et al., 2019). This demographic decline undermines the economic base of these areas, making it difficult to sustain local businesses, attract investment, or maintain essential services such as healthcare, education, and public transportation (Sharpley, 2002). The loss of economically active residents further reduces the tax base, straining municipal budgets and accelerating the withdrawal of public services (Geys et al., 2007). Compounding these demographic and economic challenges is the phenomenon of "relational remoteness," wherein rural areas become disconnected not only physically but also socially and politically from broader networks of economic exchange and governance (Cresswell, 2010). The stigmatization of rural regions as "peripheral" or "left behind" reinforces this cycle of decline, impacting local morale and external perceptions, which can deter efforts to attract new residents or initiatives (Tsfati and Cohen, 2003). Moreover, global trends such as market liberalization and urban-centric economic policies have intensified the vulnerability of rural economies, particularly those still reliant on primary sectors like agriculture, which face volatile global markets and consolidation pressures (Camară, 2020). The rise of austerity measures and welfare state reforms has also disproportionately affected rural communities, where public services are already scarce, leading to further centralization of healthcare, education, and infrastructure in urban hubs (Bock, 2016). This cumulative effect of demographic loss, economic contraction, service withdrawal, and socio-political isolation has entrenched rural marginalization, creating a systemic challenge that requires more than localized solutions.

Solutions

In response to the multifaceted crises faced by rural areas, a range of innovative, community-driven solutions has emerged to foster resilience and sustainable development. Social innovation, with its focus on new social practices and collaborative governance, has become a critical approach to revitalizing marginalized regions (Gillwald, 2000). At the same time, Values-Based Territorial Food

Networks (VTFNs) have gained prominence as place-based agro-food systems designed to reconnect local producers, consumers, and institutions while promoting ethical values such as social justice, environmental integrity, and economic fairness (Nemes et al., 2023). Social innovation offers an alternative to traditional, top-down development models by fostering local agency, empowering communities to co-create solutions that address specific needs (Nyseth and Hamdouch, 2019). This involves reimagining public service delivery through multi-service community hubs and participatory care cooperatives that strengthen social ties and economic opportunities. Social innovation also benefits from nexogenous approaches, where local initiatives are bolstered by external partnerships and resources, to bridge gaps in infrastructure and governance (Bock, 2016). Key to these efforts is the development of strong social capital, trust, and participatory mechanisms that enhance collective action (Zhou et al., 2024).

VTFNs represent a transformative approach within the agri-food sector, seeking to create decentralized, resilient food systems embedded within local cultures and geographies. Unlike conventional supply chains, VTFNs prioritize proximity, transparency, and collaboration among diverse stakeholders (Reckinger, 2022). These networks support short food supply chains (SFSCs) that reduce intermediaries and foster direct relationships between producers and consumers. By embedding agro-food systems within territorial contexts, VTFNs contribute to environmental preservation, cultural heritage, and local economic regeneration. Initiatives such as community-supported agriculture (CSA) schemes, participatory guarantee systems, and regional food hubs exemplify how VTFNs can enhance food security, stimulate local economies, and strengthen rural-urban linkages (Farreras and Salvador, 2022; Hermiatin et al., 2022; Mert-Cakal and Miele, 2021). However, the success of these approaches depends on addressing several challenges. Effective governance structures are needed to balance diverse stakeholder interests and navigate potential conflicts between local values and external policy frameworks (Siddiki et al., 2015). Ensuring inclusivity and equity requires deliberate efforts to avoid the co-optation of initiatives by powerful actors or the exclusion of marginalized groups (Aleu et al., 2022). Additionally, scaling up successful initiatives without compromising their core values necessitates adaptive management and continuous social learning, involving the understanding of context-specific successes, and the assessment of relevance in different settings (Carter and Currie-Alder, 2006).

Policy support is crucial to foster the conditions for social innovation and VTFNs to thrive. By integrating territorial perspectives into rural development strategies, policymakers can enhance the visibility and resilience of agro-food networks while addressing systemic inequalities.

Bio-district Model

The concept of bio-districts in Europe has evolved as a response to the growing need for sustainable territorial development rooted in organic agriculture and community-driven governance. Emerging initially as a grassroots movement, bio-districts reflect the principles of agroecology and place-based food systems that prioritize environmental sustainability, local economic development, and social cohesion (Passaro and Randelli, 2022). The early establishment of these districts was shaped by the recognition that rural areas required integrated approaches to address specific challenges. Over time, the idea gained traction within the European Union as policymakers began to view bio-districts as innovative governance models capable of fostering sustainable rural-urban synergies (Ovaska et al., 2021). This recognition led to their formalization within EU frameworks for organic production, highlighting their potential to align with broader sustainability goals, including those outlined in the European Green Deal and Common Agricultural Policy reforms (Mazzocchi et al., 2022). The spread of bio-districts across various European regions was further supported by local, national, and transnational initiatives promoting collaboration among farmers, civil society, and public authorities. Legislative frameworks and funding mechanisms at both the national and EU levels played a critical role in this expansion, enabling Bio-districts to institutionalize their practices and engage in knowledge-sharing networks that reinforced their territorial identity. The concept gained significant momentum with the establishment of the first bio-districts in the early 2000s, notably the Cilento Bio-district in Italy and BioVallée in France.

In 2021, the European Union acknowledged the potential of Bio-districts by including them in the Action Plan for the Development of Organic Production (European Commission, 2021a). This plan (p.15) defines a bio-district as "a geographical area where farmers, the public, tourist operators, associations, and public authorities enter into an agreement for the sustainable management of local resources, based on organic principles and practices." Further reinforcing this commitment, the EU's Long-Term Vision for Rural Areas, published in 2021, sets the underscore the potential of governance models to sustain rural development. The document emphasizes that bio-districts can strengthen the role of farmers, increase their income, and contribute to the prosperity of rural areas by promoting sustainable practices and local value chains (European Commission, 2021b).

These policy endorsements have facilitated the spread of bio-districts across Europe, with initiatives emerging in countries such as Austria, Switzerland, Portugal, and beyond. The development and proliferation of bio-districts in Europe and beyond have been significantly influenced by the activities of international networks such as the International Network of Eco-Regions (IN.N.E.R.) and the Global Alliance for Organic Districts (GAOD). IN.N.E.R, established in 2014, has positioned itself as a key actor in promoting Bio-districts as a governance model that combines organic agriculture with territorial development. Similarly, GAOD, which was launched in 2020, has sought to position bio-districts within global sustainable development agendas, emphasizing their potential contributions to the Sustainable Development Goals (SDGs). However, some critics argue that such participatory approaches can be undermined by endogenous community imperfections like power imbalances and limited resources (Platteau and Abraham, 2002). Moreover, the use of indigenous knowledge for rural development can showcase problems including romanticization and decontextualization (Briggs, 2005).

The increasing institutionalization of bio-districts through policy frameworks also raises concerns about co-optation by powerful actors and the potential shift from grassroots-driven processes to bureaucratic governance structures. Agroecology's trajectory illustrates how co-optation can occur: after being largely disregarded by major agricultural institutions, it was eventually acknowledged but often reduced to a set of technical fixes for industrial farming rather than embraced for its broader socio-ecological vision (Giraldo and Rosset, 2018). This experience foreshadows what may happen as bio-districts become more integrated into policy frameworks: dominant actors risk overshadowing local communities and transforming what began as grassroots initiatives into bureaucratic structures, potentially diluting their original transformative goals. As the concept continues to spread, a critical assessment of how these networks shape the discourse and practice of bio-districts is essential to ensure that they remain true to their original principles while adapting to new contexts and challenges.

Relevance of Social Sustainability

In order to monitor the development of social innovation initiatives and the potential contribution to the multiple challenges that are faced by rural areas, social sustainability evaluation is increasingly recognized as an essential pillar (Ravazzoli et al., 2021). Social sustainability emerged prominently alongside environmental sustainability during the environmental movements of the 1960s and 1970s (Norman, 2002). The concept gained prominence with the Brundtland Report of 1987 (Wced, 1987), marking the first comprehensive attempt by the United Nations to integrate social aspects explicitly

306 within sustainable development, emphasizing intergenerational equity and societal well-being. Despite
307 increased attention, the social dimension of sustainability remained conceptually complex and difficult
308 to define consistently across different contexts, often interpreted through subjective cultural, social, or
309 ethical values rather than objective criteria (Colantonio, 2009).

310 Social sustainability in agriculture has historically been overshadowed by environmental and economic
311 dimensions, receiving relatively less attention. Approaches from political economy (Bryden and Hart,
312 2004; Bryant and Bailey, 1997) initially analyzed rural livelihoods and agricultural communities, often
313 without explicitly embedding sustainability objectives. Scholars have explored specific social themes
314 within agriculture, such as working conditions (Dumont and Baret, 2017), rural community
315 development (Hallstrom et al., 2017), and labor conditions in farming systems. Despite these
316 contributions, a comprehensive, holistic framing of social sustainability within agriculture has
317 remained elusive (Dumont and Baret, 2017). Recently, scholars have increasingly recognized the
318 necessity of explicitly addressing social sustainability within agricultural systems, emphasizing that
319 the social dimension is crucial for achieving overall sustainability. Social sustainability can now be
320 analyzed through various lenses, including political economy, rural sociology, and social sciences,
321 each offering unique perspectives and methodologies. The themes commonly explored include fair
322 labor conditions, education, rural vitality, community cohesion, equity, and inclusion, all of which
323 contribute to fulfilling human needs and enhancing the quality of life within rural communities
324 (Hallstrom et al., 2017; Missimer et al., 2017).

325 Therefore, the assessment of social sustainability, through measurable indicators and participatory
326 approaches, has been identified as a crucial strategy to ensure that community-led initiatives. Such as
327 bio-districts remain inclusive and transparent (Sannou et al., 2023). The analysis of the social
328 dimension in any phase, from production to retail, avoids to undermine broader sustainability goals
329 (Béné et al., 2020). In this context, monitoring bio-districts could enhance social sustainability by
330 embedding practices that ensure fair labor, access to education, and community-building efforts,
331 ultimately countering rural marginalization. However, due to the context specific issues of rural areas,
332 it is essential to adopt tailored, participatory assessment methods that capture local realities. Without
333 consistent monitoring and assessment, there is a risk that such approaches could become a vague or
334 symbolic goal rather than a transformative force for marginalized rural areas (Schwilch et al., 2011).

Rationale behind the Study and Objectives

Despite increased scholarly attention toward social sustainability within agricultural systems, research explicitly dedicated to understanding and assessing social sustainability remains fragmented, subjective or insufficiently mapped (Colantonio, 2009). In particular, there is a notable gap in systematically exploring how territorial governance models, such as Bio-districts, concretely contribute to achieving social sustainability goals. Should we not consider social dimensions in rural areas by regarding bio-districts as structures of participatory territorial governance? This gap highlights the necessity for focused studies that explore, document, and evaluate best practices and innovative grassroots solutions emerging in rural areas. Social sustainability is not merely a supporting element but a core component that shapes the capacity of rural areas to thrive. This study aims to address this gap by investigating the role of social sustainability in fostering rural vitality, with a particular focus on the potential of bio-districts as territorial governance models. Drawing from existing theoretical discussions on agroecology and social innovation, it is evident that innovative governance models like bio-districts face significant challenges, including risks of co-optation, institutionalization, and dilution of their transformative potential when absorbed by mainstream institutions (Anderson and Maughan, 2021). Bio-districts must navigate the tension between preserving grassroots authenticity and becoming integrated into existing power structures. As Giraldo and Rosset (2018) illustrate in their analysis of agroecology, similar territorial governance models need critical examination to prevent their reduction to merely technical solutions, thereby maintaining their capacity for meaningful social change.

The aim of this research, therefore, is to develop a clear and context-sensitive conceptual framework for evaluating social sustainability within bio-districts. This conceptual framework will identify effective indicators and assessment tools to measure actual improvements in areas that are under the influence of VTFN and SI. Such a framework will not only reveal the strengths and areas of improvement within existing bio-district models but also offer practical guidance to policymakers and local communities. Ultimately, the goal is to ensure bio-districts genuinely tackle issues in rural areas such as marginalization, outmigration and loss of services, aligning policy objectives with grassroots realities and safeguarding the transformative potential inherent in these innovative territorial models.

General Structure

This thesis comprises three distinct research studies, each addressing specific aspects of the overarching topic. Each study is presented as an individual chapter, with dedicated introductions and conclusions that connect its findings to the broader thesis discussion. Chapter 2 offers a comprehensive literature review on the social dimensions related to bio-districts, identifying gaps in existing evaluation tools. It underscores the need for context-specific indicators and participatory approaches to effectively capture the social, economic, and environmental dimensions of these territorial initiatives. Chapter 3 investigates social sustainability in rural areas affected by SI by developing a framework on rural vitality, using bio-districts in Italy and Sweden as case studies. The chapter examines how alternative food networks, governance structures, and community engagement contribute to social cohesion, economic resilience, and environmental sustainability in rural areas affected by depopulation and economic decline. By analyzing the interaction between local dynamics and broader socio-political contexts, the study identifies the key drivers of successful rural revitalization, as well as the barriers—such as governance limitations, individualism, and communication challenges—that can impede social innovation initiatives. This analysis draws on semi-structured qualitative interviews with local stakeholders to provide an in-depth understanding of these dynamics. Chapter 4 develops an analytical framework composed of various indicators to assess socially significant aspects within bio-districts. Building on the insights from the previous studies, this framework integrates both the findings from the literature and empirical knowledge from local actors, aiming to provide a more nuanced evaluation of social sustainability practices in these contexts. Chapter 5 synthesizes the findings from the preceding chapters, discussing their contributions to the understanding of social sustainability in rural areas and the role of bio-districts in promoting rural development. The discussion also addresses the implications for policymakers, supply chain actors, and other relevant stakeholders, offering targeted recommendations for future research and practice related to social sustainability across alternative food systems. Finally, chapter 6 concludes the thesis by summarizing the key insights gained from the research, highlighting the overall contributions of the study, and reflecting on potential directions for further investigation.

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Chapter 2. Comparing Social Sustainability Assessment Indicators and Tools for Bio-districts: Towards an Analytical Framework

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Introduction

Interest in analyzing global food systems has generally been driven by concerns ranging from the environment, equity, power and trade to nutrition and health issues (Béné et al., 2019). Responsibility has been addressed to some structural aspects that directly shape human well-being (Lombardi et al., 2019) and account for a vast proportion of the human-nature impacts. Of the 3.4 billion people living in rural areas (UNDESA, 2021), the vast majority still depend on agriculture and food systems for their livelihoods (Woodhill et al., 2022). This makes them vulnerable to any form of shock to food and economic systems, as most rural people live in poor and vulnerable contexts, especially in low and middle-income countries (Tendall et al., 2015). For example, Guatemalan farmers which live of subsistence and commercial food production, struggled to cope with the commercial restrictions during the COVID-19 pandemic as loss of off-farm employment and lack of access to agricultural inputs were a threat to their livelihood (Rice et al., 2023). In addition, awareness of the conditions under which food is produced is often missing, leading to human rights violations (Farnsworth, et al. 2018), with many agricultural commodity supply chains characterized by inadequate working conditions, overlooked land rights and gender inequality (UNDESA, 2021). Only after the shocks caused by increasing economic and political instability, has the critical importance of food workers and their value to society been recognized, which contrasts sharply with the typically hidden nature of such labor (Klassen et al., 2023).

Therefore, the concept of food and agricultural system transformation has attracted the attention of many scholars, practitioners and policy makers (Chandra et al., 2019; Leclère et al., 2014). The body of research on the subject of 'sustainability transitions' has emerged, providing valuable insights into

how societies can achieve deep systemic transformations. In discussions of food system transformation, the literature often distinguishes between two major approaches. One emphasizes large-scale interventions, driven by experts or corporations and hinged on cutting-edge technologies (National Academies of Sciences and Medicine, 2019). The other focuses on small-scale changes and grassroots initiatives, featuring civil society-led processes of self-organization (Anderson et al., 2019).

In parallel with these two broad strategies for food system transformation, agroecology has gained prominence as an alternative framework for managing agricultural and food systems (Ewert et al., 2023). A plethora of different definitions of agroecology have been provided, following the different agendas of different institutions and countries (Wezel et al., 2020). However, there is a common agreement on the transdisciplinary nature of agroecology, which, unlike other approaches, promotes linkages across sectors and organizations of different sizes to address complex sustainability challenges (Pigford et al., 2018). Agroecology can be understood as a scientific discipline, a set of agricultural practices, and a social movement (Francis et al., 2003; Wezel et al., 2009; Ploeg et al., 2019). As a scientific discipline, it examines the ecological processes that underpin sustainable food systems, emphasizing interdisciplinary research methods spanning agronomy, ecology, and the social sciences. Through this lens, agroecological studies identify pathways to reduce environmental impacts, for instance, by promoting biodiversity on farms, enhancing soil fertility without chemical dependence, and improving resilience to climate-related challenges (Ploeg et al., 2019). These scientific insights feed directly into the practice-oriented dimension of agroecology, which provides practical guidelines and techniques, such as crop diversification, organic soil management, and participatory plant breeding, that help farmers maintain both high-quality production and long-term ecological balance (Altieri, 2018).

Meanwhile, agroecology as a social movement broadens the scope beyond technical or ecological considerations, calling for socio-economic reforms that make rural areas economically viable and socially just (Molina, 2013). Core objectives include empowering smallholders and family farmers, strengthening food sovereignty, and ensuring equitable access to resources such as land, water, and seeds (Wezel et al., 2009). By upholding local knowledge, cultural traditions, and respect for Indigenous communities, agroecology also contributes to social sustainability, helping preserve rural identities and bolster collective resilience (Espluga-Trenc et al., 2021).

A concrete example of agroecological principles applied to food systems is represented by bio-districts (also called “ecoregions” or “organic regions”), as shown in Figure 1. In the existing literature, bio-

563 districts are generally described as territorially based initiatives aimed at organizing agricultural
564 production and local resources under organic or agroecological principles (Poponi et al. 2021). Some
565 authors characterize them as a form of rural governance that follows a bottom-up trajectory, implying
566 grassroots involvement in shaping both local policy and production systems (Assiri et al. 2021). The
567 term “bio” is associated with the widespread adoption of organic farming methods, while “district”
568 highlights a concentration of small to medium enterprises that are regionally specialized in agricultural
569 and related rural services (Guareschi et al. 2020).

570 Many studies regard bio-districts as examples of alternative food systems (AFSs), wherein production,
571 processing, distribution, and consumption occur within a bounded geographical area (González De
572 Molina and Lopez-Garcia 2021). These systems are often linked to alternative food networks (AFNs),
573 including short supply chains, direct farmer-to-consumer channels, or region-based labels, and are said
574 to share values related to environmental sustainability and socio-economic fairness (Murdoch et al.
575 2000; Cacho et al. 2018). Nonetheless, some scholars note that large-scale food and beverage industries
576 are increasingly interested in so-called “alternative” or “high-quality” products, raising questions about
577 whether organic production or distinct distribution structures alone are enough to qualify a system as
578 genuinely “alternative” (Scrinis 2016). In response to such concerns, certain publications point to a
579 “third pillar” in bio-districts: economic models and practices that extend beyond conventional profit
580 motives, incorporating goals related to social well-being and environmental care (Rosol 2020). This
581 perspective often draws on the idea that various “hidden” or “alternative” economic activities, such as
582 non-monetary transactions, cooperative financing, or self-consumption, can contribute to social well-
583 being and ecological preservation (Gibson-Graham 2008). According to some authors, bio-districts are
584 thus aligned with a broader territorial transition toward agroecology, encompassing food security,
585 resource conservation, rural population protection, research, training, and financial coordination
586 (Wezel et al. 2018; Dias et al. 2021; Gargano et al. 2021; Zanasi et al. 2020). Although the specific
587 benefits attributed to bio-districts vary across regions and studies, several sources underscore their
588 potential to promote more sustainable consumption patterns and strengthen local economies (Kamau
589 et al. 2018).

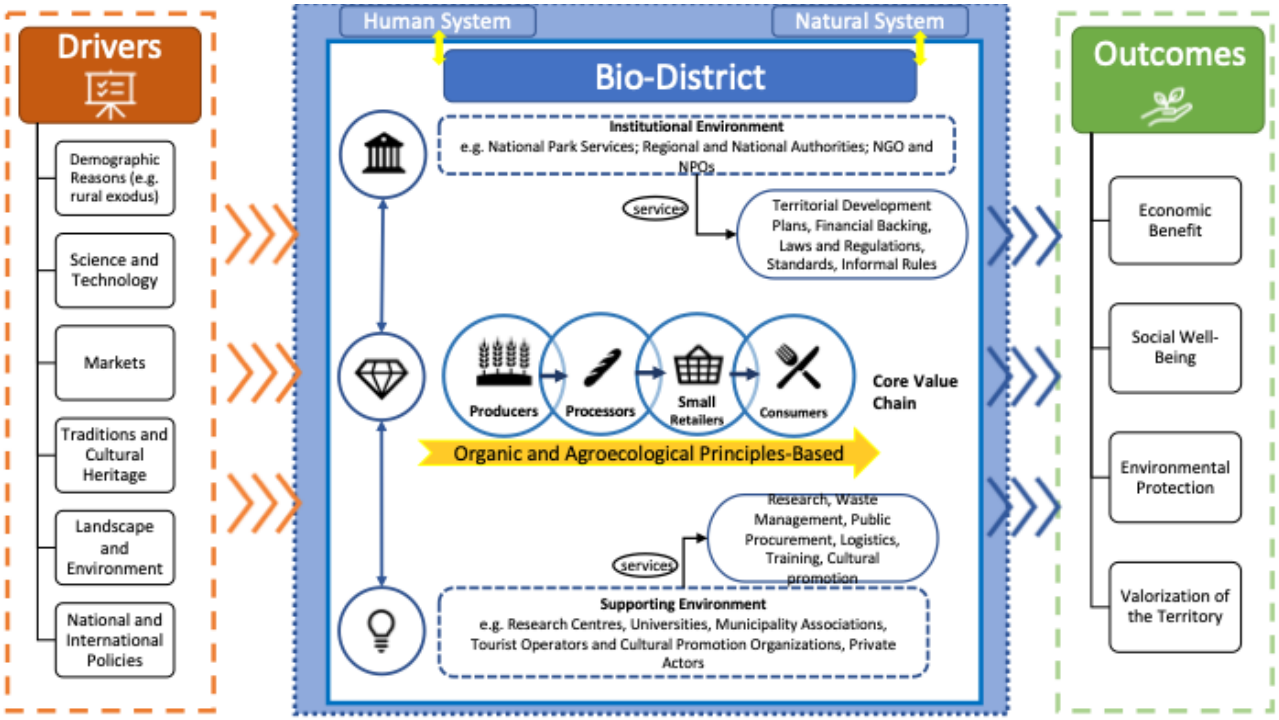


Figure 1. Conceptual model of a bio-district. Adapted from Woodhill et al. (2022).

While organic certification provides rigorous criteria for agricultural processes, it does not explicitly incorporate social and ethical dimensions, such as fair labor conditions or gender considerations, into its standards (Padel et al., 2009). Indeed, Regulation (EU) 2018/848 outlines various principles of organic production but excludes numerous social concerns, as shown in Fig. 2. The ongoing "conventionalization" of organic farming may shift attention away from social priorities, gravitating instead toward more intensive, industrialized production models (Reed, 2005). Although voluntary certification schemes attempt to address a broader range of sustainability issues (including social ones), questions of cross-country equivalences and reliable control procedures remain unresolved (Cavallet et al., 2018).

Moreover, research on sustainable food systems often focuses on economic and environmental dimensions, with social aspects receiving comparatively less attention (Eizenberg and Jabareen, 2017). One reason for this gap is the conceptual fragmentation in social science, which has led to inconsistent definitions of what "social matters" means (Littig and Griessler, 2005) and how best to measure it (Beske-Janssen et al., 2015). Complicating matters further, social sustainability is both dynamic and context-dependent—it evolves over time and may necessitate continual updates to the issues it encompasses (Dempsey et al., 2011; Boström, 2012).

As a result, the literature still lacks a comprehensive framework for describing or quantifying the social impacts of diverse territorial governance models, including bio-districts, even though there is growing pressure from governments, civil society, and other stakeholders to integrate social criteria into sustainability assessments (Mani et al., 2016). This gap is especially notable for bio-districts, since social outcomes figure prominently in the strategic plans required by INNER[2] and, in some cases, by national legislation at the outset of a new bio-district (Italian Ministry of Agricultural, Food and Forestry Policies, 2022). Relying solely on quality labels or specific distribution channels to define an "alternative" system may obscure broader social goals, underscoring the need for more robust indicators of social sustainability (Adams et al., 2021; González De Molina and Lopez-Garcia, 2021).

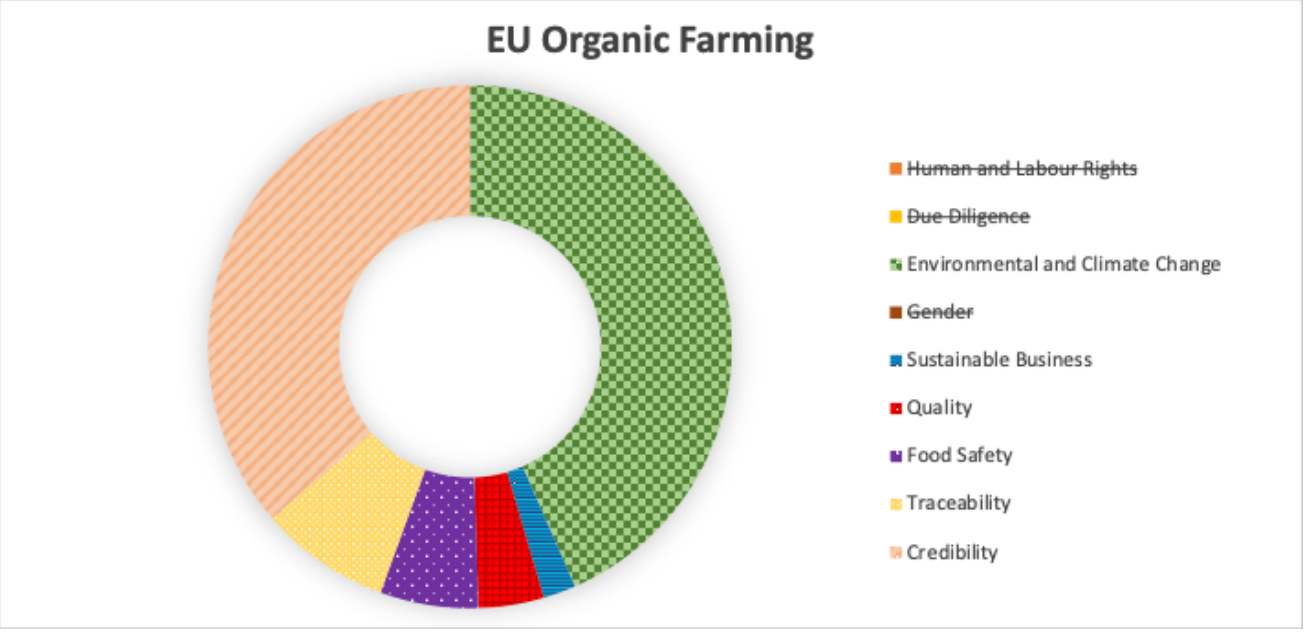


Figure 2. Main sustainability topics covered by the EU organic label. The deleted topics, which are directly related to social issues, are not addressed by the label. Source: ITC Standards Map (https://www.standardsmap.org/en/identify?name=EU%20%20Organic%20Farming).

In light of these considerations, the present study aims to contribute to the evaluation of the social impact of bio-districts. Specifically, we propose an analytical framework to help researchers and practitioners select appropriate tools and indicators for social impact analysis. By clarifying which social dimensions are relevant and how they may be tracked across different contexts, this framework

[2] Cf. https://biodistretto.net/wp-content/uploads/2016/11/disciplinare_INNER_IT.pdf.

seeks to address a pressing need for more systematic, evidence-based approaches to evaluating social sustainability in bio-districts. Hence, the following research questions were defined:

1. What are the main social sustainability issues addressed by bio-districts?
2. What are the main categories of social indicators used to analyze the social impact of bio-districts?
3. How can existing tools and frameworks be applied to the social impact analysis of bio-districts?
4. Can social sustainability be assessed in different bio-district contexts?

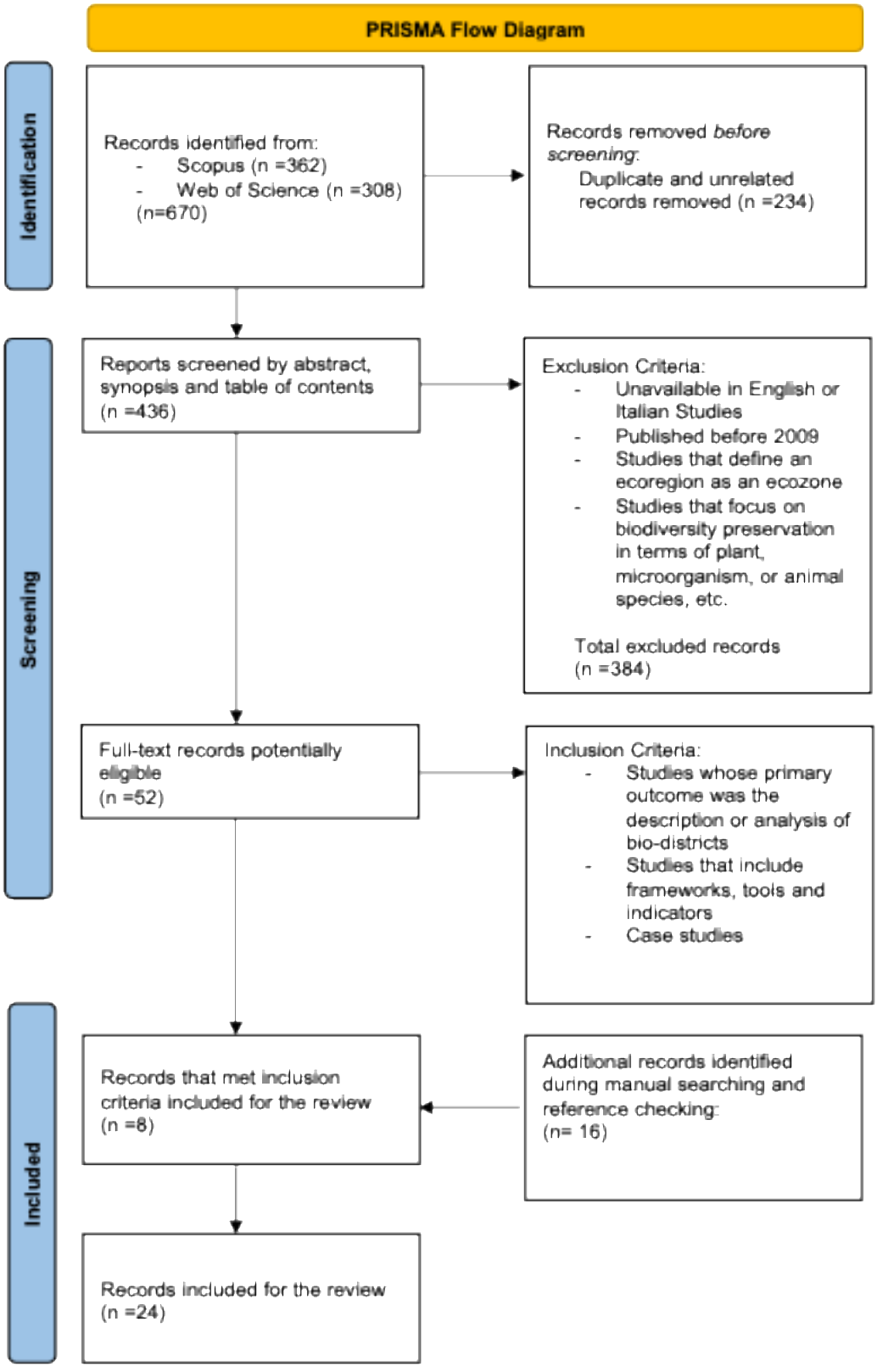
Based on the research questions, this paper will provide a comprehensive overview of the main social topics addressed by bio-districts and of the indicators fitting their different characteristics. The focus will be on the role that bio-districts play in promoting social sustainability for small-scale farmers, the whole rural community, and the other relevant external stakeholders.

The paper is structured as follows: in the first part a systematic review of the literature on all the social issues that characterize bio-districts and on the different methodologies for assessing social sustainability will be carried out; in the second part, indicators, analytical frameworks and social sustainability assessment tools will be selected and compared to build an analytical framework for assessing the social impacts of bio-districts.

Methods

Systematic Literature Review

The literature review was carried out according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2009; Page et al., 2021). The PRISMA statement was chosen because it provides a set of recommendations designed primarily to support transparent and complete reporting of systematic reviews (Sarkis-Onofre et al., 2021). Sources of data included academic research documents, journal articles, proceedings, government and international agency studies, reports, working papers, and other gray literature sources, published in English, following a three-step research path as illustrated in Figure 3.



652

653 **Figure 3**. Three-phase systematic review process illustrating the number of records identified (n),
654 screened and included in the final synthesis.

The first step included the identification of relevant peer-reviewed scientific literature. The search was conducted between February and September 2022 in the web platforms and databases "Scopus" and "Web of Science". Different combinations of keywords were applied, such as "bio district*," "eco region*," "organic district*," "measurement," "assessment," "analysis," linked with Boolean operators "AND" and "OR". 670 records were identified from the databases and 234 remained after removing duplicate citations. In order to reduce the large number of documents and retain only the relevant ones, the studies were then screened by evaluating the abstracts according to the inclusion and exclusion criteria described in Table 1.

Table 1. Eligibility criteria for the systematic review.

Inclusion criteria	**Exclusion criteria**
- English documents - Studies published from 2005 - Studies whose primary outcome is the description or analysis of bio-districts, taking as a reference for bio-district the definition given in the EU organic action plan - Studies that include frameworks, tools, indicators or other assessment approaches	- Non-English documents - Studies published before 2005 - Documents that refer to bio-districts in different meanings than the one of the organic action plan - Studies that describe ecozones (ecological zones) - Studies that focus on biodiversity preservation in terms of plants, microorganisms or animal species

The search was restricted to publications in English and to publications from 2005 onwards. Particular attention was paid to the definition of bio-districts, as some authors use the term eco-regions, which can be confused with ecological regions, which are described as areas of relative homogeneity in ecosystems. (Omernik and Bailey, 1997). Full texts of potentially eligible documents that met the inclusion criteria were then retrieved and assessed for inclusion. By implementing a snowballing technique, 16 additional relevant studies were identified and included based on reference lists of the

included documents and suggestions from website platforms such as Google Scholar. The result was that 24 documents were included in the literature review and the majority came from the snowballing technique. Eventually, the documents have been categorized based on their country, impact assessment, suggested social indicator(s) and whether or not social impacts were assessed.

Identification of Social Indicators

A key challenge in social impact assessment is the lack of consensus on which indicators should be employed, at what scale, and with which methodological approaches (Heinzle et al., 2007). Although some researchers have attempted to operationalize social sustainability quantitatively (Hutchins and Sutherland, 2008; Popovic et al., 2018), many note the difficulty of assigning numeric thresholds to culturally and contextually shaped concepts such as quality of life or societal well-being (Janker and Mann, 2020). Consequently, social topics are often underrepresented in evaluations of sustainability.

To address this gap in the context of bio-districts, we adopted a systematic procedure to extract and filter indicators from relevant studies. After selecting literature pertinent to bio-districts and social sustainability, we examined each publication to identify any references to social indicators or measures. In refining the final set of indicators, a two-step process was applied. First, any metrics referring solely to environmental or purely economic performance (for example, carbon emissions or profit margins) were removed, as they did not reflect a clear social dimension. Second, the remaining indicators were re-evaluated to verify if they included pertinent contextual details: for example, stakeholder group or community affected, relevance to a social impact category, or supply chain stage (production, processing, distribution, or consumption) to which they applied.

Several quantitative indicators, often associated with economic analysis, were retained because they served as proxies for broader social well-being. Some indicators commonly regarded as economic, such as per capita income (euro), were included only if they appeared alongside other socially relevant indicators. In practice, per capita income was retained when it served as part of a broader cluster of metrics, for instance when combined with data on youth employment, demographic changes, or community well-being. Similarly, demographic indices that gauge aspects such as aging or youth participation were included only if they demonstrated a tangible relationship to social conditions or equity. Qualitative indicators, such as stakeholder involvement or governance quality, were admitted when descriptions clarified the groups involved and the specific form of social engagement or benefit. Mixed indicators that combined numeric data with contextual elements, such as job creation paired

with an explanation of working conditions, were retained provided they aligned with clearly defined social outcomes.

Overall, this approach ensured that each indicator, whether quantitative, qualitative, or mixed, contributed to an integrative understanding of social sustainability within bio-districts.

Content analysis

The goal of this analytical step was to identify different social sustainability issues relevant to bio-districts and to gauge the extent to which these issues are addressed in the existing literature. To accomplish this, a content analysis approach was adopted, guided by the objective, systematic, and generalizable qualities outlined by Kerlinger (1986). As Prasad (2008) notes, content analysis can quantify observations about a phenomenon, here, social impacts, by linking them to frequency counts of carefully chosen keywords.

Initially, a set of 26 coding schemes (or "social themes") was developed based on relevant sustainability literature, including the SDGs and their targets. Each theme was then associated with a group of keywords (Supplementary Table A). For example, the theme "Health" was captured through words such as "health," "well-being," "disease*," or "hazard*," and the theme "Healthy diet" by "nutrition," "food consumption," or "malnutrition." Similarly, "Access to services and inputs" was searched through terms like "access," "land," "services," and "inputs." These specific keyword clusters emerged from known terminology in policy documents, previous research on social sustainability, and established goal frameworks (Hsieh and Shannon, 2005).

After establishing the keyword list, we deployed the computer-assisted qualitative data analysis software ATLAS.ti to search the selected documents. We ran separate queries for each theme's set of keywords. To illustrate, if we needed to detect "Food security" (theme) within the text, we looked for instances of "food security," "availability," or "affordability." We then cross-checked the context of each occurrence to prevent double counting or misinterpretation. For example, "health" might appear in a sentence that actually referred to "health hazards" in a purely environmental sense, prompting a closer read to confirm that it indeed related to a social dimension.

Once keywords were gathered in ATLAS.ti, they were manually assigned to their corresponding theme, adhering to the predefined coding schemes. To ensure consistency, each text excerpt was reviewed for its thematic alignment: "Health," for instance, encompassed general well-being, disease, or hazard references, while "Healthy diet" specifically focused on nutrition-related issues. Whenever ambiguity

arose (e.g., a phrase potentially signifying more than one theme), we used the broader sentence context to determine the most accurate thematic assignment, thereby minimizing subjectivity (Popovic et al., 2018). The frequency of each theme's keywords served as a proxy measure of how strongly the literature on bio-districts engages with that social issue.

Finally, to facilitate further discussion and the creation of a transparent analytical framework, these themes were referred to as "social themes" rather than simply "coding schemes." Higher word counts indicated greater emphasis on a theme within the bio-district discourse, while lower counts suggested possible underrepresentation. Through this process, we obtained a quantitative snapshot of which social issues, ranging from governance, fairness, or education to health and healthy diet, are most prominent in the current narrative on bio-districts.

Comparative Analysis of Social Sustainability Tools for Bio-districts

Once the content analysis was completed and the key social themes for bio-districts were identified, a comparative review of existing sustainability frameworks and tools was undertaken. The central purpose of this step was to determine which assessment methodologies might be most appropriate for analyzing each social issue within bio-districts, where multiple stakeholders operate across an integrated supply chain and socio-ecological system (Janker et al., 2019). While many existing evaluations of social sustainability concentrate on individual farms or enterprises (Brennan et al., 2020), this study recognizes that bio-districts entail a broader network of relationships, making supply/value chain and systems approaches particularly relevant.

In line with the approaches employed by Janker and Mann (2020) and Desiderio et al. (2022), this study conducted a targeted literature review to identify suitable social sustainability frameworks. Rather than following a fully systematic protocol, an iterative "snowball" approach was used starting from the two previously mentioned studies, wherein each relevant paper or review led to further sources of potentially applicable tools. This method enabled the identification of frameworks, that could be adapted to the broader governance structures and diverse social themes found in bio-district contexts.

The relevant frameworks and tools were screened using five criteria: (a) they had to allow ex-post evaluations; (b) they had to integrate social indicators; (c) they had to accommodate multiple scales, from farm-level up to the broader supply chain or system; (d) they had to support a multi-stakeholder perspective consistent with bio-district governance; and (e) they had to be adaptable to organic or agroecological conditions. The emphasis on supply/value chain and systems approaches reflects the

763 premise that bio-districts link production, processing, distribution, and consumption in ways that
764 single-farm assessments might overlook (Janker et al., 2019).

765 Using these criteria, a set of seven candidate tools, was identified:

766 The Indicateurs de Durabilité des Exploitations Agricoles (**IDEA**) framework was developed in France
767 to operationalize the concept of farm sustainability and has been in use since the late 1990s (Zahm et
768 al., 2008). It was originally envisioned as a self-assessment tool for farmers, although it has also been
769 employed by advisors and policy stakeholders to evaluate how farms perform across environmental,
770 economic, and social dimensions. The IDEA method bases its sustainability vision on three core
771 "scales": agroecological (which emphasizes crop diversity, space management, and farming practices),
772 socio-territorial (which addresses how a farm integrates into local landscapes, economic networks, and
773 social structures), and economic viability (which examines aspects such as farm income, financial
774 autonomy, and asset transferability). Each scale contains multiple components and a specific set of
775 indicators; the tool quantifies performance in each area and ultimately derives a farm-level
776 sustainability score. Although IDEA focuses largely on the farm scale, the socio-territorial dimension
777 does extend beyond the immediate enterprise by evaluating factors like local employment, social
778 services, and short supply chains. This has facilitated its application in contexts where community
779 engagement and the interplay between agriculture and territory are central concerns. In practice, IDEA
780 has been used on more than a thousand French farms to highlight differences in sustainability among
781 diverse production systems, and it has seen pilot applications in other regions (Zahm et al., 2008). One
782 of its distinguishing features is the requirement that users adapt or refine certain indicators to the local
783 context, an aspect that researchers see as fundamental to capturing social realities and complex rural
784 dynamics.

785 Monitoring Tool for Integrated Farm Sustainability (**MOTIFS**) (de Mey et al., 2011) was developed
786 to assess and guide sustainability transitions on Belgian farms. It focuses on dairy farms, but has been
787 adapted for other contexts as well. The tool employs a set of indicators, grouped into ecological,
788 economic, and social themes, aiming to give farmers a multi-level view of their farm's performance.
789 MOTIFS depicts results in a radar graph to help users quickly gauge strengths and weaknesses. One of
790 its distinguishing features is the participatory approach, wherein researchers and farm advisers
791 collaborate with farmers to gather data and interpret the results in discussion sessions. These sessions
792 are meant to stimulate learning and knowledge exchange, enabling farmers to see how changes in one
793 dimension (e.g. fertilizer use) may influence another (e.g. economic returns or workplace conditions).

While MOTIFS can be considered relatively user-friendly in its final presentation, its developers have noted the significance of having sufficient data available and ensuring that farmers and advisers receive adequate training in using the tool. MOTIFS can help anchor dialogue on sustainability by providing a reference point for comparing farm performance over time or against a peer group, thus providing tangible incentives and feedback for continuous improvement (de Mey et al., 2011).

The Public Goods (**PG**) tool (Gerrard et al., 2012) was developed to gauge how effectively a farm supplies a range of non-market benefits deemed "public goods," such as biodiversity, healthy soils, water quality, and social or community contributions. Although it originated in the context of English agri-environment schemes, particularly for organic farms, it embodies a broader principle of "triple bottom line" evaluation by considering environmental, economic, and social factors. The categories span areas such as soil management, landscape and heritage, energy use, food security, farm business resilience, and even animal welfare. Scoring relies on a mixture of quantitative and qualitative data, attempting to use metrics already present in a farm's own records to minimize complexity and avoid imposing excessive reporting burdens on farmers (Andreoli and Tellarini, 2000). The pilot phase involved forty organic farms, and results indicated that the PG tool could distinguish well between operations that were strong providers of certain public goods (e.g., advanced conservation plans or robust community engagement) versus those that could improve. Feedback from participating farmers highlighted the relevance of the radar-diagram visualization, which helped them quickly grasp where they stood relative to benchmarks. At the same time, the initial trials underscored the challenge of collecting reliable data for social metrics, a recurring theme in many integrated sustainability tools. Overall, the PG tool's experience suggests that delivering a straightforward yet comprehensive overview of public goods can spark farmer engagement and facilitate policy assessments of agri-environmental measures.

Response-Inducing Sustainability Evaluation (**RISE**) (Häni et al., 2003) is designed to provide a holistic snapshot of a farm's sustainability by examining a balanced set of ecological, economic, and social indicators in a single integrated assessment. RISE adopts a "driving force–state" approach, whereby each indicator is split into a "driving force" (D) variable (the pressure exerted on the system, e.g., fertilizer inputs) and a "state" (S) variable (the measured or estimated actual condition, e.g., nutrient balances). Each component is mapped to a 0–100 scale, and the net sustainability score (S – D) ranges from –100 to +100. The model covers indicators such as energy use, soil quality, water usage, local economy contributions, and farm family/social conditions. Its emphasis on a visually

interpretable output, often shown in a twelve-spoke "sustainability polygon," helps farmers and advisers pinpoint where negative pressures exist relative to the actual state (for instance, overuse of water or lack of farmland biodiversity) and thus identify opportunities for improvement. RISE has been trialed internationally, including in Switzerland, China, Brazil, and Canada, and consistently highlights that its capacity for both capturing the long-term risk factors and offering a straightforward graphical presentation aids in farm-level decision-making and learning. However, like other indicator-based methods, it relies heavily on accurate data availability and can require significant local adaptation to capture region- or sector-specific challenges (e.g., manure storage for intensive dairy farms).

The Sustainability Assessment of Food and Agriculture systems (**SAFA**) Guidelines (FAO, 2014) were conceived to provide a holistic framework for evaluating how effectively enterprises and broader value chains in agriculture, forestry, and fisheries address sustainability. Anchored in four interconnected dimensions, good governance, environmental integrity, economic resilience, and social well-being, SAFA aims to foster a shared understanding of sustainability across diverse contexts, geographies, and operational scales. Its structure comprises 21 thematic areas, further divided into 58 sub-themes, each with clear performance objectives and proposed default indicators. Rather than prescribing narrow technical measures, SAFA encourages users to integrate existing metrics from other standards or certifications, minimizing duplication and facilitating consistency with prevailing data-collection efforts.

Within the social dimension, the Guidelines focus on themes such as decent livelihoods, fair trading practices, labour rights, equity, human health and safety, and cultural diversity. These themes illuminate critical issues ranging from living wages and labor conditions to communal well-being and the preservation of local cultural identities. Users are guided to employ performance-oriented metrics, blending quantitative data (for example, income levels and working hours) with qualitative insights (such as stakeholder perceptions of cultural integrity), so that social aspects receive the same rigorous treatment typically afforded to environmental and economic assessments.

In practical terms, SAFA was piloted in around thirty distinct settings between 2012 and 2013 to assess its usability across various scales and supply chains (FAO, 2014). The pilots included smallholder operations, larger companies, and integrated value chains, revealing that while the method's breadth poses challenges, particularly in data-intensive areas such as social indicators, it also provides a flexible and comprehensive system. User feedback highlighted the benefits of visual reporting outputs (for

instance, spider diagrams) for quickly gauging areas of strength and weakness, alongside the need for continued refinement of context-specific thresholds, especially in social domains.

The Best Practice Guideline for Agriculture and Value Chains (**SOAAN**, 2013), articulates a comprehensive framework for fostering sustainability in organic agriculture across the entire value chain. Rooted in the organic movement's core principles of health, ecology, fairness, and care, the document is intended as a formative resource rather than a compliance instrument. It offers a holistic vision of sustainable development in agriculture, emphasizing the interdependence of ecological, economic, social, cultural, and accountability dimensions. Designed to be applicable across diverse geographies and scales, from smallholder farms to global supply chains, the guideline seeks to inspire continuous improvement through best practices and context-sensitive implementation.

The scope of the guideline extends beyond farm-level activities to encompass all actors within the value chain, including processors, traders, retailers, and consumers, as well as supporting stakeholders such as policymakers, researchers, and civil society organizations. It serves multiple functions: guiding the sustainability performance of operations, informing research agendas, setting benchmarks for sustainability assessments, and contributing to policy and educational initiatives. Recognizing that sustainable agriculture is dynamic and context-dependent, the guideline promotes adaptability and iterative development, positioning itself as a "living document" that evolves in response to new knowledge and experiences.

The social dimension of sustainability is addressed through a rights-based framework emphasizing equity, gender equality, right livelihood, labor rights, and workplace safety. The guidelines advocate for equal access to opportunities, non-discrimination in employment practices, and the integration of vulnerable groups into agricultural value chains. Right livelihood is conceptualized not only in terms of adequate wages and social security, but also through the provision of educational opportunities, employee incentives, and long-term community development. Labor rights are defined by the freedom of association, prohibition of forced and child labor, and enforcement of fair working conditions, including health and safety standards. These principles are operationalized through specific, qualitative best practice examples, reflecting the document's emphasis on values-based governance.

While the guideline has not been formally implemented through a global pilot program akin to those accompanying other sustainability assessment tools, it is presented as a widely adaptable reference model. Its application is envisaged globally and across sectors, wherever stakeholders aim to integrate

sustainability into their agricultural operations. The lack of prescribed indicators or metrics allows for flexibility, but may require users to supplement the framework with context-specific evaluation tools. Ultimately, the SOAAN guideline contributes to the broader discourse on sustainable agriculture by embedding organic principles into a structured yet adaptable model, capable of informing both practice and policy.

The Guidelines for Social Life Cycle Assessment (**S-LCA**) of Products and Organizations (UNEP, 2020), provide a robust methodological framework for evaluating the social and socio-economic impacts of products and organizational activities throughout their life cycles. Building on the original 2009 edition, the updated guidelines respond to growing global interest in embedding social sustainability within decision-making processes. Their core intent is to support assessments that are both scientifically robust and practically applicable across diverse value chains and geographical contexts, emphasizing the interplay between stakeholders, life cycle stages, and social impacts.

The scope of S-LCA encompasses both product systems and organizational operations, with applications ranging from cradle-to-gate product assessments to full value chain evaluations. Methodologically, S-LCA aligns with ISO 14040 and 14044 standards while incorporating a social dimension through stakeholder-specific subcategories. It employs either a reference scale approach—benchmarking performance against established norms—or an impact pathway model tracing cause-effect chains. The guidelines are designed to be flexible, encouraging the use of both site-specific and secondary data to capture context-sensitive dynamics and to accommodate both positive and negative impacts, such as social risks and benefits (or "handprints").

Social sustainability is assessed through stakeholder groups such as workers, local communities, consumers, and society at large. Indicators cover a spectrum of themes including fair wages, working conditions, health and safety, freedom of association, cultural heritage, and access to resources. The guidelines' reference scale approach enables structured yet adaptable evaluation, particularly in data-scarce environments or complex socio-political contexts.

Empirical applications of S-LCA underscore its versatility and challenges. In Thailand, a comprehensive study applied both LCA and S-LCA to assess the sustainability of sugarcane-based products (sugar, ethanol, and bagasse-based electricity) across multiple regions (Jittima Prasara et al., 2019). Social impacts were examined using the performance reference points method, with data collected from workers and farmers across central and northeastern provinces. Similarly, in Colombia,

S-LCA was applied to the chocolate sector by assessing the full life cycle of a dark chocolate product from cocoa cultivation to manufacturing (Luna Ostos et al., 2024). The study used the reference scale approach to evaluate stakeholder-specific impacts, particularly for workers, local communities, and society.

Each framework and tool's conceptual organization was studied in light of the social themes identified through content analysis.

Assessing its suitability for bio-districts meant checking how well it addressed complex governance and multi-stakeholder collaboration, two priorities noted in the earlier phase. Likewise, Janker and Mann's (2020) inventory of farm-level tools was revisited to identify those adaptable to more extensive system boundaries, given that bio-districts involve networks of farms, local institutions, and markets.

After matching these frameworks to the social themes derived from the content analysis, the final methodological step proposed modifications to accommodate the inherent complexity of bio-districts. This often meant refining or supplementing existing categories with sub-themes that captured aspects like local governance, social capital, or cultural heritage. In practical terms, such adjustments could involve incorporating multi-stakeholder consultations or adding system-level indicators extending beyond the individual farm, such as metrics for local cooperative structures or community-based resource management.

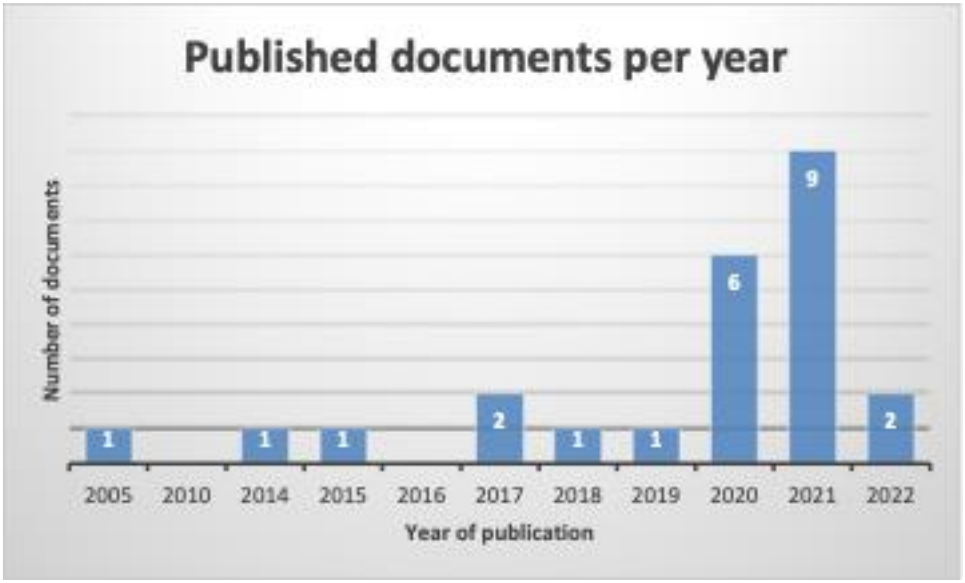
By systematically reviewing and contrasting existing social sustainability tools, this comparative step clarifies how these frameworks can be adapted for the multi-layered context of bio-districts. In doing so, it addresses Research Question 3, namely, how existing approaches can be applied to the social impact analysis of bio-districts, by indicating which methodologies appear most compatible with complex stakeholder networks, organic or agroecological practices, and the wide-ranging social issues identified earlier.

Results and Discussion

Literature Review Results

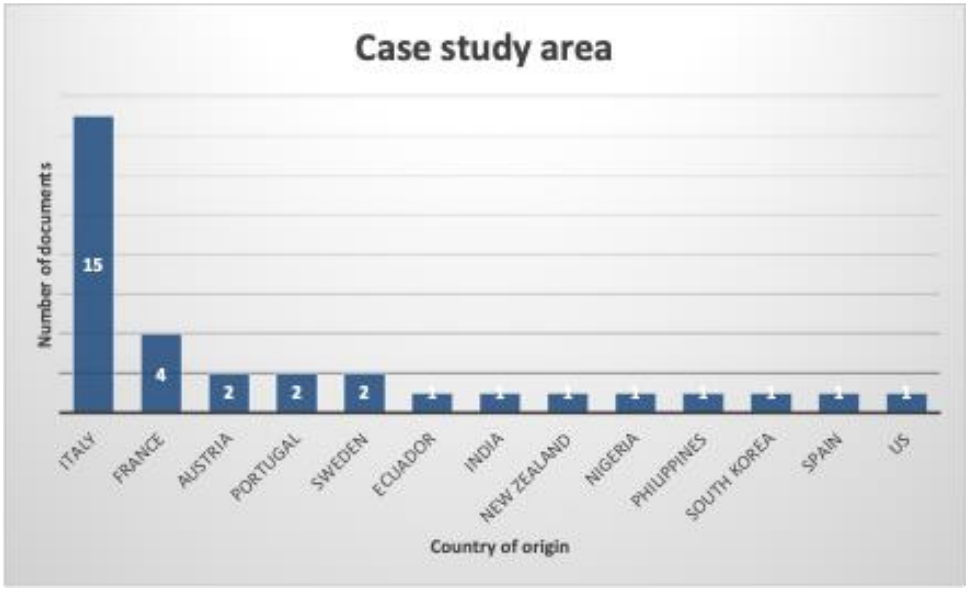
The number of published documents on bio-districts is presented in Figure 4. The first published document on bio-districts dates from 2005. From that year on, the number of circulating documents was minimal, increasing to six by 2020 and peaking at nine the following year, ending with two documents in 2022. Only eight of the 24 documents on bio-districts did not refer to case studies. Of

944 the latter, one document (Jamil et al., 2021) examined case studies outside Europe[3], while the rest
945 analyzed only bio-districts belonging to EU countries.



946

947 **Figure 4.** Number of published documents per year.



948

949 **Figure 5**. Location of the different case studies.

950 As shown in Figure 5, fifteen studies were carried out in Italy, four in France, two in Austria, Portugal
951 and Sweden, and one each in Spain, Nigeria, India, US, Ecuador, Philippines, South Korea and New

[3] The document referred to the concept of organic food system rather than bio-district, however it included in this perspective the Cilento Bio-district.

952 Zealand. Eleven of twenty-four studies analyzed social-related issues. Different methodological
953 approaches were identified. Six papers used qualitative methods, including participant observation and
954 semi-structured and in-depth interviews. Three articles used quantitative methods, including structural
955 equation modelling. Two articles adopted mixed approaches, combining both qualitative and
956 quantitative methods, as shown in Table 2.

957 ## Social Indicators Identification Results

958 A single, comprehensive framework focused exclusively on social impacts within bio-districts was not
959 found in the literature. Rather, most studies addressed only selected social themes, without offering a
960 fully integrated method. Of the 24 documents reviewed (Table 2), 11 explicitly described how social
961 indicators were chosen or applied. The majority employed qualitative approaches, often through
962 interviews or focus groups, to investigate early drivers, such as participatory decision-making,
963 community engagement, and stakeholder cooperation, critical to the establishment and evolution of
964 bio-districts. Pugliese et al. (2015), Favilli et al. (2018), and Dias et al. (2021), for example, focused
965 on governance, co-governance, and stakeholder involvement using in-depth interviews, thereby
966 revealing how local actors organize and collaborate over time.

967 Several authors used qualitative indicators to explore how bio-districts align with broader social
968 frameworks, including the Sustainable Development Goals (SDGs). Cipullo (2020) introduced "bio-
969 cultural diversity," a concept that interlinks ecological systems with the cultural heritage and traditional
970 practices maintained by local communities. This notion underscores the idea that preserving
971 biodiversity and cultural identity are inseparable aims, especially in territories shaped by
972 agroecological values (e.g., the Cilento Bio-District). Hence, "bio-cultural diversity" can be treated as
973 a social indicator insofar as it highlights how communities transfer knowledge, safeguard local
974 varieties, and collectively manage resources to maintain a sense of identity and continuity. Likewise,
975 Schermer (2005) examined "rural livelihoods" to evaluate how small organic farms adapt to shifting
976 market conditions while retaining social cohesion and local traditions.

977 Table 2. Types of social assessment used in the identified literature. The documents that did not include
978 social aspects in the research are left blank. N=24

Document	**Case Study**	**Social Assessment**	**Type of Analysis**	**Social Issue/ Indicator**

1. Assiri et al. 2021	Italy	X	Quantitative	Per capita income (Euro); Old Age Rate (index); GAS (n); Tourism rate (index); U40 conductors (n); PDO and PGI companies (n); employed in agriculture (%)
2. Basile et al. 2021a				
3. Basile et al. 2021b	France, Italy, Spain, Portugal,			
4. Belliggiano et al. 2020	Italy	X	Quantitative	Migration balance (n); ageing index (n); youth unemployment rate (%); per capita average taxable income (Euro)
5. Chaminade and Randelli 2020	Italy			
6. Cipullo 2020	Italy	X	Qualitative	Cooperation, education, Bio-Cultural Diversity
7. Dias et al. 2021	Italy and Portugal	X	Qualitative	Governance, stakeholder involvement

8. European Commission 2021				
9. Favilli et al. 2018	Italy	X	Qualitative	Co-governance
10. ALGOA and IN.N.ER. 2020				
11. Gargano et al. 2021	Italy	X	Mixed	Community empowerment (physical, economic and income data); education level; preservation local varieties; job creation; services to population; networking (human and social capital)
12. Guareschi et al. 2020	Italy			
13. Basile 2017	Italy			

14. Jamil et al. 2021	Ecuador, France, India, Italy, Philippines, New Zealand, Nigeria, South Korea, Sweden, US			
15. López-García and González de Molina 2021				
16. Mazzocchi et al. 2022	Italy	X	Quantitative	Non-profit associations (n); LAG (n); Unemployment rate (index); farmers age (n); direct farms selling (n); PDO and PGI (n farms); Per capita income (euro/municipality)
17. Poponi et al. 2021	Italy			
18. Pugliese at al. 2015	Italy	X	Qualitative	Governance
19. Schermer 2005	Austria	X	Qualitative	Rural livelihoods

20. Stefanovic 2022	France, Italy, Sweden	X	Mixed	SDG target related outcomes
21. Stotten et al. 2017	Austria, France, Italy			
22. Triantafyllidis 2014				
23. Truant et al. 2019		X	Mixed	Valorisation of tourism and landscape heritage, links with population and local territory, inclusion of disadvantaged people, gender diversity, promotion of local varieties
24. Zanasi et al. 2020				

979

Alongside such qualitative indicators, many studies incorporated quantitative measures. Although certain metrics (e.g., per capita income or tourism rate) appear primarily economic or demographic, they can convey social relevance if interpreted in context. For instance, a rising tourism rate can reflect enhanced job opportunities in local hospitality or increased community-led activities (such as cultural festivals), both of which have implications for social well-being. In similar fashion, Assiri et al. (2021) and Belliggiano et al. (2020) used numeric indices, such as old age rate, number of farm conductors under 40, and agricultural employment percentage, to cluster municipalities that might be conducive to establishing bio-districts. While these indicators do measure socioeconomic trends, they serve as proxies for social dynamics, including generational renewal, community resilience, or equitable resource distribution.

A number of studies adopted mixed methods that blend qualitative and quantitative data. Truant et al. (2019) assessed organic farms in bio-districts by examining both numeric indicators of labor inclusion or gender diversity and qualitative observations on cultural heritage and local networks. Gargano et al. (2021) similarly measured "networking" by looking at whether farms formed or participated in multi-actor or multi-level collaborations (e.g., research projects, public–private partnerships), engaged with local associations or cooperatives, and encouraged collective learning. In that study, high "networking" scores corresponded to broader stakeholder involvement and more robust social capital. Stefanovic (2022) relied on SDG-aligned indicators covering poverty, labor conditions, sustainable consumption, and institution-building to track progress in local organic food systems while also incorporating interviews to capture stakeholder perceptions.

Overall, although no single, fully integrated social-impact framework emerged from this review, a wide variety of indicators, ranging from intangible concepts like bio-cultural diversity to numeric measures of age distribution, were used to assess the social dimension of bio-districts. Whether quantitative, qualitative, or mixed, these indicators reveal different facets of social sustainability, including cultural identity, labor conditions, governance structures, and community resilience. The key is to interpret each metric in context, recognizing that even seemingly economic or demographic measures (e.g., tourism rate) can illuminate important social trends and outcomes when carefully linked to community well-being and participatory decision-making.

Content analysis results

The content analysis was carried out with the purpose of identifying the social themes that can provide an analytical framework. The results of the content analysis in Figure 6 show that the majority of the identified thematic keywords are used in project reports and proceedings of the bio-districts.

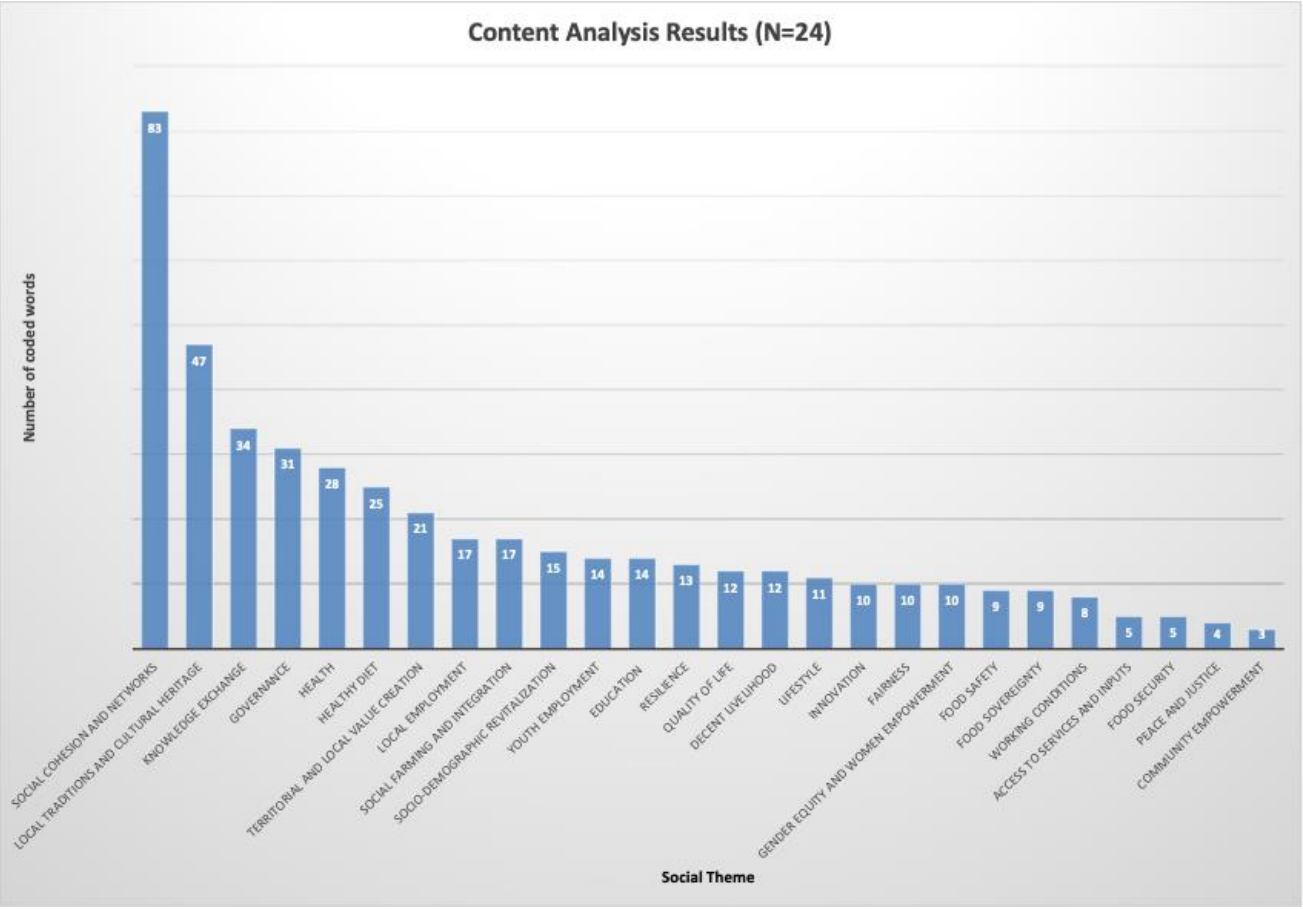


Figure 6. Results of the content analysis, showing the different trends of each social issue.

The 26 different social themes are all mentioned, and many of them are interrelated. Based on the number of words, different trends could be identified, highlighting that the agenda of the bio-district in terms of sustainable development can vary. To better understand the relative importance of each social theme in the current literature, the top five and bottom five themes were identified based on their word count. The top five social themes with the highest frequency of occurrence are *Social Cohesion and Networks, Local Traditions and Cultural Heritage, Knowledge Exchange, Governance,* and *Health*. All the documents pointed out the prominent role of *Social Cohesion and Networks* for bio-districts. Gargano et al. (2021) highlighted networking between different actors as a core element characterizing the bio-districts' commercial and institutional areas. Key element is not only the vertical

and horizontal integration of stakeholders operating along the supply chain in the bio-district, such as farmers and processors, but also the connections with external agencies, that can provide greater access to markets and income-generating activities. Moreover, linking farmers with research institutions and universities plays a crucial rule for the dissemination of information and knowledge on agroecological practices. This finding is in line with studies that place networks and social capital at the center of neo-endogenous rural development (Ray, 2006). Establishing a shared value system and drawing on local and extra-local knowledge provides the tools to respond to local needs and add value to those local resources that can carry a comparative advantage (Bosworth et al., 2016). Future research could employ dedicated network analysis methods, such as social network analysis or stakeholder mapping, to investigate how local partnerships and interlocking networks emerge and interact with governance structures in bio-districts. Such empirical approaches would offer greater insight into the relational dynamics underpinning these initiatives, providing more robust evidence on how collaborative efforts shape bio-district governance. Furthermore, it is crucial to explore the operational mechanisms through which these partnerships effectively address structural challenges related to depopulation and the need for local economic growth by facilitating innovative solutions. Examples of innovative partnerships include agricultural production and related food marketing channels such as consumer purchasing groups, community supported agriculture, producer markets, family farm markets, agroecological markets, green public procurement and the hospitality industry (HORECA), e-commerce and small food retailers including local, regional and national organic shops and supermarkets (IN.N.E.R., 2017; Stotten et al., 2017). Indeed, this highlights the relevance and the connection of the *Social Cohesion and Networks* theme with the *Innovation* theme, which is crucial for the development of social sustainability (Mani et al., 2016).

Regarding *Local Traditions and Cultural Heritage*, the bio-district agenda prioritizes the involvement of the local community as carriers of identity, tradition and culture, not only in agricultural practices that help to preserve the landscape but also in the maintenance of local ancient plant varieties (Truant et al., 2019; Gargano et al., 2021; Mazzocchi et al., 2022). Analyzing this theme has a twofold outcome. Sustainable landscape management practices can be evaluated under the broader umbrella of cultural services of ecosystem (CES). CES is often conceptualized as the intangible benefits that individuals derive from ecosystems and includes spiritual enrichment, cognitive advancement, introspection, recreational opportunities, and aesthetic encounters (Plieninger et al., 2015). It can inspire a significant transformation in the representation and analysis of the co-evolution of human well-being (related to the themes *Health* and *Quality of Life*) and ecological changes, aiming to facilitate a deeper

1056 understanding of how these dynamics may interact and impact one another (Chan et al., 2012). The
1057 second outcome refers to the concrete value this theme provides as it fosters the development of
1058 sustainable cultural tourism. The interest of sustainable tourists is not so much related to the beauty of
1059 the "end result", but to the intrinsic value they have from a cultural perspective. Landscapes, especially
1060 those associated with agriculture, are mutable and identity-defining (Ruiz Pulpón et al., 2023). Society
1061 endures in them through their use and transformation. Therefore, the implementation of many
1062 landscape practices combined with the activities from the LAG can play a relevant role in promoting
1063 both tourism and cultural activities (Pugliese et al., 2015).

1064 The theme of *Knowledge Exchange* can be linked to *Social Cohesion and Networks*, as the promotion
1065 of training, information, exchange of the best practices and participation in bio-districts (Mazzocchi et
1066 al., 2022) is achieved from a starting point of mutual shared values and trust (Chen et al., 2022). The
1067 knowledge flow between rural and urban contexts facilitates the advancement of collective action
1068 involving individuals from both settings, with the aim of fostering agricultural innovation and
1069 development. In addition, by integrating new knowledge and techniques, the rural talent structure of
1070 bio-district actors can be improved, thereby strengthening their ability to adapt effectively to external
1071 changes. Therefore, it's inclusion within the framework can contribute to the development and
1072 understanding of not only of themes such as *Innovation* and *Social Cohesion and Networks*, but also
1073 *Resilience*.

1074 *Governance* is frequently mentioned, as bio-districts are broadly perceived as a multi-level governance
1075 and bottom-up approach (Pugliese et al., 2015), involving public administrations to coordinate the
1076 various actors in the bio-district system (Assiri et al., 2021). From a multi-actor perspective, they
1077 involve both private and public actors at the territorial level (Favilli et al., 2018), and the core
1078 organizational structure is generally built on private actors and civil society. Strong governance
1079 influences the final outcomes of a bio-district. It regulates the degree of symmetry of information and
1080 the definition of common principles (Guareschi et al., 2020). Identifying the *Governance* theme,
1081 contributes to progress towards a "good" governance, which seeks to shift governing relations away
1082 from perceptions of inefficiency, corruption, maladministration, and excessive bureaucracy. Instead, it
1083 strives to promote greater accountability, transparency, effectiveness, fairness, and participation in
1084 decision making processes (Devaney et al., 2017).

1085 Eventually, *Health* is a frequently addressed issue related to the context of social sustainability. This
1086 theme includes the protection of farmers' and consumers' health (Dias et al., 2021), which reinforces

the idea that workplace benefits and health and safety measures are some of the most addressed issues in terms of social sustainability (Mani et al., 2016). As mentioned above, the concept of well-being is also included in this theme, suggesting a more subjective and culturally dependent perception of health; the link between individual and the ecosystem health is also considered (Stefanovic, 2022).

At the current moment, the literature on bio-districts pays less attention to *Working Conditions, Access to Services and Inputs, Food security, Community Empowerment,* and *Peace and Justice*. Although relatively less considered, the issues connected to these themes are high in the agenda of sustainable development and therefore should be included in the framework. One possible explanation for this discrepancy is that the context of the case study may influence the relative importance of a social issue. Indeed, bio-districts show different characteristics also in terms of social themes involved depending on specific local conditions and/or the general national context. All of the documents, with the only exception of Jamil et al. (2021), considered bio-districts or farms located in developed countries. Topics linked to food security, peace and justice, and access to services and inputs are more relevant in developing countries, which often have weaker infrastructure, limited access to resources, and a higher incidence of poverty, inequality, and conflict are often present (Bhattacharya et al., 2023; Chan et al., 2023; Lin et al., 2023). Access to basic inputs such as water, electricity, is also more limited in developing countries, which can perpetuate cycles of poverty and inequality (Rijsberman, 2006; Adair-Rohani et al., 2013).

Peace and Justice was mainly retrieved from the work of Jamil et al. (2021), which describes the case of Inba Seva Sangam, an Indian organic district that has contributed to peace in the area by dismantling the caste system in society. In contrast, developed countries tend to have more robust infrastructure and resources to meet these basic needs. This is supported by research showing that the main role of bio-districts in developed countries is to support access to the means of production, such as land (Triantafyllidis, 2014; Stotten et al., 2017), rather than to contribute to the meeting basic needs.

The lowest frequency of words was recorded by *Community Empowerment*. However, this theme is central in different documents on bio-districts, indicating that bio-districts support small farmers and rural communities (IN.N.E.R., 2017; Poponi et al., 2021; Mazzocchi et al., 2022). Including this theme in the framework allows the identification of drivers for sustainable local development. For example, community empowerment has been studied to reduce relative poverty and to maintain the population in rural areas. To improve the quality of life, jobs are created and incomes are increased for local residents in underdeveloped countries (Jung, 2020). The low word count number could be explained

by the broad scope of the concept, which overlaps with other closely related issues described by themes such as *Local Employment, Territorial and Local Value Creation, Quality of Life, Socio-demographic Revitalization*. However, the vastity of the concept underlines the need to implement a theme which covers issues related to rural community empowerment, perhaps as a sub-theme of one of these social themes.

A tailored analytical framework on social sustainability

The comparative analysis of seven social sustainability frameworks (Table 3) shows that none fully captures the breadth and specificity of social themes emerging from bio-district literature. While all tools aim to integrate the social pillar of sustainability, their suitability for assessing bio-districts varies substantially in terms of thematic coverage, scale of analysis, and inclusion of multistakeholder dynamics.

Table 3. List of frameworks and tools that could fit bio-districts' related social themes assessment.

	IDEA	**MOTIFS**	**Public Goods tool**	**RISE**	**SAFA**	**SOAAN guidelines**	**S-LCA**
Access to services and inputs	X	X		X	X	X	X
Community empowerment							X
Decent livelihood					X	X	X

Education					X		X
Fairness					X		X
Food safety					X		X
Food security			X		X	X	X
Food sovereignty					X	X	
Gender equity and women empowerment				X	X	X	X
Governance					X		
Health			X		X	X	X

Healthy diet	X		X		X	X	X
Innovation							X
Knowledge exchange	X		X	X	X		
Lifestyle					X		X
Local Employment	X		X		X		X
Local traditions and Cultural heritage	X	X	X		X	X	X
Peace and justice					X		X

Quality of life	X	X			X		
Resilience	X	X	X	X	X	X	
Social cohesion and networks		X	X		X	X	X
Social farming and integration					X		X
Socio-demographic revitalization					X	X	X
Territorial and local value creation					X		X

Working conditions				X	X	X	X
Youth employment							X
Multistakeholder approach	No	No	No	No	Yes	Yes	Yes
Scale Level	Farm/Sector	Farm/Sector	Farm/Sector	Farm/Sector	Farm/Chain/ Sector	Farm/Chain/ Sector	Farm/Chain/ Sector

Tools originally designed for farm-level application, IDEA, MOTIFS, the Public Goods tool, and RISE, focus primarily on site-specific indicators and provide limited insight into broader community-level or territorial processes. While useful for capturing working conditions, local employment, food security, and resilience, these tools largely overlook crucial themes such as governance, social cohesion and networks, community empowerment, or territorial value creation, concepts consistently emphasized in bio-district project reports and scholarly literature.

IDEA and MOTIFS include indicators on quality of life, resilience, and local employment. IDEA also integrates dimensions of land organization and ethics, offering partial alignment with themes such as local traditions and socio-demographic revitalization. However, both frameworks fall short in addressing the relational dimensions central to bio-district governance, such as the role of multistakeholder cooperation and networked innovation. MOTIFS, for instance, encourages participatory reflection among farmers but lacks operational categories to evaluate the structural role of civil society, local authorities, or research institutions, key actors in bio-district governance.

The Public Goods tool and RISE, though more structured in scoring and visualization, are similarly limited in scope. The PG tool, which views social sustainability through the lens of public goods

provision, addresses social capital and farm business resilience but does not extend to themes such as gender equity, youth employment, or cultural heritage. RISE includes quantitative indicators for local economy and social security, yet fails to consider knowledge exchange, community empowerment, or peace and justice, areas particularly relevant to bio-districts situated in post-conflict or marginalized rural areas.

By contrast, the more systemic approaches, SAFA, SOAAN, and S-LCA, demonstrate greater alignment with the multidimensional reality of bio-districts. SAFA encompasses 21 themes and 58 sub-themes across four pillars, and notably addresses governance, fairness, education, cultural diversity, and health. These align closely with the top themes identified through content analysis, especially social cohesion and networks, governance, and local traditions. SAFA also embeds participatory principles and encourages context-specific adaptations, supporting its potential use in bio-districts despite challenges in data availability for some social sub-themes.

The SOAAN guidelines similarly advocate a holistic view of agriculture grounded in rights-based principles such as labor justice, gender equity, and workplace safety. Although less prescriptive in terms of indicators, SOAAN's emphasis on continuous improvement and flexible, actor-driven adaptation aligns well with the organic origins and community-driven ethos of bio-districts. Notably, both SAFA and SOAAN are among the few tools that explicitly recognize the role of governance, cultural heritage, and territorial embeddedness, features that directly support the operational values of bio-district initiatives.

S-LCA stands out for its analytical granularity and stakeholder-specific structure. It explicitly targets social impacts on workers, communities, consumers, and society. This allows for coverage of both highly visible themes (e.g. working conditions, health, and safety) and those often overlooked by farm-level tools, such as access to services, peace and justice, and youth inclusion. Recent applications of S-LCA in countries like Colombia and Thailand have demonstrated its capacity to address post-conflict reintegration, labor rights, and inter-generational equity. Its reference scale approach also makes it adaptable to developed or developing country contexts, an important consideration given the geographic variability in bio-district missions.

Importantly, only SAFA, SOAAN, and S-LCA adopt an explicit multistakeholder approach. This is critical, as bio-districts function through complex interplays between producers, public administrations, consumers, research centers, and civil society. Tools that fail to account for this

governance architecture risk misrepresenting the processes that shape social sustainability outcomes in these initiatives.

Discussion

Farm-level sustainability assessment tools such as IDEA, MOTIFS, the Public Goods (PG) tool, and RISE provide valuable insights into social performance at the level of individual farms. However, by focusing primarily on farm-specific indicators, these tools fall short of capturing the relational and territorial dimensions that are central to bio-districts. These systems function not merely as aggregates of farms but as dynamic territorial entities embedded in networks of social, cultural, and institutional relationships (Sturla, 2020). In this context, broader frameworks such as the FAO's SAFA Guidelines, the SOAAN Best Practice Guideline, and Social Life Cycle Assessment (S-LCA) offer greater potential. Their capacity to assess themes such as multistakeholder governance, cultural heritage, and social cohesion aligns more closely with the multi-actor, place-based nature of bio-districts. However, each of these three approaches has limitations. The methodological breadth of SAFA demands substantial data collection, technical know-how, and time investment. For smaller initiatives or community-led systems, especially those without dedicated personnel or data infrastructure, this creates a barrier to adoption. Additionally, SAFA's emphasis on comparability across contexts can lead to the imposition of normative indicators that may not align with local values or priorities, limiting its contextual sensitivity.

The SOAAN guideline excels in articulating the values and principles of organic and sustainable agriculture across the value chain, but its emphasis on ethical and aspirational benchmarks comes at the cost of operational utility. Unlike SAFA or S-LCA, SOAAN does not provide standardized indicators or measurement protocols, making it difficult to use as a standalone assessment framework. Its language remains largely qualitative and principle-based, which offers flexibility but complicates comparison, benchmarking, or monitoring over time.

S-LCA offers a methodologically rigorous approach to analyzing social impacts across life cycles, yet its implementation frequently leans on sector-wide databases, desk research, and proxy indicators—particularly in early-stage or resource-limited contexts. This reliance on generalized data can obscure localized realities and lead to assessments that are technically correct but socially misaligned. Moreover, while S-LCA was conceived to account for both negative and positive social impacts, most

applications tend to focus on risk and harm (e.g., child labor, poor working conditions), with limited tools or metrics available to adequately capture social "handprints" such as empowerment, trust, or cultural regeneration.

The diversity among bio-districts, including variations in territorial morphology, governance models, and socio-economic priorities, further necessitates a context-sensitive approach. For instance, rural bio-districts may emphasize socio-demographic revitalization and access to services, while urban or peri-urban ones may prioritize food security or environmental recovery. Additionally, the geographical origin—whether a bio-district is situated in the Global North or South—also influences the prominence of certain social themes, such as peace and justice or access to basic inputs. In this light, the development of a tailored social sustainability framework should begin with a detailed contextual analysis and proceed through a participatory, bottom-up process of co-design.

Multi-Criteria Decision Making (MCDM) methods such as the Analytic Hierarchy Process (AHP) or Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) offer viable mechanisms for involving stakeholders in prioritizing social themes and indicators (De Olde et al., 2016). By drawing on both expert knowledge and local stakeholder perspectives, these approaches can help resolve tensions between universality and specificity in indicator selection (Innes and Booher, 1999). To obtain reliable and comprehensive findings, it is advisable to assemble a heterogenous set of stakeholders and experts on the bio-district, and where feasible, use sub-groups, key informants, or experts to verify the consistency of the results (Ssebunya et al., 2017). In addition, composite indicators may be particularly effective in representing complex themes like well-being or quality of life (Greco et al., 2019). These measures synthesize diverse, often incommensurable sub-indicators into a coherent metric, though care must be taken in how they are weighted and interpreted. The choice of weighting system—whether expert-defined, participatory, or data-driven—has a significant impact on outcomes and must be aligned with the analytical purpose of the framework (Farrell and Hart, 1998; Nardo et al., 2005). Criteria such as the SMART approach (Specific, Measurable, Available, Relevant, and Timely) can further support the robustness of indicator selection (Desiere et al., 2015).

In summary, while farm-level tools remain useful for assessing localized practices, they must be complemented by system-level frameworks that are adaptable to the unique characteristics of each bio-district. A flexible, stakeholder-sensitive, and methodologically sound framework, capable of addressing multi-actor dynamics and evolving socio-territorial challenges, is essential for advancing social sustainability in these innovative territorial initiatives.

Study Limitations

While this study contributes to the growing body of research on bio-districts, several limitations must be acknowledged. First, the available literature on the topic remains limited and relatively fragmented. Only 24 documents met the inclusion criteria for this analysis, and a significant proportion of these sources fall under the category of 'grey literature', including reports, institutional publications, and conference proceedings. While the use of the PRISMA methodology ensured transparency in the review process, its rigid application in a context of emergent scholarship may constrain the exploratory nature required when dealing with a nascent and evolving subject matter. In such cases, a more flexible or adaptive review strategy might be warranted to better capture the breadth and nuance of knowledge being generated outside traditional academic channels.

The quality and reliability of the included sources also present limitations. Only 8 out of the 24 documents analyzed were peer-reviewed, raising concerns about the consistency, methodological rigor, and replicability of the findings derived from the broader literature base. Furthermore, many documents were not accessible in languages other than English and Italian, which may have excluded relevant contributions from non-European regions. This language barrier likely limited the comprehensiveness of the content analysis and may have led to the underrepresentation of social sustainability themes pertinent to bio-districts in Latin America, Africa, or Asia. As such, the thematic framework proposed in this study may primarily reflect the socio-institutional realities of European contexts and may not be directly generalizable to other regions with distinct governance structures, cultural traditions, or development trajectories.

Another significant limitation lies in the study's methodological scope. While the comparative analysis of sustainability assessment tools provides valuable insights into their thematic coverage and potential applicability to bio-districts, the study does not integrate complementary analytical methods that could have deepened the understanding of territorial social dynamics. In particular, network analysis, a method increasingly used in rural sociology and territorial governance research, could have been employed to map and assess the relationships, power asymmetries, and information flows between the various actors that compose a bio-district system. This would have enabled a more robust assessment of the structural and relational dimensions underpinning key themes such as social cohesion, knowledge exchange, and multi-actor governance. The lack of such a methodological layer represents

a missed opportunity to triangulate and enrich the results derived from content analysis and indicator-based evaluation.

Finally, the thematic framework itself, while grounded in a systematic content analysis, may carry an implicit bias stemming from the dominance of Global North narratives in the current literature. Social themes that are more contextually relevant to the Global South may have been underrepresented, both due to gaps in the literature and the search terms employed.

Future research would benefit from a more diverse and cross-regional literature base, multilingual inclusion, and the integration of complementary methodologies such as stakeholder mapping, participatory appraisal techniques, and social network analysis. Such approaches would allow for a more comprehensive and nuanced understanding of how social sustainability manifests across different bio-district settings.

Conclusions

Bio-districts are a new and fast-growing example of sustainable food systems, often involving an agroecological approach. There is a limited body of literature that only considers social aspects in the analysis of food system sustainability (Janker et al., 2019). This study contributes to the growing body of knowledge on alternative food networks and their potential impacts by answering the research questions: 1) It identifies the main social issues addressed by bio-districts contributing to social sustainability. Twenty-six themes form the backbone of a framework for analyzing the impact of bio-districts. The content analysis validated these and showed the importance of social aspects in the sustainability debate. The results showed that some issues which are high on the sustainable development agenda, such as *Working Conditions, Access to Services and Inputs, Food Security, Community Empowerment* and *Peace and Justice*, are relatively underrepresented in the literature. Further analysis is therefore needed to understand the factors that influence the relative frequency of some keywords between different themes. 2) It examines the main categories of social indicators and impact assessment approaches used by academics and practitioners to analyze social impacts in bio-districts. For each approach, the different methodologies and associated indicators are highlighted and categorized according to the scope and type of data implemented. However, none of them apply a detailed and holistic approach to social sustainability assessment. 3) The research reviewed the literature for existing social sustainability approaches that could comprehensively address the social

sustainability impacts of bio-districts. The results made it possible to compare different tools and frameworks that capture social sustainability in agri-food systems, in order to identify a suitable starting point for a tailored framework on bio-districts. PG, IDEA, MOTIFS, RISE are tools that can provide valuable information and indicators at farm level. However, a multi-stakeholder approach is preferred as it allows to capture the complexity of the social dimension in a bio-district. The SAFA, SOAAN and S-LCA guidelines can contribute to this by providing a holistic pathway towards social sustainability. However, in order to adapt the approach to the specific context of a bio-district, it is necessary to make appropriate adjustments to the scope and objectives of each social theme. 4) The identification of the themes aims to provide an overview of the social sustainability aspects in the context of bio-districts. In order to adapt the existing tools and social themes to the different bio-district contexts, further steps should include the process of weighting, ranking and finally creating and then aggregating the sub-themes into themes. This can be done through a participatory approach involving relevant stakeholders and experts in the bio-district context. A diverse group can better contribute to the prioritization and ranking of the social themes and sub-themes identified from the existing social frameworks. The choice of assessment indicators should be based not only on the boundaries of the research (food system, supply chain or farm-based), but also on the possibility of implementing them in different geographical and socio-cultural contexts. In addition, the possibility of using composite indicators should be considered, given the characteristics of bio-districts and the complexity of social aspects related to sustainability. The choice of sub-indicators can be based on a SMART approach. Such criteria, which are commonly used for goal setting, support the selection of indicators and make them suitable for further analysis (Shahin and Mahbod, 2007). Moreover, the use of SMART criteria allows for regular monitoring and analysis of the indicators, with the possibility of quickly adapting their number or content to the existing context, since social systems always change not only in place but also in time (Parsons, 1991). Further studies should test the proposed steps for defining a suitable analytical framework in an existing bio-district to assess effectively and efficiently its ability to assess the social sustainability impacts of bio-districts.

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Chapter 3. Revitalizing Rural Areas through Social Innovation: Insights from Bio-districts in Italy and Sweden

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Introduction

The decline of rural areas has become a pressing global concern, exacerbated by the ongoing processes of urbanization and industrialization (Liu and Li, 2017). Across the world, rural regions have experienced depopulation, social degradation, shrinking local markets, and the closure of small businesses due to the deep impacts of global economic transformations (Carr and Kefalas, 2009; Dax and Fischer, 2018; Li et al., 2019). These challenges are not confined to specific regions but affect both developed and developing countries alike (Salvatore and Chiodo, 2024).

In Europe, rural decline presents differently depending on geographic and socio-economic contexts, with distinct patterns observed between Northern and Southern countries (Alfonso Annunziata and Murgante, 2024; Hedlund and Lundholm, 2015; Jungsberg et al., 2020; Li et al., 2016; Salvia and Quaranta, 2017). A key driver of rural decline is outmigration, largely fueled by disparities in living standards between urban and rural areas (Li et al., 2019). However, other localized factors, such as economic restructuring, marginalization, and geographical disadvantages, also play critical roles (Dolton-Thornton, 2021; Lasanta et al., 2017; Xosé Martínez-Filgueira and López-Iglesias, 2017).

To mitigate the sense of abandonment and neglect often felt in rural areas—feelings that can fuel resentment and frustration linked to rural poverty (Mamonova and Franquesa, 2020; Willett, 2021) — international policy has shifted towards bottom-up approaches. These strategies aim to empower rural populations, enabling them to fully realize their development potential (José Antonio Cañete and Cejudo, 2018). Many of these initiatives rely on collaborative frameworks that bring together diverse stakeholders, including government entities, civil society, and the private sector. Such partnerships foster cohesive networks that span across geographic regions (Jungsberg et al., 2020). Civil society actors are increasingly assuming responsibility for managing essential services, infrastructure, and local assets, thereby playing a pivotal role in rural development (Cheshire et al., 2015). These initiatives often generate innovative approaches (Eder, 2019; Galliano and Nadel, 2015; Shearmur and Doloreux, 2016), equipping rural communities with the skills and networks needed to sustain their economies (Dias et al., 2021). Enhanced cohesion across supply chains enables rural areas to capitalize on their unique socio-cultural and geographical assets. Scenic landscapes, for example, can attract tourists, while diversifying traditional agriculture-based economies with value-added, territory-linked products can offer new economic opportunities (Carneiro et al., 2015; Thompson et al., 2016).

While most of these initiatives are intimately connected to the specific geographic areas where rural inhabitants reside and work, some are characterized by new social interactions that extend beyond the community's geographical boundaries (Bosworth et al., 2016; Noack and Federwisch, 2019). Various authors agree that these social innovations (SIs), defined by new social connections transcending local confines, enhance community participation and empowerment (Lindberg, 2017; Malek and Costa, 2015; Rincón et al., 2017). These latter elements are directly linked to the vitality of rural communities, enriching the environments where people live, work, and engage in social and recreational activities. In the field of rural revitalization, the term "vitality" is often used to describe the characteristics of rural areas, exemplified by the vigor or liveliness of actions, thoughts, or expressions (Yang et al., 2022). This concept is applied to foster rural social organizations, including agricultural advancement, rural employment, housing development, enhancement of rural facilities, protection of traditional villages, and ecological governance.

Rural Vitality

Rural revitalization has long been invoked to counter declining conditions in non-urban areas (Li et al., 2019a; Luo et al., 2024), but the term often remains vague. To give it sharper definition, we draw on Montgomery's (1995) concept of urban vitality, which highlights the continuous buzz of human interaction, people on the streets, diverse transactions, and multi-layered social and economic engagement. While such "'Elan vital" is evident in dense cities, rural areas must adapt the concept to their unique realities, including lower population density and greater distances between settlements. Societal shifts toward knowledge economies (García del Horno et al., 2024) and resulting rural outmigration (Young, 2013) have made it harder to replicate the dynamism typical of bustling urban centers. Yet rural regions still support a broad mix of activities, agricultural exchanges, artisanal markets, tourism, that can promote community bonds and local pride (Alonso and O'Neill, 2014; Sharpley, 2002). This drive for vitality has led many scholars to emphasize the strategic use of cultural identity as a lever for economic convergence (Ray, 1998) and the expansion of civic governance (Leyshon et al., 2011). Agricultural discourses, for instance, now extend beyond production and profit to address public health, environmental sustainability, and social well-being (Evans et al., 2002; Fourat et al., 2020). These broadened "rules of the game" can help rural communities harness their distinct cultural and ecological assets (Luo et al., 2024). One compelling approach involves re-centering local products, businesses, and services on notions of quality, place, and trust (Lamine et al., 2019; Moragues-Faus and Sonnino, 2012; Sonnino and Marsden, 2006), thereby differentiating them from standardized global supply chains (Allen et al., 2003). Alongside such market-oriented strategies,

alternative and civic food networks, farmers' markets, and community events expand social connections and form public or semi-public spaces for exchange, mirroring the relational qualities Montgomery (1995) highlighted in urban life (Meleddu and Pulina, 2024; Lyson et al., 1995; Xia et al., 2020). Ultimately, adapting "urban vitality" to a rural setting requires grappling with a host of local challenges and opportunities. Rural communities often depend on urban centers for economic and political resources (Li et al., 2019b), making it essential to tailor solutions that reflect their specific demographic, cultural, and geographic conditions (Lee et al., 2005). Here, social innovation (SI) emerges as a tool capable of reconfiguring community practices and norms (Zapf, 1989), provided there is sufficient human and social capital to sustain experimentation, along with the outreach and partnerships needed to diffuse novel ideas (Alfonso Unceta and Fronti, 2017; Lang and Fink, 2019). In this sense, rural vitality is not a simpler version of its urban counterpart but rather an equally complex, context-driven process that balances inherited traditions with new, more inclusive forms of economic and social engagement.

This study would like to open new windows of research on what are also the non-economic factors that contribute to the overall vitality of rural areas. There is currently an established recognition of the spatial aspects of social life and their link to dynamic regions. In the past researchers and policymakers investigated the importance of various non-economic factors, including knowledge, different forms of learning, networking, social capital, reciprocity, and trust, to understand why certain regions exhibit greater dynamism than others (Hadjimichalis, 2006). Therefore, the study's aim is to present both economic and non-economic factors that are embedded in processes of SI by answering to two research questions:

1. What makes rural areas thrive in the context of social innovation?
2. What kind of challenges are hindering the development of social innovation?

This research, by examining the socio-economic dimensions within rural areas, aims to contribute valuable insights to the field of rural and regional planning. A thorough analysis of these dynamics could shed light on why development efforts succeed in some regions while failing in others, offering a nuanced understanding of sustainable development. Such insights are particularly valuable for supranational, national, and regional authorities seeking to design effective policies that promote sustainable development in declining rural areas. Rather than seeking to produce generalizable

findings, the focus is on in-depth analyses of rural vitality, which could enhance the current debate by explaining how and why regions with different starting conditions can ultimately achieve similar success stories.

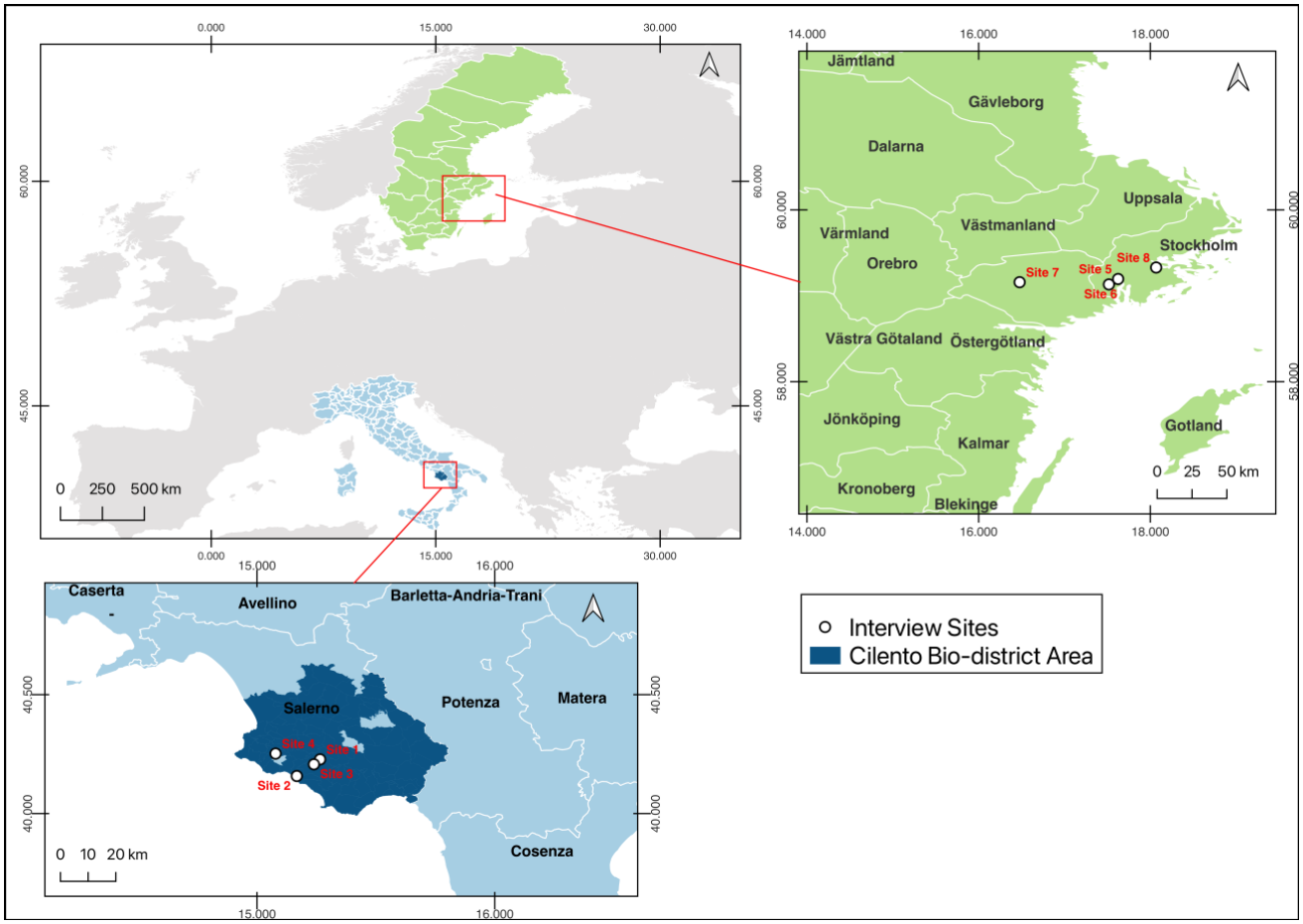
Methods and Study Areas

Research design

To provide a comprehensive understanding of the topic, this research employs an exploratory study using a qualitative methodology. A grounded theory approach was adopted to uncover the underlying structures and mechanisms driving rural vitality, focusing on the perspectives of local inhabitants. The primary aim is to understand the daily lives, beliefs, behaviors, and cultural practices that collectively contribute to rural vitality. Researchers immersed themselves in the study settings, directly participating in the community's daily activities related to SI initiatives. These included attending meetings, rural markets, and group gatherings, as well as observing behaviors and interactions within their natural context. In addition to observation, interviews were conducted with individuals directly involved in or affected by social innovation processes, as well as with those who had returned to rural areas after working in urban centers or abroad. The interviews were biographical and ethnographic in nature, capturing the stories of stakeholders and their roles within these processes. The methodological framework was designed to analyze the discourses, interactions, and strategies of stakeholders, providing detailed narratives and descriptions of their lived experiences. Challenges and opportunities were also identified to recognize patterns that could serve as benchmarks for rural inhabitants facing similar issues in other regions. To highlight the uniqueness of social innovation processes and emphasize the spatial context of the study areas, a comparative analysis was performed between two regions. This approach aligns with established practices in Rural Geography (Davies and Dwyer, 2007; Leyshon et al., 2011; Terluin and Post, 2000). By comparing these regions, the research aims to capture the context-specific dynamics of rural vitality and offer insights that may inform broader applications.

Study Areas

The sites selected for this study were required to meet three main criteria. First, they needed to be rural areas[4] engaged in a SI process that fostered significant community cohesion. Second, the sites had to represent two distinct geographical areas within Europe, reflecting diverse socio-economic contexts and environmental conditions. Finally, they needed to demonstrate strategies aimed at reversing the typical patterns of rural decline often observed in areas beyond the influence of expanding urban centers (Li et al., 2016). Based on these criteria, the research focused on two regions: one in Italy and one in Sweden, each characterized by the presence of a bio-district[5] as an example of social innovation (Fig. 6).



[4] The EU classifies regions based on the proportion of their rural and urban populations. Rural populations are defined as individuals residing outside urban clusters, which are contiguous grid cells of 1 km² with a density of at least 300 inhabitants per km² and a minimum total population of 5,000. A region is categorized as rural if more than 50% of its population resides in rural areas. Eurostat (2018).

[5] The definition can be retrieved in the Action Plan for the Development of Organic Production by European Commission (EC, 2021)

Figure 6. Study areas for interviews in Italy and Sweden.

The first study area is Cilento, a historical and natural region in southern Campania, Italy. The research concentrated on the territories influenced by the Cilento, Vallo di Diano, and Alburni National Park, which spans 3,196 square kilometers. The area features a diverse morphology, with mountainous elevations descending towards a coastal strip of beaches, inlets, and promontories. The eastern part of the region is home to the highest altitudes, including the Alburni Mountains, which rise to 1,742 meters. The region's population totals 254,200 inhabitants[6], with its settlement pattern centered on a few small urban hubs such as Agropoli, Vallo della Lucania, and Sapri, each with populations exceeding 5,000. Demographic trends in Cilento reflect significant challenges, with migration heavily impacting population growth. Between 2019 and 2023, the population declined by approximately 3%, and since 1961, there has been an average decrease of 30%, equating to 57,000[7] individuals leaving the area. Currently, 59 municipalities have fewer than 2,000 inhabitants. Interviews were conducted in larger municipalities, including Vallo della Lucania (approximately 8,000 inhabitants) and Ascea (5,900 inhabitants), as well as in smaller rural settlements like Ceraso (2,240 inhabitants) and San Mauro Cilento (840 inhabitants). These smaller communities face difficulties in maintaining essential services, including post offices, schools, healthcare centers, artisan shops, and pharmacies. These issues are compounded by the poor state of provincial and municipal roads, which suffer from neglect and inadequate maintenance due to limited funding. Despite these challenges, agriculture remains a cornerstone of the local economy, characterized by traditional practices such as olive cultivation, viticulture, and small-scale vegetable farming. The second study area is the Sörmland landscape, a historical province in southeastern Sweden. The research focused on territories within the counties of Södermanland, Stockholm, Västmanland, and Östergötland. The region's geography includes rolling hills, forests, lakes, and an extensive Baltic Sea coastline. Although major urban centers are present, rural areas face challenges similar to those in Cilento, including depopulation and demographic shifts favoring urban areas. The research specifically examined two counties. Södermanland County is characterized by dispersed rural settlements, with small villages and hamlets spread across the countryside. These peripheral rural areas, situated beyond metropolitan influence zones, have experienced economic decline due to increasing capital intensity in agriculture, forestry, and other

[6] Source: ISTAT 2023

[7] Source: ISTAT 2023

natural resource-based industries. However, agriculture remains central to the local economy, with key activities including dairy farming, cereal production, and horticulture. Interviews were conducted in settlements such as Hälleforsnäs, a small community with approximately 1,500 inhabitants. Once known for its historic ironworks, Hälleforsnäs has experienced steady population decline since 1965, when it had about 2,900 residents[8]. The second county, Stockholm, although predominantly urban, includes significant rural areas and numerous islands within the Stockholm archipelago. These rural areas, while sparsely populated, have the potential to increase interaction with the metropolitan area and achieve greater integration. Aside from interviews conducted in Stockholm itself, many were carried out in Södertälje, particularly in Järna, a community of about 6,000 inhabitants[9]. This area also includes smaller rural settlements and hamlets such as Saltå, Skäve, Yttereneby, and Skillebyholm.

Data Collection Methods

Observation was completed by taking field notes during formal and informal meetings, group meals and farmer's markets. These included descriptions of events, behaviors, interactions, settings, and conversations, as well as the overall atmosphere. The sample is shown in Table 4 and it consisted of 30 individuals, comprising 11 women and 19 men. Participants were predominantly recruited through opportunity and snowball sampling based on their availability and willingness to take part in the study (Flick, 2006). The aim was to enhance the understanding of the subjective meanings among different groups of people, and all had knowledge or were involved in the activities of bio-districts. The sample included several professional figures from the various areas sampled. Each had a different professional profile, ranging from actors of the supply chain, such as farmers, processors, restaurant and agrotourism managers, to supporting stakeholders such as policymakers, academicians and social bankers, and finally to stakeholders responsible for the implementation, management and development of the SI initiatives[10].

Table 4. Sociodemographic and Professional Profile of Respondents.

[8] Source: Statistiska Centralbyrån, Sverige, 2023

[9] Source: Statistiska Centralbyrån, Sverige, 2020

[10] For the Italian case the members of the Cilento bio-district board were included, while for the Swedish case the coordinators of an EU funded project for the implementation of the Sörmland bio-district were considered.

Participants ID	Gender	Age Range	Job	Years of Experience	Type of Service	Nationality	Stakeholder Group
#1	Female	46-60	Agrotourism Enterprise Manager	Between 10 and 20	Service Provider	Italy	Core Value Chain Stakeholder
#2	Male	46-60	Farmer	Between 10 and 20	Farmer and Processors	Italy	Core Value Chain Stakeholder
#3	Male	46-60	Agricultural Cooperative Manager	Between 10 and 20	Service Provider	Italy	Supporting Stakeholder
#4	Male	61-85	Agricultural Cooperative Founder and Public Official	More than 20	Service Provider	Italy	Supporting Stakeholder
#5	Male	61-85	Agri-food Industry Specialist	More than 20	Industry Professional	Italy	Supporting Stakeholder
#6	Male	46-60	Apiculturist	Between 5 and 10	Farmer and Processors	Italy	Core Value Chain Stakeholder
#7	Female	31-45	Restaurant Manager	Between 5 and 10	Service Provider	Italy	Core Value Chain Stakeholder
#8	Female	46-60	Public Official	Between 5 and 10	Policymaker	Italy	Institutional Stakeholder
#9	Male	18-30	Farmer Cooperative Manager	Between 10 and 20	Farmer and Processors	Italy	Core Value Chain Stakeholder
#10	Male	46-60	Bio-District Board Member	Less than 5	Bio-district Board	Italy	Institutional Stakeholder
#11	Male	46-60	Bio-District Board Member	More than 20	Bio-district Board	Italy	Institutional Stakeholder
#12	Male	61-85	Protected Area Manager	More than 20	Policymaker	Italy	Institutional Stakeholder
#13	Male	61-85	Farmer	more than 20	Farmer and Processors	Italy	Core Value Chain Stakeholder
#14	Male	31-45	Agri-food Producer	Less than 5	Farmer and Processors	Italy	Core Value Chain Stakeholder
#15	Male	46-60	Apiculturist	Between 5 and 10	Farmer and Processors	Italy	Core Value Chain Stakeholder
#16	Male	18-30	Community Resident	N.D.	Local Community Member	Italy	Core Value Chain Stakeholder
#17	Female	46-60	Social Banking Officer	Between 10 and 20	Service Provider	Sweden	Supporting Stakeholder

#18	Female	61-85	Farmer and Food Cluster Participant	More than 20	Farmer and Processors	Sweden	Core Value Chain Stakeholder
#19	Female	31-45	Public Official	Between 10 and 20	Policymaker	Sweden	Institutional Stakeholder
#20	Male	61-85	Project Coordinator	Between 5 and 10	Policymaker	Sweden	Institutional Stakeholder
#21	Male	18-30	Community Resident	N.D.	Local Community Member	Sweden	Core Value Chain Stakeholder
#22	Female	46-60	Project Coordinator	Between 10 and 20	Policymaker	Sweden	Institutional Stakeholder
#23	Male	61-85	Director of Social Development Organization	More than 20	Service Provider	Sweden	Supporting Stakeholder
#24	Male	18-30	Farmer	Between 10 and 20	Farmer and Processors	Sweden	Core Value Chain Stakeholder
#25	Female	31-45	Doctoral Researcher	Less than 5	Academic	Sweden	Supporting Stakeholders
#26	Female	31-45	Social Worker	More than 20	Service Provider	Sweden	Supporting Stakeholder
#27	Female	46-60	University Professor	More than 20	Academic	Sweden	Supporting Stakeholder
#28	Male	46-60	Social Worker	More than 20	Service Provider	Sweden	Supporting Stakeholders
#29	Male	46-60	Farmer and Food Cluster Participant	More than 20	Farmer and Processors	Sweden	Supporting Stakeholder
#30	Female	46-60	Project Coordinator	More than 20	Policymaker	Sweden	Institutional Stakeholder

The focus was on people's tasks in the working environment, their relationships with other members of the community and their understandings of sense of place. Thirty interviews were conducted between Italy and Sweden, where the participants live. The interview protocol used for the interviews can be retrieved in the Appendix C. Data were recorded using a digital voice recorder; with the exception of three interviewees where notes were made during and after the interviews and included observations about the participants and their circumstances. According to (Orne and Bell, 2015), notes are crucial for capturing intangible information that audio recordings cannot encompass. This information facilitates the creation of detailed descriptions and interpretations, which structured interviews alone cannot provide. Interviews were conducted in Italian, native language of the Italian

stakeholders, and in English for the Swedish ones. The discussions were recorded, translated into English (for the Italian interviews) and transcribed verbatim with pseudonyms appearing on the transcripts. The length of the interviews ranged from 45 to 80 minutes. Where possible, to enhance internal and external validity and reliability, and to reduce potential biases in the research, triangulation was employed as a complementary tool (Denzin, 1970). This approach involves using multiple research methods to strengthen the study design and improve the interpretability of the findings (Thurmond, 2001). In this study, data triangulation, which combines two or more data sources, was utilized. In Cilento data were collected at different time points to assess the consistency of findings as stated by Kimchi et al., (1991), while in Sörmland the interviews were performed in the same time frame due to logistical constraints. Variations in events, situations, times, locations, and participants contribute to the study by potentially revealing atypical data or identifying consistent patterns, thus increasing confidence in the results (Thurmond, 2001). Furthermore, interview data were integrated with document analysis. Information was gathered from official documents published by municipalities, organizational statutes, websites of economic activities, and other sources to enhance the credibility of the research data and to provide a comprehensive description of the phenomenon from the participants' perspectives (Orb et al., 2001; Stewart et al., 2015).

Data analysis

Following the conceptualization made by Woodhill et al., (2022) on food systems, the involvement of stakeholder actors was broken down into three categories based on the services they were delivering. It is essential to highlight that, as an explorative study, this research allowed for open coding. The research aimed to explore the components that contribute to rural vitality in various social innovation contexts, focusing on the perspective of different stakeholders. Employing thematic data analysis and grounded theory, this study utilized an inductive approach to extend new theories from existing cases (Orne and Bell, 2015). To help in the process of coding, the software Nvivo 12 was used. The initial phase involved an open reading of all data, where comments made on the software were used as initial inductive codes (Baggett and Simmons, 2017). Two separate analyses were performed for each of the study areas. Open coding was performed without limiting the codes to specific themes or numbers, identifying keywords, relationships, and other indicators. In the second phase, recurring common themes from the open coding were identified and aggregated. All the initial codes were then narrowed down into main themes for more detailed coding. These final codes were used to tag quotations with

similar themes and properties. This process was crucial for drawing comparisons and capturing central common points of social structure and perception (O.Nyumba et al., 2018; Orne and Bell, 2015).

Results

1. Community Networks and Cooperation (Italy)

Italian participants highlighted that thriving rural areas emerge from strong community networks, a strong sense of place, the integration of economic diversification with innovative practices, and a supportive governance and policy context.

Many interviewees emphasized the importance of cooperative networks in overcoming rural isolation and amplifying innovation. For example, an agritourism entrepreneur described how the creation of the Bio-district in Cilento *"made the territory aware that it is an area of very high potential"* (#1) by bringing local producers together and giving them visibility beyond what they could have imagined. Through the Bio-district, this farmer and others met new peers and exchanged ideas, finding it *"a reason for comparison, socialization, exchange of ideas, and deepening"* their knowledge (#1).

Such horizontal networking, facilitated by farmers' markets and associations, was repeatedly cited as crucial. *"You don't get anywhere alone. So there is this need for networking"* explained another farmer, contrasting this collaborative ethos with a historically individualistic culture that had to be unlearned (#3). *"Italians are not good at associationism, especially in southern Italy. We are very individualistic"* he noted (#3). Joining the Bio-district and the farmers' market association helped overcome this cultural barrier and enabled producers to form local and even international ties with like-minded innovators, an experience another farmer called *"very constructive"* (#2).

Sometimes this takes the form of simple gestures, like #1 introducing a young saffron grower through her agrotourism menu, or #2 relying on a neighbor's surplus whenever her own stocks run low. In other cases, farmers go a step further by showcasing each other's products. For instance, #14, who specializes in chamomile and teas, also sells hemp-based goods produced by a nearby farmer, underlining how shared values can foster mutual support. This spirit of cooperation and trust extended to informal arrangements as well. A beekeeper described placing his hives on friends' land and collaborating with people he met through the rural market, noting that *"the friendship relationship grows with people here, there is a favorable environment"* (#15). While such collaborations often begin informally, Italian cooperatives in Cilento offer more formal structures. They pool resources for harvesting and

processing, maintain shared storage facilities, and even distribute agricultural by-products such as olive pits, which serve as organic fertilizer.

Such examples illustrate how social capital and collective action serve as foundations for rural vitality: by sharing knowledge, resources, and market access, innovators magnify their individual efforts for broader community benefit.

2. Place-Based Identity and Heritage (Italy)

Another recurring theme was the significance of place-based identity and heritage in fostering rural social innovation. Italian respondents conveyed a deep attachment to their land and traditions, which provided both motivation and resilience in their initiatives. One agritourism owner explained that her decision to return to farming was rooted in childhood memories of a *"serene and calm"* rural upbringing, being *"in contact with the land,"* and eating *"genuine, healthy, handmade"* food produced by her family (#6). This personal heritage became a wellspring of inspiration, shaping the values and practices embedded in her business. #1, #2, and #9 recalled the revival of ancient cereal varieties once abandoned for more profitable crops. Producing "kilometer-zero" pasta became both an act of cultural preservation and a point of local pride. Participants frequently emphasized the importance of individuals who creatively reinterpreted local traditions. A young herbal farmer exemplified this by reviving a nearly forgotten regional crop, wild chamomile, and transforming it into a line of value-added products. His work was marked by *"perseverance and passion for quality"* (#14). He adopted what he called a PSS approach—*"possible small steps, without burdens on the neck… It's not necessary to look for funds… territorial commerce is needed, making Italians aware of the herbal tea market. The final customer is unaware of the quality"* (#14). His incremental strategy, grounded in local markets and relationships, enabled him to maintain independence from external financing and scale sustainably.

At the community level, the Bio-district played a central role in enhancing place identity and public awareness. It gave residents a *"consciousness of [their] own value"* (#6), instilling pride in Cilento's organic farming culture and Mediterranean traditions. This renewed pride was also reflected in municipal strategies. A Deputy Mayor described how even the naming of a new commercial area was guided by a desire to reflect *"our focus on roots and origins,"* thereby reaffirming the town's cultural identity in its development plans (#11).

These cultural initiatives had tangible effects. The same official described how a long-abandoned farmers' market was reactivated in the village square after a 70-year-old mayor recalled it from his youth. Today, the market operates *"just like the old days, with farmers bringing their products [to the piazza]"* (#11). This revitalization not only strengthened local identity but created a vibrant public space for social and economic exchange.

Participants saw their work as contributing to a larger cultural mission: preserving traditional recipes, restoring historic buildings, reintroducing local crop varieties, and sustaining culinary heritage. These efforts enriched the rural experience for residents and visitors alike. The implication is that thriving social innovation in rural areas is deeply place-based—it draws legitimacy and traction from the unique cultural and ecological landscapes of the territory. Rather than emulating urban models, these actors rooted their innovations in local history and identity, turning perceived backwardness into a strategic strength.

3. Economic Diversification and Innovation (Italy)

Italian participants repeatedly emphasized the importance of economic diversification and innovation as a strategy to sustain rural livelihoods and enrich local economies. Many initiatives purposefully integrated multiple functions—agriculture, hospitality, food processing, and education—to create resilient business models and provide community services.

A particularly illustrative example comes from an agritourism enterprise in Cilento, which operates a circular system in which a six-hectare organic farm supplies an on-site restaurant, while waste from food preparation is reused as animal feed. The result is a closed-loop model that, in the owner's words, *"fully realizes the circular economy"* within the local context (#6). The farm produces olive oil, wine, figs, and vegetables, offers accommodation, and hosts educational activities, thus embodying multifunctionality in both practice and philosophy. Some respondents spotlighted co-learning between producers and consumers as a springboard for new goods. A processor introduced novel bakery products after a customer's suggestion, later expanding due to strong demand.

Online platforms attract domestic and international buyers, with one cooperative investing in a website that centralizes members' products, expanding their reach. Additionally, technology adoption, such as radio-controlled tractors, enhances operational safety in hilly terrains. Cilento's biggest organic cooperative encourages members to share experiences with these advances, creating a ripple effect that brings more farms on board. Over time, these collective endeavors reshape traditional production

models into dynamic, future-focused systems that balance economic viability with cultural authenticity. This success, interviewees noted, was underpinned by early adoption of organic techniques and strong local value chains. As one participant put it, *"production and marketing activities are largely localized within the villages, carried out on small farms that maintain direct relationships with the markets"* (#4). Several credited this embeddedness with creating a *"robust organic farming sector"* that resisted the pressures of industrial consolidation (#4).

Diversification extended to energy and environmental innovation as well. Local leaders promoted the cultivation of woody biomass in Cilento's underutilized forests, coupling ecological restoration with renewable energy production. This strategy reflects a broader ethos of turning territorial constraints into opportunities by aligning ecological goals with local development.

Even small producers demonstrated creative diversification. A beekeeper explained how he markets honey through retail stores, online platforms, and a hive adoption program. This model combined *"traditional trust-based marketing"* with digital outreach, ensuring resilience in fluctuating markets (#15).

Across these cases, innovation was distinctly place-based. Rather than importing generic models, rural actors built on local strengths. Examples include converting abandoned stone farmhouses into agritourism facilities and reviving ancient grain varieties for niche consumer markets (#3). One farmer called this *"an agriculture that can create a future,"* contrasting it with extractive models that exploit land and labor without reinvesting in community well-being (#3).

4. Governance and Institutional Support (Italy)

Italian respondents underscored the critical role that governance and supportive policy environments play in sustaining rural social innovation. Many interviewees stressed the importance of multi-level institutional backing that aligns with the aspirations and practices of rural communities.

The evolution of organic farming in Cilento offers a striking example of how policy frameworks can enable grassroots innovation. Initially, organic methods were met with skepticism—one pioneer recalled how organic farming was once *"akin to discussing witchcraft"* (#4). However, the adoption of EU Regulation 2092/91 marked a turning point by legitimizing organic practices and creating the basis for official certification systems. Subsequently, regional and national subsidies, particularly those introduced in the 1990s, facilitated widespread conversion to organic, especially in olive groves. As

one interviewee explained, *"government subsidies for organic converters led to a swift expansion of organic farms"* (#4), showing how policy signals can catalyze innovation.

Municipal-level engagement has also proved essential. One Deputy Mayor described how her administration formally adopted the Bio-district's ten-point charter, which included commitments to sustainable procurement in schools and broader food system reforms. The municipality formed a working group with parents and teachers to redesign school cafeteria menus, now sourcing local organic products such as olive oil, bread, mozzarella, and heirloom legumes like Cicerale chickpeas. While acknowledging *"the challenge of higher costs,"* the Deputy Mayor emphasized that the investment was justified *"to ensure the children eat healthily"* and to reinforce local supply chains (#11).

This integration of public policy with grassroots initiatives exemplifies how social innovation can be institutionalized. The farm-to-school program not only improved children's diets but also provided reliable markets for small producers, embedding sustainability into daily practices.

Moreover, municipalities in the area are collaborating through broader coalitions. The Deputy Mayor referenced the formation of a "trade district," a partnership among 14 towns in Cilento aimed at coordinating commercial development with a focus on sustainability and local identity (#11). This represents a step toward multi-level governance, in which local governments, regional authorities, and civil society actors work together to implement shared goals.

Nevertheless, participants noted that institutional support is not always consistent. One farmer, reflecting critically on EU agricultural policy, pointed to a contradiction between high-level rhetoric and actual funding practices: *"The EU talks about the Green Deal, but large industrial players still dominate decision-making. Sustainable local agriculture remains underrepresented"* (#3). The call was for more inclusive and context-sensitive policies that recognize the diversity of rural realities.

Institutional frameworks can significantly influence the trajectory of rural innovation. When aligned with local dynamics and capacities, they provide critical infrastructure, incentives, and legitimacy. But when disconnected from on-the-ground realities, they risk reinforcing inequalities or stifling creativity. The Italian case illustrates both the enabling and constraining effects of institutions, highlighting the importance of governance that is both supportive and adaptive.

5. Community Networks and Relational Infrastructure (Sweden)

A key insight from the Swedish interviews is that rural vitality is strongly influenced by dense, inclusive community networks and what can be termed relational infrastructure. These networks foster mutual support, knowledge exchange, and multi-stakeholder collaboration, serving as a social foundation for rural social innovation.

In the Järna area of Södermanland, for example, a long-standing anthroposophic community has combined biodynamic agriculture with social care. One community leader described their philosophy as a form of holistic co-development: *"We wanted to be on a farm, to be close to the soil, with this cultivation work of the soil also being a cultivation work in social life. It has mutual effects on each other. It fits together very well"* (#23). The community transformed a struggling farm into a therapeutic garden where people with special needs could work and live, focusing on *"growth of individuals"* rather than profits (#23). The removal of pressure to maximize productivity was seen as essential to long-term sustainability: *"It was very difficult… to make it profitable… so we took over this work… without the stress of being very productive… that's why I think it has survived"* (#23).

Participants from other regions also emphasized the power of collaboration. In Sörmland, a food cluster was formed by chefs, farmers, artisans, and service providers to build a cohesive local food culture. One organic apple farmer described how this network emerged when local chefs struggled to source regional products: *"They started to promote cooperation between farmers and chefs. We organize everything around the good meal, so we have potters making the plates, florists making the table beautiful… primary production and processors, and then we have restaurants… all brought together, broad and diverse"* (#29). These exchanges created not only economic opportunities but also a sense of shared identity and cultural vibrancy. The food cluster's activities—such as joint marketing campaigns and food festivals like the "sausage and bread" fair—were seen as important tools for fostering community engagement. As one respondent put it, *"We have many festivals… it's a good way to cooperate"* (#29). These events allowed for repeated, informal interactions among stakeholders, helping to build trust and cohesion over time. The Swedish Bio-district initiative expanded this relational approach to a regional scale. Several interviewees involved in the Bio-district's formation emphasized the importance of uniting diverse actors. One organizer recalled convening representatives from 22 municipalities and two regions: *"Cooperation not only between municipalities but also with two different regions... is very important"* (#20). The Bio-district's thematic working groups—focused on organic farming, gastronomy, tourism, governance, and social inclusion—offered structured spaces for cross-sector dialogue and joint planning. This kind of network governance, built on regular

communication and shared commitments, was repeatedly cited as foundational to rural social innovation in Sweden. Respondents highlighted that strong ties between municipalities, producers, civil society, and businesses could reduce fragmentation and foster collective visioning. However, even in this relatively high-trust context, some interviewees acknowledged challenges. Several noted that mobilizing actors beyond the "usual suspects" remained difficult, and efforts were needed to make participation more inclusive and representative. The Swedish case underscores the centrality of relational infrastructure to successful rural innovation. While funding and formal policies matter, it is often the quality of everyday relationships—rooted in shared goals, regular interaction, and cultural cohesion—that determines whether initiatives take root and thrive.

6. Place-Based Identity and Cultural Heritage (Sweden)

Swedish participants consistently emphasized the importance of grounding rural social innovation in a strong sense of place and local identity. Similar to the Italian case, local cultural heritage, ecological values, and food traditions were seen as assets that could be harnessed for innovation and resilience.

One central example is the "Diet for a Green Planet" initiative in Södertälje municipality, which embodies a place-based approach to rethinking food systems. A public official involved in the program described its five principles: *"the food should always be tasty and healthy; from organic or regenerative agriculture; as local as possible; seasonal; and there should be a reduction of food waste"* (#19). These principles guided reforms in public catering, including school meals, which are now in the area largely organic and sourced from nearby farms. This institutional shift was seen not only as a sustainability measure but also as a way to foster pride in local food culture and traditions.

Several participants noted that Swedish rural areas had experienced a deterioration in food habits over recent decades, particularly in lower-income communities. One interviewee described this as a cultural concern: *"In some municipalities there was a very poor food culture, leading to many health problems. People were eating empty calories and had lost connection to fresh, local food"* (#19). Framing food system transformation as a way to restore health and community identity helped build broad support for the initiative was stated again by the same interviewee. Another element of place-based innovation was the revival of heritage food varieties and recipes. Participants explained how promoting local crops and traditional cooking methods could simultaneously enhance biodiversity, attract food tourism, and strengthen rural pride. The Bio-district's strategy included creating a local seasonal menu, marketed to

residents and urban visitors, with the dual aim of boosting local economies and reconnecting people to their regional foodscape (#20). In addition to food, the rural landscape itself was a focal point for community development. Efforts to preserve open farmland, promote small-scale organic cultivation, and revitalize historical farms were seen as a means to anchor innovation in cultural continuity. In Järna, for instance, the decision to maintain biodynamic practices was motivated not only by environmental concerns but also by a commitment to a particular worldview about land stewardship and human-nature relations (#23). This emphasis on identity and rootedness did not imply resistance to change. On the contrary, participants viewed tradition as a platform for innovation. As one stakeholder put it, *"We are trying to use what we have—the land, the knowledge, the recipes—not just for nostalgia but to create new futures"* (#29). This perspective aligns with broader theories of place-based development that highlight the value of endogenous resources and cultural distinctiveness. Swedish rural social innovation is strengthened when it draws from and reinforces local identity. By weaving together food, landscape, history, and community memory, actors create initiatives that resonate emotionally and socially, not just economically. This anchoring helps build legitimacy, attract allies, and sustain long-term commitment.

7. Economic Diversification and Multifunctionality (Sweden)

Swedish interviewees stressed that rural vitality is significantly enhanced when local economies are diversified and integrated across sectors. Rather than relying solely on traditional farming, many initiatives combined food production with education, health, tourism, and public procurement, thereby creating multifunctional rural spaces that serve multiple social and economic goals. A particularly illustrative example comes from the Södertälje Bio-district, where local authorities restructured school meal procurement around sustainability and local sourcing. As one municipal officer explained, *"by linking school meals to local farmers and introducing seasonal menus, we not only improved food quality but also created a stable market for producers"* (#19). This public procurement model effectively combined institutional support with local economic stimulation, encouraging farmers to shift toward organic and diversified production.

Participants repeatedly mentioned the challenge of moving away from Sweden's historical focus on large-scale cereal and dairy production. In many cases, farmers interested in diversifying into vegetables, legumes, or specialty products lacked the infrastructure and policy support to do so. As one farmer noted, *"we lack the infrastructure to support larger-scale vegetable production… there is no regional processing, no storage, no logistical support for small-scale diversity"* (#19). These

limitations make it difficult for innovators to build new value chains, despite consumer demand for fresh and local food. Nonetheless, where conditions allowed, Swedish actors experimented with new combinations of activities. In Järna, a biodynamic farm was converted into a social therapeutic garden, producing food, offering care, and hosting visitors. The initiative operated outside conventional economic metrics, focusing instead on *"growth of individuals and community well-being"* (#23). This multifunctionality made the project resilient to market pressures, while still generating economic and social value. Another example comes from Sörmland, where regional collaboration supported the growth of a vibrant local food cluster. Farmers, chefs, and artisans created integrated services around food events and tourism. As one participant explained, *"we organize everything around the good meal. It's about combining agriculture, hospitality, culture… it makes the region feel alive"* (#29). This strategy of linking production with services allowed rural enterprises to capture value from different sources and appeal to both local and urban consumers. Diversification was also framed as a response to global disruptions. Several interviewees mentioned the war in Ukraine and the COVID-19 pandemic as moments that revealed Sweden's over-reliance on imported food. One public official commented, *"for decades, Sweden has neglected this issue. Small-scale farms are struggling, larger companies are taking over, and we are losing local control"* (#19). In this context, economic diversification and local food self-sufficiency were not only sustainability goals but also matters of national resilience. Multifunctionality and diversification emerged as strategic responses to economic, environmental, and demographic pressures. Swedish actors were not merely adapting to constraints, but proactively reconfiguring rural life around integrated, context-sensitive models. These models combined economic viability with social purpose, offering a compelling vision for future rural development.

8. Urban–Rural Linkages and Public Engagement (Sweden)

One of the most prominent themes across Swedish interviews was the effort to bridge the growing divide between urban and rural populations. Despite their proximity to metropolitan areas like Stockholm, rural initiatives often faced a lack of recognition, understanding, and support from urban residents. Strengthening urban–rural linkages was therefore considered essential to the success and sustainability of rural social innovation. Several respondents noted that many urban Swedes lack exposure to agriculture and rural realities. One official remarked, *"many people in a big city today do not see cows, mud or even trees"* (#19). This disconnection leads to reduced empathy for farming challenges and, in some cases, outright resistance to rural land uses. Participants cited instances where

urban-fringe residents complained about smells or noise from farms, undermining the legitimacy of nearby food production. To counteract these trends, Swedish actors employed a variety of engagement strategies. Educational outreach was widely used, especially targeting children and families. As one participant explained, *"we have kindergartens and school classes visiting farms regularly, helping young people learn where their food comes from"* (#19). These programs not only fostered awareness among students but also served as a conduit to engage their parents and broader communities. Food was a central medium for urban–rural reconnection. Farmers' markets, seasonal festivals, and local menus in restaurants were designed to make rural products visible and desirable to urban consumers. As one participant put it, *"we try to create a local menu that is not only about taste, but also tells a story about our region and our way of farming"*(#20). By turning food into an entry point for dialogue, rural innovators aimed to shift consumer attitudes and behaviors in favor of sustainable, locally rooted production. Importantly, this reconnection was not framed as a one-way educational process. Several interviewees highlighted the need to listen to urban concerns and build mutual understanding. For example, a stakeholder involved in the Bio-district planning noted efforts to *"help city residents accept aspects of rural life, like farm smells, while also making sure rural activities respect urban sensibilities"* (#20). This two-way dialogue was seen as key to fostering long-term alliances between rural producers and urban supporters. In addition, the Bio-district initiative sought to include urban stakeholders directly in planning and strategy. The creation of cross-sectoral working groups, which included urban-based NGOs, chefs, and municipal representatives, was intended to embed rural innovation into broader societal networks. One coordinator observed, *"the goal is to make rural and urban actors feel like part of the same system, not separate worlds"* (#20). This integrated governance approach reflects a broader vision of sustainability that cuts across spatial, cultural, and institutional boundaries. Urban–rural engagement in Sweden was not simply about marketing rural products but about reweaving social relations across fragmented landscapes. By building empathy, mutual interest, and collaborative platforms, rural social innovators expanded their base of support and legitimacy, thereby enhancing their capacity to endure and grow.

9. Governance and Institutional Support (Sweden)

Swedish respondents emphasized the importance of institutional frameworks and governance mechanisms in enabling or constraining rural social innovation. Compared to the Italian case, Sweden's local and regional institutions were generally perceived as more stable and engaged, although challenges remained in navigating national policy orientations and administrative complexity.

One of the most frequently cited strengths was the presence of sustainability strategies in over half of the 22 municipalities involved in the Stockholm–Sörmland Bio-district. These strategies, which often included targets for organic food procurement and sustainable land use, provided a supportive policy backdrop for local experimentation. For instance, Södertälje municipality had achieved 70% organic food in public meals, serving up to 20,000 portions per day. As one participant stated, *"this kind of procurement creates a reliable market, and that encourages more farmers to convert to organic farming"* (#19). However, respondents also stressed that such supportive environments are not evenly distributed across Sweden, nor guaranteed in the long term. A number of interviewees expressed concern about the current national political climate, noting a lack of ambition at higher levels of government. As one Bio-district leader observed, *"we have a fairly right-wing government now, and they are not very interested in regulation or intervention. Their view is that the market should take care of these things"* (#25). This ideological stance was seen as a barrier to more proactive and tailored support for rural innovation. Rigid regulatory frameworks further compounded these difficulties. Public procurement laws, intended to ensure neutrality and transparency, often prevented municipalities from favoring local or social enterprises. A municipal official recounted the case of a social farming initiative that failed to gain support: *"we are not allowed to support one company over another. Even if their vegetables were grown sustainably and employed vulnerable people, we had to treat them the same as any other vendor"* (#22). This example illustrates a broader tension between rules designed for fairness and the need for adaptive support for emerging, non-standard enterprises.

Administrative fragmentation also posed a challenge. The Bio-district encompasses two regions and 22 municipalities, each with its own procedures, priorities, and legal interpretations. Coordinators described the governance work as complex and time-consuming: *"we chose to work with a landscape, not just administrative boundaries, but that means we have to facilitate cooperation across many jurisdictions, and that is not easy"* (#20). Despite the goodwill of local actors, institutional alignment remains fragile and requires ongoing negotiation. At the same time, Swedish interviewees pointed to positive developments in regional and transnational cooperation. The Bio-district initiative was supported by an EU-funded program designed to develop enabling environments for sustainable food systems in the Baltic Sea region. Several participants described this as a catalyst for collaboration and innovation: *"thanks to similar projects, we have a platform and some funding to work together across sectors and regions"* (#20). Some municipalities also experimented with new governance structures. For instance, they established a working group dedicated to Bio-district governance, bringing together representatives from farming, education, business, and civil society. This effort to build a durable,

multi-stakeholder institutional platform reflects a recognition that individual initiatives need structural backing to scale and endure. As one project manager explained, *"we want to move beyond dependency on a few enthusiastic individuals and embed this work in the institutional fabric"* (#20). Swedish rural social innovation benefits from relatively favorable local governance and a tradition of policy experimentation. However, challenges persist in aligning higher-level frameworks with local ambitions and in creating flexible, inclusive governance arrangements that can accommodate the unique demands of social innovation.

10. Challenges for SI (Italy)

Italian interviewees identified a range of obstacles impeding social innovation and rural vitality, rooted in structural challenges, institutional inefficiencies, and socio-cultural norms. One prominent structural barrier is the physical and demographic context of rural areas, which often limits economic viability. For example, a producer located in the inland part of Cilento described the challenge of cultivating crops on steep, hard-to-access plots: *"The mountains are beautiful but difficult, you have to harvest by hand and it is tiring. We don't have many young people who want to do this anymore"*(#8). This illustrates the dual burden of difficult geography and labor shortages in sustaining agricultural livelihoods. The issue of labor scarcity recurred across interviews. A cooperative managing both agricultural and food service activities shared their struggle to maintain agricultural production due to a lack of labor: *"We have no problem with demand, but we can't expand because there aren't enough people willing to do the hard fieldwork"* (#5). Although seasonal workers are hired for short periods, the cooperative emphasized the long-term difficulty of finding individuals willing to take up farming or related trades. This is compounded by ageing demographics and the limited generational turnover in rural regions. Fragmentation and small-scale operations present further structural hurdles. Several producers in Cilento, operating family-run farms, highlighted how small plots and limited infrastructure restrict their capacity to scale or diversify. A farmer explained: *"We manage everything ourselves, from the field to the market. It's rewarding, but it's exhausting and leaves no time for planning or innovation"* (#9). The lack of centralized facilities, such as shared processing plants or storage hubs, further isolates producers.

Financial constraints also emerged as a recurring barrier. One agrifood entrepreneur explained how initial investments came entirely from personal savings: *"There was no real support when I started. I didn't even know which measures to apply for. It was a leap in the dark"* (#6). Others pointed out that EU and national funding schemes often involve bureaucratic hurdles and high upfront costs. A

cooperative manager noted: *"It's easier to go without funding than to face the delays and conditions attached"* (#4). This discourages experimentation and undermines resilience. Overall, these examples suggest that rural social innovators in Italy frequently work within constrained environments, where innovation arises through necessity, perseverance, and trust-based collaboration rather than institutional support. On the socio-cultural front, respondents described both barriers and enablers. One recurring theme was the culture of individualism. A smallholder reflected: *"Working together is not our first instinct. We are learning cooperation slowly, through necessity"* (#10). This individualistic mindset can delay or hinder collaborative ventures. Nonetheless, informal collaboration is increasingly emerging, especially among new entrants or younger producers who share values and visions. Sustaining cohesion within collective initiatives remains challenging. A long-standing cooperative leader noted: *"It's easy to start a project, but harder to keep people committed when problems arise"* (#4). Several cooperatives have struggled during leadership transitions or financial downturns, pointing to the importance of strong governance and inclusive decision-making. Institutional discontinuity was also identified as a constraint. One participant active in agroecological advocacy recounted: *"There's enthusiasm at the beginning, but support from local institutions is inconsistent. New administrations often shift focus"* (#4). While some municipalities, particularly those aligned with the Bio-district's values, have shown ongoing commitment, others remain reactive or disengaged. These findings emphasize that while Italy's rural social innovation scene is rich in creativity and determination, its full potential is often stifled by structural, financial, and cultural limitations that require more consistent, long-term policy engagement and relational investment.

11. Challenges for SI (Sweden)

Swedish participants identified a range of barriers to rural social innovation shaped by demographic, policy, and socio-cultural contexts. A biodynamic farmer from Sörmland described how pressures from land concentration and production expectations are transforming the agricultural landscape: *"Farms are getting bigger and bigger, and there are fewer and fewer people working on them. Many of the smaller plots have been abandoned or turned into holiday homes because they don't make economic sense anymore"* (#24). Interviewees highlighted how policies have long promoted efficiency over resilience. An agronomist noted: *"Swedish policies have favored large-scale operations and rationalization. Small-scale producers are often left without proper support or infrastructure"* (#27). The dominance of a few supermarket chains and centralized processing further hinders diversification. *"It's very hard for local producers to access mainstream retail chains unless they can*

supply high volumes," another interviewee explained (#25). Public procurement laws were also seen as a barrier. One municipal project coordinator pointed out: *"We cannot include 'local' as a criterion in procurement. It's against EU rules. This limits our ability to prioritize local food systems, even if we want to"* (#22). As a result, many social farms and small-scale producers remain marginal to institutional food systems. Governance complexity adds another layer of challenge. Coordinators of the Stockholm-Sörmland Bio-district described the difficulty of engaging 22 municipalities and two regional administrations in a coherent strategy: *"Facilitating collaboration across such a wide landscape is both important and very complex"* (#20).

Short-term funding cycles and administrative fragmentation further constrain progress. As one project lead noted, *"We've seen many valuable initiatives launched and then lost due to lack of follow-up support"* (#21). Despite growing civic engagement, the reliance on temporary projects poses a risk to continuity. Culturally, a recurring theme was the perceived divide between conventional and organic farming. An organic farmer described the skepticism they face: *"People often think organic is ideological rather than practical. That makes it harder to collaborate or expand"* (#27). Another participant emphasized that despite growing interest, *"There's still low consumer awareness about food production and sustainability"* (#25). The Swedish experience underscores that structural, regulatory, and cultural conditions continue to limit the diffusion of rural social innovation. Yet, across sectors and regions, actors are actively developing adaptive responses that integrate sustainability, community building, and social inclusion in innovative ways.

Summary and conclusions

Understanding and fostering rural vitality is crucial for addressing the socio-economic and environmental challenges that rural areas face in an increasingly globalized world. Rural areas are highly diverse, differing in aspects such as climate, natural resources, population density, proximity to metropolitan regions, institutional arrangements, and social capital. These variations underline the need for localized approaches to rural development. The examples of social innovation explored in this study demonstrate the transformative potential of rural regions—not only as hubs of agricultural production and biodiversity but also as reservoirs of cultural heritage and community-driven innovation. This research is significant as it sheds light on how rural areas can remain economically viable, socially cohesive, and environmentally sustainable amidst pressures from urbanization and demographic shifts. Bio-districts, as localized models of social innovation, can provide a valuable lens for understanding

practices that revitalize rural areas. What makes rural areas thrive in the context of social innovation is the embeddedness of these practices in local culture and relational life. Social innovation is not imported or standardized—it is co-produced through situated relationships, historical continuities, and shared values. In both cases studied, innovation emerged through the weaving together of social, ecological, and economic dimensions—whether in the return to ancestral farming in Italy or the integration of social care and agriculture in Sweden. The findings also underscore the central role of networks and trust-based cooperation. Innovation flourishes where there are dense relational infrastructures—where actors across sectors, generations, and geographies can engage in mutual learning and co-production. From Italy's Bio-districts to Sweden's food clusters and community farms, collaboration appears as a catalyst for experimentation, resilience, and adaptability. Challenges to social innovation are shaped by structural and institutional limitations as well as cultural frictions. Italian cases highlight infrastructural barriers such as land fragmentation, aging populations, and limited access to credit. In Sweden, regulatory rigidity, procurement constraints, and demographic consolidation were central. Both contexts revealed cultural tensions—between individualism and cooperation, conventional and organic practices, and rural and urban imaginaries. Despite these barriers, actors continue to mobilize through hybrid strategies—blending institutional support with informal networks, economic goals with social values. Policy support is vital, but it must be flexible, responsive, and aligned with the lived realities of rural actors. Long-term investment in relational governance, communication infrastructure, and participatory planning can amplify the impact of local innovation.

Future research would benefit from expanding this comparative lens to additional contexts and investigating how rural social innovation intersects with themes such as youth inclusion, climate adaptation, and food sovereignty. Methodologically, combining ethnographic and system-level perspectives could enrich our understanding of how rural vitality is built and sustained.

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Chapter 4. Evaluating Social Sustainability in Bio-districts: A Qualitative Framework for Inclusive Rural Development

Giacomo Packer*

Introduction

The broader social objectives of sustainable agriculture are frequently highlighted in theoretical discussions within the sustainable food movement. Sumner (2005), for instance, argues that sustainable agriculture should "promote the civil commons rather than the profit margins of an elite group" and involve "dedicated support for small farms that provide meaningful employment" (p. 309). However, despite this focus on "civil commons" and "social sustainability," research on sustainable agriculture that addresses the social, economic, and environmental impacts of alternative food systems often receives less attention. This is particularly true when compared to research from the natural sciences—and even some social science studies—that tends to define sustainability narrowly, emphasizing only quantifiable environmental outcomes.

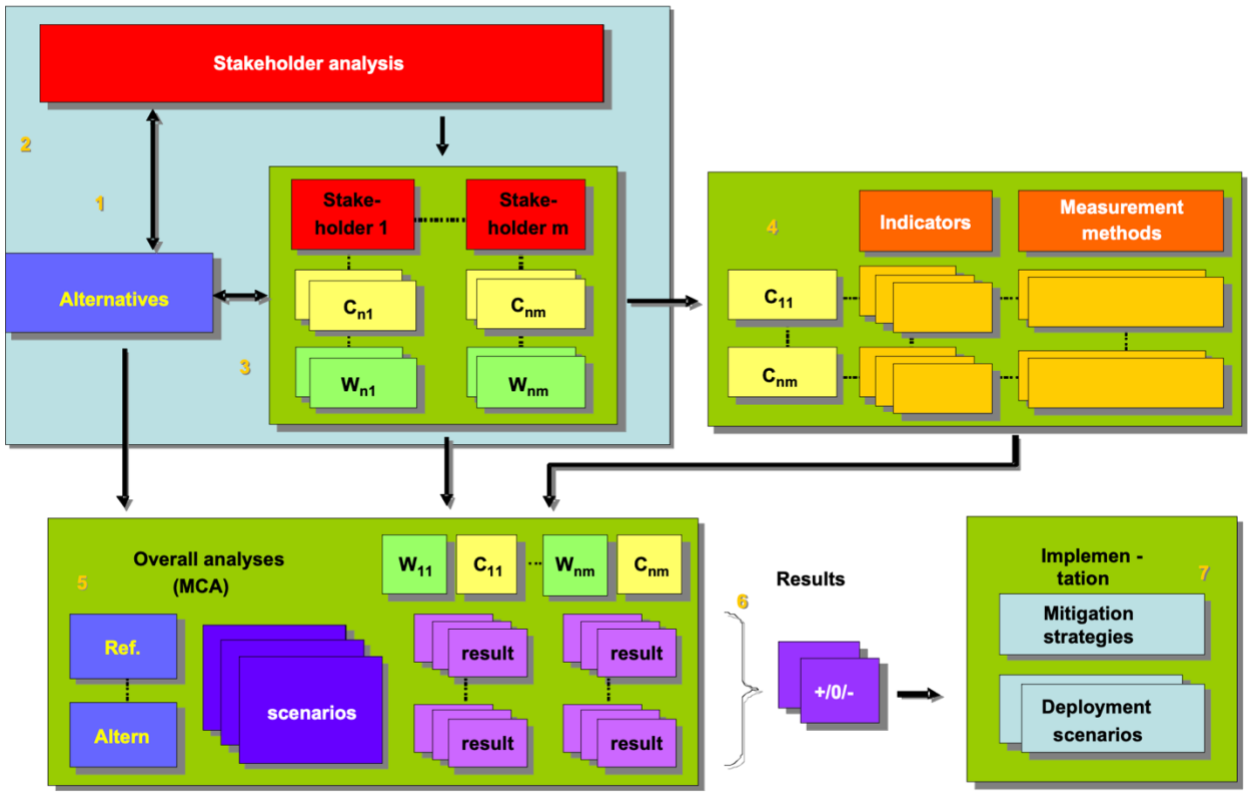
As a framework, social sustainability raises important questions: Does sustainable agriculture provide meaningful and equitable employment for farmers, laborers, and their families? Is it a system capable of offering food access to a broad and diverse demographic of consumers? Without a focus on the social dimension, sustainable agriculture risks becoming a niche disconnected from the broader conventional agricultural system. Limited efforts to conceptualize social sustainability as an independent dimension of sustainable development have been attempted (Desiderio et al., 2022). Consequently, there is no universally agreed-upon definition of social sustainability, as interpretations often vary based on the criteria adopted by researchers and policymakers. In the context of bio-districts, where sustainable development is pursued through organic agriculture and community engagement, the social dimension plays a critical role in fostering rural vitality. The inclusion of social sustainability within sustainable development gained prominence following the Lisbon European Council's 2000 recognition of the importance of a social dimension within the EU's sustainability framework (Schunz, 2022). Analyzing such concepts is central to understanding the dynamics of rural development and the ways in which Bio-districts can either promote or hinder equitable access to opportunities and resources. Therefore, it is essential to analyze these terms and develop appropriate indicators to assess how Bio-districts contribute to the overall social well-being. The aim of this chapter is to deepen the discussion on rural areas under the scope of activities of bio-districts by highlighting their potential, opportunities, and strengths, while also addressing the challenges and ambivalences that are either acknowledged or overlooked in the everyday practices of Bio-districts. To achieve this, a novel, tailored framework is developed. This framework seeks to bridge the gap in understanding and monitoring the contribution to social sustainability of bio-districts and to serve as a practical tool for policymakers and decision-makers in addressing the persistent challenges faced by rural stakeholders.

The framework is constructed from empirical data gathered through the field interviews and participant observations described in the previous chapter and is further validated through existing literature on social sustainability. It integrates the most relevant themes and indicators under a unified approach. The framework places primary focus on organic value chain actors, namely farmers, processors and actors working for businesses related to HO.RE.CA or agriculture considering both their roles as individuals and their positions as members of a broader community. These two dimensions provide a holistic perspective, illustrating how individual experiences intersect with collective dynamics to shape the social texture of rural areas. In doing so, the framework aims to capture the complexity of rural livelihoods and the ways in which Bio-districts contribute to rural development. In the first section the methodology that was used to define the analytical framework is described. Then the framework is described. Eventually, considerations and limitations of the framework are presented.

Methodology

In this chapter, an adapted version of the Multi-Actor Multi-Criteria Analysis (MAMCA) methodology (Macharis et al., 2010) is employed to develop a context-sensitive framework for assessing social sustainability and governance models within Bio-districts. MAMCA is a participatory decision-support tool designed to structure complex scenarios involving multiple stakeholders with divergent objectives by integrating their perspectives into a transparent and multi-criteria framework. Originally developed for applications such as sustainable transport and spatial planning, MAMCA has also been used in the agricultural domain to evaluate policies by incorporating environmental, economic, and social equity concerns (Turcksin et al., 2011; Macharis et al., 2010). In this research, a modified application of MAMCA is proposed—not to compare or rank competing policy or governance alternatives, but rather to co-construct a shared value framework for social sustainability. This adaptation reorients the traditional evaluative logic of MAMCA toward consensus-building, using qualitative insights from literature and fieldwork to identify convergent stakeholder priorities. Specifically, the methodology integrates evidence derived from the systematic literature review (Chapters 2), alongside findings from thirty semi-structured interviews (Chapters 3) with stakeholders involved in Bio-districts across Italy and Sweden. These interviews, conducted with farmers, civil society actors, researchers, policymakers, and community members, provided granular insights into the real-world challenges, values, and aspirations that underpin social sustainability in rural development contexts.

The decision to use MAMCA as a framework-building rather than scenario-ranking tool was grounded in both empirical and conceptual considerations. First, the findings from the empirical chapters revealed a high degree of thematic convergence across different stakeholder types and regions, particularly regarding priorities such as decent livelihoods, cultural identity, youth engagement, trust-based networks, and institutional responsiveness. This convergence—identified through thematic coding and cross-case comparison—suggested that developing a unified value structure could be more meaningful than forcing artificial trade-offs between governance options. Second, the literature review (e.g., Almeida, 2019; Lamine et al., 2019; Sonnino and Marsden, 2006) emphasized the relational, co-evolutionary nature of social innovation in rural contexts, reinforcing the suitability of participatory, deliberative approaches such as MAMCA when adapted for visioning and consensus formation. Following Almeida (2019), who demonstrates the adaptability of MAMCA to co-create indicator frameworks, this research employed a participatory logic not to prescribe optimal governance models, but to clarify stakeholder-defined criteria for assessing governance in Bio-districts. This reconfiguration permitted the identification of shared values and latent tensions, and facilitated the construction of a single, integrated value tree synthesizing stakeholder perspectives with theoretical insights. As Figure 9 illustrates, the adapted MAMCA followed seven key steps.



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2634 **Figure 9**. The 7 steps of the MAMCA methodology. Source: Turcksin et al., (2011).

2635 The process began by identifying the primary objective: to articulate a set of social sustainability
2636 priorities capable of guiding inclusive and collaborative governance models in Bio-districts.
2637 Stakeholder engagement was a core element of the methodology. Thirty participants from diverse
2638 sectors and backgrounds were purposively selected to ensure heterogeneity of perspectives and roles
2639 within rural territories. Interview data, collected as detailed in Chapters 4 and 5, were instrumental in
2640 revealing the actors' implicit evaluation criteria—namely, the principles, needs, and goals they
2641 associated with "thriving" rural communities and sustainable governance. These qualitative data were
2642 not only central to the empirical chapters but also functioned as the empirical substrate for constructing
2643 the value hierarchy. During step three of the MAMCA process—criteria definition—researcher-led
2644 thematic consolidation of interview content allowed for the emergence of transversal themes such as
2645 decent livelihood, indigenous knowledge, equitable trade relations, intergenerational learning,
2646 inclusive governance, and recognition of place-based identity. These themes were triangulated with
2647 literature findings to enhance robustness and conceptual validity. Rather than attributing themes to
2648 stakeholder groups individually, a single, merged set of criteria was elaborated to reflect the
2649 convergences across actors and contexts, privileging a deliberative rather than adversarial logic. In line

with Montgomery's (1998) framework of vitality adapted to rural areas, the value tree captured the social dynamics**,** such as civic engagement, cooperation, cultural cohesion, and multifunctionality**,** that emerged as critical in both literature and field evidence. Subsequent steps involved organizing the evaluation criteria into a hierarchical value tree (see Figure 11), which visualized the nested structure of social sustainability priorities. Each theme was disaggregated into sub-themes and linked to corresponding qualitative indicators derived from stakeholder narratives and literature. For instance, the theme of decent livelihood included sub-themes related to income stability, social protection, and non-precarious employment, informed by both the policy literature and respondents' reflections on the challenges of sustaining rural enterprises. In this way, the framework operationalized stakeholder priorities into a structured model suitable for later evaluation, while remaining grounded in the lived realities and expectations captured through the interviews. The planned analysis phase (steps 5–7), which would have included overall stakeholder-based evaluation, sensitivity analysis, and policy translation, was not completed due to time and resource constraints. These final steps are critical for testing the framework's responsiveness to diverging stakeholder weights, and for translating the co-constructed value system into actionable recommendations for policy design, institutional reform, or governance innovation. Their absence constitutes a key limitation of the present study, though the groundwork laid in the earlier stages provides a strong foundation for future research and policy experimentation.

Step 1: Problem Definition and Objective Setting

The development of the assessment framework for this research began with the formulation of clear objectives and the delineation of the thematic scope concerning social sustainability and governance in Bio-districts. This foundational step was grounded in the systematic literature review presented in Chapter 2, which analyzed a broad spectrum of conceptual and applied frameworks related to sustainability assessment, rural governance, and territorial development. Through this review, a variety of sustainability assessment models were critically examined, including those developed for agri-food systems, territorial rural development, and participatory governance structures. These ranged from regionally focused approaches—often tailored to specific policy contexts—to broader institutional models developed by international organizations. While several frameworks offered relevant insights, they frequently lacked either the thematic comprehensiveness or the multi-level stakeholder orientation necessary to address the specificities of Bio-districts, which function as hybrid territorial entities grounded in both civic engagement and agri-food value chains. Among the reviewed tools,

the Sustainability Assessment of Food and Agriculture (SAFA) guidelines developed by the Food and Agriculture Organization (FAO, 2014) were identified as the most comprehensive and adaptable reference framework for the research aims. The selection of SAFA was not made arbitrarily but resulted from a comparative analysis of its thematic depth, global applicability, and alignment with key principles of social innovation and cooperative governance highlighted in the literature. The SAFA framework stands out for its holistic architecture, encompassing four interconnected dimensions: Good Governance, Environmental Integrity, Economic Resilience, and Social Well-being. Of these, particular emphasis was placed on the first three dimensions—Good Governance, Social Well-being, and Economic Resilience—as these most directly relate to the objectives of this study, which center on assessing social sustainability and governance processes in rural contexts.

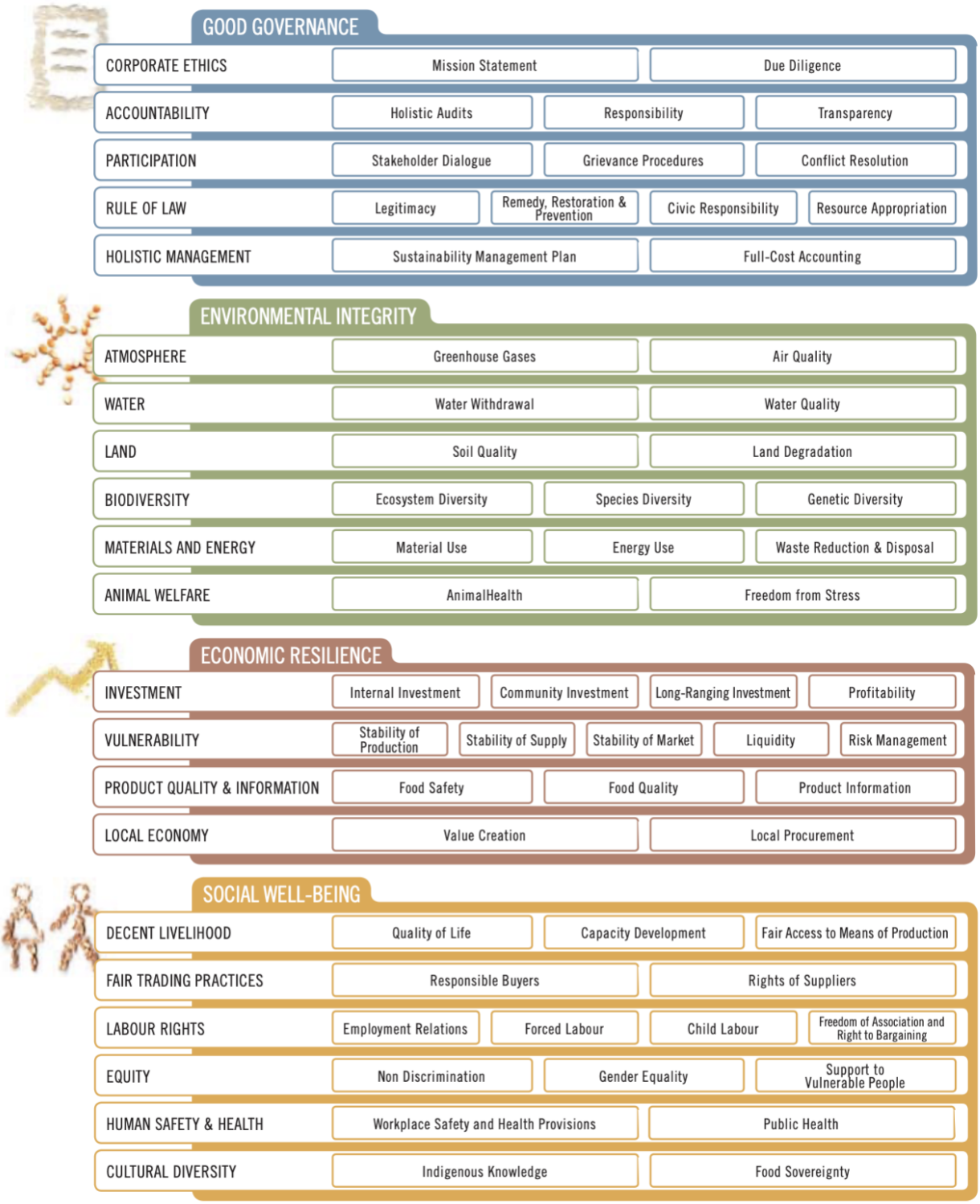

Figure 10. The 21 SAFA Sustainability Themes and 58 sub-themes.

As visualized in Figure 10, SAFA comprises 21 sustainability themes and 58 sub-themes, offering a nuanced and internationally recognized structure for evaluating performance across a range of

domains, including transparency, stakeholder participation, equity, cultural diversity, and labor rights. These themes served as a benchmark to align the study's goals with global sustainability standards, while also offering a flexible starting point for contextual adaptation. Drawing from both the literature and the empirical material presented in the subsequent chapters, the SAFA framework provided a robust conceptual scaffold from which to identify and refine evaluation criteria relevant to the diverse and evolving realities of Bio-districts. In this way, the SAFA guidelines did not impose a rigid evaluative scheme but rather acted as a conceptual filter through which stakeholder-derived themes could be organized and interpreted. This allowed for a blending of top-down structure and bottom-up empirical insight, ensuring that the resulting framework was both scientifically grounded and locally resonant, a critical balance when dealing with participatory governance in rural and territorially embedded sustainability initiatives.

Step 2: Stakeholder Identification and Engagement

Stakeholders are understood as individuals or groups with a vested interest, whether economic, institutional, or socio-cultural, in the governance processes and outcomes associated with Bio-district development. In rural territorial contexts, such as Bio-districts, stakeholders often encompass a wide range of actors engaged in the co-design, implementation, support, and critique of sustainability initiatives. Their perspectives are crucial for capturing the complexity of rural governance and for ensuring that evaluation frameworks reflect grounded, context-specific realities rather than external assumptions. The 30 stakeholders who participated in this study are the same individuals described in Chapter 3 and described in Table 4, all of whom were recruited for their active or indirect engagement with Bio-district activities in Italy and Sweden. Their selection followed a purposive strategy based on opportunity and snowball sampling (Flick, 2006), ensuring diversity in both occupational profiles and socio-institutional positions. As detailed previously, the sample included core value chain actors (e.g., farmers, processors, tourism operators), institutional stakeholders (e.g., policymakers, local administrators), and supporting stakeholders (e.g., social bankers, academics, educators, and civil society representatives). This heterogeneity reflects the multilayered structure of Bio-district ecosystems and captures the multiple domains, economic, social, political, and cultural—that influence rural sustainability and innovation. Stakeholders were engaged through semi-structured interviews and participant observation, including presence at general meetings, community events, and local markets, as reported in Chapter 3. The interviews followed a consistent protocol (Appendix C), which enabled cross-case comparability while also allowing flexibility in the depth and direction of discussion.

Because the interviews were semi-structured, they not only elicited responses to pre-established themes but also allowed participants to articulate implicit goals, priorities, and evaluative criteria related to their experiences in the Bio-district. These open-ended insights proved instrumental for the development of the decision-making value hierarchy proposed in this chapter.

Indeed, the adapted Multi-Actor Multi-Criteria Analysis (MAMCA) framework presented here builds directly on the empirical materials gathered in earlier stages of the research. Rather than defining evaluation dimensions a priori, the construction of the value tree was inductively informed by stakeholder narratives and thematic patterns identified through iterative coding of interview transcripts and fieldnotes. Recurring references to concepts such as fairness in trade, social protection, intergenerational learning, or democratic governance were not only noted but interpreted as underlying criteria through which actors assessed the performance and relevance of local governance structures. These inferred criteria were then refined, consolidated, and validated through repeated engagement with the material, as well as through triangulation with literature and expert input, especially from those stakeholders who held more sector-specific knowledge roles (e.g., researchers, cooperative organizers, policymakers). This approach ensured that the evaluation framework was grounded in lived experience, while also being robust enough to inform structured decision-making. Moreover, the framework's capacity to capture a shared vision for social sustainability was strengthened by the diversity of stakeholder viewpoints and by the cross-national comparative dimension of the research. By working with the same cohort of stakeholders throughout both the qualitative and framework-building phases, the research maintained consistency in its participatory logic and fostered a co-constructive process in which interviewees effectively contributed to the shaping of the criteria used for governance evaluation. The integration of qualitative data into the MAMCA process reflects a broader methodological orientation toward inclusive, iterative, and deliberative inquiry. Rather than positioning stakeholders merely as data sources, the research design treated them as knowledge co-producers, whose contributions not only illuminated how rural governance is experienced but also helped articulate how it ought to be evaluated. This approach aligns with contemporary understandings of participatory research in territorial development, where criteria for success are not predefined but emerge from the interaction between empirical realities, theoretical frameworks, and community-based knowledge.

Step 3: Theme and sub-Theme Identification and Consolidation

A key innovation in this study's adaptation of the Multi-Actor Multi-Criteria Analysis (MAMCA) was the decision to build a unified value structure that reflected shared priorities across diverse stakeholder groups, rather than developing separate evaluation trees per group. This approach was especially important in the context of Bio-districts, which are inherently collaborative and territorially embedded social innovation initiatives. With 30 stakeholders from both Italy and Sweden representing different institutional levels and roles a single, inclusive framework was better suited to synthesize cross-cutting concerns and to foster collective action rather than reinforce segmental interests. The identification of themes and sub-themes followed a two-tiered process: a) inductive coding of qualitative interview data using *Atlas.ti* and b) theoretical validation through comparison with existing frameworks, primarily the Sustainability Assessment of Food and Agriculture (SAFA) Guidelines (FAO, 2014).

a) Inductive Coding through Atlas.ti

The thematic analysis of interview data was conducted using Atlas.ti, a qualitative data analysis software that enabled systematic coding of stakeholder narratives. The interviews, as described in Chapter 3, were semi-structured and covered a wide range of topics, from governance processes to everyday work and social relations within Bio-districts. This flexible structure allowed for the emergence of unprompted themes, which were then grouped into categories representing stakeholder priorities, values, and challenges. Codes were developed both deductively, based on initial literature-informed sensitizing concepts, and inductively, from emergent patterns in the data. The coded segments were continuously reviewed to detect frequently mentioned themes, co-occurrences across groups, and variations by country or actor type. This iterative process led to the formation of thematic categories, which laid the empirical foundation for the framework.

b) Literature-Based Validation and Thematic Structuring

The themes derived from empirical coding were then validated and refined through comparison with existing conceptual and policy frameworks for sustainability assessment. The primary reference framework used for this validation was the SAFA Guidelines (FAO, 2014). This dual validation strategy—coding of interviews with Atlas.ti followed by literature triangulation, ensured that each decision criterion was both empirically grounded and theoretically supported. While the majority of themes and sub-themes emerged inductively from stakeholder narratives, in instances where important

dimensions of social sustainability were underrepresented or absent in the empirical material, they were carefully integrated based on established literature, particularly from the SAFA guidelines and complementary scholarly sources. This was done to ensure analytical completeness and to avoid omitting conceptually significant aspects that may not have surfaced during the interviews due to contextual constraints or variations in stakeholder awareness. Such additions were made transparently and in line with the participatory orientation of the research, with the intention of strengthening the coherence and normative validity of the framework. Only themes relevant to the social and governance dimensions were retained, in line with the study's focus. Where possible, emerging stakeholder themes were mapped directly onto existing SAFA sub-themes, thereby enhancing external validity. Where discrepancies occurred, such as when stakeholders expressed priorities that were more specific or contextual than the SAFA framework allowed, these sub-themes were either modified or renamed, while maintaining conceptual links to recognized criteria.

Step 4: Indicator development and Measurement Methods

In In this step, the previously defined themes and sub-themes were operationalized through the construction of qualitative indicators, enabling the assessment of how governance models within Bio-districts contribute to social sustainability. The development of these indicators followed a triangulated approach, drawing from three complementary sources: (1) insights derived from stakeholder consultations and thematic analysis of interview data, (2) a specific review of the scientific literature on sustainability and rural governance that addressed that specific theme and sub-theme in agricultural settings, and (3) existing indicator frameworks, particularly those included in the SAFA Guidelines (FAO, 2014), as well as more context-specific contributions from authors such as Lamine et al. (2019), Sonnino and Marsden (2006), and Ray (1998). The indicators were designed to reflect qualitative, perception-based dimensions of social sustainability, which are often difficult to capture through quantitative proxies but are nonetheless essential for understanding the functioning and legitimacy of participatory governance in rural contexts. Each indicator was thus formulated to allow for interpretive evaluation—through narrative descriptions, observed practices, or stakeholder self-assessments—rather than standardized scoring. This approach aligns with the context-sensitive and exploratory nature of the research and enhances the framework's relevance for diverse territorial settings.

Furthermore, in line with the participatory ethos of the project, the indicators were iteratively refined to reflect stakeholder vocabulary and practical relevance, ensuring they would be understandable, meaningful, and applicable to those involved in Bio-district development. Where direct stakeholder input on certain sub-themes was limited or missing, indicators were inferred from the literature to avoid neglecting important dimensions and to preserve the overall conceptual integrity of the framework.

Results: Theme and sub-Theme Identification and Consolidation

The results of the theme and sub-theme consolidation process are presented in Figure 11, which illustrates the final decision tree structured around two interrelated dimensions: Individual-Level Sustainability and Community-Level Sustainability. Each dimension comprises four core themes, resulting in a total of eight overarching themes and eighteen sub-themes. This structure reflects the dual focus of the study on both the lived experiences of individual actors within Bio-districts and the collective processes that underpin rural social innovation. The detailed description of each theme and sub-theme, along with its corresponding literature reference, is provided in the following section.

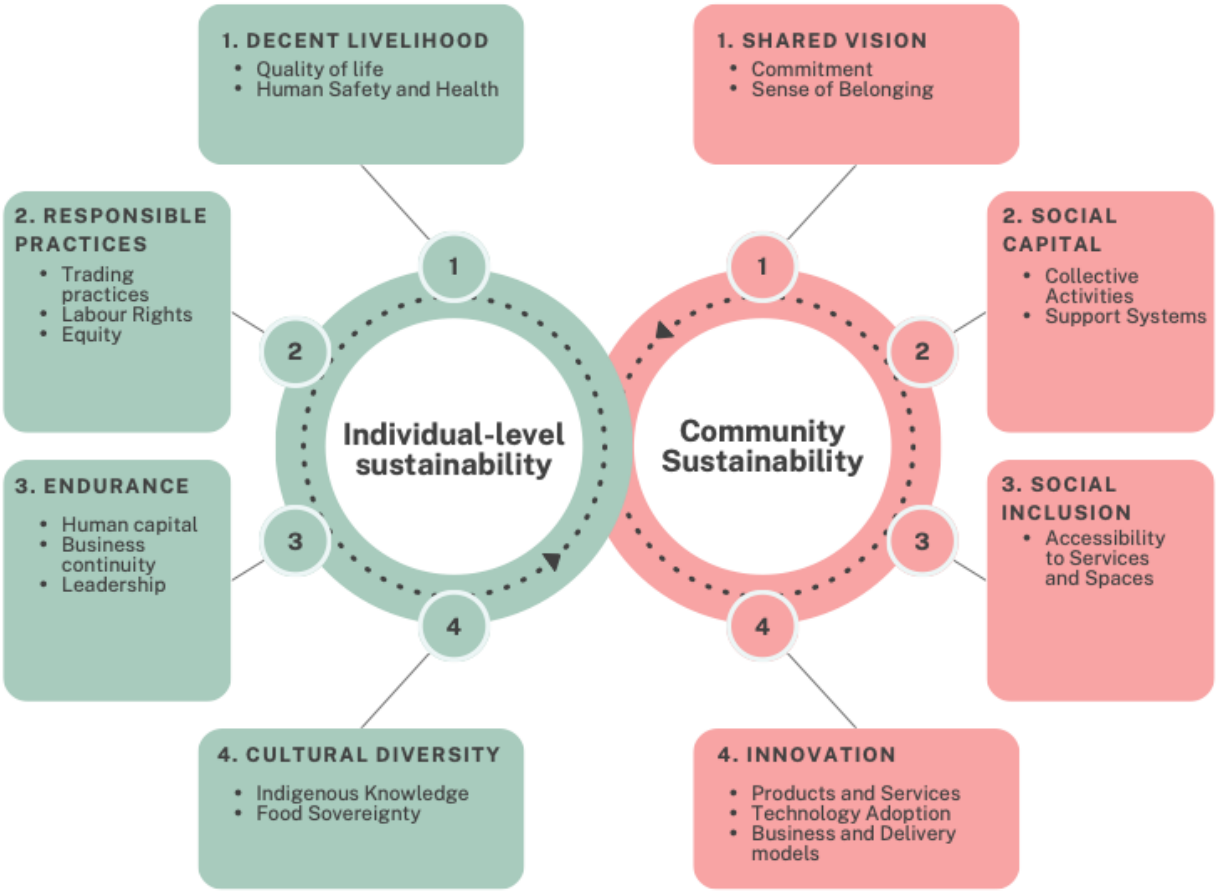

Figure 11. Final decision tree showing different themes and sub-themes.

Individual-level sustainability

The following section presents the first dimension of the framework—Individual-level sustainability—which encompasses four core themes reflecting the social and economic conditions experienced by actors in their daily lives within the Bio-district; these are detailed in Table 5.

Table 5. Themes and Sub-Themes of the Individual Level Sustainability with Key Literature References

Sustainability Dimension	Theme	Sub-Theme	Key Literature References
Individual-Level Sustainability	Decent Livelihood	Quality of Life	Rakodi (2014); Contzen & Häberli (2021)
		Human Safety and Health	FAO (2014) – SAFA Guidelines
	Responsible Practices	Trading Practices	FAO (2014) – SAFA Guidelines
		Labor Rights	FAO (2014) – SAFA Guidelines
		Equity	FAO (2014) – SAFA Guidelines
	Endurance	Human Capital	FAO (2014) – SAFA Guidelines
		Business Continuity	FAO (2014) – SAFA Guidelines
		Leadership	FAO (2014) – SAFA Guidelines
	Cultural Diversity	Indigenous Knowledge	FAO (2014) – SAFA Guidelines
		Food Sovereignty	Dekeyser et al. (2018); Sampson et al. (2021)

Decent Livelihood

The theme of "Decent Livelihood" focuses on ensuring that individuals and households engaged in agricultural and related activities can achieve a standard of living that supports their well-being, and social dignity. This involves providing fair and stable incomes, safe working conditions, and access to essential services that enable long-term resilience and satisfaction. A decent livelihood encompasses both material aspects, such as financial sustainability and workplace safety, and non-material aspects, such as work-life balance, job satisfaction, and recognition of cultural and social contributions (Rakodi, 2014). This theme is made out of two sub-themes:

a. Quality of Life

The concept of quality of life (QoL) captures both subjective well-being (personal perceptions and satisfaction) and objective well-being (measurable life conditions such as income, health, and working hours). In line with Contzen and Häberli (2021) study on dairy farmers, QoL is a multidimensional concept that encompasses material and non-material components:

Subjective Well-Being: This refers to farmers' feelings of satisfaction with their work-life balance, job fulfillment, and sense of purpose. It also includes emotional factors such as stress levels and the ability to spend time with family and pursue leisure activities. The eudaimonic aspect—finding meaning and autonomy in their work—is particularly significant in agricultural communities.

Objective Well-Being: This includes elements such as income stability, working hours, access to healthcare, and physical living conditions. Ensuring that producers have fair market access and financial support directly affects their QoL.

b. Human Safety and Health

This sub-theme addresses the physical and mental safety of farmers and workers, encompassing two key aspects identified by the SAFA framework:

Workplace Safety and Health Provisions: This includes the presence of protective measures, safe equipment, and access to medical care for preventing work-related injuries and long-term health issues.

Access to a Healthy Diet: Beyond workplace safety, accessing healthy eating habits among agricultural workers and the local community is crucial. This involves ensuring access to nutritious food and encouraging sustainable consumption patterns that benefit both producers and consumers.

Responsible Practices

The theme of "Responsible Practices" in the context of Bio-districts encompasses actions that ensure ethical, fair, and inclusive practices throughout the value chain. This theme, adapted from the SAFA framework, focuses on fostering transparent trading relationships, protecting labor rights, and promoting equity to ensure a socially sustainable agricultural system. Three sub-themes build it up:

a. Trading Practices

Trading practices in Bio-districts emphasize ethical interactions between buyers and suppliers, ensuring that economic exchanges are built on trust, fairness, and transparency. These practices aim to protect small-scale producers and promote long-term, mutually beneficial relationships. Two elements are mainly considered in this sub-theme:

Responsible Buyers: Buyers are expected to adopt fair procurement practices, avoiding exploitative contracts and supporting fair pricing mechanisms.

Rights of Suppliers: Suppliers should be empowered with clear agreements and timely payments, ensuring that they receive fair compensation for their contributions without facing unfavorable contract terms.

b. Labor Rights

Labor rights focus on ensuring that all individuals involved in agricultural production and related activities have access to fair and dignified employment conditions. This sub-theme is critical for preventing labor exploitation and fostering a safe and respectful working environment. Three elements are considered in this sub-theme:

Employment Relationships: This refers to ensuring that formal contracts outline fair working conditions, wages, and benefits, reducing the prevalence of informal or precarious labor arrangements.

Forced Labor: Measures must be in place to prevent coercion, child labor, or any form of involuntary work.

Freedom of Association and Collective Bargaining: Workers should have the right to form or join associations and engage in collective bargaining without fear of retaliation, promoting empowerment and collective decision-making.

c. Equity

Equity within Bio-districts involves promoting equal access to resources, opportunities, and decision-making processes, regardless of gender, socio-economic status, or other vulnerabilities. Three elements are considered in this sub-theme:

Non-Discrimination: Policies must be in place to prevent discrimination based on race, gender, age, or other factors in employment, training, and resource allocation.

Gender Equity: Initiatives should aim to promote equal participation of women in agricultural activities and governance roles, ensuring that they have equal access to land, training, and leadership opportunities.

Support for Vulnerable Groups: Special attention should be given to groups at risk of social and economic exclusion, such as migrant workers, youth, and marginalized communities, through targeted support programs and capacity-building initiatives.

Endurance

The theme of "Endurance," adapted from the economic dimension of the SAFA guidelines, refers to the capacity of agricultural actors to maintain sustainable and resilient operations over time. This theme encompasses the long-term viability of farming businesses, the availability and enhancement of human capital, and the role of leadership in fostering resilience and innovation. Endurance emphasizes the importance of strengthening internal resources to withstand external challenges, ensuring that the economic activities within Bio-districts are both viable and socially sustainable.

a. Human Capital

Human capital refers to the skills, knowledge, and competencies of individuals that contribute to the resilience and adaptability of farming operations. Strengthening human capital is essential for improving productivity, innovation, and long-term viability within Bio-districts. Three main elements are therefore considered:

Education: Access to formal and informal educational opportunities that enhance knowledge related to sustainable agricultural practices, governance, and market dynamics.

Training: On-the-job and specialized training programs that support skill development in areas such as organic farming, financial management, and digital tools.

Skill Development: Initiatives aimed at building both technical (e.g., crop diversification, agroecological practices) and soft skills (e.g., leadership, communication) to improve individual and collective capacity.

b. Business Continuity

Business continuity focuses on the economic viability of farming operations and their ability to maintain operations over time despite economic pressures and external challenges. This sub-theme addresses the need for businesses to remain profitable, adapt to changing circumstances, and ensure generational renewal.

Economic Viability: The capacity to generate sufficient income to cover operational costs, reinvest in the business, and provide a stable livelihood for the household.

Off Work and Family Labor: The extent to which businesses rely on supplemental income from off work or family members to maintain operations. While these strategies can enhance resilience, they may also indicate economic vulnerability.

Generational Renewal: Efforts to attract and retain younger generations in businesses and agriculture, addressing barriers such as access to land, financing, and training. Stakeholders highlighted that ensuring business continuity often requires policies and support mechanisms that encourage youth engagement and succession planning.

c. Leadership

Leadership refers to the presence of individuals or groups who inspire and guide others, promoting independent thinking and fostering resilience. Strong leadership helps drive social innovation, collective action, and knowledge-sharing, contributing to long-term sustainability.

Inspiring Models: The presence of role models who demonstrate successful sustainable farming practices and community leadership.

Independent Thinking: The ability of leaders to advocate for innovative solutions and challenge conventional approaches when necessary.

Successful Examples: Documented cases of successful farms or initiatives that serve as examples of best practices, reinforcing collective confidence and encouraging others to adopt similar strategies.

Cultural Diversity

The theme of "Cultural Diversity" in the context of Bio-districts emphasizes the importance of preserving and promoting the cultural heritage, traditional practices, and knowledge systems that shape local identities and agricultural practices. Cultural diversity plays a crucial role in fostering resilient and sustainable rural communities by embedding farming systems within the socio-cultural fabric of the region. This theme encompasses the recognition and valorization of indigenous knowledge and the promotion of food sovereignty as key elements of sustainable territorial governance.

a. Indigenous knowledge

Indigenous knowledge refers to the traditional skills, practices, and wisdom passed down through generations within local communities. This knowledge contributes to the development of agroecological practices that are closely aligned with local environmental conditions and cultural traditions.

Traditional Food and Agricultural Practices: Indigenous knowledge often includes techniques related to food recipes, crop rotation, soil preservation, biodiversity conservation, and water management that have evolved in response to local challenges.

Cultural Heritage Preservation: Recognizing and supporting practices such as seed-saving, manufacturing, heirloom crops, and community festivals that celebrate traditional agricultural activities.

Intergenerational Knowledge Transfer: Ensuring that traditional farming practices and values are passed down from older to younger generations, strengthening the cultural resilience of the community.

b. Food Sovereignty

Food sovereignty is a concept that emphasizes the right of people, communities, and nations to define their own food systems in ways that prioritize local needs, cultural values, and ecological sustainability over market-driven agendas (Dekeyser et al., 2018). Emerging as a grassroots response to the social and environmental consequences of industrial food systems, food sovereignty advocates for democratic control over food production, distribution, and consumption. This approach shifts decision-making power from corporations and international markets to local producers, consumers, and communities, ensuring that food is viewed not merely as a commodity but as a basic human right intertwined with cultural identity and ecological health. This sub-theme focuses on empowering local actors within Bio-districts to make decisions about agricultural practices and food-related policies. Two elements were prioritized:

Autonomy in Decision-Making: Ensuring that local farmers and producers have the power to make independent choices about what crops to grow, how to market their products, and how to manage their resources.

Local Food Systems: Promoting short food supply chains and local markets that prioritize regional products, thereby reducing dependency on external markets and intermediaries.

Access to Land and Resources: Supporting equitable access to land, water, seeds, and other resources necessary for sustainable food production. Ensuring land rights and avoiding land concentration are key to reinforcing food sovereignty (Sampson et al., 2021).

Community Sustainability

The second dimension, Community Sustainability, focuses on collective dynamics and governance processes that shape shared well-being, cooperation, and innovation within the Bio-district; its four key themes and associated sub-themes are presented in Table 6.

Table 6. Themes and Sub-Themes of the Community Level Sustainability with Key Literature References

Community Sustainability	Shared Vision	Commitment	Fang et al. (2021); Doten-Snitker et al. (2020); Lamine (2018)
		Sense of Belonging	Lamine (2018)
	Social Capital	Collective Activities	Straub et al. (2020); Terzo (2021); Saz-Gil et al. (2021)
		Support Systems	Straub et al. (2020); Saz-Gil et al. (2021)
	Social Inclusion	Accessibility to Services & Spaces	Bock (2016); Probst et al. (2019)
	Innovation	Products and Services	Abrol (2004)
		Technology Adoption	Virkkala (2007); Abrol (2004)
		Business and Delivery Models	Abrol (2004)

Shared Vision

The theme of "Shared Vision" within Bio-districts represents the collective sense of purpose and unity among community members. Shared vision plays a crucial role in fostering sustainable development and community empowerment. It promotes innovation, enhances green creativity, and strengthens

organizational commitment to environmental goals (Fang et al., 2021). In academic settings, shared vision development involves co-orientation, formational communication, and recognition of stakeholder autonomy, leading to increased participation and success in change projects (Doten-Snitker et al., 2020). A pragmatist approach emphasizes the significance of creating a "community of fate" where stakeholders feel collectively attached to shared problems and futures (Lamine, 2018), fostering collaboration, trust, and long-term commitment, enabling diverse stakeholders—such as farmers, consumers, local authorities, and organizations—to work towards common objectives. This theme is essential for creating socially cohesive communities where shared values guide actions and decisions.

a. Commitment

Commitment refers to the extent to which stakeholders are dedicated to the goals and long-term success of the members of the community. It involves the alignment of individual and collective actions with the shared objectives of sustainability, resilience, and community well-being. Key elements of commitment include:

Goal Orientation: The degree to which stakeholders understand, support, and actively contribute to the sustainability goals of the Bio-district. This involves having a clear and common understanding of objectives related to economic viability, environmental conservation, and social inclusion.

Challenging Environment: The resilience of stakeholders when faced with external pressures, such as economic uncertainty, depopulation, or climate challenges. Commitment in this sense refers to the community's ability to remain focused on their goals despite adversity.

Stakeholder Engagement: Regular participation in decision-making processes, meetings, and collaborative initiatives as a reflection of commitment to shared governance and collective responsibility.

b. Sense of Belonging

Sense of belonging reflects the emotional connection that stakeholders feel towards the Bio-district, their community, and the shared cultural and environmental landscape. A strong sense of belonging reinforces social cohesion and strengthens collective action. The following elements are key to fostering a sense of belonging:

Family Legacy: The transmission of values, traditions, and practices related to agriculture and community engagement across generations. Family legacy strengthens identity and reinforces the importance of continuing sustainable farming practices within the community.

Common Set of Values: The alignment of cultural, social, and ethical principles that unite stakeholders, such as a shared commitment to organic farming, environmental stewardship, and social fairness. This shared value system provides a moral and cultural framework for decision-making.

Sense of Place: The recognition of the Bio-district's landscape as a valuable cultural and natural asset that reinforces local identity. This includes pride in the area's biodiversity, scenic beauty, and historical significance, which strengthens stakeholders' connection to the land and their commitment to its preservation.

Social Capital

The theme of "Social Capital" here refers to the social networks, relationships that enable community members to act collectively. Studies indicate that rural communities frequently encounter challenges stemming from geographical isolation and constrained access to resources, contributing to a perceived disconnection from urban areas (Straub et al., 2020). Nonetheless, resilience within these communities can be fostered through the development of informal networks and collaborative relationships between communities. The cooperation involves fostering connections between individuals, community groups, and external organizations to address shared challenges and create opportunities for mutual growth. Study shows that social cooperation positively affects material living conditions through the generation of social value (Terzo, 2021). Cooperatives, as collective organizations, both create and absorb social capital, contributing to rural development (Saz-Gil et al., 2021). This theme is divided into two main sub-themes:

a. Collective Activities

Collective activities refer to the shared initiatives and events that foster social interaction and cooperation within Bio-districts. These activities provide spaces for building relationships, exchanging knowledge, and reinforcing a sense of community. Examples of collective activities include:

Community Markets and Festivals: Events that bring together producers and consumers, reinforcing cultural identity and economic exchange.

Workshops and Training Sessions: Educational gatherings that promote knowledge-sharing and skill development, particularly related to sustainable farming practices.

Collaborative Governance Meetings: Forums where community members and stakeholders participate in decision-making processes related to Bio-district governance.

b. Support Systems

Support systems refer to the external and internal mechanisms that provide resources, guidance, and assistance to community members. These systems play a crucial role in sustaining cooperation and addressing challenges faced by rural actors. Elements of support include:

Government Support: Financial incentives, policy frameworks, and programs that enhance rural development and promote cooperation within Bio-districts

Community-Based Organizations: Local cooperatives and associations that provide social and economic support through shared resources and initiatives.

External Stakeholder Engagement: Involvement of NGOs, research institutions, and private sector actors that offer technical assistance, capacity-building, and funding for innovative projects

Social Inclusion

The theme of "Social Inclusion" focuses on ensuring that all community members have equitable access to essential services, public spaces, and participatory processes that enable their active

engagement in social and economic life (Bock, 2016). Social inclusion seeks to address and reduce disparities that contribute to rural marginalization, fostering a more cohesive and empowered community.

a. Accessibility to Services and Spaces

Accessibility to services and spaces refers to the availability, affordability, and physical or digital reach of essential public services and shared spaces. This sub-theme emphasizes the importance of equitable infrastructure that supports social cohesion, reduces isolation, and promotes well-being within rural communities.

Public Services: Access to healthcare, education, and social services is critical for ensuring that marginalized groups—such as the elderly, migrants, and economically disadvantaged residents—are not excluded from essential support. For example, remote rural areas often experience "health deserts," where cuts to public funding exacerbate the lack of medical facilities, schools, and administrative offices (Probst et al., 2019).

Mobility and Transport: Effective transportation networks or alternative mobility solutions (e.g., digital connectivity and community transport) can bridge physical distances and reduce social isolation, enabling residents to participate in community life and access urban centers when needed (Bock, 2016).

Community Spaces: Public and semi-public spaces, such as markets, cultural centers, and cooperative hubs, are essential for fostering interaction and providing venues for shared activities and civic engagement. In Bio-districts, such spaces can host educational workshops, local markets, and cultural events that reinforce social bonds and enhance local pride.

Innovation

The theme of "Innovation" within Bio-districts emphasizes collaborative processes that support the development and dissemination of new ideas, products, and services aimed at strengthening community resilience and sustainability. In rural contexts, where dense local networks are often lacking, enterprises compensate by acquiring knowledge from regional actors, clients, and national support programs (Virkkala, 2007). However, efforts focused solely on enhancing individual competitiveness through small-scale technologies have proven insufficient for achieving technological efficiency. Instead, small producers benefit from forming multi-sectoral collectives that facilitate the

pooling of resources and expertise (Abrol, 2004). Rural innovation, therefore, involves not only the effective implementation of ideas and information to meet social needs and modernize agricultural practices but also the creation of inclusive and adaptive systems of governance. Community-level innovation places particular emphasis on collective action, knowledge-sharing, and partnerships among diverse stakeholders, addressing both technological advancements and the social and organizational shifts necessary to foster rural vitality.

a. Products and Services

This sub-theme refers to the development and diversification of goods and services that reflect the values and resources of the Bio-district, contributing to economic sustainability and cultural identity. Collaborative innovation in this context often involves co-creation among producers, consumers, and institutions.

Local Product Innovation: The creation of value-added products (e.g., organic processed foods, eco-tourism packages) that enhance the market appeal of local goods.

Service Expansion: The establishment of multi-functional hubs that provide educational workshops, local food markets, and agro-tourism experiences to diversify income streams and increase community interaction.

Cultural and Heritage-Based Offerings: Leveraging traditional knowledge to create unique products and services, such as heirloom crop varieties and cultural events, that reinforce local identity and attract external interest.

b. Technology Adoption

Technology adoption refers to the collective implementation of digital tools, sustainable farming techniques, and communication platforms that support productivity, connectivity, and knowledge-sharing within the Bio-district.

Digital Connectivity: The use of online platforms for marketing, knowledge dissemination, and stakeholder communication. Initiatives such as digital farmers' markets and virtual workshops can increase participation and reduce geographical barriers.

Agroecological Practices: Collaborative adoption of sustainable technologies, such as precision farming, irrigation systems, and renewable energy, to enhance resource efficiency and resilience to climate challenges.

Cooperative Learning Platforms: The development of farmer networks that share insights on best practices and innovations, fostering peer-to-peer learning and continuous improvement.

c. Business and Delivery Models

This sub-theme focuses on innovative economic models and distribution systems that enhance local market access, reduce dependency on intermediaries, and promote sustainable consumption patterns.

Short Food Supply Chains: Collaborative models that connect producers directly with consumers through community-supported agriculture (CSA), farmers' markets, and farm-to-table partnerships, reducing transaction costs and promoting transparency.

Cooperative Business Models: Collective enterprises, such as producer cooperatives and service hubs, that distribute profits and risks equitably among members, reinforcing economic solidarity.

Alternative Delivery Mechanisms: New approaches to product distribution, such as subscription boxes, online ordering platforms, and zero-waste packaging, that increase consumer convenience and align with sustainability goals.

Results: Indicator development and Measurement Methods

To evaluate how governance practices within Bio-districts contribute to social sustainability, each theme and sub-theme was translated into a corresponding set of qualitative indicators. These indicators were designed to be used in a flexible, narrative-based format that reflects the real-world practices and perceptions of diverse stakeholders. Rather than attempting to reduce complex social realities to fixed numbers, the indicators aim to capture the lived experiences, subjective meanings, and relational dynamics that underpin sustainability in rural settings. Each indicator is structured to facilitate open-ended, semi-structured discussion, ideally through interviews, workshops, or participatory

assessments. To enhance the depth and interpretability of the data collected, the use of follow-up questions is strongly recommended. These probing questions can help uncover underlying motivations, perceived barriers, or contradictions in responses—thereby providing a richer, more nuanced understanding of each theme. Although the indicators are not inherently designed for quantitative scoring, users may optionally implement a Likert scale (e.g., 1 to 5 or 1 to 7) to capture stakeholder perceptions in a standardized format. This can be particularly helpful when comparing responses across time, between regions, or among different actor groups. While such ranking is not the primary aim of the framework, it can support cross-case comparison and facilitate alignment with policy frameworks, especially in contexts where monitoring and evaluation systems require measurable outputs. The numerical scale can thus complement, but not replace, the qualitative insights that are central to the participatory and contextual approach of this methodology. Each indicator is accompanied by practical guiding questions and examples, designed to make them intuitive to apply in both formal assessments and more informal community reflections. This ensures that the framework is not only academically robust but also accessible and useful to practitioners, facilitators, and local governance actors working within Bio-districts.

Table 7. Qualitative Indicators for Themes and Sub-Themes

Theme	**Sub-Theme**	**Qualitative Indicators**
Decent Livelihood	Quality of Life	- Perception of work-life balance and satisfaction with workload. - Stakeholder views on income sufficiency for basic needs.
	Human Safety and Health	- Farmers' and workers' accounts of safety protocols and use of protective gear. - Availability of healthcare services.
Responsible Practices	Trading Practices	- Farmers' perceptions of fairness in contracts and payment timelines. - Reports of buyer-supplier negotiation transparency.

Theme	Sub-Theme	Qualitative Indicators
	Labor Rights	- Stakeholder feedback on freedom to organize or join associations. - Reports of formal contracts and job security experiences.
	Equity	- Community perceptions of gender inclusivity in governance and work roles. - Instances of support to marginalized groups.
Endurance	Human Capital	- Accounts of access to training programs and skill-building opportunities. - Perceptions of educational adequacy for farming.
	Business Continuity	- Reports of off-farm employment reliance for economic stability. - Stakeholder concerns on generational transfer of farms.
	Leadership	- Identified local role models and their influence on innovation. - Feedback on leader-driven initiatives and independent ideas.
Cultural Diversity	Indigenous Knowledge	- Stakeholder views on the recognition and application of traditional practices. - Reports on intergenerational knowledge-sharing.
	Food Sovereignty	- Perception of autonomy in decision-making about crops and markets. - Experiences with local food system participation.
Shared Vision	Commitment	- Reports on participation in community vision-building activities. - Feedback on resilience in maintaining goals during crises.

Theme	Sub-Theme	Qualitative Indicators
	Sense of Belonging	- Stakeholders' reflections on cultural events and traditions. - Perceptions of connection to the local landscape and community.
Cooperation	Social Capital	- Stakeholder feedback on levels of trust and collaboration within networks. - Reports of partnerships with external actors.
	Collective Activities	- Participation in community events such as workshops or local markets. - Perceived impact of collective governance meetings.
	Support Systems	- Stakeholder experiences with institutional and community support mechanisms. - Access to financial aid and technical support.
Social Inclusion	Accessibility to Services and Spaces	- Community perceptions of access to public services such as healthcare and transportation. - Feedback on availability of shared spaces for cultural and educational events.
Innovation	Products and Services	- Stakeholder reflections on new product development initiatives. - Participation in service diversification programs.
	Technology Adoption	- Reports on community-led digital and technical tool implementation. - Accounts of access to and training in digital platforms.
	Business and Delivery Models	- Feedback on the use of direct marketing (e.g., CSAs, farm-to-table). - Perceived success of cooperative models in delivering goods and services.

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1. Decent Livelihood

Quality of Life

- **Scope**: Assesses the balance between work and personal life, income adequacy, and subjective well-being.
- **Function**: Helps identify whether stakeholders can sustain a dignified standard of living while engaging in Bio-district activities.
- **Application**: Use in interviews or participatory sessions to explore satisfaction levels with time use and income stability.
    - **Questions**:
      "Can you manage your farm work and still have time for family or rest?"
      "Do you feel your income allows you to live decently year-round?"
      "What would improve your quality of life?"

Human Safety and Health

- **Scope**: Evaluates both physical workplace safety and access to healthcare for agricultural workers.
- **Function**: Highlights occupational health risks and the capacity of local systems to respond to emergencies.
- **Application**: Observe safety practices and ask about access to health infrastructure.
    - **Questions**:
      "Do you have protective gear and training for hazardous tasks?"
      "What do you do if someone is injured on the farm?"
      "How far is the nearest health clinic?"

2. Responsible Practices

Trading Practices

- **Scope**: Measures fairness, transparency, and trust in economic exchanges.
- **Function**: Reflects ethical dimensions of local market governance.
- **Application**: Discuss contracts, pricing, and relationships with buyers/suppliers.
    - **Questions**:
      "Are the terms of your contracts clear?"
      "Do you feel you can negotiate with buyers?"
      "Are payments made on time?"

Labor Rights

- **Scope**: Evaluates employment conditions, contracts, freedom to organize, and protection from exploitation.
- **Function**: Assesses how labor is structured and how workers' rights are respected.
- **Application**: Best used in stakeholder interviews or farm visits.
    - **Questions**:
      "Do you have a formal employment contract?"

"Are workers allowed to form or join associations?"
"How are working hours and wages defined?"

Equity

- **Scope**: Looks at inclusion in decision-making, access to resources, and protection of vulnerable groups.
- **Function**: Tracks how gender and social equity are addressed within the Bio-district.
- **Application**: Assess organizational participation and specific support measures.
    - **Questions**:
      "Are women and young people part of your board or working groups?"
      "Are there support programs for migrants or disadvantaged groups?"
      "What barriers do marginalized individuals face?"

3. Endurance

Human Capital

- **Scope**: Captures access to knowledge, education, and training.
- **Function**: Measures capacity-building efforts that support long-term sustainability.
- **Application**: Use in interviews or surveys to discuss learning opportunities.
    - **Questions**:
      "Have you attended any training related to sustainable farming?"
      "What skills do you think are missing in your community?"
      "Are training opportunities affordable and accessible?"

Business Continuity

- **Scope**: Assesses the long-term economic viability of farms and the potential for generational renewal.
- **Function**: Flags issues such as financial fragility and youth disengagement.
- **Application**: Ask about income sources and succession planning.
    - **Questions**:
      "Do you need a second job to keep the farm running?"
      "Are your children or younger people interested in farming?"
      "What are the biggest threats to your business continuity?"

Leadership

- **Scope**: Identifies the presence and impact of visionary individuals or groups.
- **Function**: Explores how informal leadership supports innovation and resilience.
- **Application**: Ask about community champions and role models.
    - **Questions**:
      "Is there someone who inspires others to innovate here?"
      "What kind of leadership does your community need?"
      "What's the most successful project you've seen and who led it?"

4. Cultural Diversity

Indigenous Knowledge

- **Scope**: Looks at the retention, transmission, and application of traditional knowledge.
- **Function**: Supports cultural resilience and agroecological sustainability.
- **Application**: Discuss everyday practices and cultural events.
    - **Questions**:
      "Do you still use techniques taught by elders?"
      "Are younger people interested in traditional knowledge?"
      "How is traditional knowledge preserved in your community?"

Food Sovereignty

- **Scope**: Measures autonomy in production and strength of local food systems.
- **Function**: Encourages self-determination and short supply chains.
- **Application**: Ask about production choices and access to markets.
    - **Questions**:
      "Can you decide what crops to grow or are you constrained by market forces?"
      "Is your food mainly sold locally?"
      "Do you have secure access to land and resources?"

5. Shared Vision

Commitment

- **Scope**: Evaluates stakeholders' active contribution and resilience to adversity.
- **Function**: Reveals whether actors identify with and support Bio-district goals.
- **Application**: Assess engagement with shared goals and coping mechanisms.
    - **Questions**:
      "Have you taken part in defining Bio-district goals?"
      "What keeps you committed during difficult times?"
      "Do you feel part of a collective mission?"

Sense of Belonging

- **Scope**: Captures emotional connection to place, identity, and collective memory.
- **Function**: Highlights intangible dimensions of rural cohesion.
- **Application**: Ask about cultural symbols, family legacy, and place identity.
    - **Questions**:
      "Do you feel proud of being part of this territory?"
      "What traditions make this place special?"
      "How important is the landscape to your identity?"

6. Social Capital

Collective Activities

- **Scope**: Looks at participation in shared events, learning, and governance.
- **Function**: Measures cohesion and opportunities for peer exchange.
- **Application**: Ask about frequency and types of interactions.
    - **Questions**:
      "Do you take part in cooperative activities, markets, or workshops?"
      "What do you gain from these gatherings?"
      "Do they help solve common problems?"

Support Systems

- **Scope**: Assesses access to both institutional (governmental) and informal (community) support.
- **Function**: Identifies the resources available for innovation and crisis response.
- **Application**: Probe assistance and institutional presence.
    - **Questions**:
      "Have you received any kind of technical or financial support?"
      "Which institutions or groups do you turn to in a crisis?"
      "Do support systems reach everyone equally?"

7. Social Inclusion

Accessibility to Services and Spaces

- **Scope**: Evaluates availability and accessibility of essential services and public spaces.
- **Function**: Flags issues of exclusion due to remoteness, age, or socio-economic status.
- **Application**: Explore transport, service access, and participation.
    - **Questions**:
      "How far is the nearest school, clinic, or transport stop?"
      "Are there spaces where people gather or organize events?"
      "Who is left out of these spaces?"

8. Innovation

Products and Services

- **Scope**: Captures the community's ability to innovate through new offerings.
- **Function**: Measures economic diversification and cultural adaptation.
- **Application**: Ask about product creation and co-designed services.
    - **Questions**:
      "Have you developed a new product or service?"
      "Was this done alone or with others?"
      "How has it been received by the community?"

Technology Adoption

- **Scope**: Measures implementation of digital tools and sustainable farming technologies.
- **Function**: Assesses capacity for modernization and peer learning.
- **Application**: Explore types of technology used and accessibility.
    - **Questions**:
      "Do you use any apps or online tools in your work?"
      "Have you adopted any new farming technologies?"
      "Who helps you understand and apply new tools?"

Business and Delivery Models

- **Scope**: Evaluates innovations in food marketing, logistics, and organizational forms.
- **Function**: Highlights systemic change in how value is created and distributed.
- **Application**: Discuss food distribution, platforms, and cooperatives.
    - **Questions**:
      "Do you use direct-to-consumer models?"
      "What alternatives have you explored to supermarkets or middlemen?"
      "How well do these models work for you?"

Final Considerations and Limitations of the Framework

The proposed framework for assessing social sustainability in Bio-districts offers a structured yet flexible tool to evaluate complex social dynamics at both individual and community levels. By integrating stakeholder perspectives through an adapted Multi-Actor Multi-Criteria Analysis (MAMCA) process, and by building on a dual foundation of literature-informed themes and field-derived evidence, the framework ensures both conceptual robustness and empirical grounding. The resulting set of themes, sub-themes, and qualitative indicators reflects the socio-cultural specificity of rural territories while offering a common language to discuss, monitor, and guide sustainability efforts.

One of the framework's central strengths lies in its qualitative orientation, which prioritizes the lived experiences, perceptions, and values of rural actors. By avoiding an over-reliance on rigid, quantitative benchmarks, the indicators capture nuanced, intangible aspects of sustainability such as trust, belonging, empowerment, and shared vision. This is particularly appropriate for the social pillar of sustainability, where meaning-making, inclusion, and relational dynamics are fundamental. Moreover, the participatory construction of the framework, through interviews, thematic analysis (using Atlas.ti), and validation against international frameworks like SAFA, ensures that the indicators are both locally

relevant and globally informed. A further advantage is the dual-scalar structure of the framework, which distinguishes between individual-level and community-level sustainability. This allows for a more precise understanding of how Bio-districts influence well-being, resilience, cooperation, and governance from both personal and collective standpoints. The flexibility of the indicators also supports adaptation to different territorial contexts, making the framework suitable for use across varied Bio-district models. Nonetheless, several limitations and methodological tensions must be acknowledged. First, the reliance on qualitative data, while rich in context, introduces subjectivity and interpretive variability. Stakeholder responses are shaped by individual histories, social positions, and temporal contexts, which may challenge consistency across cases or time periods. Although optional tools such as Likert scales may aid cross-comparison and policy alignment, this approach is not designed for standardization and should not replace the interpretive depth that qualitative methods provide. Second, the framework's implementation is resource-intensive. Conducting in-depth interviews, facilitating participatory workshops, and analyzing qualitative narratives require time, skilled facilitators, and institutional support—resources that may be scarce in underfunded rural areas. Furthermore, while the process emphasizes inclusivity, power asymmetries within communities can still influence whose voices are most heard, particularly when it comes to marginalized actors such as migrant workers, women, or youth.

Third, the framework faces challenges in causal attribution. Social sustainability outcomes, such as improved quality of life or stronger social capital, are shaped by multiple interdependent variables, many of which lie outside the scope of Bio-district governance (e.g., national agricultural policies, market shocks, climate events). Isolating the specific effects of Bio-district initiatives from broader dynamics remains methodologically complex. A related issue concerns the tension between adaptability and comparability. While the framework is designed to be responsive to different regional contexts, this very flexibility may hinder the ability of policymakers and researchers to generalize findings or synthesize lessons across different territories. In the absence of standardized metrics, comparing Bio-districts or scaling successful practices becomes more difficult. Additionally, expectations of short-term results may pose risks. Social change processes such as building trust, revitalizing cultural knowledge, or strengthening local governance take time. Stakeholders may become discouraged if tangible outcomes are not immediately visible, especially when funding cycles or political mandates demand rapid results (Wu et al., 2018). Future research should aim to complete the remaining steps of the MAMCA methodology, particularly steps 5 (performance assessment), 6 (sensitivity analysis), and 7 (policy recommendations). These are

essential for translating the qualitative framework into actionable insights that can support evidence-based decision-making and policy design.

Further exploration of digital tools for participatory engagement, including mobile surveys, online mapping platforms, and digital storytelling, may enhance inclusivity and lower logistical barriers, especially in geographically dispersed Bio-districts (Hasler et al., 2017). Research should also delve deeper into intersectional dynamics by examining how variables such as gender, class, ethnicity, and age influence access to resources and participation in governance. Comparative studies across different Bio-districts can reveal how governance models, institutional settings, and social capital configurations affect sustainability outcomes. This comparative lens is key to identifying best practices and refining the framework's adaptability. Longitudinal studies are equally critical: capturing changes over time would not only improve understanding of cause-effect relationships but also help track progress toward broader sustainable development goals.

In sum, this framework lays a foundational step toward systematic and participatory social sustainability assessmentin rural areas. While not exhaustive, it is designed to evolve, with the actors, contexts, and challenges it seeks to represent.

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Chapter 5. Conclusions

This doctoral thesis has explored the potential of bio-districts as a model for participatory territorial governance capable of enhancing social sustainability in rural areas. Grounded in an interdisciplinary perspective and informed by critical social science theory, the research has employed a multi-method approach that integrates literature review, qualitative fieldwork, and methodological innovation. The study responds to increasing calls for context-sensitive frameworks that not only measure social sustainability but also reflect the lived experiences, aspirations, and struggles of rural actors navigating complex transformations. Across four chapters, this work has developed and articulated a comprehensive understanding of social sustainability in the context of rural development and agroecological transition. Each chapter has addressed a specific research objective and generated original contributions to theory, empirical knowledge, and methodology. Together, they form a coherent narrative that advances the conceptual and practical underpinnings of socially sustainable governance in bio-districts.

Chapter 2 laid the theoretical groundwork by critically reviewing existing literature on sustainability assessment frameworks, with particular attention to how social dimensions are incorporated, or neglected, within agro-food systems and territorial development. The chapter identified a gap in current evaluation tools, which tend to privilege economic and environmental dimensions while underrepresenting key social aspects such as participation, equity, cultural continuity, and collective agency. It systematically analyzed frameworks such as SAFA (FAO, 2014), S-LCA, and SOAAN, highlighting their respective strengths and limitations. This review led to the identification of core social sustainability themes relevant for rural contexts, including decent livelihood, equity, participation, social capital, and cultural heritage. The chapter thus provided the normative and analytical basis for constructing a new framework capable of capturing the specificity of bio-districts as socially innovative governance models.

Chapter 3 shifted from conceptual analysis to empirical investigation. Drawing on 30 semi-structured interviews and participatory observation in two case studies, Cilento Bio-district in Italy and Sörmland in Sweden, the chapter examined how bio-districts operationalize social sustainability through governance practices, actor coalitions, and everyday interactions. The findings revealed both commonalities and context-specific dynamics. In Italy, strong place-based identities and historical legacies supported a sense of belonging and collective memory, yet tensions around institutionalization

and generational renewal persisted. In Sweden, a more pragmatic and market-oriented logic coexisted with informal collaboration and an emerging awareness of territorial identity. Across both contexts, the data emphasized the importance of leadership, trust-building, and horizontal coordination for sustaining collective action. The chapter demonstrated that rural vitality is not simply the presence of economic activity or services, but a relational process shaped by cultural, institutional, and political dimensions. This empirical contribution enriched the understanding of how social sustainability emerges through social innovation and grounded practice.

Chapter 4 responded to the need for an operational framework to assess social sustainability in a participatory, grounded, and adaptable manner. Building on the adapted MAMCA methodology (Macharis et al., 2010), the chapter constructed a qualitative evaluation tool that synthesizes stakeholder priorities, literature validation, and thematic analysis. The resulting framework organizes indicators into a dual-perspective decision tree comprising eight main themes and 18 sub-themes, reflecting individual-level and community-level sustainability. Themes such as decent livelihood, responsible practices, endurance, and cultural diversity capture how individual actors experience sustainability, while shared vision, social capital, inclusion, and innovation reflect collective dynamics. Each indicator is designed for qualitative application through interviews and discussions, and can be supplemented with Likert-scale scoring to support comparative analysis when necessary. The framework is not intended as a static checklist but as a reflexive tool that fosters dialogue, learning, and co-creation among diverse actors. This chapter thus contributes a practical methodology that bridges theory and practice while remaining sensitive to local contexts and power relations. Together, the chapters yield a multi-layered contribution to the literature and practice of sustainable rural development. The thesis makes three core contributions:

1. **Theoretical Contribution**: It advances the conceptualization of social sustainability by linking it with rural vitality, territorial governance, and social innovation. The research emphasizes the importance of place-based agency, intersubjective meaning-making, and collaborative governance in shaping sustainable outcomes.
2. **Empirical Contribution**: Through comparative case study analysis, the thesis provides original insights into how bio-districts function as arenas of collective action, contested governance, and evolving territorial identity. The findings highlight both enabling conditions and persistent barriers to inclusive, durable social sustainability in rural contexts.

3. **Methodological Contribution**: The development of a qualitative, stakeholder-driven framework for social sustainability assessment represents an innovative approach that prioritizes participation, reflexivity, and adaptability. By grounding indicators in both stakeholder narratives and established literature, the framework ensures both contextual relevance and academic rigor.

Despite its contributions, the research also faces several limitations that should be acknowledged. First, the reliance on qualitative methods, while suitable for capturing complex social phenomena, limits the scalability and comparability of findings. The subjectivity inherent in interview-based data and interpretive analysis can produce inconsistencies across cases or temporal settings. Second, the research does not include the final three steps of the MAMCA methodology: performance assessment, sensitivity analysis, and policy recommendation. These steps are essential for transforming the framework into a fully functional decision-support tool. Third, the intensive nature of participatory engagement, including recruitment, dialogue facilitation, and data analysis, requires significant time and resources, which may not be readily available in all territorial contexts.

Future research should aim to address these limitations in several ways. Completing the MAMCA cycle would allow for a more actionable and policy-relevant application of the framework. Comparative testing across additional bio-districts or similar territorial governance models could enhance the framework's robustness and enable identification of transferable insights. Integrating digital tools such as participatory mapping, online surveys, and mobile data collection could support broader engagement and reduce resource burdens. Furthermore, intersectional analyses should be deepened to explore how social sustainability outcomes are shaped by gender, class, ethnicity, and generation. Longitudinal studies would also be beneficial for assessing how social sustainability evolves over time, how trust is built or eroded, and how governance arrangements adapt to shifting socio-political conditions. This thesis contributes to advancing the study and practice of sustainability science by demonstrating that social sustainability must be approached not merely as an abstract principle but as a situated, participatory, and relational process. Bio-districts offer promising, though imperfect, models for cultivating such processes through embedded governance, place-based identity, and collective experimentation. The framework proposed here is a step toward capturing and fostering those dynamics in a way that is grounded in local realities while connected to broader sustainability goals. As rural areas face ongoing challenges from climate change, demographic shifts, and economic

restructuring, socially grounded governance approaches will be essential for ensuring that transitions are not only ecologically sound and economically viable, but also socially just and inclusive.

Appendix

Supplementary Table A. Keywords that were used to identify each social theme, based on the coding schemes**.**

Social Themes	**Keywords**
1. Access to services and inputs	1. Access, land, services, inputs
2. Community empowerment	2. Empowerment, development, community
3. Social cohesion and networks	3. Networks, social capital, relation*, interaction, alliance, cooperation, bond*, link*, aggregation, synergy, share, collaboration, get together
4. Decent livelihood	4. Rural livelihood*, improvement, social condition, meet need*, decent livelihood*
5. Education	5. Education, awareness, teaching, learning
6. Fairness	6. Fair, fairness, equity, respect, power balance
7. Food safety	7. Food safety, food quality, traceability, consumer safety, food risk

8. Food security	8. Food security, availability, affordability
9. Food sovereignty	9. Food sovereignty, independence
10. Gender equity and women empowerment	10. Gender, women employment, gender equity, equality, empowerment
11. Governance	11. Bottom-up, participation, governance, partnership, management, inclusion, normativity
12. Health	12. Health, well-being, disease*, hazard*
13. Healthy diet	13. Healthy diet, food consumption, purchase, nutrition, eating, malnutrition
14. Innovation	14. Research, innovation, technology development
15. Knowledge exchange	15. Knowledge exchange, training, skills, information, communication
16. Lifestyle	16. Lifestyle, responsible, practices
17. Local Employment	17. Employment, creation, job opportunities, work, unemployment
18. Local traditions and Cultural heritage	18. Traditions, culture, heritage, history, preservation, landscape enhancement
19. Peace and justice	19. Peace, justice
20. Territorial and local value creation	20. Promotion, territory, valorisation, attractiveness, product enhancement, local

21. Quality of life	21. Quality of life, living standards
22. Resilience	22. Resilience, regeneration, recovery
23. Social farming and integration	23. Inclusion, involvement, migrant, disadvantaged, vulnerable, social farming, accessibility, reduced inequalities
24. Socio-demographic revitalization	24. Depopulation, migration, demographic decline, abandonment, ageing, revitalization
25. Working conditions	25. Working conditions, accidents, occupational exposure, decent work, quality of work
26. Youth employment	26. Youth, young, young generations

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3586 Supplementary Table B. The 26 identified social themes clustered according to SDGs and targets.

Theme	SDG	Target
Access to services and Inputs	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.3**: Doubled agricultural productivity and incomes of small-scale producers, including through secure access to land and other productive resources, and opportunities for value addition and non-farm employment
Community empowerment	**Goal 16**: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	**Target 16.6** Develop effective, accountable and transparent institutions at all levels.

Social cohesion and networks	**Goal 17**: Strengthen the means of implementation and revitalize the global partnership for sustainable development	**Target 17.16**: Global and multi-stakeholder partnerships for Sustainable Development **Target 17.17**: Effective public, public-private and civil society partnerships
Decent livelihood	**Goal 3**: Ensure healthy lives and promote well-being for all at all ages **Goal 6**: Ensure availability and sustainable management of water and sanitation for all	**Target 3.9**: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination **Target 6.3**: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally **Target 6.6**: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
Education	**Goal 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	**Target 4.7**: Knowledge and skills to promote sustainable development
Fairness	**Goal 10**: Reduce inequality within and among countries	**Target 10.2**: By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
Food safety	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.1**: Access of all people to safe, nutritious and sufficient food all year round

Food security	**Goal 2:** End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.1**: Access of all people to safe, nutritious and sufficient food all year round
Food sovereignty	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.3**: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment **Target 2.4**: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
Gender equity and women empowerment	**Goal 5**: Achieve gender equality and empower all women and girls	**Target 5.1**: End all forms of discrimination against all women and girls everywhere **Target 5.4**: Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate **Target 5.5:** Ensure women's full and effective participation and equal opportunities for leadership

		at all levels of decision-making in political, economic and public life
Governance	**Goal 16**: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	**Target 16.7**: Responsive, inclusive, participatory and representative decision-making at all levels
Health	**Goal 3**: Ensure healthy lives and promote well-being for all at all ages	**Target 3.9**: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
Healthy diet	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.1**: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
Innovation	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all **Goal 9**: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	**Target 8.2**: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors **Target 9.5**: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Knowledge exchange	**Goal 4**: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	**Target 4.7**: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development
Lifestyle	**Goal 12**: Ensure sustainable consumption and production patterns	**Target 12.2**: By 2030, achieve the sustainable management and efficient use of natural resources **Target 12.3**: By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses **Target 12.4**: By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment **Target 12.5**: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse **Target 12.8:** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature **Target 12.b**: Develop and implement tools to monitor

		sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products
Local Employment	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	**Target 8.3**: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
Local traditions and Cultural heritage	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.5:** maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge
Peace and justice	**Goal 16**: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	**Target 16.7:** Responsive, inclusive, participatory and representative decision-making at all levels
Territorial and local value creation	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	**Target 8.2**: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

		Target 8.9: By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
Quality of life	**Goal 3**: Ensure healthy lives and promote well-being for all at all ages	**Target 3.4**: By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being **Target 3.9**: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
Resilience	**Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Target 2.4:** ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
Social farming and integration	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all **Goal 10**: Reduce inequality within and among countries	**Target 8.5:** achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value **Target 10.2:** By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

		Target 10.3: Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
Socio-demographic revitalization	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	**Target 8.3:** Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
Working conditions	**Goal 8:** Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	**Target 8.8**: Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment
Youth employment	**Goal 8**: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	**Target 8.6:** By 2020, substantially reduce the proportion of youth not in employment, education or training

Appendix C. Interview Procol

This interview guide is designed for a PhD research study. This interview protocol was organized around three primary stakeholder groups:

- Core Value Chain Stakeholders (individuals directly involved in producing, processing, retailing, consuming, or tourism related to local products).
- Supporting Stakeholders (individuals or organizations providing support services such as logistics, finance, communication, research & technology, education, or social services).
- Institutional Stakeholders (individuals in roles related to laws, regulations, standards, norms, or organizations that govern or influence the local system).

The core body of questions for each group is structured around five thematic areas: Background, Contribution, Relationships, Challenges, and Future Outlook. In addition, a separate section titled Community Perspectives has been developed. These questions were designed to capture respondents' perceptions and experiences as members of the local community. The Community Perspectives questions was applied in two ways:

Supplementary Use: They may be asked in addition to the main set of stakeholder-specific questions if the interviewee is also a resident or active member of the community.

Standalone Use: They can function as an independent interview guide for participants who do not fit neatly into one of the three stakeholder categories but possess valuable insights based on their community membership. This structure ensured that both role-specific and community-based experiences were adequately captured while maintaining flexibility according to the interviewee's profile.

The interview protocol was not rigidly structured or predetermined. Instead, the questions evolved in tandem with the data collected during the various interviews. Each section used open-ended questions and narrative prompts (e.g., "Tell me about a time…", "Describe how…", "Can you walk me through…") to encourage detailed, story-driven responses. Interviewers used these questions as a flexible guide, probing for more details with follow-up prompts as needed.

Core Value Chain Stakeholders (Producers, Processors, Retailers, Consumers, Tourism Operators)

Background

Could you start by telling me about yourself and how you became involved in local [farming/production/processing/retail/tourism]?
Prompt (if needed): How long have you been involved, and what drew you to this line of work in this community?

What motivated you to take on this role in the local value chain?
Prompt: Was there a particular reason or inspiration that led you to work in this field or join this initiative?

Are there any local traditions or aspects of cultural heritage that influence how you do your work, if at all? Can you share some examples or your thoughts on the role of those traditions in your activities?

What does the term “bio-district” mean to you? Is this concept something you see or are involved in within your community or work?

Contribution

Can you describe your current role and responsibilities in the local value chain?
Prompt: What products or services do you provide, and what activities are you mainly responsible for?

Can you walk me through a typical day in your work, to illustrate how you contribute to the production and distribution of local products?
Prompt: From the moment your day starts to when it ends, what do you do, and who do you engage with?

Do you engage in any specific sustainable or organic practices in your work? If so, what are they, and why are they important to you?

In what ways, if any, do you feel your work helps to preserve or promote the local cultural heritage or traditions?

Relationships

What are the key partnerships or relationships that support your work (e.g., with other farmers, suppliers, buyers, cooperatives, or a local bio-district initiative)?

How would you describe your relationships with other people or organizations in this community?
Prompt: Who do you regularly interact with as part of your work (for example, other farmers, suppliers, customers, cooperatives, local officials), and how do you collaborate with them?

Tell me about a time when you had to work closely with others in the community to achieve a goal or solve a problem.
Prompt: What was the situation, who was involved, and what was the outcome of that collaboration?

Do you feel a sense of community or belonging as part of this local network or value chain? If so, can you describe what that sense of belonging means to you?

Challenges

What are the biggest challenges or difficulties you face in your role as a [farmer/producer/retailer/etc.] in this community?
Prompt: These could be economic, environmental, social – anything that makes your work harder or stressful. Please describe.

Can you share an example of a major challenge you encountered and how you managed to overcome it?

Prompt: Tell me about a specific difficult situation (e.g., a bad season, market issue, conflict) and walk me through what you did to handle it. What did you learn from that experience?

In your opinion, what are the benefits of collaborating through a bio-district or similar collective initiative, and what are the limitations or challenges of such an approach?

What significant changes have you observed in your work or community, and how have these changes affected you or your work? How do you feel about those changes?

Future Outlook

What are your plans or aspirations for the future of your own work or business?
Prompt: This could be changes in how things are produced or sold, support from government, community initiatives, etc. Why are these plans important to you?

Where do you see yourself and your work in five or ten years, and what do you hope will be different or better by then?
Prompt: How do you envision the future of your business or activity, and the local community's development, in the long term?

How do you envision the concept of a bio-district in the future of this area? What potential benefits could it bring, and what would you like it to achieve?

Supporting Stakeholders (Logistics, Finance, Communication, Research & Technology, Education, Social Services)

Background

Please tell me about your background and how you came to be involved in supporting the local community's agriculture, food, or tourism activities.
Prompt: How did you start working in [logistics/finance/education/etc.] for this community, and how long have you been doing it?

What motivated you to work in this supporting role for the community?
Prompt: Did something in particular inspire you to contribute your expertise (transport, funding, knowledge, etc.) to the local area?

Are there any local traditions or aspects of cultural heritage that influence how you approach your work, if at all? (For example, local values or customs that guide your support activities.)

What does the term "bio-district" mean to you in the context of your work? Is your organization involved in any bio-district or similar initiative, or do you see it as relevant here?

Contribution

What is your role in supporting the local value chain or community, and what kinds of support or services do you provide?

Prompt: Describe the main activities or services your work entails – for example, transportation of goods, providing loans, training farmers, etc.

Could you walk me through a typical project or task in your work, to illustrate how your support helps the community or local businesses?
Prompt: Perhaps describe a recent project or a typical day – what did you do, who did you work with, and what was accomplished through your efforts?

Do you promote or implement any sustainable or organic practices in your work with the community? If so, what are they, and why are they important?

In what ways, if any, do your activities help preserve or promote the local cultural heritage or traditions?

Relationships

How do you typically interact or collaborate with other stakeholders in the community?
Prompt: Who are the people or organizations you work closely with (e.g., farmers, processors, local authorities, NGOs), and how do you work together?

Can you tell me about a time when you partnered with another person or organization to achieve something important for the community?
Prompt: Describe the situation – what you and your partner(s) did, and what was the result of that collaboration?

How do you engage with local institutions or authorities in your role? What does that interaction look like, and what support or coordination do you receive, if any?

Do you feel part of a community or network through your work? If so, can you describe what that sense of connection or belonging means for you in this supporting role?

Challenges

What challenges do you encounter in your role as a supporting stakeholder trying to assist the local value chain or community?
Prompt: These could include resource limitations, communication gaps, logistical issues, or any difficulty that hinders your support work.

Describe a challenging experience you have had in this role and how you dealt with it.
Prompt: For example, a time when a plan didn't work out or you faced resistance. How did you respond, and what did you learn from the experience?

In your view, what are the benefits of having a bio-district or similar collective initiative for the stakeholders you work with, and what are the limitations or challenges of such an approach?

What significant changes have you observed in the community or sector since you began this work, and how have these changes influenced you or the way you work? How do you feel about those changes?

Future Outlook

From your perspective, what changes or improvements would enable you (and others in support roles) to better support the local community in the future?
Prompt: This might involve more coordination, policy changes, additional resources, new technologies, etc. – what would make the most difference?

How do you envision the future of support services in this community over the next several years?
Prompt: Are there any new initiatives or opportunities you would like to see, or plans you have, that you believe will strengthen the support system for local stakeholders?

What role do you think a bio-district or similar initiative could play in the future here? What potential benefits might it have, and what would you like it to accomplish?

Institutional Stakeholders (Policy Makers, Regulators, Local Officials, Organizational Leaders)

Background

Could you tell me about your role/position and how you became involved in guiding or regulating the local community's activities?
Prompt: What is your institutional or organizational background, and what path led you to working with this community or sector?

What motivates you in your position to support and oversee the development of this community or region?
Prompt: For instance, do you have a personal connection or vision that drives your work in policy, governance, or institutional support here?

How do local cultural heritage or traditions factor into your work, if at all? (For instance, do they influence any policies or programs you oversee?)

What does the term "bio-district" mean to you, and how does this concept relate to your work? Is your institution involved in any bio-district or similar initiatives?

Contribution

What are the main responsibilities of your institution/organization in the context of this community, and what kind of support or regulation do you provide?
Prompt: Describe the key functions you and your institution serve – for example, setting standards, providing funding or services, enforcing regulations, facilitating programs, etc.

Can you walk me through an example of a policy or initiative that you have worked on for this community?
Prompt: Describe how that policy/initiative was developed and implemented. What issue did it address, who was involved, and what happened as it was put into practice?

Does your institution undertake any efforts to preserve or promote local cultural heritage? If so, how do these efforts take shape?

Relationships

What other organizations or stakeholder groups does your institution collaborate with in this field? (For example, partnerships with farmer cooperatives, NGOs, other government agencies, or bio-district networks.) How do these collaborations work?

How does your organization engage with other stakeholders (community members, businesses, other agencies) on a regular basis?
Prompt: Describe the ways you communicate or collaborate – for instance, through meetings, partnerships, public consultations – and with whom (farmers' groups, local leaders, NGOs, etc.).

Tell me about a time when you had to work closely with community members or other organizations to address any issue.
Prompt: What was the situation, how did you collaborate with others, and what was the outcome?

Do you feel a personal sense of connection or commitment to the community you serve through your institutional role? If so, what does that connection or sense of belonging mean to you?

Challenges

What challenges do you face in your role when trying to implement policies or support this community?
Prompt: Challenges might include bureaucratic hurdles, limited resources, resistance from stakeholders, or balancing different interests. Please elaborate on any major difficulties.

Can you describe a particularly difficult situation you encountered in this role and how you handled it?
Prompt: For example, a time when a project did not go as planned or a policy met with opposition – what did you do to manage the situation, and what insights did you gain from it?

In your view, what are the benefits of establishing a bio-district or similar initiative in this region, and what challenges or limitations might such an initiative face from an institutional standpoint?

What significant changes have you observed in the community or sector during your tenure, and how have these changes influenced your perspective or approach? How do you feel about those changes?

Future Outlook

What are your institution's priorities or plans for the future in supporting this community or sector?

Prompt: Are there any new policies, programs, or collaborations you believe should be introduced to improve the local value chain or community welfare?

What is your vision for the future of this community or region, say in the next 5–10 years?
Prompt: Describe how you hope things will evolve. What are your long-term goals or hopes for the community, and how do you see your institution's role in that future?

What role do you think a bio-district or similar initiative could play in the future here? What potential benefits might it have, and how would your institution support or respond to it?

Community Perspective (General Residents of the Community)

Background

Could you tell me a bit about yourself and your connection to this community?
Prompt: Have you lived here all your life or did you move here? What do you do for a living?

How would you describe this community to someone who has never been here?
Prompt: Consider things like the people, local culture, or anything that stands out to you about life here.

What do you enjoy or value most about being part of this community? Is there anything that gives you a sense of belonging here?

What does the term "bio-district" mean to you? Is it something you've heard of or see as relevant to this community?

Contribution (Involvement and Perspective)

In what ways do you and your family participate in the local community's life or economy?
Prompt: For example, do you buy from local farmers or markets, attend community events or festivals, participate in any local projects, or otherwise engage with what's happening here?

Describe how the local farming, food, or tourism activities in this area affect you personally or the community as a whole.
Prompt: What benefits do you notice from these activities (e.g., fresh food, jobs, community pride)? Are there any negative effects you've observed?

How do people in the community contribute to preserving local traditions or caring for the local environment? Can you give some examples?

Relationships

Do you have any personal connections or interactions with the farmers, producers, or organizations involved in local initiatives?
Prompt: Maybe you know some of them as friends or neighbors, or you chat with vendors at the market. Please describe any such relationships or experiences.

Tell me about a time when the community came together for a local event or to address an issue.
Prompt: This could be a festival, a community meeting, or responding to a problem. What happened, and what was it like for you to be part of that experience (even if you were just observing)?

Challenges

What do you see as the biggest challenges facing this community right now?
Prompt: These might be related to jobs, opportunities for young people, cost of living, environmental concerns, social issues, or anything else that worries you.

Can you share an example of a difficult time or challenge that you or your community experienced, and how people here dealt with it?
Prompt: It could be something like a bad season for farmers, a local business closing, a natural event, or any challenge. How did the community respond, and what was the outcome?

Are you concerned about any threats to the community's cultural heritage or traditions? (For example, younger generations losing touch with traditions, or important knowledge being forgotten.)

What changes have you seen in this community over time, and how do those changes make you feel about the direction the community is going?

Future Outlook

What changes or improvements would you like to see in your community in the future?
Prompt: Think about the next generation or the next decade – are there things you hope will be better or different (in terms of economy, environment, services, community life)?

What are your hopes or concerns for the future of this community?
Prompt: Feel free to share anything you are optimistic about or worried about when you think about the coming years. Why do you feel that way?

How do you imagine the future of sustainable agriculture or initiatives like a bio-district in this community? What impact do you think such efforts could have, and would you personally support them (why or why not)?