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Policy mix formulation in rural areas: a holistic approach to achieve sustainability transition

Supervisor:

Professor Roberta Sisto

Professor Antonio Lopolito

PhD Candidate:

Dr. Naomi di Santo

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Introduction

In recent years, challenges related to waste management, social inclusion, land degradation, and reducing greenhouse gas emissions required a policy formulation transformation to sustainability objectives (Rogge & Reichardt, 2016). The necessary sustainability transition calls for a shift in the view to manage these challenges. Indeed, considering this latter transition as a technological, institutional and social transformation emphasises the need to consider the link between global challenges (Köhler et al., 2019). The interconnection has been a central focus in various academic discourse and policy documents. Scholars have investigated these issues, focusing on i) socio-technical dualism essential for overcoming challenges (Borrás & Edler, 2020), ii) necessary technological changes to overcome traditional applied models (Lopolito et al., 2011), and iii) the analysis of an increasingly environmentally conscious consumer (Morone et al., 2021). In addition, international and national policy documents have also directed their efforts toward designing a policy objective that includes sustainability in the environmental, social and economic spheres (Murphy, 2012). Literature has reinforced that adopting a policy mix in this complex scenario could overcome current global concerns (Quitzow, 2015; Rogge & Reichardt, 2013). The traditional sectoral approach to policies field, designed to address individual problems, is no longer adaptable to today's issues and develops several unsustainable results like inadequate soil and resource use (Flanagan et al., 2011).

Achieving sustainability requires moving beyond the idea of isolated and direct instruments among different global issues (Niemeyer & Vale, 2022). The new vision is based on adopting a mix of coherent and cohesive policies, leveraging the strengths of each policy to overcome their limitations (Milhorance et al., 2020).

Coherence is fundamental in this scenario, emphasizing adopting a policy mix resulting from the integration and synergy of various policies, not merely their summation or matching (Carbone, 2008; Milhorance et al., 2020). For example, supporting the adoption of new technologies in agriculture must be merged with policies improving knowledge, infrastructure, and market dynamics (Cejudo & Trein, 2023).

In this context, it is crucial to highlight the role of rural areas, traditionally associated with sectors such as agriculture, agri-food production (Maulu et al., 2021). Covering many territories, these areas could play a key role in sustainable transition (European Commission, 2023). In fact, rural areas constitute more than 80% of the European Union territory and include 30% of the European population (European Commission, 2023). In this context, rural areas seems to be key actors due to their link to resource-based economic activities such as agriculture, forestry, fisheries, and energy, significantly contributing to CO2 emissions (Maulu et al., 2021). In addition, the transformation of

the linear economic models could overcome the challenges, the depletion of natural resources, the socioeconomic inequalities, and the marginalization of local communities (Mihai, 2023).
In this scenario, the literature lacks an in-depth investigation of complex global challenges that must be overcome with policy mixes and the reinforced role of rural areas. This doctoral thesis is set in evidence-informed policymaking with the purpose of exploring the policy mix process in a rural area, with specific objectives and contributions to the literature in each chapter (Figure 1).

Figure 1: The flow of the thesis implementation

It is important to emphasise that the complex nature of the thesis objective has required the integration and interconnection of different but contiguous research fields, encompassing domains such as consumer theory, management theory, and participatory approaches. This holistic approach recognises the necessity to combine terminology and methodologies from these different but connected domains to manage the complexity intrinsic to the purpose comprehensively.

Specifically:

- The first chapter, titled "*Policy mixes in rural areas: a scoping literature review*", submitted to the international journal "*Land Use Policy*", aims to develop the basic work for the research. Using a scoping literature review, it explores the literature on the link between policy mixes

and rural areas. The main results include exploring what is studied in the literature and what requires further investigation.

- The second chapter, titled "*Governance in policy mixes for sustainability transition: an analytical toolbox*" submitted to the international journal "*Journal of Environmental Policy & Planning*" explores governance factors that could support or limit the adoption of a policy mix in a territory. It identifies an operational toolbox through a bibliographic literature review, focusing on a case study of Local Action Group, the minimal unit of rural development.
- The third chapter presents a paper titled "*Tokenism in territorial development: enabling factors and mitigation measures*" published in the international journal "*European Countryside*". This chapter comes from the analysis of international policy documents emphasizing the role of participatory approaches. This paper investigates tokenism as an obstacle to territorial development and carries out a scoping literature review using the PRISMA approach.
- After the initial chapters investigating literature on policy mixes and rural areas, the following studies analyse the formulation of a policy mix in a Local Action Group. The fourth paper, titled "*Policy mix for a circular economy: exploring barriers in rural areas*" and submitted to the international journal "*Futures*" explores barriers to sustainable transition placed on adopting circular economy innovations. The flow is divided into exploring barriers to circular economy innovations and considering actions to overcome these latter in formulating the final policy mix. This objective is achieved by developing two focus groups that follow the participatory approach required by policy documents.
- The fifth chapter, titled "*Are university students really hungry for sustainability? A choice experiment on new food products from circular economy*" and submitted to the international journal "*Agricultural and Food Economics*" directly follows the results of the fourth chapter. It addresses the key barrier of consumer readiness to recognize farmers' adaptation efforts. Specifically, the paper uses a choice model to measure the exist of a premium price by young consumers for circular economy products.
- The sixth chapter, titled "*Integrating micro and macro perspectives: Unveiling the multilevel dynamics of proactive sustainability strategies in the agricultural sector*" and submitted to the international journal "*Long Range Planning*" examines aspects related to farmers within the Local Action Group. This agency plays a crucial role in the sustainability transition, and it is essential to explore the capabilities that make entrepreneurs and their businesses ready to recognize and participate in this territorial development unit. This exploration is achieved

through semi-structured interviews with entrepreneurs operating in the Local Action Group territory.

- Finally, the last chapter of the thesis includes the paper titled "*Policy mix formulation for sustainability transition in rural areas: an integrated approach*" submitted to the international journal "*Technological Forecasting and Social Change*". This chapter aims to propose methodological innovation in policy mix formulation by integrating participatory approaches and the COCOSO method.

The contribution of this thesis can be divided into conceptual and methodological aspects. On the one hand, the novelty of the topic related to implementing a policy mix in rural areas confirms the usefulness of this work in overcoming a gap in the literature, aligning with current policy indications. On the other hand, structuring the thesis with a combination of different methodologies is of great importance in this research field because it enhances the literature with an actual case study and data on the issues discussed. Lastly, the innovation of focusing on rural areas aligns with the importance given to these areas in policy documents.

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Chapter 1

Policy mixes in rural areas: a scoping literature review

Naomi di Santo[1,*], Teresa Del Giudice[2], Roberta Sisto[1]

1 *Department of Economics, Management and Territory, University of Foggia.*
2 Department of Agriculture, University of Naples Federico II.
* Corresponding author. Email: naomi.disanto@unifg.it

1. Introduction

The impacts of climate change, the increasing variability of weather and the need for sustainable natural resource management require complex policies to enhance the adaptation capability of territories (Milhorance et al., 2020). The United Nations have set forth a comprehensive vision in the 2030 Agenda for Sustainable Development, encompassing a diverse range of interconnected objectives. These Sustainable Development Goals (SDGs) are founded on principles, demanding a multifaceted and collaborative transformation to address the complexities of the world's challenges. By combining goals of environmental management, economic prosperity, and social equity, the policy documents aim to achieve these ambitious objectives by fostering a holistic global transformation. Consistent with this, the European Commission aspires to achieve sustainability objectives encompassing the three interconnected dimensions, through various initiatives. One of these is the European Green Deal, which seeks to facilitate a prosperous and inclusive transition within the EU and involves the establishment of an equitable society, promoting a circular economy, resource-efficient rural and regional development, and incentivizing the reduction of CO2 emissions (Filipović et al., 2022; Bieroza et al., 2021).

To achieve these purposes, especially in Europe, it is necessary to implement a sustainability transition, particularly when considering the potential impact of rural areas, which represent the key players in this transition (Partanen, 2011; Bock, 2016). Indeed, as is commonly known, in 2018, the rural territories encompassed over 341 million hectares, equivalent to 83% of the total EU territory and approximately the 30.6% of the EU population resides in rural areas (European Commission, 2023). Scholars as Zang et al. (2023) highlight as the current global challenges, including managing resources, land, and waste, are accentuated in rural regions, calling for a deeper emphasis on solving these concerns. In this intricate and multifaceted landscape, scholars like Vávra et al. (2022) have analysed the pivotal role of rural areas in promoting rural development. This is evident in various European initiatives like "The Long Term Vision for Rural Areas (LTVRA)" developed to shape a new vision for rural regions by 2040 and foster a shared perspective on the evolving role of rural areas (Ahlmeyer and Volgmann, 2023; European Commission, 2023).

The urgency to implement a transition towards sustainability has driven academic research to analyse this issue. For instance, Köhler et al., (2019) conducted a literature review on sustainability transitions and found that early publications primarily emphasized electricity and transportation. At the same time, more recent articles frequently explore a broader spectrum of societal domains, including food, water, heating, housing, urban development, and waste management. Nevertheless, a research gap still remains evident, as it overlooks a significant contributor to this transition: rural areas.

However, to overcome the rural issues and foster the role of rural area, although the guidelines in policy documents emphasise the need to consider issues as interconnected areas, policies and policymakers often have focused on a single problem area. As Niemeyer and Vale (2022) pointed out, inappropriate sectorial policies conducted to the detriment of the environment, such as deforestation, inadequate soil use and massive exploitation of natural resources, have led to food and water insecurity. This negative result highlights the necessity to implement comprehensive strategies that address various factors (Wilts and O'Brien, 2019) , necessitating transformative shifts in technology, in policies and societal dimensions to duel pressing environmental challenges effectively.

This new approach requires the implementation of multi-actor, multidisciplinary and long-term processes (Geels, 2019), introducing the concept of a 'policy mix' within this framework. The impacts of a policy mix have been analysed by various authors in different fields, e.g. in biochemistry (Vonhedemann et al. 2020), energy (Zhenghui et al. 2022), innovation studies (Howlett and Rayner, 2007) and decision sciences (Kivimaa and Kern, 2016). On the contrary, also in this perspective, it is rather unexplored in rural development. There should be a focus on the implementation of policy mix in rural areas for these main reasons, also earlier mentioned: i) the wide extent of territories, ii) the role of rural areas in stimulating biodiversity, and iii) the multifunctionality of these territories, iv) the European Commission itself also continues to give great attention to these territories, identifying them as the “beating heart” of the European economy (European Commission, 2021).

Thus, starting from the need to implement a transition to sustainability, also considering the synergy of a policy mix and the fundamental role of rural areas, the present study aims to investigate what the existing literature has examined and to identify the future research areas that should be explored for a comprehensive understanding of the dualism between policy mix and rural territories. Specifically, a scoping literature review was implemented to answer the following research questions: i) What are the main topics analysed in the literature regarding policy mixes and rural areas? ii) What are the future research strands suggested by each paper? iii) What are the most widely used methodologies for analysing policy mixes in rural areas? and iv) What are the main features to delineate policy mixes?

The paper is structured as follows: Section 2 presents the policy mix theoretical framework, section 3 describes the methodology and data, section 4 reports the main results of the analysis, and sections 5 and 6 present the discussions and some concluding remarks, respectively.

2. Theoretical framework

In the 1960s, the concept of “policy mix” was introduced in the economic policy literature as a combination of both monetary and fiscal policies. This new vision emphasised the idea that adoption of a single policy instrument is not sufficient to achieve effective territorial development and socio-technical transition (Quitzow, 2015), as well as the need to explore the possible interactions and advantages generated by combining different policies (Trotter and Brophy, 2022). However, this approach is rather complex and far from a simple process: policy mix should not be merely the use of several policy instruments because it integrates the strengths of different policies and, on the other hand, balances the weaknesses of each individual instrument, resulting in increasing advantages (Milhorance et al. 2020).

The concept of policy mix has been described as an elusive and fuzzy concept, and an explicit definition has not yet been defined. On the one hand, some authors describe policy mixes as an appropriate mix of policy instruments (for example, Vlačić et al. (2018). On the other hand, many authors describe policy mixes as a combination of different plans cooperating at different government levels to achieve a common goal (for example, Tønnesen et al. (2022). In this paper, the idea followed is that policy mixes should be thought of not as a mere mix of instruments but also as implementation of policy strategies, definition of policy processes and combination of various characteristics that build an adequate policy mix for each territory (Rogge and Reichardt, 2016).

Specifically, in different territories, such as rural areas, a range of policies are already in place, each of which aims to solve specific challenges. However, the phrase "policy mix” emphasizes the

importance of an integrated and coordinated approach to policy formulation. This implies establishing a framework where these policies do not operate in isolation but harmonize and intersect synergistically to achieve multidisciplinary goals. Indeed, sometimes there is an overlap of policies that may even conflict, generating confusion rather than optimal outcomes (Scordato et al., 2018). Therefore, the policy mix view promotes a more structured and coordinated approach in which policies are designed and amalgamated into a coherent "mix" that can address rural challenges and efficiently use available resources (Uyarra et al., 2016).

To provide a more precise description of policy mix concept, a study is referenced that utilized multiple case studies to investigate this concept in rural areas. In fact, in Mantino and Vanni's paper (2019) employ the term 'environmental and social benefits' (ESB) to encompass all benefits associated with agriculture. Mantino and Vanni's research explores the idea that when markets fail to deliver the desired level of the agricultural landscape, rural vitality, farmland biological diversity, and other community benefits, various policy actions (such as regulations, direct funding, or rural development strategies) can be employed to enhance the delivery of these services.

This concept underscores a policy mix's potency, which arises from the ability to facilitate interactions between different policy instruments and frameworks. This interaction compensates for weaknesses and amplifies the strengths of individual policies. Mantino and Vanni's primary objective was to evaluate, through an analysis of six European case studies, how several combinations of policy strategies can be tailored to varying spatial contexts and how implementing management mechanisms can positively influence both environmental and social outcomes. Through the analysis of case studies, the authors identified additional policy instruments, which they categorized, including Common Agricultural Policy (CAP), distinguished by Pillar I and Pillar II, EU cohesion, and social, national, and local policies. In the subsequent step, several interviews were conducted with stakeholders and local experts to better investigate the impact of each instrument on ESB and explore these dynamics more deeply (Mantino and Vanni, 2019). The findings of Mantino and Vanni's case study reveal that the policy mixes encompass additional categories of policies and policy instruments:

1) One such case from the Northern region of Italy, which revolves around the processed tomato supply chain, is highlighted as a positive instance of policy mix implementation. Notably, subsidies from the first pillar of the CAP were significantly reduced in this context. Other forms of CAP support or regional incentives did not offset this reduction. Consequently, a shift occurred towards a local-level governance model characterized by collaboration between farmers and processors within the inter-branch organization. This collaboration became mandatory following the Common Market Organization (CMO) reform. The transformation also prompted processors and primary producers in the tomato industry to adopt a strategy aimed at cost reduction, sustainability promotion, and quality improvement. Support was implemented through multiple stages, starting with regulatory measures, followed by the allocation of financial resources, the integrated production system of the CMO, and rural development programs. Lastly, support was provided through specific research initiatives and technical advisory structures at the regional level.
2) In contrast, the Portuguese case is presented as a negative outcome of policy mix implementation. Specifically, CAP support favours large-scale and highly specialized agriculture to enhance competitiveness and global market presence. Smaller-scale farms often do not benefit from CAP assistance due to their inability to meet investment support

criteria and high transaction costs. Conversely, spatial planning measures aim to safeguard small-scale and diversified agriculture. National laws, implemented through local schemes, stipulate that farms with an area of less than 7.5 hectares cannot be further subdivided. Additionally, municipal plans impose stringent restrictions on non-agricultural land use, effectively preserving the integrity of the small-scale farming system and its mosaic style.

This focused examination underscores that the topic of policy mix remains an area with significant gaps and an ongoing need for developing assessment methods, as much of the knowledge is derived from qualitative interviews.

From this perspective, the study investigates the link between policy mix and rural areas, collected the results based on the seminal work by Rogge and Reichardt (2016), who outlined the characteristics by which a policy mix is distinguished. In fact, policy mixes can be analysed according to the elements such as long-term plans and objectives included in the policies. Then there are the processes linked to territorial governance, innovation or time frame. Finally, intrinsic characteristics such as consistency, coherence and credibility are analysed. These segmentations and screening are effective for exploring the synergies and the overlaps of a policy mix that can be involved in this approach.

3. Materials and Methods

A scoping literature review is conducted to identify what the current literature has explored regarding policy mix implementation in rural areas and to recognize potential future directions for comprehensively understanding this phenomenon. This method was selected for two main reasons: firstly, it aligns with the exploring nature of the topic, proving particularly suitable when the research question is broad and underexplored, and secondly, it facilitates the generation of objective and replicable results, minimizing potential biases related to selection or reporting (Gray, 2019).

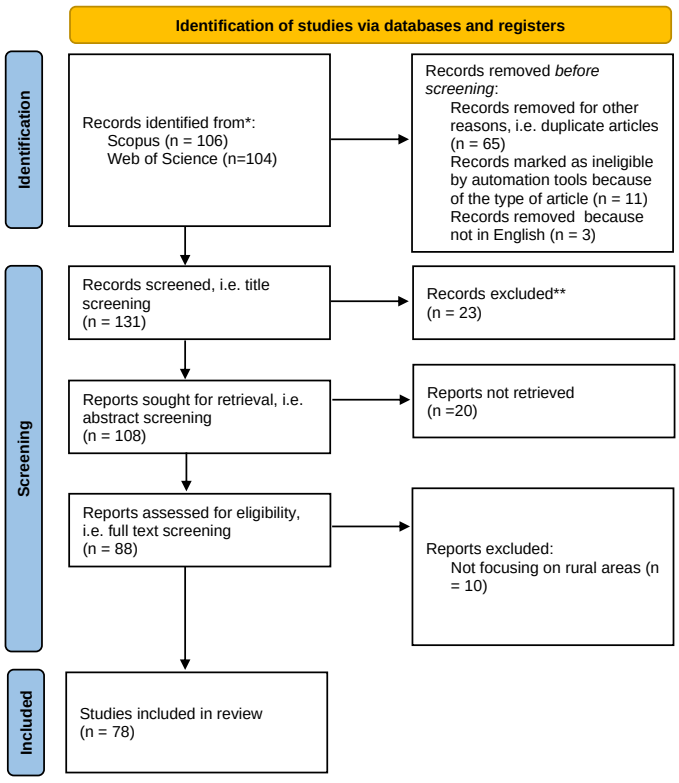
Specifically, scoping reviews aim to assess the size and scope of the available literature on the chosen topic and the current level of synthesis available (Grant and Booth, 2009). Thus, this type of review has a broader scope than traditional systematic reviews with correspondingly more selective inclusion criteria (Sengers, Wieczorek, and Raven, 2019). Compared to a traditional literature review, a scoping review appears to be an explicit, transparent and replicable research strategy. On the other hand, traditional literature reviews can be considered subjective because of their substantial dependence on the author's pre-existing knowledge and experience. Moreover, the scoping review does not present an unbiased, exhaustive and systematic summary of a topic (Gray, 2019).

The analysis was carried out on the major online scientific search engines, such as Web of Science and Scopus. The main keywords, "polic* mix*" OR "polic* portfolio*" OR "polic* package*", were combined, through the use of Boolean operators, with the following terms: "rural development" OR "territorial development" OR "rural area*" OR "territor* transition*" OR "rural territor*" OR "rural growth" OR "territorial growth" OR "ecosystem*" OR "rural ecosystem*" OR "knowledge* ecosystem*" OR "innovation* ecosystem*". Specifically, keywords were selected for query formulation by distinguishing two main topic areas. The first area concerned the analysis of policy mixes, including most of the synonyms used in the literature to examine this topic. However, the term "instruments mix" was excluded because it could lead to results far from our goal. In fact, during the paper selection phase, it was noted that most papers that used the term "instruments mix" were already included in the search because of the mention of "policy mix" in the abstract, keywords or title.

The second area was concerned with the development of rural and territorial areas. Using keywords such as "rural development," "territorial development," or "rural area*," important documents dealing with topics such as "rural development tools" were included. In summary, it was chosen to construct the query by including broader keywords to cover all possible facets of the research topics.

The process for selecting papers is summarized in Figure 1, reporting the scheme suggested by the guidelines of the PRISMA extension for scoping reviews. This process has enabled the creation of a review characterized by remarkable robustness. In literature, to enhance the objectivity and relevance of scientific research, the first version of the PRISMA flow chart was initially developed, known as the QUOROM (Quality Of Reporting Of Meta-analyses) Statement. Subsequently, this tool was adapted into the current PRISMA format used in this study (Liberati et al., 2009). The reliability of this procedure aligns with the goal of improving the quality of research findings and making them accessible to readers (Page et al., 2021). This tool was developed by experts, including review authors, methodologists, physicians, medical editors, and consumers (Liberati et al., 2009). It was later extended to the social sciences, demonstrating its utility in studies characterized by broadly framed questions. By utilizing this flow chart, it becomes possible to assess the existing literature and identify unexplored areas of study, thereby reducing the risk of arbitrary selection or author subjectivity and establishing a robust and scientifically approved methodology (Page et al. 2021).

Figure 1. Article selection process: Flow chart



Source: Page et al., (2021)

From the initial database search, 210 articles were identified, of which 65 documents were removed because they were found to be duplicate articles (resulting from both Scopus and Web of Science databases). In addition, only articles published in peer-reviewed journals were included, and this led to the exclusion of an additional 11 papers. Finally, it was decided to include only papers written in

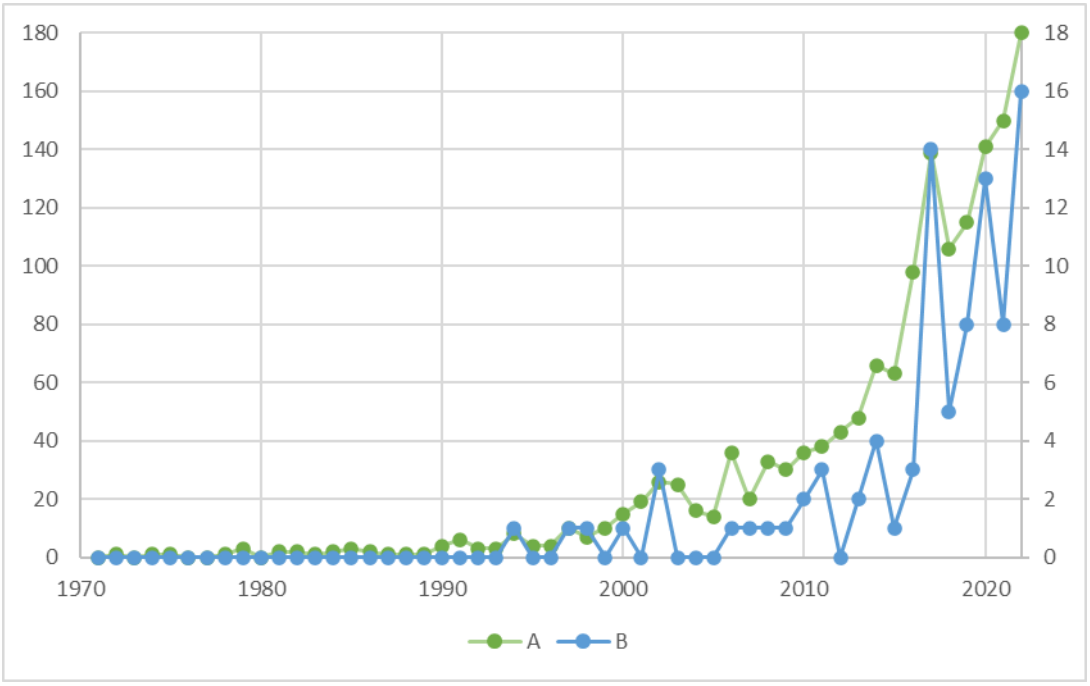
English, so 3 papers were eliminated. Next, the relevance and conformity of papers were assessed through the analysis of titles and abstracts. At this point, 88 articles met the inclusion criteria and were included in the next step, i.e., a full-text reading. Those articles were read to further evaluate their eligibility. This led to the exclusion of 10 more articles because they did not focus on the analysis of rural areas (but rather mainly on entrepreneurship aspects). The final review included 78 articles (the full list is in the appendix - Table A).

4. Results

4.1 Descriptive overview

The first investigated aspect was the annual trend of research about the topic (Figure 2).

Figure 2. Published papers through the years



Source: our elaboration. Green line= papers on policy mix; Blue line= papers on policy mix and rural areas

Figure 2 shows the trend of papers published on the topic of policy mix (green line) and the trend of papers included in this review (blue line). The selected papers (blue line) were published between 1994 and 2022. Figure 2 highlights an increasing trend on this topic. Indeed, since 2000, there has been an increase in the number of papers including the expression "policy mix" in their title, abstract or keywords. At the same time, the trend related to the selected items (blue line) has also increased. After 2010, in fact, there is a growing literature analysing the topic. This may be due to the objectives of various policy documents highlighting the importance of the issue, in particular referring to rural territory analysis and the need for implementation of a policy mix, or maybe this increasing trend is the impact of the consistently growing volume of publications in Web of Science and Scopus.

Table 1. Main journals that published the selected studies

Journals	Number of papers
Land Use Policy	7

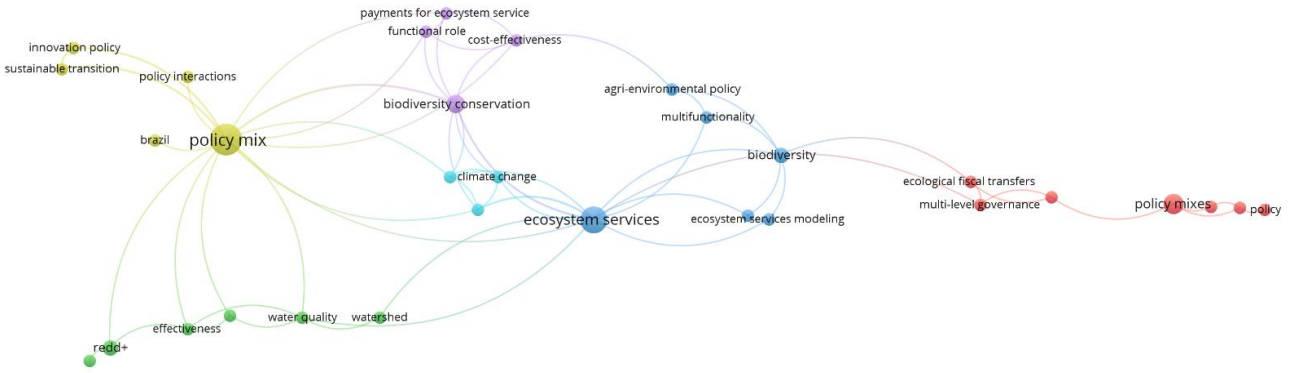
Sustainability (Switzerland)	7
Environmental Policy and Governance	6
Ecological Economics	3
Ecosystem Services	2
Energy Policy	2
Journal of Rural Studies	2
Sustainability Science	2

Source: our elaboration

Table 1 summarises the main journals in which the selected papers were published (only journals with at least 2 publications were included in the table). The main publishing journal are *Land Use Policy* and *Sustainability* (Switzerland), but there are also journals such as *Energy Policy* and *Ecological Economics*. This shows that policy mixes are included in many issues related to the environment, energy and land use.

After that, the papers' keywords were analysed to obtain a preliminary segmentation of the main strands studied in the literature. In this case, given the large number of collected keywords, VOSviewer software was used to split and group the keywords into clusters.

Figure 3. The keywords of the selected documents



Source: VOSviewer elaboration

Figure 3 shows six clusters that the VOSviewer software divided the keywords into according to their frequency. Specifically, the co-occurrence number was set to two, so the clusters were generated by considering those keywords appearing at least twice together. From this segmentation, it can be seen that the keyword "rural areas" does not appear, but there are keywords such as "biodiversity", "multi-level governance" and "water quality". This highlights the fact that the literature is fragmented and weak on topics concerning rural areas and the need for further studies on the issue; that is one of the main drivers of this scoping review, as pointed out in the introduction.

4.2 Substantive overview

To answer the research questions, Table A (in the appendix) was created based on the literature analysis. This table reports the goals, the research methodology, the analysed countries, the link to

the concept of the policy mix and the future research strands of each considered article. The preliminary reading of the papers highlighted that the most widely used investigation methodology is based upon literature review and examination of policy documents focusing on specific territories. Specifically, many authors focused on Brazil, China and Africa. This choice may be related to the wide extent of rural areas and the greater impact of climate change in these territories (Davenport et al. 2017; Zhang et al. 2019; Urgenson et al., 2013). The goals of the selected papers seem very broad. Some authors concentrated on analysis of the ecosystem services payments by considering, for example, their implementation factors, their integration with conditional cash transfers and stakeholder involvement (Nimubona and Pereau, 2022; Izquierdo-Tort, 2020). Most of the papers examine the current policy scenarios and, in particular, the policy situation, policy documents and governance frameworks. It was evident that the current literature focuses on the actuarial scenario, but there appears to be a lack of studies about policy mixes' future impacts and their overall evaluation. Many recommended research strands suggest including different factors in the analyses such as political systems, endogenous factors, policy costs and sustainability-oriented innovations (Trotter and Brophy, 2022; Lopolito and Sica, 2022; Costa and Matias, 2020). In addition, some authors highlighted the need to investigate the policy mix concept and how it can impact territories (J. Zhang and Yu, 2019).

From this perspective, it was decided to follow Rogge and Reichardt's (2016) definition of policy mix to collect and sum up the main findings of the selected papers. Thus, based on Rogge and Reichardt (2016), in this paper, policy mixes are classified relying on three key concepts: i) goals, ii) policy plans and iii) evaluation methodology. The classification of papers according to their topics is already widely used in literature to provide an overview of the available studies about a specific topic (Galego et al., 2022; Cosgrave et al., 2019; Villalonga-Olives and Kawachi, 2017). The following sections analyse the selected papers on the basis of these criteria.

4.2.1 The goals of policy mixes

Table 2 summarises the goals mainly investigated by the selected papers. Specifically, the objectives in the table are grouped into macro areas identifying long-term goals (Rogge and Reichardt, 2016).

Table 2. The principal goals of policy mixes

Principal goals	Number of papers
Environmental degradation, Environmental impact and Biodiversity loss	16
Provision of ecosystem services	10
Conservation	10
Sustainability and Sustainable transition	8
Competitiveness, Innovation and Digitalization	8
Climate change	7
Agricultural support policies	7
Land use	5

Resource management	4
Drought and water resource management	3
Energy security	3
Multifunctionality	3
Rural area growth and Countering depopulation	2

Source: our elaboration

The macro areas that most papers focused on were biodiversity loss and persistent environmental degradation. Specifically, 16 papers analysed and justified the use of a policy mix to manage these issues. Some authors, such as Zabala et al. (2022), only suggested implementing policy mixes because of the weaknesses of a single policy for the management of complex topics, such as the environmental forest. On the other hand, other authors (Ngan, 2022; Droste et al., 2017; Kubo et al., 2019) pointed out that biodiversity conservation requires an appropriate combination of regulatory tools. Some papers (e.g., Meinard, 2017; Venturini et al., 2019) highlighted different types of tools that can be combined: i) regulatory tools, such as licenses and standard-setting; ii) economic tools, such as taxes and fees; and iii) information tools.

Regarding environmental impacts and the level of environmental degradation, many papers focus on the status of forest areas (e.g., Rezende et al., 2018; Scullion et al., 2016; Wong et al., 2017).

In this regard, the Reducing Emissions from Deforestation and Degradation (REDD+) projects emerge as a good policy mix strategy (Albert et al., 2020). This strategy is based upon the idea that environmental and social objectives are not distinct goals. Thus, primary objectives (reduction of deforestation and forest management) are joint with objectives such as poverty reduction and economic development of rural areas (Sarker et al., 2022). Among the instruments found in REDD+, there are some aimed at defining property rights, introducing incentive-based instruments, and sharing the benefits from the implementation of REDD+ projects. In addition, when considering the influence of other sectoral policies, such as low-emission development strategies, it is important to consider the redundancy of some aspects, which very often results from a lack of consciousness of the related issues (Scullion et al., 2016).

The second macro area that appears to be frequently investigated in the literature concerns the provision of ecosystem services. Indeed, many authors pointed out that ecosystem-based adaptation (EBA) is a specific type of policy mix that can drive a sustainable transition. According to Scarano (2017), EBA is a specific policy mix that integrates socio-economic policies with conservation and land use policies. For example, protected area management tools and biodiversity conservation plans are included in policy mixes related to income generation and infrastructure development.

On the other hand, payments for ecosystem services (PES) are just part of a more comprehensive policy mix directed toward ecosystem management (Montoya-Zumaeta et al., 2019; Barton et al., 2017; Cook et al., 2017). The link between PES and rural areas emerges from the inclusion of these payments in national rural development strategies. For example, PES can interact with various poverty reduction policies and can coexist with conditional cash transfers (CCTs) when present on the territory (Izquierdo-Tort, 2020).

Another issue analysed in rural area management concerns conservation. Among the papers that have analysed this issue (Niemeyer and Vale, 2022; Lopolito and Sica, 2022; Tønnesen et al., 2022;

Meinard, 2017), the results of the paper by Kubo et al. (2019) are very interesting. This study suggests two important strands to be considered when implementing a policy mix. First, it is essential to summarise all the existing policy instruments without forgetting the emerging and the potential ones. The sharing of feedback with stakeholders is also essential to reduce the negative impacts that can be created in a policy mix, such as overlap or contrast (Scordato et al., 2018).

As previously highlighted, the concept of policy mix was introduced in the social sciences with the aim of promoting a transition toward sustainability, considering the economic, social and environmental spheres. This link also emerges from Table 2. In fact, the topic of sustainability and the sustainable transition has been investigated in the literature (D'Adamo et al., 2022; Trotter and Brophy, 2022; Bhandari and Jana, 2010). More and more attempts are being made to include the societal aspect in this research topic. According to Jeannerat and Crevoisier (2022), it is important to consider strategies that include social innovation in a policy mix that aims to develop rural territories. For example, since the introduction of these aspects in the Europe 2020 policy strategy, the implementation of inclusive policy mixes should be desired. The goal is to establish social awareness to overcome social problems. In summary, to support the achievement of sustainable goals, a targeted spatial development intervention should consider an inclusive policy mix: moreover, it is crucial to base policy cohesion strategies on pillars such as co-innovation, common value creation and collaboration (Braito et al., 2020; Jeannerat and Crevoisier, 2022; Urgenson et al., 2013). This concept makes it possible to analyse another topic that emerged from the study: the link between social innovation and digital transformation. These two aspects are needed to build competitive and resilient rural communities (James, 2021).

Thus, due to the complexity of the challenges in rural areas, it is necessary to create common values that can foster sustainable development. From a territorial perspective, for example, firms should change their vision from short-term economic maximization to economic and social responsibility based on a long-term vision (Costa and Matias, 2020; Henderson and Roche, 2020; Tønnesen et al., 2022).

From a goals-clustered policy mix perspective, the impacts of climate change are linked to drought. Although water scarcity is not the only effect of climate change, it is one of the most impactful for management of rural areas (di Santo et al., 2022). Overall, among the selected papers, 10 analysed the effect of policy mixes in managing this issue (e.g., Farjalla et al., 2021; Fedrigo-Fazio et al., 2016; Reside et al., 2017). Some studies have focused on the analysis of drylands; for example, Milhorance et al. (2020) analysed the Brazilian context. His study is very important from a policy planning perspective because it describes three types of policy mix tools: enabling tools (i.e., the formal prerequisites for policy mix implementation, such as certificates, quality control and registries); adaptation tools (such as technical assistance to farmers or insurance against damages) and, finally, complementary tools (such as tools related to generational renewal).

Furthermore, the literature review revealed that several authors (Venturini et al., 2019; Milios, 2018; Hailu et al., 2020) analysed policy mixes from the perspective of land and resource management. For example, Fedrigo-Fazio et al., (2016) classified the variables that can be included in the selection of a policy mix as the long-term view or the success level. In fact, the authors selected a policy mix based on these variables, followed by type of goals, geographic coverage, data availability and replicability. Following this pattern, they reported several case studies, such as a case in Finland

concerning forest and land use. In this case, the policy mix included nature conservation laws, national forest management plans, certification and labelling schemes, subsidies and funding to develop innovation.

The other aspects considered in the selected papers concern multidimensionality, energy security and territorial growth. These areas seem unexplored and under-investigated; in fact, only 8 studies consider these three issues (e.g., Barton et al., 2017; Simões et al., 2021; Venturini et al., 2019). It may be concluded that these fundamental and characterizing aspects (such as multifunctionality) have not received much attention in the literature.

4.2.2 The policy processes

The first step of this review was the summing up of the main policy mix goals analysed by the literature. Then, an analysis of the plans to achieve these goals—in other words, the policy processes regarding the guidelines, roadmaps and programs for achieving long-term goals—was carried out (Rogge and Reichardt, 2016).

The selected papers, for example, the Global COVID-19 Humanitarian Response Plan (Mugabe et al., 2022), the National Adaptation Plan (Niemeyer and Vale, 2022), Payments for Ecosystem Services (Nimubona and Pereau, 2022; Zabala et al., 2022), the Clean Air Action Plan (CAAP) and the National Strategic Plan for Solid Waste Management (Ngan et al., 2022), focused on different types of intervention.

Rather than outline the individual plans or programs that currently exist in the political landscape, it is important to emphasize other key aspects in the analysis of political processes: the role of governance and the role of participatory approaches in the implementation of a policy mix in rural areas. Starting with the analysis of the governance, as various studies show (Davenport et al., 2017; Mann and Plieninger, 2017; Scordato et al., 2018; Könnölä et al., 2021), it is worth considering that policy mix projects move in a vertical context. In fact, considering the multiplicity of different levels of national, regional and local governance must be a key element for policymakers to avoid conflict between the instruments. It turns out, however, that the true impact that governance has on the effectiveness of a policy mix is still little explored. Moreover, focusing on the participatory approaches, they are not considered in their full and complete execution. According to Uyarra et al. (2016), rural areas are characterized by intrinsic elements, issues and characteristics; thus, it appears necessary that the development of a policy mix must follow and analyse the coherence of different levels of governance.

The scoping literature review shows that innovation strategy could be a winning strategy for promoting change in society's vision. For example, new business models related to innovation can deliver both a simple service and other enabling services that can achieve sustainability goals (Trotter and Brophy, 2022).

In addition, policy processes are recognized as the fundamentals for establishing strategies and shifting from long-term goals to feasible actions (Rogge and Reichardt, 2016). Thus, an important focus must be on decision-making processes that identify which instruments to include in policy mixes. From this perspective, the study by Schader et al. (2014), who contrasted the Tinbergen rule

with the implementation of a policy mix, is important. The Tinbergen rule defines an efficient policy as a set of individual independent instruments each addressing a specific issue. In fact, according to this role, some multitarget instruments (such as PES) have been shown to be inefficient.

More specifically, the Tinbergen Rule (1956) served as a pivotal guideline that found application across all sectors of the economy, and its implications were explored within contexts including agricultural policy, waste management, and health policy. The core premise of the Tinbergen Rule revolves around the pursuit of effective policy formulation. It posits the essential requirement of having at least as many distinct policy instruments as the goals to be achieved.

Within the framework of this principle, four distinct categories of variables have been delineated: i) policy instrument variables are subject to policy-driven decisions, such as fees on fertilizers, ii) objective variables pertinent to the policy goal system include safeguarding natural resources, iii) variables beyond the complete control of policymakers, exemplified by environmental policy's inability to influence inflation, iv) neutral variables with no bearing on the policy goal system.

Each policy objective is represented through a linear equation, encompassing uncontrollable, inconsequential, and unidentified variables tied to the policy instruments. This equation system's solution illuminates the path. Hence, rooted in the fundamental traits of linear equation systems, Tinbergen concluded that an equivalent number of independent policy instrument variables and policy objectives leads to a resolvable model.

In cases where the count of policy instrument variables surpasses that of policy objectives (equations), the equation system unfolds into an array of infinite solutions. In contrast, when the number of policy instrument variables falls short of the policy objectives, solutions manifest only sporadically.

However, this view is opposed to the idea behind a policy mix. Indeed, in the policy mix concept, interactions among different instruments can be successful in overcoming the criticism of various issues (Milhorance et al., 2020). A critical study in policy mix formulation is that of Schader et al. (2014), because it highlights how policy tools aimed at achieving different goals can be included in policy mixes. Thus, the basic rule is that multi-target instruments can be included in the design of a policy mix if “their average cost-effectiveness over all policy targets is not lower than the average cost-effectiveness of targeted divided by the number of policy targets” (Schader et al., 2014; p.189). According to this statement, it is possible to introduce multi-objective instruments to policy mixes, especially if they bring co-benefits, to increase the advantage of implementing the policy mix itself. This feature of the evaluation of policy mixes is useful in moving to the third key element in defining policy mixes, which will be discussed in the following section.

4.2.3 The evaluation of policy mixes

The last characterisation of policy mixes concerns the assessment of their key aspects.

For policy assessment, several authors analysed case study analyses, many of which focused on areas such as Brazil (Farjalla et al., 2021; Ghinoi et al., 2018), Germany (Droste et al., 2017; Schrader, 1994), Finland (Könnölä et al., 2021) and Norway (Barton et al., 2017). The use of a case study is considered an optimal strategy to assess policies’ impacts because the intrinsic characteristics of each area can modify policies’ outcomes and impacts. Moreover, the consideration of the various current

policies and of the different issues rural areas face is a key point that should be included in policy mix implementation. Furthermore, in single policy evaluation, the most used criteria are effectiveness, efficiency and equity perspectives (Barton et al., 2017). However, when considering the interactions between different policies, these criteria should be combined with other indicators, such as consistency, coherence, credibility, stability and completeness. Consistency concerns the presence of synergies between policies (Kuberska and Mackiewicz, 2022; Trotter and Brophy, 2022). Coherence is about the "absence of contradictions between instrument mixes and different policies" (Scordato et al., 2018). Credibility concerns the understanding of a policy as a consideration of its feasibility, together with the trust between the parties. The latter two aspects (stability and completeness) do not indicate the rigidity of a policy mix, which can change over time, but the concreteness of objectives and completeness at the decision-making level (Rogge and Reichardt, 2016).

Only a few papers extracted from the database focused on the evaluation of the policy mix. This represents a literature gap. The first emerging feature is the lack of data or the difficulty of evaluating policies that are distributed differently over time (Mantino and Vanni, 2019). It also turns out to be essential to define a systemic strategy for evaluating implemented policy mixes, which does not yet appear in the literature (Fedrigo-Fazio et al., 2016). Diversity of objectives also appears to be an obstacle to measuring the effects of a policy mix. Many papers merely illustrate a policy mix implemented in a particular territory, but objective results of the entire policy mix are lacking in the literature In fact, according to Banerjee et al. (2020), a separate assessment of each component of a policy mix is not sufficient and can lead to misleading policy advice.

Many authors, to overcome this gap in the literature, attempt to use methodologies based on future scenario analysis (Lopolito and Sica, 2022; Venturini et al., 2019; Q. Zhang et al., 2019). However, this approach also highlights the lack of objective and commonly accepted indicators in the literature. Thus, these findings suggest the lack of a universal quantitative approach that can be adopted in different territories for the evaluation of policy mixes' efficiency.

5. Discussion

The analysis of the papers was used to summarise the documents on policy mixes implemented in rural areas. The first result concerns the classification of policy mixes according to the three areas analysed (the area of interest, the policy processes and the evaluation of policy mixes). Indeed, the classification of policy mixes' objectives appears highly investigated. On the other hand, policy processes and policy mix evaluation methods seem little analysed. Thus, there are two important gaps in the literature: i) the lack of definition of territorial governance's impacts and ii) the way to implement an *ex-post* evaluation of the policy mix results.

In order to analyse the gaps in the literature for rural areas, it could be interesting to compare the objectives analysed in the selected papers with the 17 Sustainable Development Goals (SDGs; Figure 4) and The Common Agricultural Policy (CAP) objectives (Figure 5). In fact, these objectives appear to be goals pursued by the majority of policies and instruments worldwide aiming at achieving sustainability.

Figure 4. Topics of policy mixes in relationship to the SDGs

Source: Our adaptation based on the Sustainable Development Goals (SDGs) objectives. Grey boxes are the not-investigated objectives in the selected papers

Looking at the SDGs, 4 goals appear to be unexplored in the selected papers, specifically, Goal 5 "Achieve gender equality and empower all women and girls", Goal 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all", Goal 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development", and 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" (United Nations, 2016). Goal 14 was excluded from the query because of the diversity of aims and knowledge needed for the analysis of "rural areas" and "life before water". However, it could be necessary to implement studies analysing the other un-investigated goals. Indeed, it seems difficult to think about the implementation of a policy mix in rural areas without considering, for example, the female workforce (Goal 5). In addition, when considering the characteristics of rural areas and the difficulties related to working conditions, it is important to include plans for compliance with working conditions (Goal 8).

Figure 5. Topics of policy mixes in relationship to the CAP's goals

Source: Our adaptation based on the Common Agricultural Policy (CAP) objectives. The red crosses mark the un-explored objectives.

Figure 5 shows that among the CAP objectives, three of them appear to be poorly investigated. A lack of implementation of policy mixes emerges, including policies related to knowledge and training of territorial stakeholders on the policies' aims (Fischer et al., 2023). In addition, the analysis revealed an important lack of analysis of the inclusion of the various tools related to risk management and financial policies in rural areas. Risk management and financial policies are now considered indispensable tools in facing climate impacts that can no longer be overcome only with economic policies, but awareness of financial instruments' role is necessary.

Over the past decades, governments have invested heavily in immaterial capital, including new architectural designs, training of specific human capital, and investment in market research and scientific R&D. Still, adequate evaluation methods still need to be implemented. In fact, there were substantial investments in knowledge sharing and innovations, which are transversal aspects very difficult to evaluate. For this reason, most of the papers evaluate just one policy, as it is an easier analysis to carry out. On the contrary, there is a need to find how to measure the joint effects of the several policies implemented, considering that a single policy or instrument can have transversal effects and help achieve different goals. Therefore, it becomes necessary not only to evaluate only a single policy and how much it helps to achieve a single goal. But, the interconnectedness and sometimes overlap between goals must also be regarded. With this in mind, it is important to consider the system evaluation of the instruments used and the objectives achieved.

6. Concluding remarks

The key areas of focus in this research paper involve investigating the main topics analysed in the literature concerning policy mixes in rural areas, the future research directions suggested by each paper, the most commonly used methodologies for analysing policy mixes in rural contexts, and the primary characteristics employed to delineate these policy mixes. In fact, there is a growing consciousness that environmental and social issues cannot be analysed separately. In addition, a multidimensional and long-term view of topics is needed to manage multiple interconnected actors and issues, considering enabling factors, in which the institutional contest plays a primary role.

This is particularly important in rural areas, where policy mixes play a key role in limiting climate change effects and implementing a sustainable development strategy. Indeed, while the challenge is necessary and the role of rural areas is recognised by various policy documents, there still appears to be little literature on the topic. From this perspective, conducting a scoping literature review exploring how to address the research questions has been possible. According to several authors (Tricco et al., 2016; Davis, Drey, and Gould, 2009; Pham et al., 2014), this review method is widely acknowledged as an effective tool for synthesizing key findings from extensive and complex scientific literature and investigating future possible strands. The choice to follow a rigorous and transparent approach, supported by predefined protocols, has allowed for the structured and precise identification of research results of sufficient quality.

Based on the work by Rogge and Reichardt (2016), the study categorizes policy combinations using three fundamental principles: i) objectives, ii) policy strategies, and iii) assessment methods. Commonly occurring objectives in the analysed documents encompassed themes like biodiversity

loss, ecosystem services, and climate change. In contrast, topics like gender equality and the financial considerations associated with climate change insurance were less frequently addressed. The overarching takeaway from this analysis is identifying a significant gap in the existing research: a notable absence of ex-post policy evaluations and assessments of governance's influence on implementing policy combinations. Specifically, policy documents are increasingly emphasizing the need for a coherent policy mix implementation, while the significance of rural areas is growing in importance for achieving complex objectives like sustainable transition. In this perspective, a greater understanding of overall principles that could aid in the drafting of documents and formulation of policies is required. This paper aims to aid policymakers in identifying specific areas that require more attention, such as enhancing policy coherence, fostering greater stakeholder inclusion, or incorporating core objectives of each area more comprehensively through specialized analysis.

This study, envisioned as both a reference and a consultative resource, carries multiple recommendation. To begin with, it offers valuable insights for local businesses and stakeholders in different rural areas. Examining rural issues and the critical elements required for executing a policy mix underscores the efficient utilization of financial and territorial resources. Furthermore, it accentuates the vital role of various stakeholders within a region in formulating effective, long-term strategies. By incorporating the findings from this analysis into regional governance, local actors can expedite and optimize the essential sustainability transition.

In addition, the results support substantial suggestions for policymakers. A deep understanding of the essential considerations and potential barriers when adapting the policy mix to contemporary challenges can help mitigate the adverse outcomes of conventional policies, such as wasteful spending, inefficient resource allocation, and the failure to achieve long-term goals. From a more practical perspective, it has become clear that there is a critical need to establish good governance that can effectively support the implementation of a policy mix in rural areas. The expected governance should focus on the area's specific characteristics, involving stakeholders, and consider each need, all to ensure policy consistency and mitigate the risk of failure.

Furthermore, the policy mix analysis employed in this study can be instrumental in identifying critical factors for policymakers to establish valuable evaluation tools. Finally, given the substantial gap identified with this literature review, there may be a need for a quantitative approach to evaluate the impact of policy mixes, encompassing both social and economic dimensions. This approach is crucial as policy mixes are the primary means of achieving sustainability transitions.

This study offers an initial perspective on policy mix analysis within rural areas, serving as a foundation for subsequent research to explore various aspects, such as the influence of governance on rural area implementation or the development of measurement indices for diverse policy mixes. In conclusion, this study not only aids the scientific community and policymakers in enhancing and promoting the need for policy mix implementations but also reiterates the pivotal role of rural areas. But this study is not without limitations. First of all, it is evident that the review’s results are not applicable because of the lack of a specific case study. However, the goal of the present study is to analyse the current state of the art to direct future research and point out the literature gaps on such an important and actual issue.

With this aim, Scopus and Web of Science are considered the most reliable and comprehensive databases, encompassing the majority of available literature (Pranckutė, 2021). However, it's worth

noting that this choice may result in excluding a wide range of grey literature, which often includes essential policy documents. Although there are increasing efforts to include grey literature, the decision to exclude it in this study aligns with the robust and rigorous approach of the PRISMA method, ensuring reproducibility and objectivity in the methodology, ultimately leading to high-quality results. It's important to acknowledge that grey literature, not subject to double-blind peer review processes, may impact the quality of the results (Mahood, Van Eerd, and Irvin, 2014). Nonetheless, this choice paves the way for potential future research. If, through this literature review, more specific objectives on particular topics emerge, it may be beneficial to consider both academic and grey literature for a more comprehensive and detailed perspective. In addition, future strands of research should include long-term goals that appear to be little explored in the analysis of policy mixes. In addition, there is a need to fill the gap regarding methodologies for evaluating the impacts of different governance levels in policy mix implementation. Furthermore, the topic is covered very broadly, but rural areas turn out to have intrinsic peculiarities, also related to the territory. Thus, it should be interesting to consider the diversity among countries, as this difference can be an important variable in implementing an effective policy mix.

Appendix

Table A. The selected papers

Authors	Title	Year	Methodology	Country	Goals	Link with policy mix	Future research avenues
Mugabe et al., (2022)	Governing COVID-19: analyzing the effects of policy responses on food systems in Tanzania	2022	Survey; Semi-structured interviews.	Tanzania	Investigating the implications of policy responses and national restrictions concerning farm systems for smallholder farmers during Covid-19.	Policy package as a livelihood solution for small farmers, including investment, small loans and regulatory changes.	Considering the impacts of Covid-19 on the environment and processing.
Niemeyer & Vale, (2022)	Obstacles and opportunities for implementing a policy-mix for ecosystem-based adaptation to climate change in Brazil's Caatinga	2022	Literature review	Brazil's Caatinga	i) Analysis of EbA policies, nature-based solutions or ecosystem services ii) How these align with climate change iii) Main challenges in Caatinga Iv) EbA implementation in Caatinga.	Ecosystem-based adaptation (EbA) is a specific type of policy mix that supports sustainable transition.	Considering EbA in the development of land use and socio-economic policies.
Sarker et al., (2022)	Analyzing forest policy mixes based on the coherence of policies and the consistency of legislative policy instruments: A case study from Ecuador	2022	Documents qualitative content analysis; Expert interviews.	Ecuador	i) Studying new methodologies of current design studies on tropical forest policy design ii) Analyse the coherence of sectoral policies iii) Assess the coherence of forest policy instruments based on specific indicators.	Challenges of implementing policy mixes to maintain consistency of policy instruments across different policy areas and including existing policies.	No specific future research avenues
Zabala et al., (2022)	From participation to commitment in silvopastoral programmes: Insights from Chiapas, Mexico	2022	Heckman selection model	Mexico	Investigating project participation and adoption of the silvopastoral approach are impacted by livelihood diversity	Provides info to design policies to encourage sustainable agriculture considering multiple interventions and	i) Considering the effect and interaction of a variety of contextual subsidies ii) analysing what led individual to stop activity participation iii) implementing longer-

						implementation of policy mixes.	term ecological measurement
D'Adamo et al., (2022)	Solar collective self-consumption: Economic analysis of a policy mix	2022	Mathematical model that integrates new policy instruments	Italy	Calculating the profitability of PV systems regarding self-consumers.	Analysis of a specific policy mix in Italy.	Applying the methodology to other territorial contexts
Nimubona & Pereau, (2022)	Negotiating over payments for wetland ecosystem services	2022	Development of a new theoretical model	Canada	Analysing the efficiency of payment schemes for the provision of wetland ecosystem services	Means as a new policy mix a combination of PES with other policy instruments.	Understanding the impacts of other features of PES implementation
Trotter & Brophy, (2022)	Policy mixes for business model innovation: The case of off-grid energy for sustainable development in six sub-Saharan African countries	2022	Documents analysis; Semi-structured interviews.	Uganda Zambia, Nigeria, Tanzania, Sierra Leone and Ghana.	i) Considering the relationship between policy mixes with BMI ii) Studying how sector-specific and society-wide policy influence BMI	Dwelling on the policy strategy and combination of policy objectives, a policy mix is deemed necessary to support innovation, encouraging the sustainable transition.	i)Including political systems, the strength of institutions, entrepreneurs or cultural differences in the analysis ii) Applying methodology to other territorial contexts
Geisendorf & Klippert, (2022)	Integrated sustainability policy assessment – an agent-based ecological-economic model	2022	Economic model	Global	i) Considering how growing economy and a regenerative resource system impact policy in sustainable management. ii) Assessing the effects of different policies	Policy mix becomes necessary when analysing the links between economic and ecological systems.	i) Defining demand considering endogenous factors. ii) Modelling market dynamics. iii) Considering empirical validation
Lopolito & Sica, (2022)	Designing Policy Mixes to Address the World's Worst Devastation of a Rural Landscape Caused by Xylella Epidemic	2022	Fuzzy cognitive maps	Italy (Apulia)	Developing empirically analyse stakeholder knowledge (Xylella Epidemic)	"Fuzzy cognitive maps" are used to identify policy mixes to fight the Xylella epidemic.	Including analysis of political costs
Kuberska & Mackiewicz, (2022)	Cluster Policy in Poland—Failures and Opportunities	2022	Documents analysis; Semi-structured interviews.	Poland	i) Considering the evolution of cluster policy ii) identify its successful factors iii)	Looking at the case of Poland, cluster policy was combined in the analysis of policy mixes.	No specific future research avenues
Ngan et al., (2022)	The Role of Policy Mix in Driving Sustainable Development: Idealism or Realism?	2022	Drivers, Pressures, State, Impact and Response Model	Malaysia	i) Identifying the execution gap between the policy agenda and its implementation ii) Enhancing communication among key stakeholders	Assessment of the policy mix through Drivers, Pressures, State, Impact and Response Model of Intervention (DPSIR).	Considering the societal dimension of environmental issues
Howland, (2022)	Local climate change policy and rural development in Colombia's post-peace agreements context	2022	Mixed approach; Semi-structured interviews.	Colombia	Considering fragmentation, discontinuity, coherence building, and local power in the gap between discourse and political implementation	In the context of the policy mix, this research investigates fragmentation, coherence, and the local power.	No specific future research avenues
Jeannerat & Crevoisier, (2022)	From competitiveness to territorial value: transformative territorial innovation policies and	2022	Literature review	Global	i) Identifying how to address territorial innovation within a transformative innovation paradigm and ii) Considering how to conceptualize current territorial innovation policies	In terms of inclusiveness, the policy mix should include "Co-innovation, entrepreneurship, sense-making and institutionalization" (p. 2158).	i) conceptualizations on territorial value and territorial valuation processes at stake in innovation ii) the role of the social sciences and humanities in innovation

	anchoring milieus						
Tønnesen et al., (2022)	Planning for climate-friendly transport in Norwegian rural areas	2022	Several methods	Norway	Analysing how can local land use planning facilitate climate-friendly transportation in rural areas	rural policy packages, understood as the aggregation of different measures to achieve a common goal, are analysed in rural realities.	No specific future research avenues
Farjalla et al., (2021)	Turning Water Abundance Into Sustainability in Brazil	2021	Case study	Brazil	Focusing on water resources use to sustainable transition	To overcome the difficulty of a fragmented water policy developed the need to consider I policy mix for the water-food-energy-ecosystem nexus.	No specific future research avenues
Könnölä et al., (2021)	Transformative governance of innovation ecosystems	2021	Conceptual framework	Finland	Analysing transformative innovation policy regarding i) complex adaptive, ii) ecosystems iii) adaptive and participatory governance.	the concept of policy mix from Rogge e Reichardt, (2016) is taken up, to support the development of sustainable innovation ecosystems.	Include an empirical multi-case analysis; Apply methodology to other territorial contexts; policy experimentation and exploration of mechanisms for improve innovation ecosystems.
Eberhard et al., (2021)	Understanding the effectiveness of policy instruments to encourage adoption of farming practices to improve water quality for the Great Barrier Reef	2021	Case study	Australia	Considering how policy instruments and different social and geographic contexts influence farmers' behavioural	The concept of policy mix is taken up by developing a critical review on the issue of water quality of agricultural systems.	No specific future research avenues
Cong & Thomsen, (2021)	Review of ecosystem services in a bio-based circular economy and governance mechanisms	2021	Literature review	Global	i) Studying the ecosystem services of the local bio-based circular economy within urban areas?" ii) Analysing how policy instruments can support the BCE transition	A combination of interventions and policy instruments is proposed to improve policy efficiency and avoid policy failure.	No specific future research avenues
James, (2021)	Confronting the scarcity of digital skills among the poor in developing countries	2021	Mixed approach	Global	i) Analyse the components of a policy package to address the digital skills shortage in poor countries.	Evaluation of a policy package to combat the digital skills shortage in poor countries.	No specific future research avenues
Simões et al., (2021)	Time to get emotional: Determinants of university students' intention to return to rural areas	2021	Tobit panel model approach	Azores	How structural factors and subjective factors adjust these students' return intentions over time, prior to completion of their studies.	Review of what to include in policy packages to limit youth departure from rural areas.	No specific future research avenues
Banerjee et al., (2020)	Global socio-economic impacts of changes in natural capital and ecosystem	2020	Mixed approach	Global	How ecosystem services can get global commitments met	Screening of particular strategies and sets of policies in order to achieve the sustainability	Changes in model parameters

	services: State of play and new modeling approaches					goals advocated by policy documents.	
Costa & Matias, (2020)	Open innovation 4.0 as an enhancer of sustainable innovation ecosystems	2020	Logit model	Portugal	i) Identify relevant actors in promoting sustainable innovation ecosystems ii) The importance of connecting open innovation with academia and the user community	Policy mixes as a solution to reallocate spending especially in technology-intensive sectors.	i) The role of the digital revolution in reshaping knowledge processes ii) The impacts on business performance of sustainability-oriented innovations
Banerjee et al., (2020)	Economic, land use, and ecosystem services impacts of Rwanda's Green Growth Strategy: An application of the IEEM+ESM platform	2020	The IEEM+ESM approach	Rwanda	Explore the economic and environmental impacts of specific actions to achieve green growth	Integrated Economic-Environmental Modelling (IEEM) platform is linked to ecosystem services(ESM) modelling to assess synergies and trade-offs between policy mixes.	i) more complete monitoring data ii) Include the effects of climate change in ecosystem service models.
Milhorance C et al., (2020)	Unpacking the policy mix of adaptation to climate change in Brazil's semiarid region: enabling instruments and coordination mechanisms	2020	Documents analysis; Semi-structured interviews.	Brazil	Analyse coordination models of a range of policy instruments to promote climate adaptation in rural areas of the semi-arid region	A policy mix approach to analyse climate adaptation policies and assess the interactions and synergies of policy instruments.	i) analyse the impacts of a policy mix ii) investigate the network of actors
Albert et al., (2020)	Research note: Spatial planning in Europe and Central Asia – Enhancing the consideration of biodiversity and ecosystem services	2020	Review	Europe; Central Asia	Opportunities for land use planning to improve consideration of biodiversity and ecosystem services	A policy mix approach to understanding land-use planning.	No specific future research avenues
Henderson & Roche, (2020)	Examining the policy mix for broadband deployment in Wales: The role of informal coordination in the last mile	2020	Case study	Wales	How actors try to manage complexity among policy objectives	Analysis of the interactions of the elements included in a policy mix.	Considering the institutional key aspects of the broadband policy process
Izquierdo-Tort S., (2020)	Payments for ecosystem services and conditional cash transfers in a policy mix: Microlevel interactions in Selva Lacandona, Mexico	2020	Documents analysis; Semi-structured interviews.	Mexico	i)Analyse PES' interactions with a conditional cash transfer ii) considering the participant involve	Analysis of payment programs for ecosystem services from a policy mix perspective.	The potential benefits of cooperation regardless of the objectives pursued by each policy
van den Bergh, (2020)	Six policy perspectives on the future of a semi-circular economy	2020	Review	Global	Examine the circular economy concept	Assessment of the policy mix to achieve the full circular economy.	No specific future research avenues
Braito et al., (2020)	The plurality of farmers' views on soil	2020	Q methodology	Austria	Indicate new insights for targeted policies for sustainable land	The importance of stakeholder inclusion in	Include the opinion of traditional food

	management calls for a policy mix				management considering farmers' opinion	establishing a policy mix is highlighted.	providers and pleasure seekers .
vonHedemann et al., (2020)	Forest policy and management approaches for carbon dioxide removal	2020	Documents analysis; Case study	USA	Different policy instruments could be mixed in different contexts and integrated (or not) with each other and with existing forest policies.	Evaluation of the tools included in the policy mix to fight climate change by highlighting the role of forests.	Analysing who is likely to benefit of changes in forest management
Hailu et al., (2020)	Dynamics of land use, land cover change trend and its drivers in Jimma Geneti District, Western Ethiopia	2020	Documents analysis; Interviews.	Ethiopia	Analyse the dynamics of land management and identify drivers of change	"A wide range of policy packages are required for sustainable land management practices which take in to account synergies and trade-offs between the various land uses in the study area." (p.1)	No specific future research avenues
Mantino & Vanni, (2019)	Policy mixes as a strategy to provide more effective social and environmental benefits: Evidence from six rural areas in Europe	2019	Case study	Europe	i) reports of policy instruments to improve environmental and social benefits for agriculture ii) introduce the new governance arrangements and multi-stakeholder coordination iii)provide some insights on policy implications for the post-2020 period	The ability of policy mixes to exploit the strengths of individual instruments and offset their weaknesses is emphasized, for example in the CAP debate.	Include complementarity and trade-offs between policy combinations and policy mechanisms
Kubo et al., (2019)	Toward a policy mix in conservation governance: A case of Gunung Palung National Park, West Kalimantan, Indonesia	2019	Case study	Indonesia	i) prove the effectiveness of a policy mix ii) suggests a means to move forward toward better conservation governance	Strategic coordination among different instruments is considered essential to avoid the emergence of negative outcomes given by non-synergistic policy mixes.	No specific future research avenues
Venturini et al., (2019)	Impact and effectiveness of transport policy measures for a renewable-based energy system	2019	Mixed methods	Denmark	Analyse transport measures concerning emission reduction in the integrated energy and transport system	Comparison of the synergistic combination of different instruments in a policy mix.	Consider the impact of the maritime and aviation sectors on fuel consumption and greenhouse gas emissions
Zhang et al., (2019)	Evaluation and scenario simulation for forest ecological security in China	2019	Integrated dynamic simulation model; Scenario simulation	China	Analyse forest ecological security	Analysis of the benefits of a policy mix regarding forestry policies.	No specific future research avenues
Bouma et al., (2019)	Policy mix: mess or merit?	2019	Review	Global	i) concept analysis and motivation for implementing a policy mix, and ii) exploring methodologies to evaluate them	Evaluation and detailed analysis of the policy mix-based approach.	No specific future research avenues
Zhang & Yu, (2019)	Policy Mixes for the Sustainability Transition of the Battery Industry in China	2019	Mixed methods	China	Investigating the implementation of a policy mix for sustainable transition of domestic battery industry	Analysis of policy mixes to promote empirical research on innovation and sustainability policies.	Include a creative destruction perspective

Selva et al., (2019)	Can environmental compensation contribute to socially equitable conservation? The case of an ecological fiscal transfer in the Brazilian Atlantic forest	2019	Case study	Brazil	i) whether financial compensation influences local perceptions of the conservation regime ii) contributes towards the reconciliation of human-conservation conflicts iii) triggers any meaningful socio-economic improvement that would counter the local costs of conservation.	The importance of implementing a policy mix to realize benefits for the community.	No specific future research avenues
Montoya-Zumaeta et al., (2019)	Adding rewards to regulation: The impacts of watershed conservation on land cover and household wellbeing in Moyobamba, Peru	2019	Mixed methods	Peru	i) quantifying the effects of a conservation initiative ii) the effect on the welfare of participating households.	Evaluation of a mix of interventions in a specific case study.	No specific future research avenues
Vlačić et al., (2018)	National innovation system: Where do government and business diverge	2018	Mixed methods	Croatia	Does the institutional framework promote a "cocktail" of innovation support measures sufficiently adapted to the needs of enterprises?	"Under the policy mix term, we consider the idea of the departure from focusing on a single instrument and single optimal policy model, towards accepting the idea that the optimal policy model should be focused on the appropriate mix of policy instruments." (p.650)	i) include both the supply and demand side policy ii) Apply methodology to other territorial contexts and sectors
Ghinoi et al., (2018)	Political debates and agricultural policies: Discourse coalitions behind the creation of Brazil's Pronaf	2018	Literature review; Case study	Brazil	To assess how policy debates among key stakeholders contribute to the design of policies to support agriculture.	Evaluation of the importance of including stakeholders in shaping a combination of policies.	Implement a panel study
Scordato et al., (2018)	Policy mixes for the sustainability transition of the pulp and paper industry in Sweden	2018	Literature review; Case study; Semi-structured interviews.	Sweden	Examining the development of the policy mix toward sustainability in the pulp and paper industry	Evaluation of policy mixes for sustainable transition with a focus on coherence and timing.	No specific future research avenues
Milios, (2018)	Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix	2018	Documents and literature review	Global	Identify currently underutilized policy areas at the EU level for the circular economy	Focus on the synergistic effects that a single policy can have when combined with another policy.	i) emphasize the social dimensions of CE ii) Develop improved metrics of environmental and economic costs and benefits in light of increased sustainability
Rezende et al., (2018)	Land use policy as a driver for climate change adaptation: A case in the domain of the	2018	Case study	Brazil	Discuss the role of land use conformity as a driver for adaptation in the Brazilian Atlantic forest domain	Policy mix needed for ecosystem-based climate change adaptation.	No specific future research avenues

	Brazilian Atlantic forest						
Mann & Plieninger, (2017)	The potential of landscape labelling approaches for integrated landscape management in Europe	2017	Mixed methods	Europe	i) explore the conceptual orientation of landscape labelling, ii) analyse existing approaches in Europe iii) elaborate on its potential for integrated landscape management on a regional scale.	Focus on the importance of hybrid institutional arrangements and policy mixes.	No specific future research avenues
Li, (2017)	Balancing rural and urban development: Applying Coordinated Urban-Rural Development (CURD) strategy to achieve sustainable urbanisation in China	2017	Literature review; Case study	China	Analysis of the ideology of coordinated urban and rural development	Analysis of the policy mix implemented in rural China.	No specific future research avenues
Wong et al., (2017)	An Assessment Framework for Benefit Sharing Mechanisms to Reduce Emissions from Deforestation and Forest Degradation within a Forest Policy Mix	2017	Case study	Cameroon; Vietnam;	Evaluate REDD+ benefit-sharing mechanisms, using the criteria of effectiveness, efficiency, and equity	Focus on REDD+ as an example of a policy mix.	No specific future research avenues
Barton et al., (2017)	Payments for Ecosystem Services as a Policy Mix: Demonstrating the institutional analysis and development framework on conservation policy instruments	2017	Mixed methods	Costa Rica	Demonstrate how the Institutional Analysis and Development framework can contribute to policy mix analysis and integrative environmental governance	Evaluation of the Institutional Analysis and Development framework in analysing the policy mix.	Include a set of analytical tools
Droste et al., (2017)	Integrating Ecological Indicators into Federal-State Fiscal Relations: A policy design study for Germany	2017	Empirical	Germany	Explore the possibility of integrating ecological indicators into federal-state fiscal relations	Considering the importance of a policy mix, it is necessary to focus on the institutional context, knowledge gaps, and policy design.	Distinguish by categories of protected areas
Robert et al., (2017)	Interaction effects of targeted agri-environmental payments on non-marketed goods and services under climate change in a mountain region	2017	Empirical	Switzerland	Study the interactions of three direct payment schemes	"Interaction effects of a set of policies in a given policy mix may influence the cost-effectiveness of single measures." (p.49)	No specific future research avenues
Scarano, (2017)	Ecosystem-based adaptation to climate change: concept, scalability and a role for	2017	Review; Case study	Brazil	i)improve the definition of EbA ii) analyse the concept at global and local levels iii) need to adhere to the EbA policy	"I propose that EbA is a policy mix that includes typical BES related policy instruments and tools, but also socioeconomic and	No specific future research avenues

	conservation science					development-related policies." (p. 67)	
Cook et al., (2017)	An Assessment of Intermediary Roles in Payments for Ecosystem Services Schemes in the Context of Catchment Management: An Example from South West England	2017	Review; Case study	England	Analyse the importance of intermediaries for I payment systems for ecosystem services	Evaluation of Payments for Ecosystem Services as a component of a policy mix.	No specific future research avenues
Reside et al., (2017)	Ecological consequences of land clearing and policy reform in Queensland	2017	Review; Case study	Queensland	Provide information on the policy debate on logging	Identification of key components of policy mixes such as regulation and incentives.	No specific future research avenues
Bartolini et al., (2017)	Biogas and EU's 2020 targets: Evidence from a regional case study in Italy	2017	Empirical	Italy	Whether agricultural biogas makes it possible to meet the EU's 2020 energy targets on a regional scale	Identification of key components of policy mixes such as coherence and territorial specificity.	i) Extension of scope to other regions of the EU ii) Consider a spatial equilibrium model
Barton et al., (2017)	Policy Mixes: Aligning instruments for biodiversity conservation and ecosystem service provision	2017	Review	Global	Explain policy mixes	Evaluation of the policy mix as a tool to achieve biodiversity conservation through a combination of several instruments.	No specific future research avenues
Davenport et al., (2017)	Adaptive Forest Governance in Northwestern Mato Grosso, Brazil: Pilot project outcomes across agrarian reform landscapes	2017	Case study	Brazil	How pilot projects for integrated conservation and sustainable development have influenced forest governance	Evaluation of the policy mix as a scenario in a specific case study.	i) Mapping policy mixes and interventions considering sustainability and duration of relationships ii) a focus on institutional and policy mix enablers and pathways toward sustainable landscapes in the Brazilian
Meinard, (2017)	What is a legitimate conservation policy?	2017	Review	Global	To elaborating a framework encompassing the aspects of relevant theories in conservation contexts	"Most conservation policies are public policies: they make use of public money, provide public goods, are financed through taxes and are part of policy packages." (p. 122)	No specific future research avenues
Fedrigo-Fazio et al., (2016)	Evidence of absolute decoupling from Real World Policy Mixes in Europe	2016	Case study	Europe	The relationship between human development, planet's resources, and related environmental impacts	Evaluation of the policy mix as a scenario in a specific case study.	No specific future research avenues
Scullion et al., (2016)	Designing conservation-development policies for the forest frontier	2016	Case study	Peru	Demonstrate the usefulness of the framework for forest conservation and development	Evaluation of the policy mix as a scenario in a specific case study.	Analyses of the efficacy and trade-offs of alternative policies and policy mixes.
Urge-Vorsatz et al., (2016)	Measuring multiple impacts of low-	2016	Mixed methods	Global	i) provide an overview of the complex methodologies for	Review of different solutions based on the combination of	No specific future research avenues

	carbon energy options in a green economy context				assessing the impacts of energy options ii) provide appropriate solutions	policies to achieve sustainability.	
Schader et al., (2014)	The role of multi-target policy instruments in agri-environmental policy mixes	2014	Empirical	Global	i) How to determine the economically optimal mix of single- and multi-objective policies ii) Emphasize the advantageous conditions and not	Contrasting policy mixes with the Tinbergen rule.	Apply methodology to other territorial contexts
Santos et al., (2014)	Reviewing the role of habitat banking and tradable development rights in the conservation policy mix	2014	Review	Global	Analyse the habitat bank and tradable development rights and their role in the policy mix	Analysis of the role of individual instruments included in a policy mix for biodiversity conservation.	No specific future research avenues
Barton et al., (2013)	Policyscape-A Spatially Explicit Evaluation of Voluntary Conservation in a Policy Mix for Biodiversity Conservation in Norway	2013	Empirical	Norway	To evaluate the role of PES in a mix of policy instruments distributed across a landscape	Evaluation of a specific policy mix to biodiversity conservation.	No specific future research avenues
Urgenson et al., (2013)	Stakeholder perceptions of an ecosystem services approach to clearing invasive alien plants on private land	2013	Mixed methods	Africa	To catch stakeholders' perspectives on the eradication of invasive exotic plants	Evaluation of the role of stakeholders in the implementation of policy mixes.	No specific future research avenues
Wiebelt et al., (2011)	Oil revenues for public investment in Africa: Targeting urban or rural areas?	2011	Empirical	Africa	Investigate the impacts of oil revenues on poverty reduction and economic growth	Evaluation of a policy mix in a specific case study.	No specific future research avenues
Davidova, (2011)	Semi-subsistence farming: An elusive concept posing thorny policy questions	2011	Review	Global	Importance of semi-subsistence agriculture in the EU-27	Policy packages as a tool to be included in the Common Agricultural Policy to solve the problems of semi-subsistence farms.	No specific future research avenues
Bhandari & Jana, (2010)	A comparative evaluation of household preferences for solar photovoltaic standalone and mini-grid system: An empirical study in a costal village of Indian Sundarban	2010	Empirical	India	The impact of household characteristics on the preference for electricity from solar PV-based systems	Analysis of the efficient policy mix to solve rural electrification issues.	No specific future research avenues
Willemen et al., (2010)	Evaluating the impact of regional development policies on future landscape services	2010	Mixed methods	Netherla nd	Analyse the change in landscape service provision and value under the influence of policy measures	Analysis of the potential impact of a policy mix in the Netherlands on different landscape services.	No specific future research avenues

Behrens et al., (2009)	Sustainable management of an alpine national park: Handling the two-edged effect of tourism	2009	Empirical; Case study	Austria	Suggest the optimal park management policy that can be supported in the long run	Analysis of the potential impact of a policy mix for conservation and tourism in a rural area.	i) include other species ii)analyse the optimal allocation of conservation budgets among different species.
Broberg & Brännlund, (2008)	On the value of large predators in Sweden: A regional stratified contingent valuation analysis	2008	Empirical	Sweden	WTP to conserve the predators in Swedish wildlife	Analysis of the determinants affecting WTP with regard to the existing policy package.	Consider models that include negative WTP and response uncertainty
Sharma et al., (2007)	Rehabilitation and resettlement policy of Tehri Dam Project - Meeting the needs & aspirations of the people	2007	Case study	India	The principles and basic objectives that led to the formulation of the R&R policy of the Tehri Dam project	Analysis of the goals and principles that developed the existing policy package.	No specific future research avenues
Potter & Burney, (2002)	Agricultural multifunctionality in the WTO - Legitimate non-trade concern or disguised protectionism?	2002	Review	Global	i) multifunctionality as a policy concept ii) to what extent does liberalization of agricultural policy threaten the joint production of food and environmental goods in the rural area ii) Consistency with EU policy	Focus on the multifunctionality of agriculture and the need for a policy mix to protect environmental assets.	No specific future research avenues
Reddy, (2002)	A generic Southern perspective on renewable energy	2002	Review; SWOT analysis	Global	A specification of sustainable development and the link to renewable energy	Outline the features of a renewable energy policy package for sustainable development.	No specific future research avenues
Blamey et al., (2002)	Attribute causality in environmental choice modelling	2002	Survey; Case study	Australia	i) Include a causal environmental attribute on the overall vector of choice parameters in a choice model ii) The impact of including a causal attribute	Empirical analysis of the role of individual instruments included in a policy mix.	i) From where in the chain of causes and effects should attributes be drawn? ii) which attributes should be chosen? iii) how should they be presented?
Curtis & Lockwood, (2000)	Landcare and catchment management in Australia: Lessons for state-sponsored community participation	2000	Case study	Australia	Analyse a model of state-sponsored community participation	An evidence of negative outcomes that can be limited by including stakeholders in the formulation of a policy mix.	No specific future research avenues
Menotti, (1998)	Globalization and the acceleration of forest destruction since Rio	1998	Case study; Review	Brazil	Impacts of globalization of the logging industry.	Policy mixes as a solution to reallocate funds and improve natural resource use.	No specific future research avenues
Alden, (1997)	Recreational user management of parks: An ecological economic framework	1997	Review	Global	i) management model for "publicly owned parks and reserves" , following an ecological economic approach to sustainability ii)	Policy mix as one of the guidelines for managing ecosystem services.	No specific future research avenues

					management of recreational users.		
Schrader, (1994)	Impact assessment of the EU structural funds to support regional economic development in rural areas of Germany	1994	Case study	Germany	i) context and financial analysis against policy documents (ii) monitoring models (iii) situational change assumptions	Design of a policy mix focused on rural economic development.	Include case studies for specific sectors under different local conventions

Source: our elaboration

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Chapter 2

Governance in policy mixes for sustainability transition: an analytical toolbox

Naomi di Santo [*1], Teresa Del Giudice[2], Gianluca Brunori[3], Roberta Sisto[1]

1 *Department of Economics, Management and Territory, University of Foggia.*
2 *Department of Agriculture, University of Naples Federico II.*
3 Department of Agriculture, Food and Environment, University of Pisa
* Corresponding author. Email: naomi.disanto@unifg.it

Governance in policy mixes for sustainability transition: an analytical toolbox

1. Introduction

Sustainability represents one of the most urgent priorities of the international community and various conceptions of sustainability can be found in UN reports and documents that have guided policy as well as academic analyses. However, a significant weakness is represented by sustainability policies still focusing on single specific issues, notwithstanding the need of adopting policy mixes capable of incorporating the complex nature of transitions (Uyarra et al., 2016; Wilts & O'Brien, 2019; Muscio & Sisto; 2020).

In this context, there is a growing interest in investigating the policy mix implementation in specific areas and, consequently, analysing the governance structures that give rise to them (Capano et al., 2020; Morrison, 2014). According to the European Commission (2017), governance quality is critical to economic productivity and societal well-being. Consequently, "good governance" is increasingly recognised as a pre-requisite for achieving EU goals. From this perspective, Wilts and O'Brien (2019) have investigated the various changes in the forms of governance and their adaptability over time, recognising the central role of interdisciplinary approaches. However, how governance elements can act as barriers or drivers for the policy mixes to sustainability transition are still being determined (Kirsop-taylor et al., 2022) and studies promoted by the OECD on "good governance" focus on the best mix of adoptable policy instruments but lack guidelines (Capano et al., 2020).

For this reason, considering a more operational dimension, there is evidence of the need for identifying a comprehensive set of factors accounting principles and values of good governance.

This toolbox, in addition to providing help to policymakers in formulating their strategies, represents an essential prerequisite for the success of policy initiatives.

Moving to a rural dimension and focusing on the smallest territorial unit for rural development planning, the Local Action Group (LAG), it is fundamental investigating whether the various policy documents at different administrative boundaries (e.g. Rural Development Program, Regional Complement for Rural Development and Local Development Strategy) contain references to specific governance elements or not.

In terms of sustainability transition, the above three mentioned levels of programming documents are very significant because they bolster and shape the operations for territorial development, supported by LAGs, thereby establishing the framework and the objectives for the strategies implemented by each group. From this point of view, formulating an evaluation protocol for governance is fundamental for a comprehensive and non-superficial investigation before

proceeding to LAG policy document analysis. Coherently, this study aims to outline an analytical toolbox for the governance analysis at the LAG level evaluating if the existing governance in a rural area can support a sustainability transition.

Therefore, starting from existing literature, the study's objective is managed by means of a bibliometric analysis using the VOSviewer software that has defined a starting point and identified the factors for implementing an effective policy mix.

The paper is structured as follows: Section 2 highlights the role of the LAGs in rural development actions, Section 3 presents the fundamental concepts used in the study, Section 4 focuses on the methodological approach and Section 5 focuses on the main results of the analysis. Finally, Section 6 and Section 7 present some discussion and concluding remarks.

2. The key role of Local Action Groups

Local Action Groups (LAGs) were conceived as an integral component of the LEADER (Liaisons Entre Actions de Développement de l'Économie Rurale) Program and represent the leading units for rural development policy. They are composed of a balanced combination of participants from both the public and private sectors by including the tacit knowledge of all stakeholders to promote cooperation between actors in rural areas and to define realistic and feasible strategies on the ground. Therefore, their investigation becomes compelling and important, including the critical role these entities play in influencing the quality and likelihood of local public policies' success for the areas in which they are established (Pappalardo et al., 2018; Sisto et al., 2018). Additionally, according to Bock (2016), analysing these entities, which are formed on rural partnerships, can help to investigate the role of new forms of governance in local realities.

Nowadays, these groups are called upon to play a key role in developing and implementing integrated policies in rural areas. Whereas in the past, the objectives were mainly focused on aspects such as territorial animation and social inclusion, currently, LAGs can be the real supporters of the sustainability transition, managing complex situations that arise in these areas (Vávra et al., 2022).

In previous programming, LAGs saw their role grow, introducing the requirement to adopt a CLLD (Community-Led Local Development) approach in defining their development strategy. Consequently, due to the increasing importance of public participation, the quality and structure of the partnership are likely to influence the effectiveness of the local development plan of the LAG and then the quality of rural endogenous development in these areas (Sisto et al., 2018).

However, the challenges facing rural areas are increasingly complex and implementing a policy mix in these areas raises more specific and tricky obstacles. Analysis of these issues is even more

critical when such policies require initial top-down planning and subsequent adjustment based on experience and a bottom-up view (Mazzucato, 2018). Indeed, due to the urgency of aligning different needs and the necessity to use resources efficiently, strategies to overcome barriers to sustainability transition appear fragmented and sometimes need to be more aligned concerning the real issues of the territory.

From this perspective, the factors that governance must include to support a sustainability transition by implementing an efficient policy mix still need to be explored. In related literature, there is a growing consensus that obstacles to growth and outcomes are closely linked to governance (Kern et al., 2019) since the literature has highlighted the role of partnership governance as a key tool for promoting endogenous rural development. In particular, effective governance in complex territories such as rural areas requires the implementation of measures to (i) involve different levels of government; (ii) establish horizontal and vertical connections between institutions; and (iii) promote learning mechanisms among the actors involved (Mantino, 2019). Therefore, it is increasingly necessary to understand what essential components must be considered, what potential obstacles should be addressed, and what tools are required.

3. Key concepts

This section will present the key concepts of this article, specifically related to governance and policy mixes.

The concept of "governance" denotes the context for policy implementation, considering how political issues are addressed and policies are designed (March & Olsen, 2014). In this context, political institutions work within institutional logic to determine policies that could address political challenges, the processes through which these policies are developed, the allocation of different roles, and the institutional forms that promote these practices (March & Olsen, 2014).

Indeed, policies follow specific governance schemes, including rules, instruments, relationships, individuals, and stakeholders (Howlett et al., 2017). For instance, according to Sisto et al. (2018), effective participation and inclusion of heterogeneous stakeholders in decision-making can limit policy failure risk. Various authors (Capano et al., 2020; di Santo et al., 2023) have emphasised how different modes and arrangements of governance can produce different outcomes. However, more knowledge about their impacts on implementing a policy mix is still needed. In addition, as indicated by certain policy documents (see European Commission, 2017), each governance scheme operates with its values, but only when these values are explicitly stated and shared can they mitigate the risk of inconsistency, uncertainty, and instability. On this topic, for the EU and its member states, the development of good governance is a crucial factor in extracting the maximum value from the

management of public funds. As outlined in many policy documents from the European Commission, common responsibilities and shared objectives (such as smart, inclusive, and sustainable growth) can only be realised through the synergy of efficient public administrations, high-quality judicial systems, and transparent, independent governance (European Commission, 2017). At the same time, there remain inherent gaps worthy of interest, such as the governance factors that can facilitate the implementation of a policy mix and why some policy mixes work better than others (Kivimaa & Sivonen, 2021).

In the EU, rural development policies are built upon two essential institutional levels. The first institutional framework involves multi-level governance, which refers to vertical coordination of the system at the political-administrative level, establishing the surrounding conditions, such as institutional and regulatory aspects (Pappalardo et al., 2018). The second one is local governance, representing the horizontal dimension of the issue. In this context, considering the LEADER guidelines, it entails the involvement of diverse groups of local actors, including civil society, public administration, and the private/economic sector (Murdoch, 2000).

In this scenario, numerous authors depict policy mixes as a fusion of various plans collaborating across multiple levels of government to attain a shared objective (e.g., Tønnesen et al., 2022). In this study, the approach pursued suggests that policy mixes should not be viewed solely as a combination of instruments but rather as the implementation of policy strategies, the delineation of policy processes, and the amalgamation of various characteristics that construct an appropriate policy mix for each specific territory (Kern et al., 2019). This aspect holds particular significance in rural areas, where policy mixes are crucial in mitigating the impacts of climate change and implementing sustainable development strategies. Although the need to address this challenge is evident, and the significance of rural areas is acknowledged in various policy documents, the literature on this topic still needs to be expanded.

4. Materials and Methods

To achieve the paper's objective, this study adopts a hybrid approach, combining elements of a systematic literature review with a bibliometric review, which provided quantitative data and useful maps for analysing the current state of the art on the topic. Indeed, by choosing to use Scopus as the scientific search engine, most of the papers in the literature could be included, and results could be extracted quickly and accurately.

Three primary reasons drove the selection of this method. Firstly, the novelty of the topic in the existing literature. While VOSviewer is a software widely used for analysing complex phenomena across various disciplines (Marzi et al., 2021), to the best of our knowledge, this study represents the

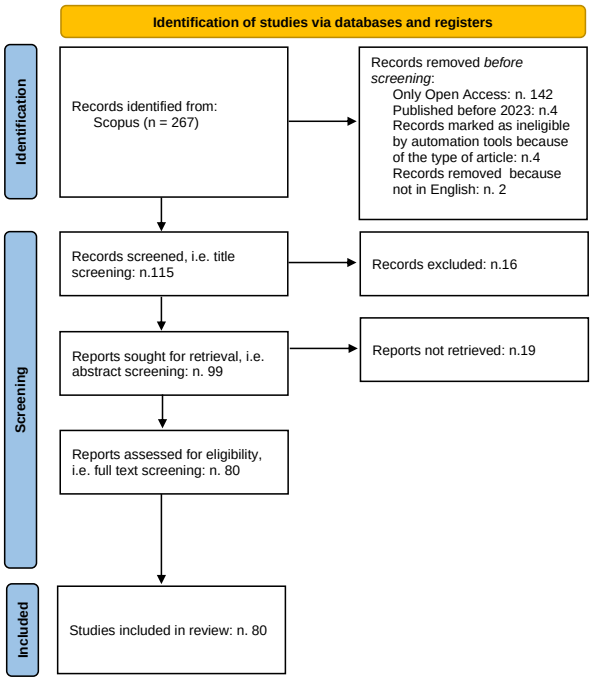
first attempt to employ this method for analysing policy mix and governance schemes. Secondly, using this software enables the generation of objective and reproducible bibliometric results. Finally, with this tool, it is possible to manage a large number of papers and divide them into clusters to describe a more comprehensive analysis and summarisation of the findings from the literature review (Marzi et al., 2021).

Specifically, the PRISMA extension approach was chosen for paper selection since it ensures precise and objective steps. Then, using VOSviewer, it becomes possible to cluster the main thematic areas into which the research subject can be divided.

More specifically, in the initial step, a query was created, including main keywords such as "policy mix," "policy portfolio," and "governance" using Boolean operators. Notably, excluding the word "LAG" from the query was a deliberate decision of several considerations. First, it made it possible to conduct a comprehensive analysis that did not consider the limitations imposed by focusing on individual cases. As an initial effort to fill the gaps in the literature, it was deemed necessary to encompass the totality of the literature without limiting it to a specific domain.

As depicted in Figure 1, the initial database contained 267 articles. After considering the inclusion screening criteria, including the utilisation of open-access sources, papers written in English, and documents published in scientific journals, a total of 115 relevant studies were identified. Finally, after reading the abstracts, 80 articles were selected and imported into the VOSviewer software.

Figure 1. "Prisma" flow chart

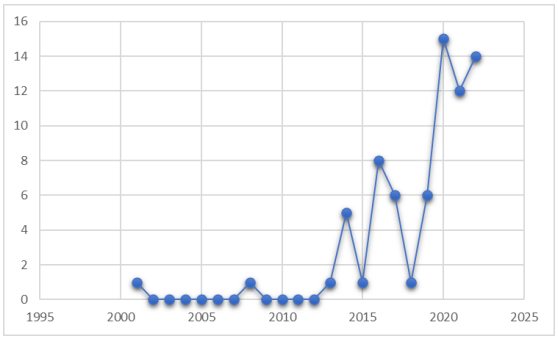


Source: Page et al., 2020

5. Results

The Vosviewer results show that some of the 80 selected documents are unconnected; the largest group of related articles includes 71 papers. As shown in Figure 2, the selected papers were published between 2001 and 2022, and from 2001 to 2013, only three articles perfectly matched the query. From 2018 onwards, a significant increase in interest in the subject can be observed, which had already experienced a substantial peak in publications in 2016.

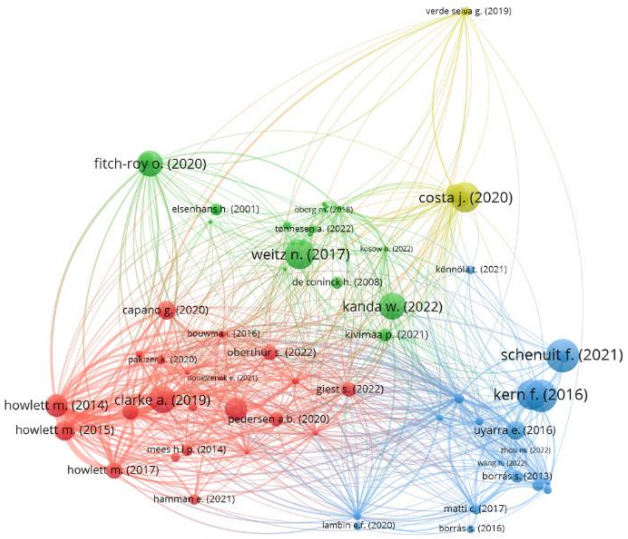
Figure 2. Papers distribution over the year



Source: our elaboration

The focused analysis regards the bibliographic coupling. Specifically, this analysis reports the connections between the papers that represent the presence of shared citations between the two units. Furthermore, the closer the dots in the image are, the greater the number of documents cited by both articles (Marzi et al., 2021). Figure 3 illustrates the VOS analysis's visual output, revealing four clusters representing different research streams within the governance and policy mix field.

Figure 3. VOSviewer results



Source: VOSviewer output

Table 1 shows the descriptive statistics associated with the identified clusters, providing an overview of their characteristics. The bibliographic details for each article can be found in the Appendix, specifically in Table A.

Table 1. Cluster descriptive statistics

	Number of Papers	**Total Citations**	**Total Normalised Citations**	**Total Citations/Number of Articles**
Red Cluster	22	699	173311,57	31.77
Green Cluster	21	517	126544,36	24.62
Blue Cluster	20	829	157263,22	41.45
Yellow Cluster	8	131	70037,00	16.37

Source: our elaboration

The Red and Green clusters generally encompass the highest number of articles (22 and 21, respectively). Notably, the Red cluster also exhibits the highest number of citations (699). The reading of the four identified clusters reveals distinct topics, which can be summarized as follows:

- The Red cluster, titled "*Effective Sustainability Transition Implementation".*
- The Green cluster, titled *"Policy coherence issue",*
- The Blue cluster, titled *"Key governance tools";*
- The Yellow cluster, titled *"The key role of stakeholders involvement.*

5.1 Red cluster: *"Effective Sustainability Transition Implementation"*

This cluster comprises 22 documents, and a reading of these papers reveals that the predominant methodology employed is a combination of literature review and document review (Domorenok & Zito, 2021; Hamman et al., 2021; Howlett et al., 2015; Kirsop-taylor et al., 2022). This finding underscores the need for quantitative evaluation methods concerning the impact of governance on the policy mix's adoption.

Table 2. Factors that improve Effective Transition Implementation

FACTORS	DESCRIPTION	AUTHOR
General ambition	Assessing the adequacy of governance	(Eckersley et al., 2022; Kammermann & Ingold, 2019; Oberthür & Homeyer, 2023)
Binding nature and rigor of the political framework	Possibility of effective implementation of transition	(Mees et al., 2014; Mukherjee et al., 2021; Oberthür & Homeyer, 2023)
Depth/diversity of the instruments mix	Addressing the multiple barriers and driving factors of transformation	(Kammermann & Ingold, 2019; Mukherjee et al., 2021; Oberthür & Homeyer, 2023)
Extension of policy integration	Addressing the multiple barriers and driving factors of transformation	(Oberthür & Homeyer, 2023)
Alignment of more relevant policy sectors	Deliberately improving policy-making outcomes	(Clarke & Craft, 2019; Kammermann & Ingold, 2019; Oberthür & Homeyer, 2023)

Intentional or conscious nature of policy design	Deliberately improving policy-making outcomes	(Clarke & Craft, 2019; Pedersen et al., 2020; van Geet et al., 2021)
Types, selection, and evaluation of policy instruments	Deliberately improving policy-making outcomes	(Clarke & Craft, 2019; Hartley & Howlett, 2021; Kammermann & Ingold, 2019)
Attention to the actors involved in the design	Deliberately improving policy-making outcomes	(Clarke & Craft, 2019; Kammermann & Ingold, 2019; Kirsop-taylor et al., 2022; Mantino & Vanni, 2019; Mees et al., 2014; Pakizer et al., 2020; Pedersen et al., 2020)
Institutional operational logics	Assessing the adequacy of governance	(Bouwma et al., 2016; Kirsop-taylor et al., 2022; Mukherjee et al., 2021; Pakizer et al., 2020; Pedersen et al., 2020)
Administrative dynamics	Understood as autonomy, centralization, discretion, responsibility	(Kirsop-taylor et al., 2022)
Control and longevity of municipal funding	Tendency to use combinations of instruments with attention to collaboration and participation	(Kirsop-taylor et al., 2022; Mantino & Vanni, 2019; van Geet et al., 2021)
Substantive policy tools: regulation, expenditure, taxation, and information	Ability to induce behaviours	(Capano et al., 2020; Hartley & Howlett, 2021; Mantino & Vanni, 2019; Mees et al., 2014; Pakizer et al., 2020; Vonhedemann et al., 2020)
Temporal dynamics	Explore changes over time	(Clarke & Craft, 2019; Howlett, 2014; Mantino & Vanni, 2019; Mukherjee et al., 2021)

Source: our elaboration

Table 2 summarises the factors that can facilitate the implementation of a transition. Various articles argue that there is an interesting correlation between policy design and the implementation of a policy mix (Clarke & Craft, 2019; van Geet et al., 2021).

More specifically, policy design defines and achieves policy objectives through specific policy tools (Howlett et al., 2015; Clarke & Craft, 2019) and starting from the importance of interdisciplinary approaches that consider long-term changes and systemic thinking, the close link between policy design and policy mix arises from the need for the long-term strategy of a policy package based on listening to the territory's needs (Howlett, 2014; Christensen et al., 2002; Mulgan, 2014). Understanding the temporal processes through which projects and design spaces evolve is crucial because they can gradually transform into degraded blends through multiple processes of layering (Howlett et al., 2017; Thelen, 2004; Van Der Heijden, 2011).

The strong connection between policy design and policy mix has also emerged from the need to develop implemented policy projects that address multilevel governance contexts and relationships between actors (Matti et al., 2014; Del Rio, 2014). In this regard, one of the elements various Scholars consider is policy coherence, which refers to the ability of different policies to coexist logically and not contradict each other (Giest et al., 2022). However, many existing governance scenarios and policy mixes have developed randomly through policy overlap processes, resulting in incoherent and

inefficient blends of policy elements (Thelen, 2004; Van Der Heijden, 2011). The current design orientation has gained significant emphasis because understanding how institutional governance arrangements frame the policy problem and influence policy approaches requires attention from policymakers (Mees et al., 2014). This involves analysing decision-making processes, implementing participatory procedures, and examining current funding regimes.

In terms of participatory procedures, Kirsop-Taylor (2022) identified four fundamental dynamics that influenced the outcomes of a policy mix: i) control and longevity of municipal funding; ii) bureaucratic discretion and autonomy; iii) administrative cohesion; and iv) political actors.

Another critical factor is the attention to the involved actors (Howlett et al., 2017; Oberthür & Homeyer, 2023; Pedersen et al., 2020). Efforts to promote collaborative or horizontal governance agreements influence the number of multisectoral and multipolicy situations (Pakizer et al., 2020), highlighting the importance of policy integration in such multilevel government and governance contexts (Vonhedemann et al., 2020). Given the cross-border nature of many environmental issues, it is common for different levels of government (international, national, regional, and local) to be involved in decision-making processes (Hamman et al., 2021). Integration efforts in these cases have been more effective. They are examples of successful multilevel governance, multiple-use management, marine spatial planning, and integration across jurisdictions, sectors, and communities (Bouwma et al., 2016).

Furthermore, the performance and interaction of policy mix components are influenced by specific governance contexts and their historical development (Hartley & Howlett, 2021; Mantino & Vanni, 2019). Therefore, a policy mix should be tailored to the specific context and period (Milhorance et al., 2020; Nimubona & Pereau, 2022). A relevant research strand focuses on New Governance Arrangements (NGAs), which aim to integrate existing, sometimes conflicting, policy strategies into a cohesive system to coordinate the activities of heterogeneous stakeholders (Mantino & Vanni, 2019). This highlights the importance of developing shared awareness among local stakeholders to coordinate actions and establish a shared learning platform to support a concrete socio-technical transition (Kammermann & Ingold, 2019).

5.2 Green cluster: *"Policy coherence issue"*

The Green cluster includes 21 articles highlighting the importance of policy consistency within a policy mix for achieving a sustainability transition (Kanda et al., 2022). Notably, a significant portion of the studies on policy coherence focuses on European cases, indicating a gap and limitation in results generalizability (Fitch-Roy et al., 2020; Mann & Plieninger, 2017; Watkins et al., 2016).

While governance has been recognized as a crucial factor in attaining policy coherence, more research still needs to be done on the enabling conditions, dynamics, and political and cognitive factors that influence policy coherence (Weitz et al., 2017). Carbone (2008) proposes four types of policy coherence: (1) horizontal coherence between different policy subsystems, (2) vertical coherence between the European Union and member states, (3) internal coherence, which refers to the consistency of objectives within the same policy subsystem, and (4) multilateral coherence, which pertains to the interaction between international organizations.

Examining policy coherence can minimize conflicts between different policy domains and enhance effectiveness, particularly in allocating public funds. Conflicts often pose significant barriers to sustainability transitions across various fields and levels of governance (Segal et al., 2022). Morrison (2014) suggests four proxies for measuring the level of regional governance: (i) active involvement in regional networks, (ii) assessment of the mix of instruments based on synergies and divergences, (iii) strengthening and flexibility in instrument design, and (iv) expanding financial, administrative, and democratic support.

Apart from conflicts, the nature of existing policy mixes can also contribute to their failure. Because policy mixes are often formulated within preexisting policy contexts, resulting in a fragmented and complex landscape (Scheer et al., 2022). Traditional governance systems, characterized by linearity and a top-down approach, often need to be revised to solve territories' complex challenges. Instead, governance approaches would embrace dialogue-based processes, long-term visioning, and collective commitment and action (Eshuis & Gerrits, 2021; Folke et al., 2005). Several tools can support this shift, including (i) authority tools used by government authorities to grant permits, prohibit actions, or impose requirements (Vazquez-Brust et al., 2014), (ii) incentive tools such as financial incentives and market-related benefits (Elsenhans, 2001), and (iii) capacity tools that address the lack of information, skills, and resources (de Coninck et al., 2008).

While key barriers to policy coherence were discussed thus far, Table 3 presents additional barriers to formulating a policy mix for sustainability transitions. They encompass: (i) insufficient attention to interconnections between sectors, leading to inefficient resource utilization and wasted funds (Schmieder et al., 2021); (ii) involvement of diverse actors with individual goals rather than a shared vision for a coherent policy mix (Dialga, 2021); and (iii) the development of a long-term vision, which, if not calibrated adequately over time, can increase the likelihood of policy failure.

Table 3. Major barriers to sustainability transition implementation

BARRIERS	KEY CONCEPTS	AUTHORS
Political fragmentation	Achieving policy coherence by identifying synergies and trade-offs	(Kivimaa & Sivonen, 2021; Kosow et al., 2022; Morrison, 2014; Weitz et al., 2017)
Disregard connections between sectors	Worsen resource scarcity and induce conflict	(Weitz et al., 2017; Westskog et al., 2020)
Economic rationality	Attention to cost-effectiveness of policies and efficiency in the use of resources	(Fitch-Roy et al., 2020; Morrison, 2014; Watkins et al., 2016; Weitz et al., 2017)
Unequal distribution among actors and institutions	Different actors with distinct perceptions, interests, and practices	(Gong et al., 2020; Kanda et al., 2022; Kivimaa & Sivonen, 2021; Morrison, 2014; Weitz et al., 2017; Westskog et al., 2020)
Different institutional frameworks	Unclear responsibilities	(Gong et al., 2020; Öberg et al., 2018; Weitz et al., 2017)
Lock-in	Obstacle to sustainability transitions in socio-technical systems	(Fitch-Roy et al., 2020; Kanda et al., 2022)
Time aspect	Convergence to failure	(Kanda et al., 2022; Morrison, 2014)
Cultural, market, and regulatory barriers	Obstacle to sustainability transitions	(Fitch-Roy et al., 2020; Morrison, 2014; Ravazzi & Belligni, 2016)
Policy flexibility	Problems of scenario uncertainty	(Morrison, 2014; Watkins et al., 2016)

Source: our elaboration

5.3 Blue cluster: *"Key governance tools"*

The Blue cluster includes 20 articles. Figure 3 shows this cluster's strong connections with the red and green clusters. This is also evident because of several shared aspects across all three clusters. For instance, within this cluster, there is an emergence of (i) the importance of developing long-term visions, (ii) the necessity of ensuring coherence among various policies, (iii) the recognition of the significance of adopting a systemic perspective that encompasses interactions among different actors, and (iv) the acknowledgement of diverse thematic areas essential for promoting resource efficiency and facilitating a sustainability transition (Bontoux & Bengtsson, 2016; Borrás & Jordana, 2016; Douglas & Radicic, 2020; Matti et al., 2017; Nykamp, 2020; Wang et al., 2022; Zhou et al., 2022). The significant results from this cluster are mentioned in Table 4, which shows nine tools that can help the governance sphere achieve a sustainability transition (Borrás & Edquist, 2013; Jensen & Mina, 2019; Radicic & Pugh, 2017). It is important to emphasise that this cluster differs from the first one. The factors that contributed to implementing policy mixes not strictly related to local governance, were in the red cluster. In this case, however, we emphasise the tools that area governance must consider to play an enabling role in developing a policy mix.

Table 4. Key governance tools

TOOLS	KEY CONCEPTS	AUTHORS
Mitigation tools	Including the mix of incentives and stimuli linked to the larger goals in the long run, e.g. general climate goal	(Furumo & Lambin, 2021; Könnölä et al., 2021; Schenuit et al., 2021)
Financial and economic tools	Including monetary or non-monetary means based on positive incentives (encouragement, promotion of certain activities) or disincentives (discouragement, containment of certain activities)	(Bahn-Walkowiak & Wilts, 2017; Fridahl et al., 2020; Mulligan et al., 2019; Schenuit et al., 2021; Uyarra et al., 2016)
Policy experimentation	Including redefining political issues, reformulating political objectives, and developing new political strategies and tools	(Jakobsen et al., 2022)
Demand analysis tools	Including grants for research and development activities and pilots, research and development infrastructure, and research and development personnel	(Bahn-Walkowiak & Wilts, 2017; Jakobsen et al., 2022; Uyarra et al., 2016)
Regulatory tools	Including resource caps, anti-money laundering regulations, standards, and product certification	(Bahn-Walkowiak & Wilts, 2017; Uyarra et al., 2016)
Soft tools	Including awareness campaigns, codes of conduct, recommendations, and public and private partnerships	(Bahn-Walkowiak & Wilts, 2017; Furumo & Lambin, 2021; Lambin et al., 2020; Uyarra et al., 2016)
Networking	Including a focus on overcoming market failures and systemic failures or addressing social transitions.	(Bahn-Walkowiak & Wilts, 2017; Könnölä et al., 2021; Uyarra et al., 2016)

Source: our elaboration

5.4 Yellow cluster: *"The key role of stakeholders involvement"*

Figure 3 shows that the yellow cluster is significantly distant from the others, resulting from having few common topics but focusing on an important element to consider when discussing the role of governance in implementing policy mixes: the role of participants. According to Costa & Matias (2020), developing integrated collaboration, value sharing, and co-creation, is crucial when approaching innovation schemes. The ecosystemic approach emphasises the position of local and public actors' role in developing innovative activities. Developing open innovation ecosystems is vital for accelerating recovery, promoting sustainable and responsible practices, and respecting local communities. Considering their different roles, this new vision places humans at the centre of the transition. The need to consider a sustainability transition from an environmental perspective and an economic and social one highlights the importance of developing a natural social contract that promotes an equitable and sustainable society (Huntjens & Kemp, 2022). In this process, the characteristics of collaborative governance, such as deliberation, consensus-seeking, and orientation towards joint production of results and solutions, become key elements for fruitful integrated

collaboration (Davenport et al., 2016). The studies of De Vito et al. (2020) also emphasise the need to avoid policy fragmentation. Specifically, to mitigate the damages caused by various barriers to sustainability transition, policymakers should create the right conditions for equitable and open public participation by including suitable decision-making tools for the specific policy mix implementation (Verde Selva et al., 2019). Another important concept developed in this cluster is the concept of resilience (Miller & Belton; 2014), and the formation of new interdependencies require a systemic and prospective knowledge base, along with inclusive decision-making processes (Feindt et al., 2020).

6. Discussion: the toolbox

This study sheds light on some critical elements that should be included in the governance's analysis to understand its suitability in supporting a sustainability transition based on policy mix.

Results from literature review indicate that the first cluster identifies the enabling factors, while the second cluster identifies the barriers to governance for a policy mix. Conversely, the third cluster highlights the tools necessary to build an effective and coherent policy mix. Finally, the last set of papers emphasizes the crucial importance of stakeholder participation and active involvement. As highlighted by the yellow cluster, the implementation of the policy mix can simultaneously target the same groups, potentially reinforcing or conflicting with each other. The results confirm the necessity of a balanced or comprehensive policy mix that includes different instruments from various policy domains or governance levels.

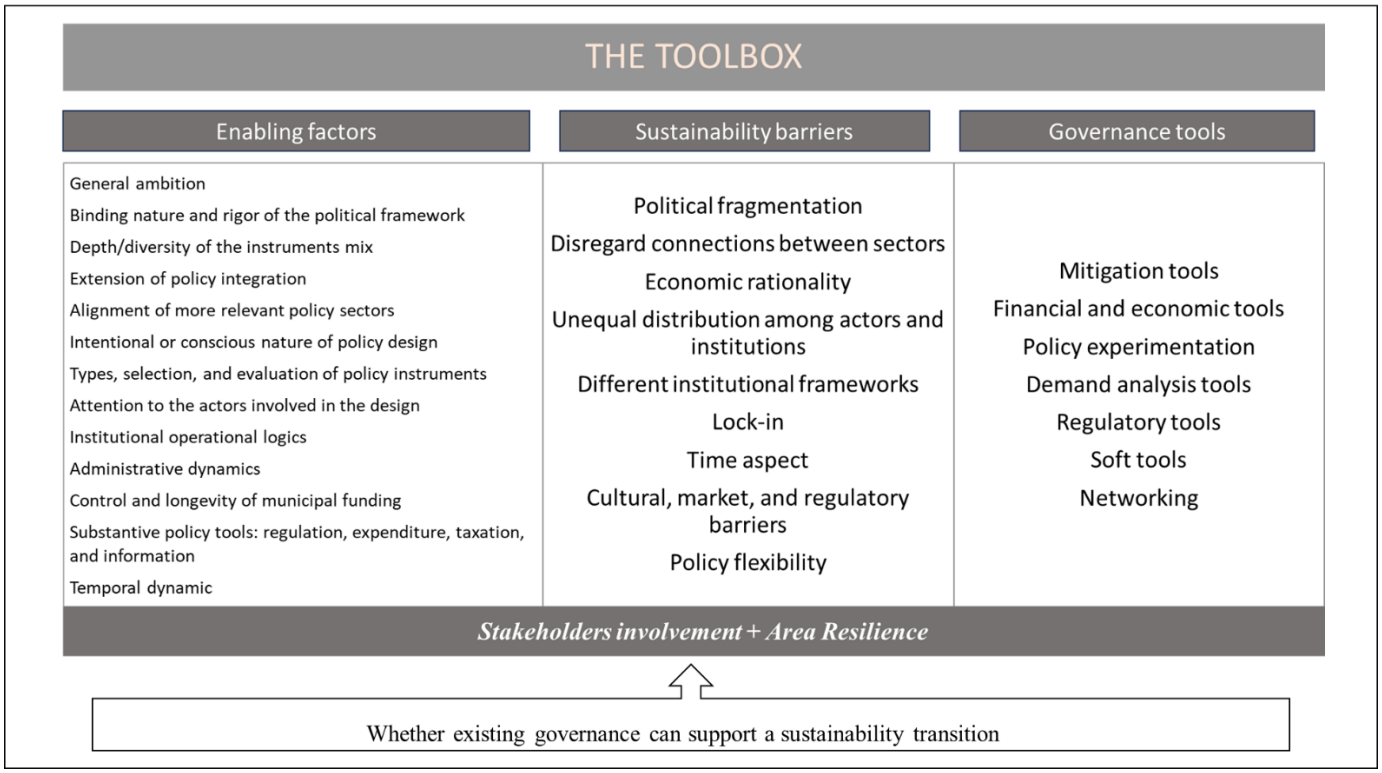
In addition, bibliometric analysis has highlighted some variables that could negatively influence the adoption of the policy mix, grouped in the red cluster. These variables are represented by: i) the binding nature and rigour of the policy framework to address the multiple barriers and drivers of transformation; ii) the intentional or conscious nature of policy design that deliberately improves outcomes; iii) attention to the actors involved in the design and a shared consensus among stakeholders; iv) discretion and bureaucratic autonomy; v) administrative cohesion. Moreover, as mentioned in green cluster, some governance obstacles limiting the implementation of a policy mix are: i) not taking into account the connections between sectors that could worsen resource scarcity and induce conflicts; ii) unclear rights and responsibilities and their different institutional frameworks; iii) path dependence as not all policies are consistent, nor is consistency constantly desired due to different and competing interests among stakeholders; iv) unpredictability and instability of policies that represent the main obstacle.

The literature review has yielded insights into the tools that regional governance should consider to facilitate the development of a policy mix. Indeed, the blue cluster highlights various categories,

including mitigation measures, demand analysis tools, and financial and economic instruments, which are integral in building effective governance.

In this study's context, a comprehensive toolbox was developed, as depicted in Figure 4. This toolbox comprises the primary guidelines for evaluating governance quality to support the sustainability transition.

Figure 4. The final toolbox



Source: our elaboration

7. Concluding remarks

Currently, more is needed to understand why policy mix implementation was successful in some areas while other territories faced numerous obstacles. To better understand the reasons and fill this gap, thus reducing the risk of future failures, the study's main objective was to outline an analytical toolbox focused on governance factors influencing the implementation of policy mixes. The toolbox is assembled initially to support and suggest a critical governance document analysis. Indeed, considering the lack of general guidelines in previous scholarly studies, this paper, using a bibliometric analysis of the literature, takes a first step by extrapolating the main governance factors that should characterise the main policy documents.

So, starting from this helpful and practical toolbox, it is possible to define the future guidelines for analysing the documents and strategies of the LAG. At this point, attention focuses on two critical issues to examine: i) whether the governance structure and operational design of a LAG are suitable

for achieving increasingly challenging objectives, such as defining a policy mix; ii) whether the three mentioned levels of programming (such as the Rural Development Program, Regional Complement for Rural Development, and Local Development Strategy) align with the outputs found in the literature.

Some questions to analyse the governance documents can be outlined. Specifically:

1. Does the governance documentation of a LAG reflect a design thinking approach and embrace the necessary interdisciplinarity? In particular, is there any reference to long-term perspectives in resource allocation and an indication of discretionary autonomy in assessing and organising a policy mix within the relevant area? Moreover, considering the participatory vision upon which LAGs are built, do the documents refer to an interdisciplinary view of the issue, such as aligning more relevant policy sectors or shared general ambition?
2. Given the need to develop a coherent policy mix, do the policy documents include information on aligning all active policies in the territory? Specifically, is there any information on the level of LAG involvement in regional networks? Is there any tool or strategy for flexibility and modification in the design of policy instruments used in the LAG? Is there any helpful information regarding the adaptability of financial, administrative and democratic support?
3. Considering the tools that should be included in an effective policy mix, is information regarding these different tools included in rural area's governance documents? Or do some of them need to be included in the design of the various strategies?
4. Ultimately, considering the necessary involvement of stakeholders, do the LAG governance documents (e.g. the Rural Development Program, Regional Complement for Rural Development, and Local Development Strategy) bring out the role that heterogeneous stakeholders play in the various steps of the rural development strategy outline?

This study, intended as a reference and a resource to be consulted, has several implications. Firstly, they hold suggestions for local businesses and participants in different LAGs. Analysing governance and the essential factors for implementing a policy mix involves efficiently utilising financial and other territorial resources. Additionally, this analysis underscores the pivotal role of various actors in the area in defining efficient long-term strategies. In fact, by incorporating the factors from this analysis into territorial governance, regional actors can expedite and optimise the necessary sustainability transition.

Moreover, the results have significant suggestions for policymakers at various levels. Specifically, being aware of crucial aspects to consider and the barriers to avoid when adapting governance to current challenges can mitigate typical policies' undesirable effects, such as wasteful expenditure, inefficient resource utilisation, and failure to achieve long-term objectives.

Finally, this study has various implications for Scholars as well as for young researchers: i) this toolbox could represent a new approach to assess the LAG operation aboard the currently used methods, which might only partially capture some of the adaptation efforts made by the GAL; ii) this study has the potential to contribute to the identification of universally applicable elements that can be extended to diverse geographical contexts in future research.

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Chapter 3

Tokenism in territorial development: enabling factors and mitigation measures

Naomi di Santo [*1], Antonio Lopolito[1], Roberta Sisto[1]

1 *Department of Economics, Management and Territory, University of Foggia.*
* Corresponding author. Email: naomi.disanto@unifg.it

Tokenism in territorial development: enabling factors and mitigation measures

1. Introduction

Sustainability is a challenge for environmental, economic and social policies at the European level. The European Commission has outlined several programs aimed at promoting sustainability in member states and their regions. Coherently, the whole sustainability of rural areas is one of the objectives of the Common Agricultural Policy (CAP) (European Commission, 2021). Furthermore, the United Nations' 2030 Agenda for Sustainable Development recognises the importance of sustainability not only in the economic or environmental sphere but also in the social sphere (ONU, 2019). Indeed, it is crucial to analyse this topic to achieve Sustainable Development Goals (SDGs), and emphasizing the importance of social sustainability (Khan, 2016; Walker et al., 2021).

By structuring the initial phase of this study around an analysis of current policy documents, we can underscore the profound connection and significance that policy documents hold for territorial development. The European Union's active advocacy and implementation of strategic initiatives aim to bolster and coordinate socio-economic progress within territories. For instance, the adoption of regional policies by the European Union strives to foster balanced and sustainable growth across regions. At the same time, the guidelines offered through the European Structural and Investment Funds outline interventions for territorial development. European documents provide invaluable guidance and directives for spatial planning and management, facilitating an integrated and harmonized approach to territory development. Instruments like the European Territorial Cohesion Policy exemplify this approach. Other documents prove instrumental in stimulating innovation, supporting small and medium-sized enterprises, enhancing infrastructure, and promoting economic growth in European regions. These documents provide strategic guidelines and financing instruments that directly shape the development agenda of areas.

However, unlike economic and environmental sustainability, the issue of social sustainability in rural development has received limited attention so far. Policy and research papers (Littig & Grieβler, 2005; McManus et al., 2012; Sisto et al., 2022) demonstrate a strong link between social sustainability and critical aspects such as inclusion, social equity and, community participation.

Territories have increasingly become complex systems in which various challenges arise, for example, rural exodus, ageing, marginalisation, social exclusion and other associated problems (Aldea-Partanen, 2011; Bock, 2016; Dax & Fischer, 2018). Concerning the social sphere, literature stressed the role of participatory processes involving stakeholders as a fundamental strategy to address the complexity of rural areas and promote their development (Brown et al., 2017; Halonen & Kattilakoski, 2018; Nunkoo & Ramkissoon, 2012; Sisto et al., 2022; Sisto et al., 2016; Vijayanand,

2013). More specifically, the complete involvement of local actors in the decision-making process, supported by partnerships with local enterprises, public authorities and community representatives, is advocated in Agenda 2030. This approach, known as the place-based approach to policymaking, stimulates economic development which highlights as the place-based approach to policymaking stimulates economic development (Campbell & Marshall, 2000; Weck et al., 2021).

However, it is important to acknowledge that stakeholder interaction complicates the decision-making process because each stakeholder has multiple interests and objectives to pursue (Ahenkan et al., 2013; Hart & Bas-Defossez, 2018).

This situation, more frequently in areas with a weak tradition of participation, can generate negative phenomena such as tokenism, that can lead to unsuccessful processes. Although this phenomenon has been analysed in different research fields, a single definition is difficult to identify. Oxford Dictionaries (2017) defines tokenism as: 'The practice of making only a perfunctory or symbolic effort to do a particular thing, especially by recruiting a small number of people from underrepresented groups to give the appearance of sexual or ethnic equality'. However, this definition is only a starting point, and this review will summarize several conceptual ideas surrounding tokenism. Notwithstanding tokenism is analysed by several authors in studies such as health care, women's employment and youth development programs (Adley Hiebert et al., 2018; Ban & Rao, 2008; Elstad & Ladegard, 2012; Linkov, 2014; Morrison & Dearden, 2013; Ocloo & Matthews, 2016), to the best of our knowledge, only a few documents have focused on the relationship between tokenism and rural areas. For example, Furmankiewicz's study (2017) investigates tokenism in the Local Action Groups (LAGs), which are critical territorial unit for rural development planning.

Therefore, to overcome this gap, this paper has two main objectives: (i) to analyse the different forms of tokenism affecting the territorial development practices and (ii) to identify factors factors that can prevent this phenomenon. To achieve these objectives, a scoping literature review was performed, focusing on recent scientific papers dealing with tokenism, social capital, rural areas, and decision processes. This review sheds light on the various covert practices in which tokenism manifests and explores potential limiting factors associated with it. Considering this study as one of the first attempts to shed light on the relationship between tokenism and territorial development practices worldwide, the literature analysis is not limited by geography or time. Its aim is to identify (i) the various definitions of tokenism found in the literature and (ii) the different forms it takes concerning territorial development. After providing a comprehensive understanding of the phenomenon, the research then focuses on the factors that can prevent or limit tokenism.

The structure of this paper is organised as follows. Section 2 presents the theoretical background of the main concepts, Section 3 describes the methodology adopted. Moving forward, Section 4 reveals

the initial results from the scoping review, shedding light on the current state of research in the field. Section 5 describes the various way in which tokenism can manifest itself. Section 6 reveals a comprehensive discussion of the findings. Finally, Section 7 summarizes the key results and offers insights for future research, concluding the paper.

2. State of the art

Considering sustainability as an environmental and resource use issue leaves out essential aspects of a territory's development (Ly & Cope, 2023). Many scholars in the literature have emphasized the positive effects of a participatory process (Berner et al., 2011; Bos & Brown, 2015). Many scholars in the literature have emphasized the positive effects of a participatory process (Berner et al., 2011; Bos & Brown, 2015), as it increases community support, which in turn has a significant influence on the outcomes of spatial projects. Efficient resource management is also influenced by the development of transparent participation of local stakeholders (Nkansa & Chapman, 2006).

The pursuit of a healthy society is one of the first indications pointed out in the SDGs. According to Ly & Cope (2023), these considerations of a healthy society moved through the concepts of the Social Capital Theory. There are various definitions of Social Capital. We recognize the relevance of that expressed by Putnam (Putnam et al., 1993), who defines Social Capital as a set of characteristics that can improve the efficiency of society through better coordination of individual actions and collective action, through trust, solidarity, tolerance, customs.

This definition emphasizes the importance of effective and efficient collective actions, focusing on the characteristics of social organization that promote the development of norms based on reciprocity and enhance overall societal efficiency (Putnam et al., 1993; Sobels et al., 2001; Zarra Nezhad, 2007). Moreover, in several papers, Social Capital has been studied as an element that affects the quality and the success of territorial development projects. Positive impacts can also be traced to the effect of economic growth (Woodhouse, 2006):

1. There is an improvement in market exchanges as there is a reduction in transaction costs and an increased focus on avoiding or limiting opportunistic or churning behaviour induced by the stakeholders.
2. There is an increase in the quality and quantity of public goods that otherwise would not have been produced in less quantity in the territory.

Institutional frameworks play a fundamental role in improving the availability of public goods and ensuring transparency and democratization, thereby fostering inclusivity within the territory. Another key element of Social Capital is the civic participation, often used as a proxy for measuring the phenomenon. Many authors identify this predisposition to shared norms and one’s drive for the

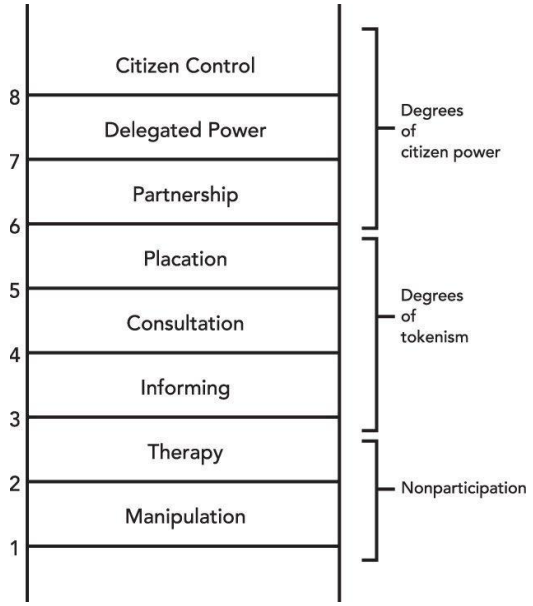
community's well-being as an essential element in the analysis of Social Capital. Furthermore, many stakeholders find a solid motivation to support a participatory approach in this subject. (Arrighetti et al., 2003; Parker & Murray, 2012).

While Social Capital can positively affect projects' success and improve an area's social sustainability, phenomena such as tokenism can limit the positive effects mentioned above. Therefore, scholars are interested in analyzing how this phenomenon manifests itself and what factors may limit its spread.

In the literature, the need to adopt a theoretical framework for a scoping review is widely recognized. This need is based on several aspects: i) the initial theoretical framework can provide a conceptual structure for the entire process of the scoping review; ii) a scientific starting point can help identify key concepts and relevant variables, guiding the selection of inclusion and exclusion criteria for studies to be included in the review; iii) using a theoretical framework can enhance the transparency and reproducibility of the scoping review by defining a specific scope; iv) the adoption of a theoretical framework can facilitate the association between variables found in the selected papers; v) finally, the addition of a theoretical framework can aid in the process of synthesizing the results (Godfrey et al., 2010).

So, to analyse the phenomenon of tokenism, this paper uses the seminal work of Sherry Arnstein's article "A Ladder of Citizen Participation", published in the Journal of the American Institute of Planners in 1969. Specifically, citizen participation was classified by Arnestein based on different power levels into eight levels (Figure 1). Moreover, from the literature review's preliminary results, several authors applied this method to address this topic (Kamols et al., 2021; Nugroho et al., 2021; Pipan & Zorn, 2013).

Figure 1 - Arnstein's ladder of citizen participation (1969)



Source: Arnstein, 1969: 217

In particular, tokenism can assume three different forms: informing, consultation and placation:

● Informing: In this case, there is a one-way information flow between policymakers and stakeholders. Participation is only apparent because information or previously made decisions are disseminated (Brownill & Inch, 2019; Nugroho et al., 2021; Pipan & Zorn, 2013).

● Consultation: The information flow is two-way, but the participatory decision-making process is not developed (Christensen & Grant, 2016; Jocom et al., 2021). Participation is minimal, and this approach is only used to increase trust in public decision-makers and develop only apparent stakeholder engagement.

● Placation: A two-way information flow takes place; some weak attempts to include participants' concerns and expectations are made, but the strategy outline does never consider stakeholders' expectations and needs (Brownill & Inch, 2019; Nugroho et al., 2021; Pipan & Zorn, 2013).

Therefore, tokenism is considered the practice of taking inclusive action, only in appearance, towards "disadvantaged" groups (Chinyele & Lwoga, 2019; Kumi-kyereme, 2008; Snape et al., 2014). Often, the purposes of this practice are deflecting and eliminating accusations of discrimination, improving the legitimacy of the decision process and of rural development partnerships and local governance, with the overall result of increasing consensus from public authorities (Castell, 2016; Kersten et al., 2015; Parker & Murray, 2012). The literature has shown that stopping at limited levels of participation, such as informing, consultation and placation, is not enough to improve complex systems such as territories. However, it is necessary to develop other tools to address the potential weaknesses of participatory approaches and an overall policy failure.

3. Methodology

A scoping literature review was adopted to analyse the various forms that tokenism can assume, especially in the context of rural development practices, and to identify factors that can prevent this phenomenon. A thorough review of the current state of the art could help identify potential future research avenues to fill existing literature gaps. Also, considering the research question involves topics that have yet to be fully explored, this methodology seems appropriate.

Moreover, scoping literature review follows a detailed process consisting of orderly, replicable, and transparent procedures (Littell et al., 2008). This approach is advantageous in overcoming the limitations of traditional literature reviews and in establishing an objective methodology (Carlucci et al., 2015).

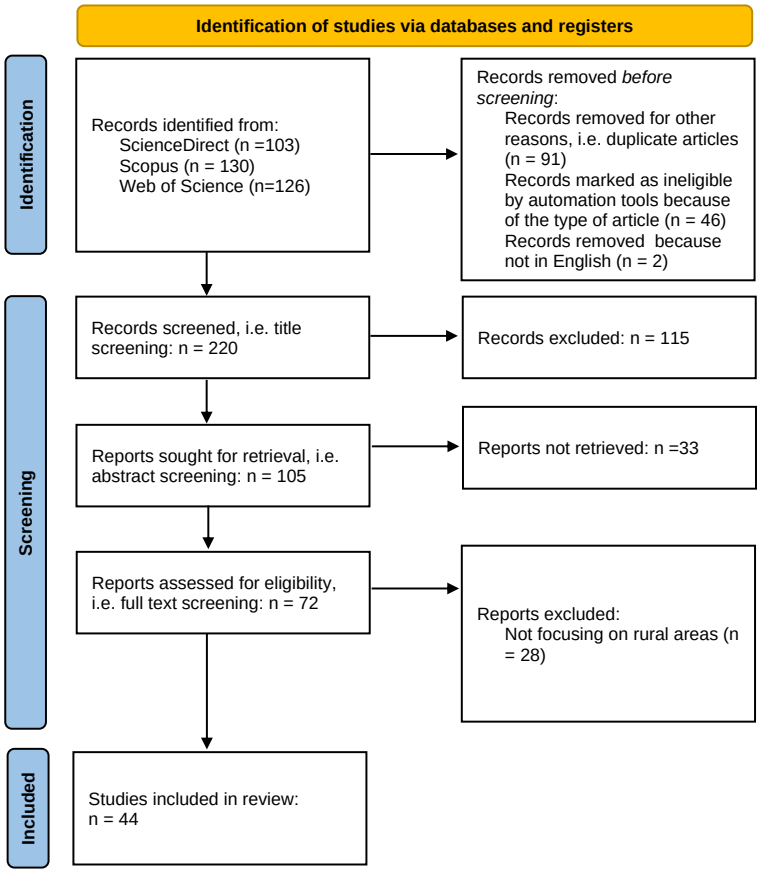
The analysis was conducted on online scientific search engines such as Web of Science and Scopus. To further enrich the review, according to the current practice (Ansu-Mensah et al., 2021;

Chakraborty & Chakraborty, 2022; Mohd Hamzi et al., 2020), we also performed a search on ScienceDirect which is considered a good tool to expand the potentiality to retrieve original article not included in other research engines (de la Cruz del Río-Rama et al., 2020; Lee & Gambiza, 2022; Oliveira et al., 2018).

The first step was matching the keywords with Boolean operators. Specifically, the query used is: "TITLE-ABS-KEY ("tokenism*") AND TITLE-ABS-KEY ("social capital" OR "citizen*" OR "local development" OR "rural area*" OR "decision making" OR "rural development" OR "territorial development" OR "participatory approach*")".

This implemented query searched for the information in the title, keywords and abstract. The papers' selection process is briefly summarized in Figure 2, following the flow chart suggested by the PRISMA extension guidelines.

Figure 2 - Flow chart of the articles' selection process



Source: Page et al., (2021)

Applying the query in the search engines, 359 papers were selected (Web of Science: n. 126, Scopus: n. 130, ScienceDirect: n. 103). Considering the limited literature on the topic, no limits were imposed

on the year of publication. Subsequently, duplicate articles were removed (n. 91). In addition, 46 other papers were excluded because they were not articles published in peer-reviewed journals related to the topic. Moreover, only articles written in English were included, so two more papers were eliminated. At this point, 148 papers were excluded based on the information obtained while reading the title and the abstract. After that, a full-text reading step was performed, and 28 papers were eliminated. For example, many papers were not considered because they used the term "token" concerning the blockchain, which is different from the concept of tokenism considered in this paper (Bamakan et al., 2021; Santana & Albareda, 2022). Thus, the final sample for this scoping review included 44 articles.

4. Results

In this section, the results of the scoping review are presented, starting with an overview of the key global features of the literature in this field, including the time of publication, the geographical coverage, and the definitional contributions of the papers. Then, the research questions are addressed by describing the forms of tokenism prevalent in the territorial development practices as emerged by the literature review, along with the identified mitigation factors.

The survey of selected papers begins with a comprehensive overview of the results. The first step includes a study of the publication years and an overview of the geographic locations of the case studies. Next, each paper is analysed to explore the different levels of tokenism and the variables that may limit its impact.

The interest in the field started in 2006 and has remained constant during the years, except for the period between 2018-2021, in which there was an increase in the number of publications in this field. Since this study was carried out at the end of 2022, there should have been an increase in the published works, partially explaining the drop in the publication trend. Therefore, Table 1 reports the 44 results indicating the year of publication, the location of the case study and the tokenism definition used in the paper.

As Table 1 shows, there are several definitions of tokenism which focus on different features of the phenomenon, with eight papers including some aspect of the Arnstein's definition previously introduced. In addition, the studies cover different Countries and different geographical dimensions, including counties, villages, municipalities, and rural areas.

Table 1: Selected papers

No.	Authors	Title	Year	Location	Tokenism definition
1	(Kamete, 2006)	Participatory force: Youth and the making of urban places in Zimbabwe	2006	Zimbabwe	No definition
2	(Kumi-Kyereme, 2008)	Community participation in the Ghana Poverty Reduction Strategy in the Twifu-Heman-Lower Denkyira District	2008	Ghana	Tokenism allows citizens to participate but have no power to influence decisions.
3	(Mayo & Rooke, 2008)	Active learning for active citizenship: Participatory approaches to evaluating a programme to promote citizen participation in England	2008	England	Tokenism shows itself when the most powerful ones maintain power and marginalise other participants.
4	(Manteaw, 2008)	Tokenism or agency? The impact of women's reservations on village democracies in South India	2008	India	Tokenism is described as a symbolic strategy
5	(Ban & Rao, 2008)	Tokenism or agency? The impact of women's reservations on village democracies in South India	2008	India	Tokenism is described as a phenomenon in contrast to genuine participation.
6	(Bess et al., 2009)	Participatory Organizational Change in Community-Based Health and Human Services: From Tokenism to Political Engagement	2009	Global	Tokenism is described as a symbolic strategy.
7	(Seyed Hamid et al., 2011)	Relationship Between citizen's Perception and Level of Participation in Local Government	2011	Iran	Tokenism shows itself when stakeholders lack power to influence decisions. Tokenism is described as an illusion to be influential.
8	(Pollock & Sharp, 2012)	Real Participation or the Tyranny of Participatory Practice? Public Art and Community Involvement in the Regeneration of the Raploch, Scotland	2012	Scotland	Based on Arnstein's definition (1969).
9	(Monno & Khakee, 2012)	Tokenism or Political Activism? Some Reflections on Participatory Planning	2012	Sweden, Italy	Tokenism shows itself as a reluctance on the part of planners to provide citizens with real influence.
10	(Pipan & Zorn, 2013)	Public participation in recovery after earthquakes in Friuli (NE Italy) and the Upper Soča Valley (NW Slovenia) in 1976, 1998, and 2004	2013	Italy, Slovenia	Based on Arnstein's definition (1969).
11	(Hoskins, 2013)	Meet the habermasses: Charting the emergence of a social media-enabled public sphere in new democracies	2013	Brazil	No definition
12	(Furmankiewicz, 2013)	Co-governance or hidden domination of the public sector? the concept of governance in the practice of 'Leader' Local Action Groups	2013	Poland	Tokenism relates to the practice of symbolically including actors traditionally excluded from decision-making.

13	(Snape et al., 2014)	Exploring perceived barriers, drivers, impacts and the need for evaluation of public involvement in health and social care research: A modified Delphi study	2014	United Kingdom	Tokenism is described as a symbolic strategy.
14	(Kenny et al., 2015)	Community participation for rural health: a review of challenges	2015	Global	Tokenism is a phenomenon in contrast to meaningful participation.
15	(Christensen & Grant, 2016)	Participatory Budgeting in Australian Local Government: An Initial Assessment and Critical Issues	2016	Australia	Tokenism is described as a symbolic effort to implement participatory approaches.
16	(Kariuki, 2016)	Community experiences of engaging political representatives using mobile phone technology and web app in KwaZulu-Natal, South Africa	2016	Africa	Tokenism is described as a phenomenon in contrast to genuine participation.
17	(Rusnaini, 2016)	Citizen Participation in Medium-Term Local Development Plan in Indonesia	2016	Indonesia	Tokenism shows itself when the powerholders retain the right to decide
18	(Cortés-Selva & Pérez-Escolar, 2016)	Civic participation and interactive documentaries: a contribution to the open government model	2016	Global	Tokenism is considered as a distraction strategy. Although citizens express ideas and opinions, there is no feedback between citizenship and political power.
19	(Campbell et al., 2021)	Collaborative Counties: Questioning the Role of Civil Society	2017	United States	Based on Arnstein's definition (1969).
20	(Chado et al., 2017)	Citizen participation in urban governance: experiences from traditional city of Bida, Nigeria	2017	Nigeria	No definition
21	(Kotus & Sowada, 2017)	Behavioural model of collaborative urban management: extending the concept of Arnstein's ladder	2017	Poland	Described tokenism as a tool to legitimise previously chosen decisions.
22	(Furmankiewicz , 2017)	Government within governance? Polish rural development partnerships through the lens of functional representation	2017	Poland	Tokenism relates to the illusory actions of collaboration towards representatives of other interests.
23	(Lundy, 2018)	In defence of tokenism? Implementing children's right to participate in collective decision-making	2018	Global	Tokenism is considered like a manipulation strategy.
24	(Adley Hiebert et al., 2018)	Tokenism and mending fences: How rural male farmers and their health needs are discussed in health policy and planning documents	2018	California	Tokenism is considered as a symbolic strategy.
25	(Chinyele & Lwoga, 2019)	Participation in decision making regarding the conservation of heritage resources and conservation attitudes in Kilwa Kisiwani, Tanzania	2019	Tanzania	Tokenism is described as a symbolic effort allowing residents to take part but with limited power to decide.
26	(Brownill & Inch, 2019)	Framing people and planning: 50 years of debate	2019	Global	Tokenism is described as a tool to incorporate, co-opt and manipulate citizen action.

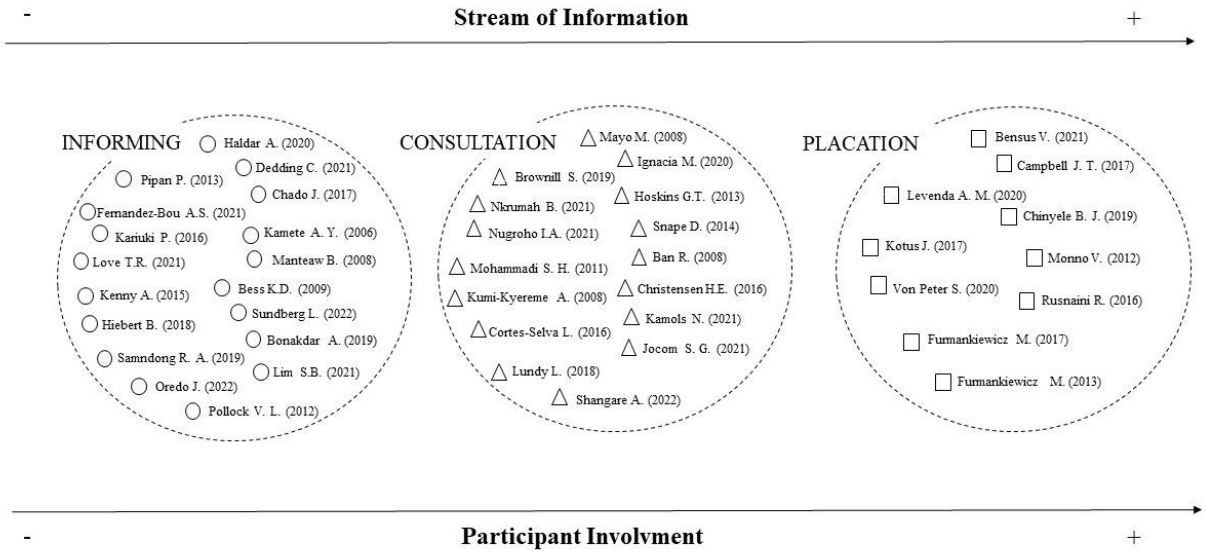
27	(Bonakdar & Audirac, 2019)	City Branding and the Link to Urban Planning: Theories, Practices, and Challenges	2019	Global	Based on Arnstein's definition (1969)
28	(Samndong, 2019)	The participation illusion: questioning community participation in a REDD plus pilot project in the Democratic Republic of Congo	2019	Democratic Republic of Congo	No definition
29	(Haldar et al., 2020)	Tokenism or realism? Gender inclusion in corporate boards	2020	India	Described tokenism as opposed to realism.
30	(Levenda et al., 2020)	Rethinking public participation in the smart city	2020	Canada	Based on Arnstein's definition (1969).
31	(Ignacia & Valenzuela, 2020)	Santiago, providencia y las condes. Tokenism participation?	2020	Chile	No definition
32	(Von Peter et al., 2020)	Participatory research in Germany - quo vadis?	2020	Germany	No definition
33	(Nugroho et al., 2021)	Stakeholders' mapping and strategy for restoring peatland forest in Indonesia	2021	Indonesia	Based on Arnstein's definition (1969).
34	(Bensus, 2021)	Improving local governance with citizen engagement?: Quotidian participatory mechanisms in two middle-class districts in Lima, Peru	2021	Peru	No definition
35	(Dedding et al., 2021)	Exploring the boundaries of ‘good’ Participatory Action Research in times of increasing popularity: dealing with constraints in local policy for digital inclusion	2021	Netherlands	Tokenism is described as symbolism and it is considered in contrast with ‘good’ Participatory Action Research.
36	(Jocom et al., 2021)	Community participation in local economic development in the village of Makalu, Posumaen sub-district	2021	Indonesia	Tokenism is described as a justification to make the community feel recognized.
37	(Nkrumah, 2021)	Beyond Tokenism: The "Born Frees" and Climate Change in South Africa	2021	Africa	Tokenism is conceived as a decorative involvement.
38	(Kamols et al., 2021)	Beyond engagement theatre: challenging institutional constraints of participatory planning practice	2021	Australia	Based on Arnstein's definition (1969).
39	(Love & Hall, 2021)	Decolonising the Marketing Academy: An Indigenous Māori Perspective on Engagement, Methodologies and Practices	2021	Global	Tokenism is conceived as a "ticking box" to " fill" a position.
40	(Lim et al., 2021)	The Right or Wrong to the City? Understanding Citizen Participation in the Pre- and Post-COVID-19 Eras in Malaysia	2021	Malaysia	Tokenism is considered as a symbolic strategy.

41	(Fernandez-Bou et al., 2021)	3 Challenges, 3 Errors, and 3 Solutions to Integrate Frontline Communities in Climate Change Policy and Research: Lessons From California	2021	California	Tokenism is described as a tool to incorporate vulnerable stakeholders to manipulate citizen action.
42	(Sundberg & Gidlund, 2022)	Dimensions of e-Participation: Levels of Participation and Citizen Configurations	2022	Sweden	Based on Arnstein's definition (1969).
43	(Oredo, 2022)	Evaluating the Impact of e-Government Initiatives on Citizens: Empowerment or Tokenism?	2022	Kenya	Based on Arnstein's definition (1969).
44	(Shangare & Wielenga, 2022)	Repositioning African women in politics: From critical mass to critical acts	2022	Africa	Tokenism is conceived as a "ticking box" to enable women's representation desired by policy documents.

Source: our elaboration

Figure 3 provides a visual inspection of the forms of tokenism as defined by Arnstein (1969). Indeed, the idea is that the three tokenism forms can be classified according to two variables: the "stream of information" and the "participant involvement": when these are at their minimum level, tokenism assumes the form of *information*. In contrast, *placation* is characterised by a two-way flow of information and a true citizen participation. Between the previously cited ranks, there is the *consultation* form, which has a medium level of the two variables. As shown in Figure 3, 18 documents identified tokenism as *information*, 16 as *consultation*, and 10 as *placation*. This classification is based alternatively on: i) the identification, explicitly made in the paper, of the form that tokenism assumed; ii) on our own reading and analysis.

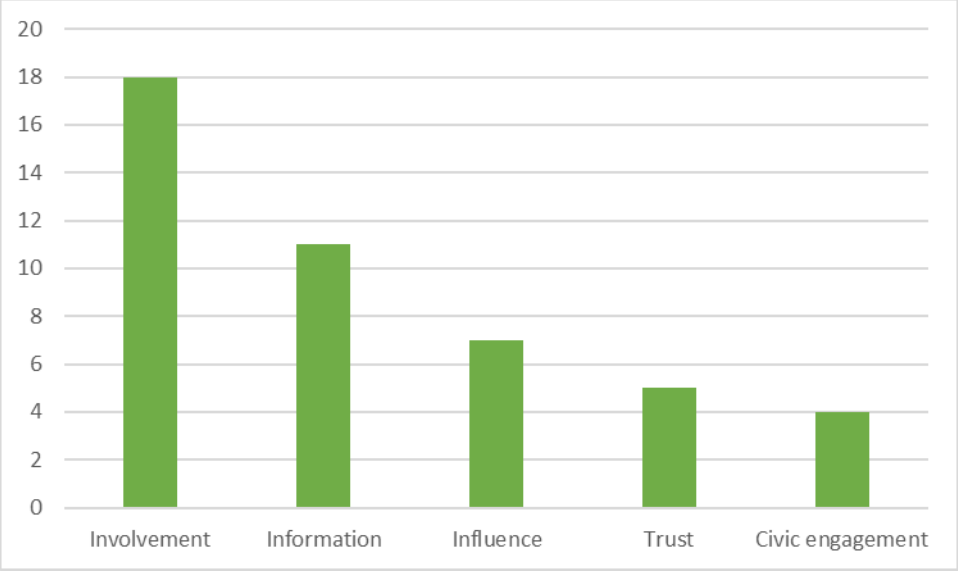
Figure 3 – Papers' sorting based on variables by Arnstein's classification



Source: our elaboration. Notes: i) selected papers are mentioned in this figure with the name of the first author; ii) The arrows' direction indicates an increasing level of the variables ("stream of information" and "participant involvement").

Furthermore, after reading the selected papers in-depth, it was possible to recognize some factors that can limit tokenism, namely involvement, information, influence, trust, and civic engagement. Figure 4 shows that involvement and information are the variables most frequently used to mitigate the effect of tokenism, followed by influence and trust, which are also frequently utilised. In the next paragraph, these variables will be discussed in relation to the literature, elucidating their effects on local development.

Figure 4 - Variables that can limit tokenism



Source: our elaboration based on the number of papers which analyse the variables

5. Discussion: How tokenism manifests itself?

Table 1 shows that many papers used Arnstein's theory to explain tokenism (Campbell et al., 2017; Levenda et al., 2020; Pipan & Zorn, 2013; Sundberg & Gidlund, 2022). Other studies have attempted to provide their own definitions. For example, it was described as a phenomenon that stands in opposition to realism (Haldar et al., 2020) or as a symbolic and illusory practice of collaboration and participation (Chinyele & Lwoga, 2019; Furmankiewicz, 2017; Lim et al., 2021).

In some studies, the phenomenon is seen as i) a practice employed to legitimize decisions made by policymakers (Jocom et al., 2021; Kotus & Sowada, 2017) ii) a distraction to avoid obstacles to political power (Cortés-Selva & Pérez-Escolar, 2016) iii) an illusory process of making stakeholders apparently influential in the decision process (Chinyele & Lwoga, 2019; Christensen & Grant, 2016; Fernandez-Bou et al., 2021; Kumi-kyereme, 2008; Mohammadi & Ahmad, 2011; Rusnaini, 2016).

Tokenism can also manifest itself in the composition of a LAG. Specifically, the number of the representation of different sectors must not exceed a maximum threshold of 50% of the total members of the LAG's decision-making committees (European Commission, 2006). This highlights the importance of the diversity of the LAGs partnership composition, including representatives of the public administration, the business world, the community, and the local population, to guarantee effective participation. Furmankiewicz (2017) analysed this aspect, and he found that in 89% of LAG decision-making committees, the representation of statutory interests was higher than the officially declared percentage since many committee members, officially recorded as representing the non-statutory sector, were employees of the municipal or district government. This analysis shows that phenomena can develop that limit the representativeness of the various sectors.

Another critical case of tokenism analysis is found in Pipan's studies (2013). His analyses included the case of the Municipality of Venzone (Italy), which was affected by earthquakes in 1976. Its residents opposed the manipulation attempts by the municipal authorities, who planned to raze buildings not damaged by the earthquake to build a new sports centre as part of post-earthquake recovery. Residents established a special committee which criticised even the most minor step of the municipal and regional authorities (Bellina et al., 2006). Indeed, the citizen supported the Regional Cultural Heritage Superintendency during critical moments of post-earthquake recovery. In this case, the level of tokenism has been surpassed, and this municipality is classified under "Citizen Control" on Arnstein's ladder.

Considering tokenism as a limited effort to develop participatory approaches, the variables potentially limiting its effects have been analysed in Figure 4.

6. Discussion

The literature review revealed several factors capable of mitigating tokenism, analysed one by one below.

Involvement. The analysis of the literature (Ahenkan et al., 2013; Kersten et al., 2015; Morrison & Dearden, 2013) has revealed several challenges that hinder involvement, such as the limited number of stakeholders present at meetings, the use of specific terminology or different norms that make it difficult to integrate different actors, and the limited availability of resources, which obstructs the development of a linear decision-making process. On the other hand, some studies shown how non-active participation, i.e. the presence at meetings or activities, was used as a tool to legitimize decisions that organizations would have made anyway or to increase public consensus (Love & Hall, 2021; Morrison & Dearden, 2013).

Indeed, Tokenism develops in situations where active public participation is restricted, and the few stakeholders involved in territorial strategy decision-making cannot bring about significant changes to strategies that have already been developed by policymakers.

So, participant involvement is a complex process that allows individuals to formulate goals and actions that emphasize their desire to participate in decision-making (Campbell et al., 2017; Cortés-Selva & Pérez-Escolar, 2016; Levenda et al., 2020; Maier, 2010; Sundberg & Gidlund, 2022).

This issue entails a dynamic and intricate process that necessitates the development of various tools and actions to ensure its success (Tritter & McCallum, 2006).

Thus, a good level of active involvement of the various actors makes it possible to generate a sense of commitment and participation that can limit the proliferation of the phenomenon of tokenism (Maier, 2010).

Tokenism is present in processes where involvement is limited, and a small group makes decisions of stakeholders (Luisi & Hämel, 2021; Ocloo & Matthews, 2016).

Trust. This is one of the most recurring factors analysed by various authors (Christensen & Grant, 2016; Dedding et al., 2021; Nugroho et al., 2021). In many cases, it is described as the willingness to limit one's individuality for the sake of achieving better community outcomes (Campos-Matos et al., 2016; Farrell & Knight, 2003). Complete trust on a territorial level is difficult to consolidate. Indeed, some citizens consider it impossible to trust the system because it needs to be more transparent. This is not helped by the negative news that current policymakers are reporting (Bess et al., 2009).

In this context, trust can be taken as vertical, considering the relationship with various institutions at different levels. However, it can also be taken as horizontal trust between the parties. In rural territories, in particular, cooperation among parties and increased trust among neighbours can lead to greater participation in various initiatives and the adoption of more sustainable practices facilitated by the disclosure of information (Carpenter et al., 2004).

Therefore, in the territories where the level of trust is shallow, participation in decision-making processes is limited, and this is precisely a critical aspect that can facilitate tokenism.

Influence. Tokenism is present when minority groups are suffering from the influence of stronger ones. In many cases, participatory processes should guarantee the participation of all sections present in the community and not only of the more influencing groups (Monno & Khakee, 2012). The literature analysis has shown that even if the presence of all local groups is respected, they are subject to the influence and directives issued by the most vital groups (Brownell & Inch, 2019; Nugroho et al., 2021; Ruming, 2019).

Every part of the stakeholder's involvement in the area can ensure the development of effective strategies with lower risks of failure as opposed to the tokenism that develops in processes in which minority groups tend not to have effective influence (Nunkoo & Ramkissoon, 2012; Vijayanand, 2013).

Civic engagement. Many individuals are motivated to support a participatory approach to this issue. From this perspective, it emerges how the concepts of civic engagement and tokenism are contrasting: where civic engagement is well-established, tokenism will be less available (Cortés-Selva & Pérez-Escolar, 2016; Levenda et al., 2020; Oredo, 2022; Pipan & Zorn, 2013). Indeed, in practice, a process based on civic engagement presupposes a dialogue between all interested parties, which promotes and listens to all points of view without preferring any (Bull et al., 2010). Strategies based on civic engagement are developed on the strengthened expectations of citizens who want to assume their responsibilities and have their say without hiding behind choices made by others. In recent years, civic engagement has appeared as a symbol of democracy and a stimulus to develop a society resilient to difficulties (Petts, 2008). Thus, according to Levenda et al. (2020), social sustainability and participatory approaches are empty without civic engagement.

Information. Arnstein's theory (1969) revealed that information flow is crucial in developing practical participatory approaches. A proper flow of information can be fundamental to the success of local development strategies (Brownill & Inch, 2019; Jocom et al., 2021). The participation of different stakeholders is necessary because of the information they can share, helping the development of the area. It is not easy to give the correct information clearly to stakeholders, nor to receive so much different information from different actors (Lewis, 2013; Weinstein, 2010).
Indeed, however, exchanging information allows the success of rural development projects. On the other hand, the flow of information is unidirectional or limited to the simple disclosure of previously developed choices: tokenism can develop further (Brownill & Inch, 2019; Kenny et al., 2015; Nugroho et al., 2021).

7. Conclusions

The need to guarantee and contribute to the achievement of the social sustainability objective has emerged from EU policy documents and is highlighted by the crucial link between the 17 SDGs of the 2030 Agenda (United Nations, 2015) and the ten key objectives of the Common Agricultural Policy for the period 2023-27 (Matthews, 2020). Therefore, this study is the first attempt to conduct a scoping literature review to analyse the forms of tokenism affecting the territorial development

practices and which factors can prevent this phenomenon. This literature review has shown that tokenism has been discussed in various thematic areas for many years, but only some authors have analysed its link with rural development. Stakeholders must be aware of their essential role in supporting policy-making processes, even though they are often eager to express their opinions (Sisto et al., 2016). The literature is replete with examples of best practices of active stakeholder involvement in defining medium- and long-term strategies, especially in the case of "complex" issues such as rural development, sustainable development or tourism. This focus on rural areas was chosen because, in these territories characterized by different challenges, phenomena that impair active participation appear to be more present. The different rural areas need an integrated policy to improve economic and environmental well-being, generating, as a not secondary objective, wealth and employment innovation (Kenny et al., 2015).

Therefore, this paper investigates tokenism, a phenomenon commonly affecting territorial development practices, but one that has yet to be widely studied. Many authors (Brown et al., 2017; Rizzi et al., 2011; Sisto et al., 2018) have highlighted how the tacit potential and interactions among actors can overcome the obstacles arising from the multidimensionality of problems and expectations in an area. Regarding local actors and relations between them, one local resource whose endowment affects the territorial development path and its quality is social capital (Kafková et al., 2018; Rizzi et al., 2011). As highlighted by many scholars (Belussi & Pilotti, 2000; Christoforou, 2013; Coleman, 1988; Shucksmith, 2000), social capital is a specific added value formed, maintained and developed through social interactions. In this way, the notion of place-based development involves a policy approach anchored in a locality, enabling it to develop its strategic capacity by utilizing its local social capital (Pappalardo et al., 2018; Weck et al., 2021).

This analysis reveals the various levels of tokenism and the main elements which, if adopted, could limit this phenomenon. Moreover, the study showed the importance of some variables that could reduce the phenomenon of tokenism (e.g., trust, influence, involvement, civic engagement, information) with a subsequent overall policy failure.

For example, the principal efforts to increase involvement and increment influence could focus on a more careful selection of stakeholders in the area. Also, a good strategy is to combine knowledge and adopt all participants of the same terminology as much as possible to have a free and smooth dialogue. In addition, mitigating the strength of some participants would be recommended, which may limit the free participation of others who feel afraid or in the background. In addition, information campaigns and new information-sharing technologies can be tools targeted at local communities for creating registries, bulletin boards, and unique sites where interested citizens can be kept up-to-date on future

meetings and issues and leave their suggestions. The latter strategy requires a substantial effort, especially in rural settings where digital backwardness is still a significant obstacle.

In the same way, to increase participants' confidence, it is difficult to identify a strategy; ideally, the results achieved should be shared to increase clarity and transparency and make it clear that the strategies discussed became fundamental strategies that led to objective results. This new approach could also increase civic sense. Forming a sense of community and belonging through revalue of relationships, culture, and traditions can limit the spread of phenomena such as tokenism.

Therefore, it is essential to highlight how these variables have been used as proxies for social capital assessment in several studies (Adler & Kwon, 2017; Nardone et al., 2010; Wilson & Osborne, 2004). So, developing the highest level of social capital is certainly a key factor for the implementation of effective strategies for territorial development.

Consideration should be given to ensure stakeholders have practical implications in decision processes, but it is necessary to develop strategies supporting marginalised groups' participation in the territories. Institutions at different levels should build stronger links with universities, research centres, associations, and territorial units such as LAGs. These entities can act as intermediaries, take initiatives, and build with territorial communities winning strategies, enhancing positive social capital.

Tokenism is still unexplored: it is necessary to study the practices that could reduce its effects on the future planning of territorial areas. Indeed, when appraising the research findings, a more detailed analysis developed in other journals can help discover other variables useful to limit tokenism effects. It would be interesting for future research to analyse how much this variable is impactful, also using a quantitative approach to investigate the relationship between social capital and tokenism.

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Chapter 4

Policy mix for a circular economy: exploring barriers in rural areas

Naomi di Santo[1*], Simona Negro[2], Roberta Sisto[1]

[1] Department of Economics, Management and Territory, University of Foggia

[2] Department of Innovation Studies, Copernicus Institute for Sustainable Development and Innovation, Utrecht University

* Corresponding author. Email: naomi.disanto@unifg.it

Policy mix for a circular economy: exploring barriers in rural areas

1. Introduction

In recent years, national and international policies have increasingly focused on addressing environmental challenges, such as the efficient use of resources, the reduction of greenhouse gas emissions, and optimizing waste management (Ghisellini et al., 2016; Yang et al., 2023). Within this perspective, some authors (Murray et al., 2017; Alhawari et al., 2021) consider the implementation of circular economy strategies a valuable tool in the achievement of sustainable development. Actually, this is a multidimensional and complex issue that requires the adoption of a policy mix rather than several specific policies (Scordato et al., 2018) addressing individual problems – as in traditional practice. The term 'policy mix' refers to the consistent formulation and interaction of policies that include various policy instruments (Rogge & Reichardt, 2013; Trotter & Brophy, 2022). As the various global challenges are interconnected, it is deemed necessary that a coherent policy mix can yield positive results, reducing the risk of overlapping policies, wasted funds, and inefficient management of resources (Quitzow, 2015; Schmieder et al., 2021; Wilts & O'Brien, 2019). Although the circular economy approach for sustainability is desirable, considered as the adoptions of process innovations and system transformation, it requires considerable efforts by scholars and policymakers to investigate its implementation. In literature, the adoption of innovations has gained relevance since the 2000s, focusing on: *i*) various constructs, such as the sociopolitical and external influence (Wisdom et al., 2014), *ii*) different disciplines, like marketing and sociology (Gruenhagen & Parker, 2020); and *iii*) enabling factors such as technology previously used (Wisdom et al., 2014). Moreover, considering the circular economy transition as a system transformation reinforced the key role of the relationships between independent parts forming the system and actively interacting within the system (WBCSD, 2020). The interest in this topic is due to the possible limitations of multi-actor and multi-model transitions needed to manage complex issues resulting from an unsustainable systemic perspective (Yalçın & Foxon, 2021). The transformation to a circular economy has been studied in different countries (Yalçın & Foxon, 2021) and various sectors, such as textiles (Reike et al., 2023). In addition, it has become a point of interest because of its role in the evolutionary process (Chizaryfard et al., 2021) and sustainable development (Evans, 2023).

Despite these progresses in literature, there remains a gap regarding the implementation of policy mixes supporting the adoption of process innovations for circular economy transition.

Focusing on policy documents, they highlight the role potentially played by rural territories in the circular economy transition. The European Union's interest in issue such as secondary raw materials, waste management or innovation has led to various projects promoting the circular economy in rural

areas, such as CIRCLE[1], focusing on small and medium-sized enterprises, and initiatives like "The Long Term Vision for Rural Areas (LTVRA)" (Ahlmeyer & Volgmann, 2023; European Commission, 2021). Despite scholars exploring the implementation of innovations for sustainability, mainly in sociotechnical terms (Geels, 2019; Lopolito et al., 2011; Moreno Vargas et al., 2023), there remains a gap in the literature regarding the implementation of transitions in rural areas. Even more so when focusing on the key role of the rural areas in circular economy, where policy mixes supporting this transition in those areas still need to be further developed.

In this perspective, the study aims to support evidence-informed policymaking by offering a multistage method to identify potential barriers and potential solving actions for the circular economy transition in rural areas that need to be considered while formulating a policy mix. This final step can be reached after a segmentation of the process into different stages, i) starting with the definition of a circular economy scenario, ii) followed by the investigation of barriers and actions to its realization, to finally identify the main objectives on which to formulate a policy mix and *iii*) an involvement of stakeholders' opinions. This participatory nature of the method aims to minimize the risks of failure of the resulting policy mix by addressing and including all the necessary barriers and solving actions indicated by the stakeholders into policy mixes. Specifically, this paper investigates the implementation of a biorefinery in a rural area based on the reuse of agri-food waste, which could represent the tool for achieving circular economy goals (Kumar & Verma, 2021).

This study contributes to the policy mix literature in the context of the transition towards a circular economy in rural areas, by:

- Addressing the growing concept of the circular economy but focusing on interdependencies in the operational policy framework rather than individual issues or sectors (Milios, 2018).
- Proposing a novel approach to investigate barriers to a circular economy scenario, utilizing a participative approach like focus groups for barrier identification. This method aligns with EU policy recommendations to develop participatory approaches to improve policy results, enhancing democratic processes and gathering reliable information (Kah et al., 2023).
- Highlighting the link between policy mixes and the circular economy, an area with limited exploration in the existing literature.
- Following the case study approach used in the literature for analysing policy mixes but suggesting a focus on rural areas, particularly on Local Action Groups, despite these areas being prevalent in policy documents with limited scholarly attention.

[1] Relevant information on https://www.skanesess.se/about-circle/

This study is articulated as follows: Section 2 provides an overview of the principal theoretical framework. Section 3 describes the methodology in detail; Section 4 presents the primary analysis results; Section 5 discusses the results; and Section 6 provides some fundamental concluding remarks.

2. Theoretical framework

2.1 Exploring barriers for circular economy

Conducting a review of the barriers to the circular economy scenario is of paramount importance in effectively tackling sustainability challenges. Such a study allows for the identification of barriers that could hinder the adoption of more sustainable practices. Furthermore, understanding these barriers is instrumental in recognizing the requirements for successfully addressing them and facilitating the development of more effective strategies and solutions to surmount them (Ferrari et al., 2022). Some studies currently focus on exploring barriers related to specific processes within the circular economy. This increased focus is due to the diffusion of the principles of waste reduction, reuse, and repair, which are prioritized in the policies of regional and local authorities, encompassing practices for citizens, businesses, and organizations.

1. Market and specialization barriers: this set of barriers includes those related to adopting new technologies, such as the construction of new facilities or challenges in adapting existing infrastructure (de Jesus & Mendonça, 2018). Among the significant technical barriers, high initial investment costs limit entrepreneurs' willingness to transform their business models into more sustainable ones. This category also encompasses market barriers, such as low prices for virgin raw materials, limited consumer interest in new products derived from the circular economy, resulting in low demand, and competition from foreign countries (Kirchherr et al., 2018; Vermunt et al., 2019).
2. Economic and financial barriers: in this category of barriers, scholars have included factors such as the economic feasibility of a particular sustainable innovation in a given area or challenges in accessing external financing for the enterprise. Among these factors, the need to make significant changes to the current practices within the enterprise can pose potential financial barriers, including high initial investment costs (Bechini et al., 2020). On the economic side, uncertainty and lack of familiarity with new markets are also cited as potential barriers to sustainability (Masi et al., 2018; Salmenperä et al., 2021).
3. Institutional and regulatory barriers: a third category of barriers encompasses institutional and regulatory obstacles, encompassing administrative and bureaucratic hurdles (Salmenperä et al., 2021). Within this category, numerous authors have identified factors such as inefficient recycling policies and the absence of quality standards for products from the circular

economy. Additionally, despite policy documents advocating for a transition to sustainability, some authors have highlighted the persistence of financial incentives that support the linear economy (Vermunt et al., 2019). Interestingly, within this group of barriers, some authors have emphasized the pivotal role of governance, including territorial governance, in facilitating the effective implementation of a sustainable transition (Masi et al., 2018; Vermunt et al., 2019).

4. Sociocultural and informational barriers: This final macro-area includes all barriers related to sociocultural aspects and associated with awareness and knowledge of the issue (Lee & Gambiza, 2022). These encompass factors such as the insufficient technical skills of farmers necessary to change their current farming practices (Salminen et al., 2022), a lack of adequate awareness regarding environmental issues, and a need for knowledge regarding implementable solutions. These types of barriers also encompass potential resistance from specific stakeholders who benefit from the current linear approach or even a deficiency in a system of interconnection and information exchange among various stakeholders (Donner & de Vries, 2023; Verburg et al., 2022).

According to Tapia (2021), although implementing circular economy strategies is linked to spatial and relational dimensions, the role of territorial implications remains unexplored. Considering the territory as a geographic space that a community should perceive as its own, the need arises to overcome the gaps in the literature on social cohesion and the significant role of territorial identity.

Despite the extensive investigation of "identity" being important in various research strands (Banini, 2017; Christoforou, 2013), its role in adopting innovation in this field still needs to be explored. While some authors examine how the likelihood of innovation adoption may increase when individuals align themselves with their group's strategy, several social barriers still need sufficient consideration (Smaldino et al., 2017). These encompass, for example, the above concepts, like the role of territorial identity, social value, or the necessity for a sense of urgency in adopting innovation.

Furthermore, research concerning the connection between individuals and their environment has traditionally centred on how the characteristics of a territory can impact individuals' behaviour or how tacit knowledge related to the area can mitigate policy failures (Biddau et al., 2023; Sisto et al., 2018; Timilsina et al., 2019). While the adoption of innovation may be influenced by identity signalling, there remains a need for more studies investigating this issue in the context of sustainability for local development.

For more details, Table A, in Appendix A, provides a summary of the key findings discussed in this section. The table compiles the primary barriers highlighted in various studies, the paper titles and authors.

2.2 Key aspects of policy mixes

The need to shift to a circular economy approach must consider both economic, environmental and social aspects at the same time. This view suggests an evolution towards implementing a policy mix. It is well known that individual policies are insufficient to drive the necessary systemic changes to transition to more sustainable modes of production and consumption (Flanagan et al., 2011). While no single definition of a policy mix exists, it goes beyond the simultaneous use of different policy instruments. The fundamental concept of a policy mix is to incorporate each policy's strengths while balancing the weaknesses through specific policy instruments (Milhorance et al., 2020).

The systemic approach in developing a mix of policies changes the traditional sectoral view of policies, where applying a single policy instrument was intended to address a single issue. This conventional view should have accounted for synergies and overlaps of policy instruments and objectives, leading to inefficient use of resources and policy failures. For example, in terms of the circular economy, policies focused solely on collecting and recycling products would only be effective if they considered necessary changes in product design to reduce waste from the beginning of the cycle (Cejudo & Trein, 2023).

In the domain of the policy mix, the idea is to go beyond the simple overlap of policies but instead blend and mix various policies to strengthen the coherence of the mix. This coherence involves not only the absence of conflicting policies within the same subsystem (internal coherence) but also coherence between different subsystems (horizontal), between the European Union and member states (vertical), and between interactions among international organizations (multilateral) (Carbone, 2008).

Considering this aspect related to the coherence of the policy mix enhances the feasibility of implementation, avoiding conflicts between different policy domains and ensuring efficient fund management (Rogge & Reichardt, 2016). The overall awareness of the importance of political intervention to facilitate the transition to sustainability has contributed to the spread of the theory of policy mixes in environmental policy analysis since the 1990s. The dissemination of the policy mix concept to address contemporary environmental challenges has been translated into literature through various papers analysing the policy mix for different issues, for instance, in the field of biodiversity conservation (Barton et al., 2017), land use (Rezende et al., 2018), limited access to natural resources (Matti et al., 2017), waste management (Wilts & O'Brien, 2019), and sustainability transitions (Rogge & Reichardt, 2016; Zhang & Yu, 2019). Additionally, to support the innovativeness of the approach and the challenges of both ex-ante and ex-post analysis of the policy mix, literature has witnessed a succession of case study analyses involving numerous instances of data analysis or individual

interviews on existing policy mixes (Milios, 2018; Nykamp, 2020; Sarker et al., 2022; Trotter & Brophy, 2022).

3. Methodology

A multistage approach was chosen to investigate factors affecting the innovation adoption for the socio-technical transition (Aspers & Corte, 2019). Considering that several authors have emphasised that the context of analysis and their intrinsic characteristics are key elements for examining barriers and potential solutions (Mantino & Vanni, 2019; Milhorance et al., 2020), a specific rural area was chosen as a case study unit. The following paragraphs will focus on the selected case study, the methodology and analysed data.

3.1 Case study

Since various policy documents and current issues related to sustainable transition increasingly emphasise the role of rural areas, it was chosen to analyse the potential barriers to implementing innovation within a Local Action Group (LAG). The choice of the LAG as a case study is based on its consistent implementation of strategies and proposal of various potential solutions to revitalise and develop rural areas. Groups are formed through the participation of both the public and private sectors to promote action plans that lead to sustainable development of the territory, encompassing economic, environmental, and most importantly, social aspects (Sisto et al., 2018).

Therefore, considering the future planning of LAGs in the region, it appears crucial to analyse the main obstacles to an effective circular economy transition. The LAG Daunia Rurale 2020 was selected as a case study in this context. This agency of rural development includes the municipalities of Apricena, Chieti, Poggio Imperiale, San Paolo Civitate, San Severo, Serracapriola and Torremaggiore. All of them are located in the Apulia Region, one of the Italian regions with the majority of rural territories.

This LAG comprises 80 members between private and public sectors, such as two entities in education and research, six trade associations, seven private associations and consortia and 69 firms. Analysing the territorial structure of LAG Daunia Rurale 2020, the predominance of ancient rural buildings and infra-structures appears evident. Moreover, the landscape is mainly characterised by oil mills and wineries distributed across the territory. From this perspective, territorial identity and the relationship with the territory itself could be the strengths distinguishing the productions and economic activities of this area.

Moreover, other essential strengths for the area's competitiveness are represented by several EU quality scheme productions. Specifically, in the municipality of Apricena, Puglia TGI wine and Daunia TGI wine are produced. In the municipality of San Severo, there is the production of extra virgin olive oil PDO Dauno, as well as in the municipalities of Poggio Imperiale, Serracapriola and Torremaggiore. These are just some examples of how the comprehensive eco-gastronomic supply is an essential area feature.

Another important strength is related to the environmental and cultural heritage. For example, the transhumance ("the seasonal movement of herds to take advantage of the availability of natural pastures" (Aguilera-Alcalá et al., 2022, p.1330)) and wine and oil routes are cultural assets that enhance the territorial offer with history and culture. Having several castles and archaeological areas, the LAG territory presents an important heritage whose recovery and enhancement are important development opportunities.

However, two important phenomena in the area emerge: depopulation and ageing. These are very often weaknesses characterising rural areas, causing difficulties in generational turnover and reluctance to adopt innovations such as, for example, financial insurance in agriculture (Caffaro et al., 2020; Rizzo et al., 2023).

These weaknesses are linked to relevant threats such as the population decline and lower per-capita income. Data registered in the area confirm a high unemployment rate among women and youth and show a low educational level that is expected to improve. In addition, as already mentioned, low attitudes to generational turnover lead to a low innovation attitude toward farming activities, causing low readiness to implement policies to support rural areas.

3.2 Methods

A two-stage methodology was implemented to achieve the study's objective based on two focus groups. More specifically, the focus groups involve interviews with a carefully selected group of participants who possess specific qualifications, such as a deep understanding of the subject matter, shared sociodemographic characteristics, and a willingness to engage in group discussions with an interviewer (Rabiee, 2004). This approach is well-suited to the study's objectives because it allowed for gathering i) diverse viewpoints, ii) considering participants' varying personal backgrounds, iii) the legitimization and democratization of results (Šantrůčkova et al., 2013; Sisto et al., 2016). The exchange among stakeholders fosters crucial discussions regarding the future strategies to be implemented in the area (Rabiee, 2004; Redden et al., 2023).

This approach falls within the spectrum of techniques for implementing participatory methodologies. Its primary goal is to minimize information asymmetry between the researcher and participants.

Furthermore, involving diverse categories of stakeholders helps harness various knowledge, contributing to developing a more effective strategy. In essence, participatory approaches are rooted in two fundamental principles: subsidiarity and partnership. This means that decision-making should occur as close as possible to the implementation site and include representatives from a broad spectrum of governmental and non-governmental groups (Sisto et al., 2018).
Table 1 summarises the stakeholders' categories for implementing this study.

Table 1. The study participants

PARTICIPANTS	FOCUS GROUP	ROLE
Farmer 1	Stakeholders focus group	LAG member farm
Farmer 2	Stakeholders focus group	LAG member farm
Farmer 3	Stakeholders focus group	LAG member farm
Farmer 4	Stakeholders focus group	LAG member farm
Farmer 5	Stakeholders focus group	LAG member farm
Farmer 6	Stakeholders focus group	LAG member farm
Farmer 7	Stakeholders focus group	LAG member farm
Farmer 8	Stakeholders focus group	LAG member farm
Farmer 9	Stakeholders focus group	LAG member farm
Expert 1	Stakeholders and experts focus groups	University researcher
Expert 2	Stakeholders and experts focus groups	University researcher
Expert 3	Stakeholders and experts focus groups	Rural development scholar
Expert 4	Stakeholders and experts focus groups	Socio-technical transition expert
Expert 5	Experts focus group	LAG Daunia Rurale 2020 Director
Expert 6	Experts focus group	LAG Daunia Rurale 2020 President
Expert 7	Experts focus group	Organic chemical
Expert 8	Experts focus group	Apulia region delegate operating on Local Development Funds linked to LEADER program
Expert 9	Experts focus group	UNIFG Grant Office Delegate and Coordinator
Expert 10	Experts focus group	Regional agribusiness district delegate
Expert 11	Experts focus group	Participant in the drafting of the local development strategy of the LAG

Source: our elaboration

3.3 Overview of the focus group sessions

The first focus group occurred online in April 2023 and lasted 3 hours. Eleven participants attended, selected for their expertise in the study's topics and in-depth knowledge of the case study. Among the participants were university professors, a rural development scholar, a socio-technical transition expert, an organic chemist, a representative from the Apulia Region involved in local development

funding, the president and director of LAG Daunia Rurale 2020, a regional agribusiness district delegate, and other individuals interested in the area's Action Plan Development, such as experts in marketing (Table 1).

After obtaining informed consent from the participants, the meeting facilitator guided the discussion using selected questions and incorporating new questions based on the topics that emerged during the focus group. The main goal was to define a feasible scenario within the LAG Daunia Rurale 2020 area oriented towards circular economy and identify potential barriers to implementing this scenario.

The second step involved organising a focus group, complementary to the first one, held in June 2023. This second focus group aimed to assess the feasibility of the scenario selected by the experts and identify possible solutions to the barriers identified. On this occasion, the participants were local stakeholders, including producers who were invited via email to participate in person at the LAG's central office in San Severo. The meeting was attended by 12 stakeholders (Table 1).

The meeting began with a presentation on the topic, the focus group's objectives, the expert findings, data on the territory's biomass, and concrete examples of possible solutions (Appendix B). During the focus group, participants were divided into groups of 6-7 people, which was a suitable number to ensure that each participant's voice was heard (Cortini et al., 2019). Each group aimed to discuss potential factors that could help overcome barriers to the transition and address the chosen scenario's main weaknesses.

After executing the focus groups, evaluation questionnaires were administered to the participants at the end of the meeting. The questionnaires asked them to rate various aspects of the meeting, including clarity of objectives and perceived level of involvement. Also, they included open-ended questions to gather feedback and suggestions. This practice serves to: i) provide helpful information to improve the effectiveness of the participatory approach used (Dagenais et al., 2012), ii) assess the overall satisfaction of the participants (Dagenais et al., 2012), iii) contribute to developing a participatory strategy that is not limited to superficial participation but promotes active involvement and a two-way flow of information between researchers and participants (di Santo et al., 2023).

4. Results

4.1 Scenario identified by experts

The first focus group aimed to identify possible scenarios for the development of the rural territory within LAG Daunia Rurale 2020, also considering prospects related to the circular economy and bio-economy as outlined in the Regional Programming Complement of the Apulia Region. In this regard,

participants identified a single potential scenario based on the area's characteristics. Table 2 reports the scenario description.

Table 2. The scenario description

ITEMS	DESCRIPTION
Name	Valorisation of agricultural waste
Reference documents	Regional Programming Supplement of the Apulia Region
Motivation	Rural territory development considering the circular economy perspective and bioeconomy
Description	Building a biorefinery capable of reusing agricultural waste with a view to the circular economy
Site	LAG Daunia Rurale 2020 jurisdiction
Raw Material Collection	Straw Olive tree pruning Vineyard pruning
Agricultural waste available	Straw → 130.745,76 (ton) Olive tree pruning → 33.754,73 (ton) Vineyard pruning → 22.270,74 (ton)
Actors/ Governance	- Local farmers - Research institutions/University - Biorefinery experts - Category associations - LAG governance - Municipalities governance - Agricultural Activity Coordination - A third entity manages and develops cooperation between individuals
Pre-requirements	- Available budget - Available facilities - Available agricultural waste - Managing waste collection and logistics
Infrastructures	Using existing facilities in the area, focusing on olive oil mills and wineries
Envisioned outputs of the scenario	- Use of agricultural waste - Implementation of circular economy - Networking development - Reinforcing social networks within the LAG - Efficient management of local structures

This future scenario involves the creation of a biorefinery utilizing existing facilities in the area, focusing on olive oil mills and wineries as the main facilities. In addition, one of the primary goals of this scenario would have been establishing a cooperative network.

The biorefinery, specifically the utilization of olive oil mills and wineries, could contribute to de-seasonalise the operations while fostering the development of a network of social and logistical relationships. This scenario has several strengths, including a robust agri-food production, existing local expertise, and small-scale technologies that could be beneficially employed and implemented.

However, several obstacles were identified, including challenges related to fostering cooperation among businesses, issues concerning corporate culture, technological barriers, and the complexity involved in introducing innovation.

4.2 Overview of barriers experienced by experts

Table 3 shows the main barriers that emerged in the focus group, which were divided according to the macro areas identified in Section 2. For instance, concerning economic barriers, we encounter limited financial resources for rural development. Regarding social barriers, there is the sociocultural inertia of local workers. Experts have also pointed out market-related barriers, such as the complexity of technological innovation. Finally, some institutional barriers, such as limited institutional networking, have been identified.

Table 3. Barriers to circular economy on LAG Daunia Rurale 2020

BARRIERS	DESCRIPTION
Economic-financial barriers	Limited financial resources for rural development
	Substandard infrastructure
	Scant territorial size
Social barriers	Low willingness of operators to cooperate
	Sociocultural inertia of local workers
	Lack of green vision of local operators
	Use of waste in non-legal practices
	Lack of social security
Market barriers	Market uncertainty for new products
	Complexity of technological innovation
	Competition in the use of residues from off-site alternatives
Institutional barriers	New CAP incentives
	Limited institutional networking
	Central planning unsuited to the needs of the territory
	Dispersion/overlapping of calls
	Rigorous regulations that place administrative constraints

Source: our elaboration

Following the experts' discussion, important points of reflection on the topic have emerged. In particular, the need to develop a systemic vision in the territory become evident, where various productive activities interact regarding material flows that can transform the waste of one sector into inputs for other processes.

Furthermore, one of the significant points of reflection that emerged from the focus group is the need to recover the entrepreneurial function of a LAG, meaning the construction of a network of relationships. Projects require substantial investment in terms of costs, given their high level of complexity, so funding from European projects is necessary, well beyond the financial resources allocated to the LAG.

Moreover, networks for the exchange of knowledge and materials are important. The key question is how well the local agri-food companies are prepared for this transition. The challenge lies in moving from individual contracts to network contracts, with a role of the LAG that strengthens cooperation in rural areas.

4.2 The stakeholders' perspective

The second focus group was organized by inviting the local stakeholders to identify potential actions to overcome the circular economy transition barriers. In the initial phase of the focus group, the bio-refinery scenario was presented to the stakeholders, who agreed that it could be a possible future strategy. Table 4 summarizes the results of this meeting, reporting, the potential action for limiting each barrier. As anticipated in the previous paragraphs, during the workshop organized with the stakeholders, two subgroups were created, each consisting of approximately 7-8 participants, to hear the voices of all. Furthermore, to develop effective focus groups, it was decided that one group would address the economic, financial, and social aspects. In contrast, the other group would focus on institutional and market factors.

Table 4. Actions to overcome barriers to circular economy on LAG Daunia Rurale 2020

BARRIERS	DESCRIPTION	SOLVING ACTIONS
Economic-financial barriers	Limited financial resources for rural development	-Realization of pilot facilities -Fund raising -Sharing of machinery and facilities -Creation of subsidized finance opportunities
	Substandard infrastructure	-Realization of pilot facilities -Implementation of common infrastructure and logistics platforms
	Scant territorial size	-Creating network contracts
Social barriers	Low willingness of operators to cooperate	-Realization of pilot facilities -Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians -Participation in exhibitions -Implementation of common infrastructure and logistics platforms -Dissemination of technical knowledge

		-Fostering the exchange of waste material within a shared network -Generational renewal
	Sociocultural inertia of local workers	-Knowledge sharing -Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians -Participation in exhibitions -Fostering the exchange of waste material within a shared network
	Lack of green vision of local operators	-Creation of green job opportunities -Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians -Dissemination of technical knowledge -Generational renewal
	Use of waste in non-legal practices	-Creating network contracts -Generational renewal
	Lack of social security	-Sharing of machinery and facilities -Creating network contracts -Generational renewal
Market barriers	Market uncertainty for new products	- Realization of pilot facilities - Knowledge sharing -Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians -Participation in exhibitions - Dissemination of technical knowledge - Research on market readiness
	Complexity of technological innovation	- Upgrading of processing facilities (oil mills and wineries) - Realization of pilot facilities - Knowledge sharing - Sharing of machinery and facilities -Implementation of common infrastructure and logistics platforms -Dissemination of technical knowledge - Use of winery and oil mill plants and facilities for other closely related production activities -Fostering the exchange of waste material within a shared network - Specific training for biorefinery technicians
	Competition in the use of residues from off-site alternatives	- Knowledge sharing - Sharing of machinery and facilities -Implementation of common infrastructure and logistics platforms -Creation of subsidized finance opportunities -Use of winery and oil mill plants and facilities for other closely related production activities -Fostering the exchange of waste material within a shared network - Creating network contracts - Value chain organization
Institutional barriers	New CAP incentives	- Creation of subsidized finance opportunities - Creating network contracts - Value chain organization

	Limited institutional networking	- Knowledge sharing - Creating network contracts - Value chain organization
	Central planning unsuited to the needs of the territory	- Knowledge sharing - Creating network contracts
	Dispersion/overlapping of calls	-Knowledge sharing -Dissemination of technical knowledge
	Rigorous regulations that place administrative constraints	-Knowledge sharing -Dissemination of technical knowledge
New barrier	Lack of territorial identity	- Knowledge sharing - Creating network contracts -Generational renewal -Specific training for biorefinery technicians

Source: our elaboration

In addition, each group was then asked to establish a timeline to indicate the urgency of the territory's actions and the key actors responsible for addressing those.

Regarding the economic and social aspects, the priority is knowledge sharing, followed by organising guided tours, inviting highly specialised entrepreneurs and technicians, and fundraising. In this case, the key actors involved are research institution or University, universities and biorefinery experts, local companies, development agencies, and category associations. As for the actions that should be implemented last and, therefore, are less urgent, they include creating green job opportunities, sharing machinery and facilities, and implementing joint infrastructure and logistics platforms. According to the stakeholders, research institutions are crucial in addressing these issues.

A significant result that emerged during this focus group was that the participants wanted to introduce a new barrier. In fact, after preparing the material and discussing the various barriers proposed by experts, some participants felt that one of the main obstacles to starting a true transition to sustainability in the area needed to be addressed. This barrier has been called "Lack of territorial identity." In this case, participants wanted to emphasize an established view in the area based on the idea that not all entrepreneurs are prepared for change. According to their perspective, the territory is characterized by individuals who do not consider the long-term implications, focusing solely on the economic aspects of their business activities. Some solutions identified for this barrier included, for example, "generational renewal" and "knowledge sharing." Furthermore, research centres, the university, and the LAG played an essential role in overcoming this barrier.

On the other hand, regarding institutional and market aspects, the priority is knowledge sharing, followed by the organisation of guided tours, the invitation of highly specialised entrepreneurs and

technicians and participation in exhibitions. In this case, the key actors involved are LAG, universities and trade associations.

5. Discussion

The first fundamental result of this paper is that Table 4 is a clear summary of what must be considered in formulating a policy mix in the LAG Daunia Rurale area to build a bioraffinery to reuse agricultural waste.

The barriers expressed by experts, and in line with the notions in the Section 2, have highlighted various aspects that can hinder the adoption of innovations in the territory. An important finding is that these barriers, in addition to being related to productive and economic factors, significantly concern the social sustainability aspect of the territory.

Moreover, in the context of the overall paper's aim related to formulating policy mixes for the circular economy, it is possible to split the barriers identified by the focus groups into those that are transversal to all territories and those specific to rural areas - allowing the results to be generalisable to other territories.

In the first group, there are i) market barriers, which include, for example, obstacles related to the complexity of adopting new technologies for innovation different from existing ones or market uncertainty in buying new products, and ii) institutional barriers, such as institutional and administrative limitations.

On the other hand, the barriers related to rural areas include typical elements of these territories that is: i) economic barriers, such as limited resources for rural development or the underdevelopment of specific infrastructures in rural areas, and ii) social barriers related to a lack of willingness to cooperate among entrepreneurs in the territory or the weak territorial identity that could affect some rural areas.

Considering that one of the main objectives of the LAG is related to social inclusion, it is important to note that the role of these “rural structures” as aggregators is essential to support a sustainable transition based on the participation of all stakeholders in the territory, strengthening gender equality in rural areas, and promoting shared knowledge among all individuals in the area.

Another noteworthy result is that both experts and stakeholders agreed on focusing on a strategy that involves reusing agricultural processing waste when considering potential future scenarios for the sustainability of the territory. Other scenarios, such as the reuse of food waste at the household level, were not considered. An interesting output is that all participants in the focus groups developed a scenario that, starting from the environmental aspect, also encompassed other aspects of sustainability, such as economic and social ones.

Furthermore, conducting a qualitative analysis allowed to give representatives to all stakeholders and highlight a result of significant importance. While, on the one hand, the experts involved in the focus group emphasised social barriers, they mainly discussed the lack of entrepreneurial awareness and the lack of information among local farmers. Participants in the second focus group merely mentioned territorial identity for the first time. In particular, this concept was introduced by stakeholders without any suggestions from the focus group moderators. Therefore, their awareness of the challenges in the territory brought to light the absence of territorial identity as one of the main barriers. This stimulating information highlights the importance of developing participatory approaches, as only those who live in the territory recognised and emphasised this concept's value and potential impact (di Santo et al., 2023). This result emphasises how territorial identity can serve as a driver for adopting sustainable innovations in rural areas. Still, it needs to be strengthened in territories where it is lacking.

In conclusion, it becomes evident that while economic, financial, and institutional support are crucial for embracing a transition to a circular economy, there is also a requisite attitude among participants in rural areas to support the adoption of innovation. This attitude may encompass, for instance, i) a readiness to collaborate among local stakeholders, ii) the establishment of a robust and positive territorial identity that fosters the acceptance of innovation, iii) an open-minded approach, particularly about a willingness to embrace the circular economy, aiding the adoption of innovations that lead to, for example, a shift in adopted technologies, iv) a strong inclination toward acquiring knowledge and information on new sustainable approaches to be implemented in the area.

6. Concluding remarks

As already highlighted, the study aims to support evidence-informed policymaking by proposing an innovative multistage methodological approach for exploring stakeholders' needs that should be considered while formulating a policy mix for circular economy transitions. The method comprises breaking down the process into sequential steps, outlining a scenario for the circular economy, examining barriers to its actualization, and establishing the overarching framework on which crafting the policy mix.

The objective was achieved through a participatory approach based on two focus groups. The first meeting with experts helped to explore the barriers to innovation adoption. In contrast, the last meeting with stakeholders allowed to extract actions that can help the area to implement circular economy innovation.

Furthermore, these results contribute significantly to the literature on policy mix formulation. Despite this concept's essential role in the literature, attention needs to be directed toward how to formulate a policy mix that can support the territory in adapting to circular economy practices. Therefore,

analysing barriers that could hinder the implementation of a scenario is an essential step for calibrating and formulating a policy mix that avoids negative outcomes or overlooks critical aspects. Moreover, employing a participatory approach, as suggested by several policy documents, has reinforced our results. Indeed, the barriers identified by various stakeholders in the area substantiate the feasibility of our results in implementing an efficient policy.

Despite the contributes to the literature, mentioned in above sections, this paper has some limitations, such as focusing the entire analysis on a possible scenario rather than expanding the investigation to other scenarios. This was due to the unanimous awareness among stakeholders and experts that this could be an important scenario considering the area's resources. Additionally, although the invitation to the second focus group was extended to non-member companies of the LAG, these companies were absent. This may have created a self-selection bias but does not invalidate the results. Stakeholders discussed the territory, sharing experiences with other entrepreneurs and considering all the needs of the area.

In conclusion, this study enabled us to analyse a theme that, although centred on a single case study, could be extrapolated to other contexts, taking into account the unique characteristics of each territory. This consideration aligns with the suggested categorization of barriers into transversal issues or specific barriers specific to rural areas.

These results can be useful from various perspectives.

On the one hand, for entrepreneurs, understanding innovation barriers can be a fundamental step in raising awareness of the issue and building efficient development strategies.

It can also be important for researchers in the field, as it has helped fill a gap in the literature on local development agencies and sustainable transitions.

Moreover, results from participatory approaches have helped identify the main barriers to innovation implementation and, subsequently, the solving actions and key actors that could be considered in the policy mix process.

Finally, these findings are significant for policymakers to better understand, identify and assess policy options, and they could represent a starting point for formulating an efficient policy mix in the rural area, thus contributing to support evidence-informed policymaking.

Appendix A

Table A. Results of the literature review on barriers to circular economy

Title	Authors	Barriers	Description
Critical factors for enhancing the circular economy in waste	(Salmenperä et al., 2021)	Economic aspects	- Feasibility economical - Functionality of the recyclable materials market - Price of materials - Harvesting costs are high - Undeveloped markets for secondary materials - Inefficient logistics - Investment costs - Market uncertainty - Public procurement has no circular requirements - Lack government support - External financing difficulties
		Technological aspects	- Lack of systemic planning in the circular use of materials - Product design should take circularity into account - Lack of specific skills - Lack of data - Lack of indicators and consultancy services - Failure to evaluate environmental impacts - Difficulty for small businesses in obtaining resources
		Institutional and regulatory barriers	- Concerns about privacy or data security - Strict legislation - Insufficient public support - Complexity of regulation - Different decisions at regional level
		Sociocultural barriers	- Customer preferences and citizen behaviour - Negative or disinterested attitudes among residents - Company culture and routine
Accelerating the transition towards sustainable agriculture: the case of organic dairy farming in the Netherlands	(Verburg et al., 2022)	Activity entrepreneurial	Difficult and expensive transition process
		Development and exchange of knowledge	Lack of research and education
		Orientation from the research	- Cultural influences - Lack of national policy - No long-term political vision - Unequal vision - No intrinsic value of the farmer
		Market formation	- Lack of demand - Expensive/low quality products - Insufficient demand - Lack of supply resellers - No trust in banks - Competition Country foreign
		Mobilization from the resources	- Lack of government support and subsidies for farmers - High land prices
		Resistance to change	Resistance
Innovative business models for a sustainable circular bioeconomy in the French agrifood domain.	(Donner & de Vries, 2023)	Organizational and spatial	- Skills complementary - Rooting territorial
		Environmental, social cultural	- Media share different information
		Technical, logistical	- Consolidated logistics - Central positioning of the company
		Economic, financial, marketing	- Support financial - Financing public
		Institutional and legal	- Public Regulation
Exploring barriers to implementing different circular business models. Journal of cleaner production.	(Vermunt et al., 2019)	Financial	- Lack of financial resources - High initial investment costs - Unclear financial business case
		Organisational	- Administrative burden - Reverse infrastructure organization - More complex management and planning processes
		Knowledge and technology	- Lack of technical knowledge and skills - Lack of information/data - Design challenges to create durable products
		Supply chain	- Lack of partners and poor availability of materials

			- Greater dependence on external parties - Lack of information exchange between supply chain actors - Conflicting interests among supply chain actors - Lack of consideration for circular design by supply chain actors - Bad reuse practices/reluctance by third parties
		Market	- Low prices of virgin material - Lack of consumer interest - Resistance from stakeholders with vested interests in the linear economy
		Institutional	- Ineffective recycling policies - Incentives that promote the consumption of materials over services, such as VAT (value added tax) - Specific current accounting rules and management systems that are inadequate for the circular economy - Lack of standards and guidelines for the quality of renovation products - Lack of awareness and sense of urgency within society
Towards a more circular economy: exploring the awareness, practices, and barriers from a focal firm perspective	(Masi et al., 2018)	Financial costs	- Higher initial investment costs - Shareholders with short-term agendas dominate corporate governance - Recycled materials are often even more expensive than virgin raw materials - Higher costs for management and planning
		Institutional	- Government financial incentives support the linear economy - Circularity is not effectively integrated into innovation policies - Competition law inhibits collaboration between companies - Recycling policies are ineffective in achieving high-quality recycling - Governance issues related to responsibilities, burdens and ownership
		Infrastructure	- Limited application of new sustainable business models - Lack of an information exchange system between the different stakeholders - Confidentiality and trust issues hinder the exchange of information
		Society	- Lack of awareness and sense of urgency, even in businesses - Resistance from powerful stakeholders with big interests in the status quo
		Technological	- Limited attention to the end-of-life phase in the design of current products - Limited availability and quality of recycled materials - New challenges to separate biocycling from technology - Linear technologies are deeply rooted
Barriers to the circular economy: evidence from the European Union (EU).	(Kirchherr et al., 2018)	Lack of awareness and/or willingness to engage with CE	- Corporate culture hesitant - Limited availability to collaborate in the value chain - Lack of awareness and interest on the part of consumers - Currently we operate in a linear system
		Poor policies to support an EC transition	- Obstruction of laws and regulations - Lack of global consensus
		Lack of economic feasibility of circular business models	- Low prices of virgin material - Lack of standardization - High initial investment costs - Limited funding for circular business models
		There is a lack of (proven) technologies to implement CE	- Lack of ability to provide high quality remanufactured products - Too few large-scale demonstration projects - Lack of data, for example on impacts

Source: our elaboration

Appendix B

Before operationally starting the discussion with stakeholders in the focus group, an initial presentation was organized and segmented into various steps:

Step 1: Explanation of the meeting's objective, specifying the reference period and the geographical area on which to focus the discussion.

Step 2: Description of the reference document - Regional Programming Complement of the Apulia Region

Step 3: Description of the main critical issues in the area of interest (e.g., presentation of data on depopulation).

Step 4: Presentation of data on businesses in the Apulia region and specification of the agricultural and rural vocation of the territory.

Step 5: Presentation of the barriers identified during the first focus group with experts.

Step 6: Presentation of data on quantifying different types of agricultural and agro-food residues in the LAG Daunia Rurale 2020 territory.

Step 7: Presentation of different methods for quantifying residues.

Step 8: Presentation of the data to demonstrate the availability of agricultural waste.

Step 9: Presentation of possible solutions, specifying which types of waste are compliant, what the necessary preconditions are, and potentially producible future products.

Step 10: Presentation and description of a possible cogeneration scenario.

Step 11: Presentation and description of a possible biodigestion scenario.

Step 12: Presentation and description of a possible biorefinery scenario.

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Chapter 5

Are university students really hungry for sustainability? A choice experiment on new food products from circular economy

Naomi di Santo[a], Giovanbattista Califano[b*], Vittoria Pilone[a], Francesco Caracciolo[b], Roberta Sisto[a]

a Department of Economics, Management and Territory. University of Foggia

b Department of Agricultural Sciences - Economics and Policy Group. University of Naples Federico II

*Corresponding Author: giovanbattista.califano@unina.it

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1. Introduction

Global concerns surrounding sustainability and the adoption of a Circular Economy (CE) approach have gained paramount importance on both national and international agendas. Commencing in 2015, the United Nations incorporated this thematic focus into its array of 17 Sustainable Development Goals[2] (SDGs). Within the European context, the European Commission (EC) has promulgated specialized guidelines to foster a sustainable vision[3]. Further reinforcing these initiatives is the European Green Deal, which envisages a prosperous and inclusive transition towards an equitable society that robustly embraces CE principles (Bieroza et al., 2021; Filipović et al., 2022). Accordingly, a diverse consortium of stakeholders—encompassing governments, commercial enterprises, research institutes, and non-governmental organizations—is collaboratively exploring innovative pathways for actualizing a CE-oriented production model (Muscio and Sisto, 2020).

Within this overarching framework, the agri-food sector emerges as fundamental in the transition to CE. The importance arises from the undeniable fact that both livestock and agriculture are important contributors to CO_2 emissions (Despotović et al., 2021). However, there are still several barriers that could limit the implementation of a more sustainable paradigm. These barriers range from an underdeveloped market demand for CE-aligned products and services to uninformed consumer choices, operational inefficiencies among business entities, and policy incongruities (Muscio and Sisto, 2020).

Turning attention to market-specific barriers, existing literature accentuates the limited consumer understanding of "green" product claims as well as a prevalent knowledge deficit concerning the implications of the CE (Blengini and Shields, 2010). Conversely, prior empirical studies corroborate that elevated educational level is positively associated with pro-environmental behaviours (Meyer, 2015). Additionally, Deliens et al. (2014) suggest that individuals typically set their lifestyle and dietary choices between the ages of 18 and 30, and that the critical thinking developed during this formative period has a consequential impact on their purchasing and consumption patterns.

[2] Notably, the exigency for effectuating a sustainable transition is explicitly articulated in Goal 8, which pertains to "Decent Work and Economic Growth," as well as in Goal 12, which addresses "Sustainable Consumption and Production."

[3] One relevant document in this regard is the EC 2015 publication, "Closing the Loop - An EU Action Plan for the Circular Economy," which delineates a comprehensive monitoring framework for CE implementation.

As substantiated by empirical evidence, university students appear to be more actively engaged in pro-environmental behaviour (Omisakin and Kularatne, 2022), thus representing a promising prospective target demographic for "green" food products. Moreover, non-compulsory university courses related to sustainability and the circular economy have been shown to positively impact students' propensities toward sustainable consumption (Prieto-Sandoval et al., 2022). Given that students are often seen as early adopters of change and potential future leaders, producers could strategically target their offerings to this group, thereby overcoming existing market barriers and facilitating a sustainable transition.

Focusing on this specific market segment, the present study aims to quantify the Willingness To Pay (WTP) attributable to a circular economy certification - a relatively new standard - in comparison to the widely recognized and appreciated organic certification. Furthermore, the study evaluates the potential additive value of possessing both certifications jointly. Additionally, the research investigates whether specific training on environmental issues positively influences premium prices for organic and CE certifications.

To achieve these objectives, a choice experiment was designed. An online survey targeting Italian university students was conducted, and fruit juice was selected as the product for study. Fruit juice is widespread consumed among young people making it a pertinent subject for a study targeting university students. Secondly, as demonstrated by Lerro et al. (2018), fruit juice emerges as an advantageous product for conveying green labels. Owing to its relatively unprocessed nature in comparison to other food products, fruit juice serves as an efficacious carrier, facilitating a more unambiguous analysis of the roles assumed by labels and certifications. This occurs in the absence of confounding variables attributable to attributes typically present in more highly processed foods. The choice experiments investigate the preferences towards three specific attributes of the product: price, organic and the CE certifications. For the latter, the recent AFNOR XP X30-901 standard launched at the end of 2018 served as the reference (AFNOR, 2020).

Results could be useful to producers for orienting their offerings to specific consumer targets, and, on the other hand, they could support policymakers in introducing appropriate certifications to reduce information asymmetry and facilitate consumers' purchasing choices. In fact, as organic certification, ecological labels by circular economy could be useful as green marketing tools, and they could serve as incentives for businesses to adopt sustainable environmental strategies (Donato and D'Aniello, 2022).

The paper is structured as follows: Section 2 presents the study background, Section 3 includes the study's methodology, specifically focusing on the survey design and the empirical model

employed. Section 4 shows the results obtained from the choice experiment. Section 5 and Section 6 will focus on the main conclusions and implications of the conducted study.

2. Study background

Several scholars have identified various barriers that could limit the transition to a sustainability perspective, encompassing economic, social, institutional, and market-related obstacles (de Jesus and Mendonça, 2018; Salmenperä et al., 2021; Salminen et al., 2022). Among them, the market barrier is considered particularly influential. According to the literature (Kirchherr et al., 2018; Vermunt et al., 2019), market barriers include various aspects such as lack of consumer interest in buying circular economy products, the need for more information about prices and implementation costs of innovations, or the resistance by farmers to modify traditional production processes. As previously highlighted, in this study the focus will specifically fall on market barriers, and to this aim two perspectives will be considered: the demand and the supply side.

From the supply side, the circular economy is increasingly developing interest in the public debate (Lahti et al., 2018; Santa-Maria et al., 2021; Urbinati et al., 2017). The growing pressure on resources and increased awareness of the Earth's vulnerability make the widespread take-make-dispose model no longer sustainable. The main goal of EC is to promote sustainable production and consumption patterns that close the resource cycle (Ghisellini et al., 2016; Gusmerotti et al., 2019). Therefore, there is a need for a shift from the current linear system to a circular economy approach (Goyal et al., 2016). The agricultural sector is the only one that has already begun a sustainable transition, reducing 20 percent of greenhouse gas emissions since 1994 (Peters and Hertwich, 2008). Despite this, agricultural activities remain among the main climate change drivers. As highlighted by many scholars (Beckman et al., 2020; Thyberg and Tonjes, 2016), the agri-food system is responsible for around the 30 per cent of the total greenhouse gas emissions. In addition, the agri-food system involves the overuse of natural resources and contributes to a very high percentage of wasted food (Gallagher et al., 2022). Moreover, food production contributes significantly to atmospheric pollution, soil degradation and biodiversity loss. Promoting responsible consumer behaviour, informed purchasing choices and label information could increase awareness among consumers who are increasingly concerned about the environmental impact of food production and consumption (Sala et al., 2017; Stiletto and Trestini, 2022). In this scenario, businesses, universities, research centres, institutions and citizens are all called upon to contribute to the transition to circular production, distribution, and consumption systems (Sisto et al., 2020; Del Vecchio et al., 2021).

In such a situation, one of the many challenges that consumers have to face is asymmetric information. Certification is recognised as one of the key mechanisms for addressing this problem.

Through the use of certification, producers can employ labels as voluntary signals of quality, thereby informing the market about otherwise unobservable and unverifiable attributes of the product or process. However, in the context of the circular economy, further progresses in implementing certifications for food products are required (Pretner et al., 2021). In fact, although the EC is already studying the introduction of product labels to certify the production process's circularity, currently more process certifications for food packaging, proving the use of this approach are required. Indeed, to date, there are only private certifications indicating the circular economy, such as i) BS 8001:2017 is a standard published by the British Standards Institute to implement circular economy guidelines and ii) AFNOR XP X30-901, the French standard for defining the circular management of a company (Urain et al., 2022). However, from a business perspective, for the long-term implementation of CE principles, the costs incurred by companies must be offset by a premium price for products bearing CE labels. If these costs outweigh the benefits, a market failure is likely to occur (Del Giudice et al., 2018). This underscores the importance, as our study also does, of investigating the existence of such a premium in a market context crowded with various certifications.

Furthermore, society at large, which includes consumers, remains far from possessing a comprehensive understanding of the concept and implications of the circular economy, as indicated by Vargas-Merino et al. (2022). Consequently, this study aims to examine whether students with varying levels of knowledge on sustainability manifest different price premiums for products bearing CE certification. The pivotal role of education is increasingly scrutinized in the literature, yielding two essential findings: i) the university period is often considered a time of significant life changes for most students, particularly in terms of autonomy in food choices. Research suggests that young adulthood is a critical phase for establishing eating behaviours that persist throughout life (Deliens et al., 2014); ii) a positive correlation exists between education and pro-environmental behaviour (Meyer, 2015).

In this study, we examine consumer preferences for fruit juice produced by a food company that is hypothetically certified under AFNOR XP X30-901. In particular, the certification attests that the organization efficiently utilizes resources in a manner that maximizes the retention of the economic value of products, materials, and resources for an extended period (de Arroyabe et al., 2021; Urain et al., 2022). This approach is evaluated in the context of the seven key action areas of the circular economy: sustainable procurement, eco-design, industrial symbiosis, functional economy, responsible consumption, extension of service life, and the effective management of materials and products at the end of their life cycle. These action areas are, in turn, aligned with the three principal dimensions of sustainability: environmental, economic, and social (AFNOR, 2020). Moreover, this study aims to compare circular economy certification to the organic certification. Specifically, it

explores the effects of introducing such a CE certification in contexts where other labels already exist on the market, namely the organic ones. As discussed by Borrello et al. (2022), the mere presence of multiple labels does not inherently signal an advantage to consumers (Barreiro-Hurle et al., 2010). Interactions between these various certifications—whether they conflict, are redundant, or complement each other—can result in unpredictable pricing premiums. It should be noted that the choices presented in this study are hypothetical; to the best of our knowledge, although rare cases exist among food processors, no fruit juice companies in Italy have yet attained this particular certification, given its novelty. Nevertheless, the absence of such certified entities in Italy renders the investigation particularly pertinent, especially considering the scarcity of scholarly attention devoted to this subject in the existing literature.

3. Data and Methods

3.1 Choice experiment

Research increasingly utilises discrete choice models to analyse individuals' decision-making processes (Grunert, 2005). Several studies in the literature employ this approach to evaluate how product attributes can influence consumers' purchasing or preference choices (Gracia and de Magistris, 2008; Kamphuis et al., 2015; Lizin et al., 2022). Specifically, individuals' choices are assessed using an experimental design. This approach is advantageous in cases where evaluations need to be made on attributes of a product or products that still need to be made available or present in the market. The underlying idea of this method is that a product is a combination of attributes, and each consumer decides among alternatives during various stages of the purchase process (Lancaster, 2016).

As mentioned earlier, since the objective was to examine the impact of circular economy labels and its complementarity or substitution to other "green" labels, three essential attributes for this purpose were selected. Specifically, two attributes were dichotomous, indicating the presence or absence of *organic* and *circular economy* labels. While consumers are familiar with organic labelling, CE labels interpretation may still be confusing (Kuchler et al., 2020). The third attribute was the price, which was divided into three levels. We opted for a lower price level (€2.50 for 750 ml of product), a medium price level (€4.25 for 750 ml of product), and a higher price level (€5.65 for 750 ml of product). The average price of juices in different supermarkets and hypermarkets was considered to determine the price levels[4]. On the other hand, the existing literature that has used prices as an

[4] https://www.trovaprezzi.it

attribute for fruit juices was consulted (see Luckow and Delahunty, 2004 or Otieno and Nyikal, 2017). Table 1 provides an overview of the chosen attributes and levels for the choice set.

Table 1. Attributes and levels considered

Attributes	Levels Definition
Organic label	Absence
	Presence
Circular economy label	Absence
	Presence
Price	€2.50
	€4.25
	€5.65

Source: our elaboration

A pilot questionnaire was constructed before distributing the final version through social media and university groups in Italy. This decision was driven by the limited knowledge of the coefficient to be included in the efficient design regarding the circular economy labelling attribute. After administering the pretest to 30 respondents, initial analyses were conducted, which allowed the determination of the efficient design for the choice sets.

The D-optimal design employed in this study comprised 12 possible combinations. The design was generated using the modified Fedorov algorithm (Carlsson and Martinsson, 2003; Zwerina et al., 1996) which maximises the D-efficiency of the design based on the covariance matrix of the conditional logit model. The design with the highest D-efficiency coefficient (1.03) was chosen after several iterations. These combinations were organised into three blocks, and each participant was presented with four choice sets. In each choice set, participants were asked to express their preference between two multi-attribute alternatives (options A and B) and a "no-buy" option (C) (Hensher et al., 2015). Options A and B differed in the levels of each attribute, allowing participants to compare and evaluate their preferences. The "no-buy" option allowed for a realistic purchase scenario, wherein participants could opt not to purchase the product if its characteristics did not align with their preferences (Stiletto and Trestini, 2022).

3.2 Empirical model

When participating in choice experiments, respondents evaluate and compare the available alternatives to choose the option that provides the highest utility (Gracia and de Magistris, 2008). It is assumed that individuals derive utility from the characteristics that describe a product rather than the product itself (Lancaster, 1966).

Consumers' preferences for product options were examined using the theoretical framework of the Random Utility Model (RUM) developed by McFadden (2001) and the Conditional Logit technique for estimating model parameters (Train, 2009). To illustrate, considering a set of *C* juice alternatives presented to each *i*-th consumer, the utility associated with option *c* can be expressed as a linear function of all ***h*** attributes and levels specific to product option *c*:

$$U_c^i = h_c' \Omega + v_c^i \quad (1)$$

where h_c represents the vector of product attributes, **Ω** stands for a parameter vector, and the term v_c^i accounts for the stochastic error element. The model assumes that a consumer selects product alternative *c* over *k* if it maximises their expected utility: $U_c^i \geq U_k^i$, where *c* and *k* are alternatives within the set *C*, and $k \neq c$.

In the present model, the observed choice can be translated into probabilities. Mathematically, the probability that the *i*-th consumer selects a specific product alternative *c* out of all the available alternatives in set *C* is determined by the probability that the utility of alternative *c* is greater than or equal to the utilities of other proposed options: $p(U_c^i) = p\{U_c^i > U_k^i, \dots, U_C^i\}$. Consequently, the parameter estimates denoted by **Ω** reveal how the product attributes influence the likelihood of a certain option being chosen. This enables the identification of how the three product attributes affect consumers' decisions. The model parameters were estimated using the maximum likelihood estimator under the assumption of fixed parameter specifications for conditional logit (Amemiya, 1985).

The study employed two models: a conditional logit model considering only main effects with the interaction of both certifications, and another conditional logit model incorporating interaction effects of attending training or university courses focused on environmental sustainability. The primary aim of the initial conditional logit model was to assess how the chosen attributes impact decision-making within the experiment.

After estimating both models, the Marginal Willingness To Pay (MWTP) was calculated. This involved determining the ratio of the parameter for non-monetary attributes to the price parameter, which was then multiplied by negative one.

3.3 Survey design

To implement the analysis, a questionnaire targeting Italian university students, PhD students, or research fellows, between 18 and 30 years, was constructed. The selected sample was chosen because it could represent the potential marketing target for interested green food producers. Also, it is homogeneous in other important characteristics such as age, income, and purchasing behaviour and consequently, it allowed to isolate the effect of education on consumers' WTP.

Firstly, the questionnaire provided information on privacy and an explanation of the research objectives, preparing the respondent for the compilation. Subsequently, it included one screening question to select only the eligible sample. The following sections included questions regarding the respondent's sociodemographic characteristics and their knowledge about organic certifications or circular economy concepts. A general food purchasing habits were assessed in a specific section. The core of the questionnaire was dedicated to the choice experiment. Finally, the last sections of the questionnaire investigated the specific purchasing habits related to fruit juices.

It is important to highlight that no questionnaire section included additional information or a definition of environmental sustainability and circular economy. This choice aimed to capture potential consumers' awareness of the sustainability issues without giving any other information and to simulate a typical situation during the purchasing process. The survey was conducted online using Google Forms between March and June 2023.

4. Results

4.1 Descriptive Statistics of the Sample

A total of 415 respondents participated in the survey, nevertheless 62 of them were excluded for the following reasons: i) not being university students, PhD students, or research fellows, ii) not providing informed consent for the questionnaire, and iii) being above the age of 30.

Consequently, the results refer to 353 valid questionnaires. Descriptive statistics of the sample are presented in Table 2. Most respondents are women, accounting for 71.1% of the sample, while a significant portion (37.1%) falls within the age range of 21 to 23 years. Concerning the geographical distribution of the sample, it is evenly divided across all parts of Italy, with a slightly higher percentage for the south and islands (45.3%). Regarding educational attainment, 47.3% reported having a bachelor's degree, 42.8% a master's degree and only around 10% reported a higher level of education. Approximately half of the respondents reported a monthly family income of around €2550. About engagement in seminars, university courses, and training programs on environmental sustainability and the circular economy, 65.2% of the sample reported participating in at least one. In comparison, 34.8% had not taken specialised courses on these topics. Finally, one of the main findings

is that 80% of the sample exhibited a good level of knowledge regarding organic certification (83%) and the circular economy (81.6%).

Table 2. Descriptive statistics of the sample

Variable	Item	Frequency	Percentage (%)
Gender	Female	251	71.1
	Male	98	27.8
	Other	4	1.1
Age	18-20 years	117	33.1
	21-23 years	131	37.1
	24-26 years	72	20.4
	27-29 years	33	9.4
Region	North	72	20.4
	Center	121	34.3
	South and islands	160	45.3
Education	Bachelor degree	167	47.3
	Master's degree	151	42.8
	Other	35	9.9
Income	Below €2500/month	103	29.2
	About €2500/month	178	50.4
	Above €2500/month	72	20.4
Courses/seminars/lessons about sustainability	Yes	230	65.2
	No	123	34.8
Grocery shopping per week	Below €50	142	40.2
	€51-€100	160	45.3
	€101-€150	40	11.3
	Above 150	11	3.2
Healthy product	1-2 times a week	174	49.3
	>3 times a week	51	14.4
	Never	28	7.9
	<1 times a month	100	28.4
Packaging	Unconcerned	87	24.6
	Plastic	11	3.1
	Tetra Pak	130	36.9
	Glass	125	35.4
Consumer knowledge of organic product	Yes	293	83.0
	No	41	11.6
	I don't know	19	5.4
Consumer knowledge of circular economy	Yes	288	81.6
	No	22	6.2
	I don't know	43	12.2

Source: our elaboration

4.2 Conditional logit estimates

Based on the described variables, a conditional logit model was implemented. Table 3 shows the estimated coefficients, all of which are highly significant. Considering that the coefficients obtained can be meaningfully interpreted by considering their signs, it is possible to highlight

significant results. Specifically, the price coefficient and the no-buy option have negative coefficients, while the attributes related to the organic and CE certifications have positive coefficients, showing their positive influence on purchase decisions. Furthermore, the interaction between organic and circular economy certifications exhibited a negative coefficient, suggesting that when these labels are presented together, their combined effect is less than additive.

Table 3. Conditional logit model

	Coef.	Std. Err.	z	p-value
Price	-0.773	0.060	-12.79	0.000
Organic label	1.310	0.137	9.58	0.000
Circular economy label	0.746	0.130	5.73	0.000
Organic label × CE label	-0.527	0.183	-2.88	0.004
No-buy option	-1.466	0.143	-10.24	0.000

Source: our elaboration

Additionally, it was observed that there is a positive correlation between consumers with good knowledge of circular economy and sustainable topics and those who attended training courses or seminars on these subjects (Table 4). Therefore, two subgroups were created, and a new conditional logit model was implemented to measure the marginal utilities for students who have attended environmental sustainability training courses and students who have not. The results of the second model are presented in Table 5.

Table 4. Pearson's correlation

	Training	Knowledge of CE	Knowledge of Organic
Training	1.000		
Knowledge of CE	0.103*	1.000	
Knowledge of Organic	0.112**	0.192***	1.000

*Notes: CE = Circular Economy; Training = students who have attended environmental sustainability training courses; * p < 0.10; ** p < 0.05; *** p < 0.01.*

Table 5. Conditional logit model with interactions

	Coef.	Std. Err.	z	p-value
Price	-0.779	0.060	-12.98	0.000
Organic label	1.312	0.201	6.54	0.000
CE label	0.247	0.201	1.23	0.220
Organic label × CE label	0.161	0.286	0.56	0.574
No-buy option	-1.466	0.143	-10.27	0.000
Organic label × Training	0.023	0.241	0.10	0.922
CE label × Training	0.762	0.244	3.12	0.002
Organic label × CE label × Training	-1.058	0.377	-2.81	0.005

Notes: CE = Circular Economy; Training = students who have attended environmental sustainability training courses.

The results indicate that both trained and untrained students are equally willing to pay the same amount for a product with organic certification. However, it is noteworthy that only respondents who have participated in an environmental sustainability training course are willing to pay a premium for products with circular economy certification. While both labels, when presented individually, positively influence product choice for trained students, it is interesting to observe that when presented together, the impact of the circular economy label does not significantly surpass the effect of the organic label alone ($\chi^2_{(1)} = 0.63$; $p > .10$).

As concerns the estimate of the MWTP, the hypothetical nature of choice experiments often leads to inflated estimates of MWTP (Menapace and Raffaelli, 2020). However, the emphasis of the analysis should focus less on these absolute figures and more on the relative values across different attributes. Such comparative measures are invaluable for understanding consumer preferences and market segmentation, especially when variations across different consumer groups are considered.

As indicated in Table 6, respondents were willing to pay an additional 1.69€ for a certified organic juice compared with an identical product without certification. The most interesting output of the analysis is that respondents are willing to pay a premium price of 0.96€ for a product labelled with circular economy attributes compared to the same product without certification. Moreover, the estimates revealed that the combined effect of the two labels was slightly greater, but statistically significant (+0.28€ in MWTP), than that of the organic certification when presented alone ($\chi^2_{(1)} =$

4.17; $p < .05$). Finally, the results indicate that solely students who have engaged in environmental sustainability training courses were willing to pay a premium price for circular economy-certified juice, while there was no discernible difference in MWTP for organic certification between trained and untrained respondents.

Table 6. MWTP for organic and circular economy certification

	Whole sample	Trained students	Untrained students
Organic label	1.69€^{a1}	1.71€^{a1}	1.68€^{a1}
Circular economy label	0.96€^{b1}	1.30€^{b2}	0.32€^{b3}
Both labels	1.97€^{c1}	1.86€^{a1}	2.21€^{a1}

Notes: Different superscript letters/numbers indicate significant differences within a column/row at the 5% level.

5. Discussion

The conditional logit results consistently shed light on consumer readiness to recognize circular economy-certified products. Specifically, the findings in Table 3 align with existing literature, as the negative coefficients associated with the variables "price" and "no-buy options" indicate:

i) Higher prices decrease the likelihood of selecting a specific product (Krovetz, 2016).

ii) A decrease in individual utility occurs when the preference is not to purchase a choice set (Barreiro-Hurle et al., 2010).

Furthermore, the positive effect of the "organic label" variable confirms respondents' awareness and the impact of this labelling on consumers, consistent with previous research on organic certification (Aprile and Punzo, 2022; Rousseau and Vranken, 2013).

Notably, labelling a product as originating from the circular economy also has a positive coefficient, signifying consumers' awareness of the need for companies to adapt and preserve resources. This positive influence supports sustainable transitions and reduces market barriers' impact (Kirchherr et al., 2018; Vermunt et al., 2019).

Table 5 unveils additional significant insights: only students who have participated in environmental sustainability training courses are willing to pay a premium price for circular economy-certified juice, with a MWTP of 1.30€. This result highlights the significance of specific sustainability-related education in shaping pro-environmental behaviours (Meyer, 2015).

These findings underscore several important points. Firstly, the study establishes a preference for organic certification over circular economy certification due to consumers' familiarity, enabling them to readily recognize and associate it with products. Secondly, the consumer's willingness to pay a premium price for products from the circular economy suggests promising market potential, even without current certification. However, our results reveal the presence of an 'embedding effect' of CE certification within the organic one. In simpler terms, we observe a situation where the concurrent presentation of both labels, which theoretically convey distinct information, results in the same premium as using only the organic label. As stated by Borrello et al. (2022), this could suggest that students derive utility from the concept of "sustainability," which they perceive as already encompassed by the organic certification, thereby assigning no additional value to the CE label, even when it may technically represent a higher degree of sustainability.

6. Concluding remarks

Considering the need to investigate barriers to sustainable transition, this study is the first step in analysing the existence of market barriers by analysing the WTP for products with circular economy certification. The analysis focused on university students because: i) the university years represent a susceptible period because environmental awareness and future purchasing and consumption behaviours are formed; ii) the increasingly recognized role of training courses in fostering the sustainable transition; iii) the desire to have a homogeneous group of respondents that did not differ either by income or other sociodemographic characteristics. Thanks to the implementation of two conditional logit models, achieving the study's objective of recording positive marginal WTP for circular economy products was possible. Furthermore, when considering two groups of respondents, those who attended specialised courses and those who were never trained on environmental sustainability or circular economy, there are very different MWTPs between the groups. Results are significant from several perspectives and suggest important insights.

On the consumer side, even if the choice experiment was only hypothetical, the positive MWTP associated to CE label indicates that there could be a potential market ready to buy which recognizes certification from the circular economy. Moreover, these results can represent an important incentive for firms. As mentioned at the beginning, market barriers are a significant challenge for the agricultural sector. By encouraging businesses to adopt circular economy practices, there can be a positive response and potential market for these products. However, in the presence of an organic certification, the additive value of the circular economy certification is diminished by more than half, also to trained students.

Additionally, the study emphasises the crucial role of universities as increasingly important actors in sustainable transition, either for their educational role or giving their scientific support to the innovation adoption processes. Thus, the direction taken by various policy documents, as well as the SDGs, of focusing on the critical role of universities and incentivizing specialised training can be a suitable strategy to stimulate conscious behaviours to support a sustainable transition.

However, the study presents some limitations. Responses can be influenced by significant biases caused by the lack of realism in the study scenario (Hensher et al., 2015). In such cases, actual future behaviour may differ from the responses and choices the respondent makes. Future steps will involve implementing these considerations and including other attributes in the analysis. For example, brand influence could play a significant role in consumer choices, as certification on a product with a recognized brand may have more relevance than certification imposed on a lesser-known brand.

In this context, this study represents an interesting starting point for analysing and finding strategies to limit the effects of the various barriers hindering the implementation of a sustainable transition that addresses economic, environmental and social aspects.

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Chapter 6

Integrating micro and macro perspectives: Unveiling the multilevel dynamics of proactive sustainability strategies in the agricultural sector

Naomi di Santo[a], Maria Carmela Annosi[b], Roberta Sisto[a] , Francesco Paolo Appio[c*]

[a] Department of Economics, Management and Territory. University of Foggia

[b] Wageningen University, the Netherlands

[c] Paris School of Business, France

*Corresponding Author: f.appio@psbedu.paris

Integrating micro and macro perspectives: Unveiling the multilevel dynamics of proactive sustainability strategies in the agricultural sector

1. Introduction

Sustainability is undeniably one of the most critical challenges facing organizations in our contemporary world. Orlitzky et al. (2003) conducted a comprehensive and rigorous meta-analysis to investigate the relationships between social/environmental responsibility (as different dimensions of sustainability) and corporate financial performance. Their research revealed that, in general, there is a positive correlation between social responsibility and, to a somewhat lesser extent, environmental responsibility, and improved corporate financial performance. These findings provide some empirical support for the notion that firms' efforts aimed at driving social change can have a favourable impact on business outcomes.

Nevertheless, it is imperative to progress beyond this examination and explore the complex dynamics associated with corporate proactive involvement in social change and environmental strategies. These proactive strategies encompass deliberate, voluntary practices that extend beyond legal mandates, such as efforts to reduce waste and prevent pollution at its source. The discourse surrounding the firm-level proactive contribution to sustainability has predominantly centered on macro-level considerations (Godfrey and Hatch, 2007). An exemplary case is the work of Shrivastava (1995) discussing the implications of ecologically sustainable development for corporations. Other studies have focused on the application of quantitative research methodologies to debate the question of whether businesses can achieve an improved commercial and/or competitive advantage through improved environmental behaviour (e.g., Dechant and Altman, 1994; Hart, 1995; Henriques and Sadorsky, 1996; Sadorsky, 1999; Russo and Fouts, 1997; Walley and Whitehead, 1994), which then negatively affect the understanding of the implementation of sustainability in on-ground operations and the related implications. Many other studies have also analysed the drivers of sustainability at the organizational level (e.g., Epstein and Roy, 2001; Giunipero et al., 2012; Lozano, 2015; Ferlie et al., 2010; Gonzalez-Benito and Gonzalez-Benito, 2005; Rueda-Manzanares et al., 2008). Consultants and scholars have emphasized the importance of firms' proactive sustainability strategies since the 1990s, highlighting their critical role in addressing environmental concerns (Aragón-Correa and Rubio-Lopez, 2007).

To analyse the dynamics associated with proactive sustainability strategies, the concept of sustainability should no longer be confined solely to the macro level but should be deeply integrated into the micro-level operations of firms. This integration has the potential to yield mutual benefits for businesses and society as a whole. However, current literature is paying less attention to how

sustainability is permeated at micro-level and how these micro-level factors can justify firms' proactive contribution to sustainability strategies (Aktar et al., 2018). Studies on the internal organizational factors determining firms' proactive contribution to sustainability tend to rely mainly on the analysis of attitudes and competence of organizational actors avoiding to examine the influence of organizational characteristics and capabilities. However, in line with Russo and Fouts (1997), we contend that firms leaning towards a compliance-oriented approach will possess distinct resource foundations compared to those inclined towards a proactive approach, and this policy decision will impact their profit-generating capabilities. The preliminary work of Sharma and Vredenburg (1998) reported evidence of the development of some organizational capabilities as associated to proactive sustainability strategy. Other authors have emphasized the importance of developing organizational capabilities to support proactive sustainability strategies (Aragón-Correa and Sharma, 2003; Russo, 2009; Zhu et al., 2013). Since Godfrey and Hatch (2007), research works have called for the usage of micro-level theorising to progress in our understanding of firms' contribution to sustainability and proposed to connect sustainability concerns with micro-level firms' characteristics (including capabilities) that have a direct impact on customers. Indeed, despite Drucker (1973) noted firms should function as vital organs of society, with their primary purpose extending beyond profit making, the true essence of firms' activities lies in the creation of value for the customer. This value creation serves as a blueprint for advancing sustainability strategies. As a consequence, when businesses prioritize enhancing customer value within a framework of sustainability, they stand to gain additional benefits, such as heightened customer loyalty, improved brand image (as seen in Miles and Covin, 2000), and increased appeal to socially and environmentally conscious investors—an increasingly influential primary stakeholder group (Schueth, 2003; Sethi, 2005; Social Investment Forum, 2007). And even when the full environmental and social costs of business actions are internalized, marketing capability plays a pivotal role in enhancing long-term firm profitability (Sharma et al., 2010).

Consequently, understanding the micro-foundations behind the elaborations of firms' proactive sustainability strategies implies examining the relationship between firm's economic systems and the larger dynamic within their environment composed by an ecosystems of actors involved and the ability of firms to adapt while recognizing the opportunities inherent in sustainability practices. Indeed, past literature (e.g., Miemczyk et al., 2012; Roome, 2001; Schoenherr et al., 2015; Stea et al., 2016) has emphasized the influence of the social interactions within their proximal environment on sustainability strategies. Along the same line of reasoning, Hinings and Greenwood (2002) contend that it is essential for firms to acknowledge their role in their local context and actively contribute to it. Thus, even though previous studies have put forward several potential organizational capabilities

and enablers, the relationships and interplay across different levels of analysis including the firms and its social and economic environment are still not fully understood (Hina et al., 2022; Urbinati et al., 2021).

Specifically, more studies are required to understand how contextual factors enable or inhibit organisations and how firms can leverage enabling factors and overcome inhibiting factors (Urbinati et al., 2021). Examining this interplay provides important insights into wider micro and macro-level factors controlling the proactive contribution to sustainability (Hina et al., 2022; Sarasini and Linder, 2018; Urbinati et al., 2020). Analysing the role of micro-foundations including firms' characteristics and their relationships with their ecosystem of actors in their economic and social environment and their impact on the emergence of proactive sustainability strategies is still in its infancy (Akhtar et al., 2018).

In this study, we integrate this micro and macro level view seldom combined to build a multilevel model of how organizations proactively participate to the sustainability strategies. We know little about how processes at the basis of firms' interactions with the ecosystem and the characteristics of firms work across level of analysis as most of the studies on proactive sustainability strategies focus either on micro (despite very few) or macro level focusing on only one level. Ecosystems of actors established for sustainable development such as Local Action Groups (Bruckmeier, 2000) - in particular with intense work collaborations between firms and local governments – are ideal context for this study. In this context, the scope of boosting local development is extreme in question, the interactions between firm and the central administration are demanded to the firms as no codified rules given for incentivizing the local participation and the central administration trying to regulate the collection of set of cultural and political resources (e.g., policies and procedures) that other firms can use selectively and strategically. Drawing on 27 interviews, archival data, and visit observations at the ecosystem level, we shed light on three emerging critical dimensions: (1) the managerial cognitions that drive active participation in ecosystems, (2) the essential routines that serve as prerequisites for sustainable ecosystem engagement, and (3) the ecosystem configurations conducive to value creation and competitive advantage, especially in the context of proactive involvement in sustainability strategies. As we explore these dimensions, we develop a firm-specific theory that underpins the growth and success of an ecosystem aiming at sustainable development.

2. Theoretical background

2.1 Setting the stage: Sustainability and firm strategy

The dawn of the 21st century has observed an escalating emphasis on sustainability as a pivotal driver in the realm of corporate strategy (Snihur and Bocken, 2022). Historically, firms' mission primarily focused on profit generation, placing economic priorities over environmental and social concerns

(Kudłak and Low, 2015). The focus has since shifted, with contemporary firms being compelled, both internally and externally, to broaden their operational and strategic horizons to encompass the triple bottom line - people, planet, and profit (Elkington, 1997; Willard, 2012).

The role of sustainability in contemporary firms has undergone a significant transformation. From being regarded as an ancillary concern, it has been ushered to the forefront of strategic priorities. This shift can be attributed to a multitude of factors, including mounting stakeholder pressures, shifting consumer preferences, and increasing recognition of the long-term benefits of sustainable operations (Laszlo, 2008; Porter and Kramer, 2011; Laszlo and Zhexembayeva, 2017). Companies now view sustainability not just as a moral obligation, but also as an avenue for innovation, competitive advantage, and market differentiation (Gabler et al., 2023; Husted and Allen, 2007; Chiesa et al., 1999).

Porter and Kramer (2011) further postulate the concept of 'Creating Shared Value', arguing that firms can generate economic value while simultaneously addressing societal challenges. Recent studies underscore the growing centrality of environmental ethics in corporate strategy, emphasizing its potential for competitive advantage (Gabler et al., 2023). This transition recognizes firms as collections of individuals, including 'environmental stewards' deeply committed to ecological concerns. Through the lens of the Natural Resource-Based View, the research suggests that by building eco-capabilities, top management can align with these stewards, enhancing job meaningfulness. This alignment boosts employee advocacy and customer satisfaction, illustrating the pervasive influence of corporate environmental ethics across firm levels and to external stakeholders (Gabler et al., 2023). This symbiotic relationship, where societal progression complements firm success, posits that firms can reconceive products and markets, redefine productivity in the value chain, and bolster local cluster development to achieve sustainability goals.

Parallel to this, Elkington (1997) introduced the concept of the triple bottom line, which emphasizes three dimensions of performance: social, environmental, and financial. This model has since acted as a linchpin for corporations, urging them to adopt strategies that concurrently advance economic, environmental, and societal objectives. Elkington's (1997) pioneering concept of the triple bottom line reshaped the manner in which firms evaluate their overall performance. By suggesting that companies consider not just financial measures but also social and environmental impacts, the model broadened the parameters of corporate responsibility. Willard (2012) further elaborated on this paradigm, emphasizing the intertwined nature of these three dimensions. Instead of viewing them as separate or even competing elements, Willard posits that they are symbiotic, each influencing and reinforcing the other. This comprehensive perspective has since been recognized by many firms as a holistic approach to strategy development. By integrating economic, environmental, and societal

goals, firms are not only able to achieve sustainable growth but also foster a more resilient and responsible ethos. The triple bottom line thus serves as both a framework for assessment and a strategic roadmap for corporations aspiring to create value that transcends mere financial metrics.

Building upon the foundational understanding of sustainability's evolving role in firm strategy, there arises an essential distinction in analytical focus that deserves attention. The journey of sustainability from a strategic ancillary to a central focus has been shaped by factors characterizing both the internal firms and the broader environment. These influences can be dissected through different lenses—ranging from the micro-level, where the complex individual behaviours and decisions within firms play out, to the macro-level, where broader industry dynamics and societal expectations come to the fore. Such a duality in perspectives has been instrumental in shaping the academic and practical discourse around firm sustainability. As we delve deeper, we will explore the merits and potential limitations of these micro and macro viewpoints, striving to weave them together for a richer understanding of the sustainability landscape.

2.2 Duality of micro and macro views in sustainability

The academic landscape surrounding firm sustainability, for many years, has reflected a division of analytical focus. On one hand, research often delves deeply into the micro-level nuances of sustainability, emphasizing individual behaviours, decision-making processes, and localized actions within firms (Barney et al., 2001). On the other hand, a more macro perspective examines the broader industry dynamics, regulatory environments, societal expectations, and other external factors that shape firms' sustainability agendas (Aguinis and Glavas, 2012). Li et al. (2016) underscore this prevailing dichotomy, highlighting the propensity of researchers to either zoom into the granular details or to take a step back and evaluate the wider landscape. While both views are instrumental in their own right — the former elucidating the ground realities and nuances of everyday firm life, and the latter offering a panoramic view of the systemic forces at play — their parallel tracks often run without converging. The result is a potential gap in our collective understanding, a blind spot that fails to account for the dynamic interplay between the micro and macro realms of sustainability.

This dichotomous approach, though common, has its limitations. For instance, Felin et al. (2015) stress the importance of micro-foundations in understanding broader firm phenomena. By focusing solely on macro-level influences, research might miss the underlying individual-level actions and interactions that drive larger trends. Similarly, without a macro lens, the influence of broader socio-economic, cultural, and regulatory factors on individual behaviours within firms might be overlooked (George et al., 2014). Moreover, scholars like Margolis and Walsh (2003) have contended that an undue emphasis on one level at the expense of the other could produce skewed insights, potentially limiting the applicability and robustness of findings. They argue for a more integrative approach, one

that melds the insights gleaned from both micro and macro analyses, to craft a comprehensive understanding of sustainability in firms.

It emerges that while the distinct foci on micro and macro perspectives have undeniably enriched the discourse on firm sustainability, there is an emerging call to bridge the divide. By interweaving these perspectives, academia might be better poised to grasp the multifaceted nature of sustainability, appreciating how individual actions intertwine with systemic forces to shape sustainable trajectories for firms.

More precisely, at the micro-level, the emphasis often rests on understanding the individual components, processes, and actors within a firm that influence and are influenced by sustainability initiatives. This approach recognizes the importance of internal firm dynamics, the behaviours and beliefs of individual employees, and the smaller-scale processes that underpin the broader strategic direction. However, this micro-level view, while essential, is just one facet of the sustainability paradigm.

Conversely, the macro perspective offers a broader, more holistic view, focusing on external pressures, industry standards, regulatory environments, and other overarching factors that influence firm strategies. These macro-level insights provide context, highlighting how exogenous factors can shape, constrain, or catalyze a firm's sustainability initiatives.

Yet, as Godfrey and Hatch (2007) assert, one cannot overlook the significance of micro-foundations when endeavouring to understand sustainability at a firm level. Micro-foundations, as the underpinnings of broader theories bring forth the mechanisms, behaviours, and interactions at the grassroots level that cumulatively influence firm outcomes. By analyzing these micro-processes, researchers can uncover the intricate webs of cause and effect that lay the groundwork for macro-level phenomena. This is particularly pertinent in the context of sustainability, where individual beliefs, actions, and decision-making processes (Haffar and Searcy, 2019) can have ripple effects on a firm's broader sustainability strategies and outcomes.

Overall, while the existing literature has contributed significantly by examining sustainability through either a micro or macro lens, there is a growing imperative to integrate these perspectives. Recognizing the symbiotic relationship between individual-level processes and broader systemic factors offers a more holistic, nuanced understanding of sustainability, ultimately equipping firms with the insights needed to navigate the multifaceted challenges of sustainable development.

Navigating the dichotomy between the micro and macro perspectives of sustainability is analogous to understanding the trees in relation to the forest. As the discourse evolves, the ecosystem perspective emerges as a bridge connecting these seemingly contrasting views, positioning firms within a dynamic web of interrelated entities. The idea of ecosystems in sustainability extends the

understanding that firms do not operate in isolation. This integrative lens reflects a growing acknowledgment that the sustainability of an individual entity is interdependent on the well-being of the entire system. Thus, while the micro-level actions of individual firms are pivotal, they are part of a larger mosaic of actions at the macro-level, intricately intertwined and mutually impactful. In this evolving landscape, the ecosystem perspective serves as a conduit that harmoniously merges the micro with the macro, enriching our understanding of sustainability in its multifaceted dimensions.

2.3 Ecosystems: The nexus of micro and macro in sustainability?

The concept of ecosystems in firm studies represents a shift from viewing firms as isolated entities to perceiving them as interconnected nodes within a larger network. Such a perspective takes into account not only the firm itself but its relationship with a large number of actors, including suppliers, customers, competitors, regulatory bodies, and even civil society firms. Van Zanten and Van Tulder (2021) and Ashraf et al. (2019) emphasize the centrality of these interactions, illustrating how firms are inextricably woven into the fabric of broader socio-economic, environmental, and institutional landscapes.

Moore (1993) was among the early proponents of the business ecosystem model, describing it as a symbiotic environment where companies co-evolve their capabilities and roles based on the shifting contexts of their networks. In such ecosystems, the success of a single firm is intertwined with the health and prosperity of the entire system. This relational dynamic implies that sustainability initiatives by one firm can have ripple effects, impacting others within the ecosystem, and vice-versa (Adner and Kapoor, 2010).

Building upon the ecosystems framework, there is a burgeoning emphasis on multi-level models that endeavour to merge the micro and macro views, providing a more holistic understanding of sustainability strategies. Such models recognize that individual actions (micro) within firms do not occur in a vacuum; they are shaped by, and in turn shape, broader industry and societal trends (macro). Central to this multi-level perspective is the idea that there exists a continuous feedback loop between the micro and macro dimensions. For instance, individual-level initiatives within a firm can collectively culminate into industry-wide best practices or norms. Conversely, broader industry trends or regulatory changes can trickle down, influencing individual behaviours and decision-making processes within firms (Rousseau, 1985; Klein et al., 1994).

Hitt et al. (2007) stress the need for research designs that accommodate these multi-level interactions. By doing so, scholars can better capture the complexities of sustainability strategies, understanding how they emerge, evolve, and ultimately manifest in tangible firm outcomes.

Overall, a multi-level approach to studying sustainability, underpinned by the ecosystems framework, offers a more nuanced and integrative understanding. By recognizing the interplay between

individual-level actions and broader systemic forces, such an approach can provide richer insights, guiding firms in shaping and implementing more effective sustainability strategies. The ecosystem framework's portrayal of firms as interconnected nodes within a larger tapestry underscores the significance of interdependencies and interactions in shaping sustainability trajectories. Such a perspective has naturally paved the way for nuanced inquiries into the dynamic interplay of micro and macro factors. As we transition from the established characterization of ecosystems and the need for a multi-level approach to understanding sustainability, it becomes imperative to highlight the gaps that exist in the current body of literature. While the ecosystem framework offers an all-encompassing view of firms as part of a larger network, an exhaustive dive into how micro-foundations and firm-specific characteristics influence sustainability strategies within these ecosystems remains an untapped frontier.

2.3 What is missing in the debate

The body of literature on firm sustainability has undeniably grown in depth and breadth over the past decades. However, as with any evolving academic field, there remain distinct lacunae and avenues for further exploration.

Scholars increasingly and aptly point to a significant oversight in existing studies: the role of micro-foundations and specific firm characteristics within their broader ecosystems when adopting proactive sustainability strategies. While considerable research has delineated macro-level factors and broad industry trends, there is a relative paucity in understanding how foundational elements at the micro-level (e.g., individual behaviours, internal processes, and firm-specific attributes) contribute to or detract from these strategies. Barreto (2010) argues that micro-foundations form the bedrock of any strategic initiative, and understanding them is pivotal to deciphering the mechanisms through which broader strategies unfold. Given this, the absence of a comprehensive understanding of these micro-elements represents a marked gap in the literature.

Further compounding the aforementioned gap is the siloed nature of sustainability research, with studies often heavily skewed towards either a micro or macro orientation, but not both. This dichotomous approach, while valuable in isolation, risks offering a fragmented view of the sustainability landscape. There is a pressing need to bridge this divide and adopt a holistic lens that seamlessly integrates both perspectives. As Pettigrew (1992) notes, to truly understand the dynamics of firm strategies and their outcomes, one must consider multi-level interactions, spanning from granular individual-level processes to overarching industry and societal influences.

In light of this, there exists a ripe opportunity for scholars to pioneer research that merges these two domains, offering insights that are both deep and broad. Such a combined perspective not only holds the promise of theoretical advancements but can also guide practitioners in more effectively

navigating the complex terrain of sustainability. Hence, while strides have been made in the realm of sustainability research, the field stands at a juncture where it can substantially benefit from filling these identified gaps. By deep diving into the micro-foundations of firm behaviours within ecosystems and synthesizing this with the macro view, academia can provide a more comprehensive roadmap for firms aiming to champion sustainability in the modern era.

In tracing the arc of sustainability's progression, our theoretical underpinnings have highlighted its journey from a peripheral to a central strategic focus. This transition underscores the nuanced dance of micro-level managerial decisions with overarching macro-level forces in sketching the course of sustainable endeavors. This balance, illustrated through key academic contributions, paints ecosystems as vibrant webs of interwoven entities, constantly influenced by the push and pull of their interdependencies.

Our aim is to craft a refined and firm-centric narrative that helps illuminating pathways that best foster the growth of ecosystems deeply anchored in sustainable development. Accordingly, the leading research question follows: *How can firms reconcile micro-level foundational elements and macro-level ecosystem configurations in order to champion proactive sustainability strategies?*

3. Data and Methods

3.1 Research setting and case selection

To address the research gap, we have chosen to focus on LAG Daunia Rurale 2020[5] and the farms situated within its geographic jurisdiction. LAG Daunia Rurale 2020 is a rural development agency operating in the Southern region of Apulia (Italy) with a primary mission of promoting sustainable development in the rural areas it serves. This is achieved by harnessing local food supply chains, fostering food production systems, and enriching the cultural and artistic heritage associated with the region. The agency places strong emphasis on regional development and sustainability within an integrated, spatial development framework, where economic diversification is prioritized, and agriculture no longer dominates.

Founded as part of an initiative by the European Commission, LAG Daunia Rurale 2020, following the L.E.A.D.E.R. approach (Liaisons Entre Actions de Développement de l'Economie Rural), secured funding in 2020. Since its launch, it successfully established public-private partnerships within the local area, including collaborations with local farms, with the overarching goal of enabling their active participation in regional development initiatives. However, no formalized regulations were introduced to ensure equitable opportunities for local farms to contribute to local development while pursuing their economic interests. This gap in governance is notable despite the existence of two

[5] https://www.galdauniarurale2020.it/ where GAL stands for Gruppi di Azione Locale (i.e. Local Action Groups).

administrative levels, featuring a regional coordination unit and a service unit responsible for network management. This service unit facilitates communication, information dissemination, and consultation among different rural stakeholders, supporting the emergence of new projects.

Research from prior studies (see Bruckmeier, 2000) has already indicated that the L.E.A.D.E.R. approach has been less effective in empowering marginalized local groups and has placed the onus on individual firms to shape L.E.A.D.E.R. projects and succeed with their own ideas. In fact, the community initiative is rooted in the principles of both endogenous development and neo-endogenous development. Key tenets include a bottom-up approach, active participation of local firms in decision-making processes, fostering public-private partnerships, promoting inter-territorial cooperation and networks, and pursuing integrated rural development. These principles collectively aim to optimize the utilization of resources and enhance overall effectiveness. Consequently, newcomers or smaller/less organized firms struggle to fully participate in the burgeoning project landscape. Despite the training initiatives provided by L.E.A.D.E.R. often result in selective exclusion by LAGs, failing to reach the groups most in need of skills development.

Given this contextual backdrop and recognizing the relevance of a firm's active participation in the LAG, we aim to identify the critical capabilities and firm-specific factors that influence the emergence of ecosystem growth such as the LAG. Our investigation seeks to elucidate the conditions under which a firm's participation in ecosystems is considered conducive to realizing firm value. Through an inductive study based on a grounded theory-building approach (Glaser and Strauss, 1967), we analysed the complex processes underlying the relationship between firms and the formed ecosystem. Through multiple case studies, the sequences of actions retrospectively reported and the transitions towards the participation to the LAG can be explored generating a rich, field-based insights into the firm-related factors responsible of the active participation into the ecosystem and having an impact on the ecosystem development.

We performed a total of 27 interviews. Specifically, we identified and selected cases following the principles of theoretical sampling (Glaser and Strass, 1967) identifying those collaborative farms, members of the LAG, that had a history of actively participation in the ecosystem and therefore showing significant interaction and exchange in the LAG with a participation into projects involving more than a small team of members. Thirteen interviews were carried out among the firms showing commitment and interest for the shared purpose of this study. As a second step, we tried to include variation in the sample in term of forms of collaboration in the LAG to create polar cases regarding their participation in the ecosystem; therefore, we also selected farms not exhibiting form of strong collaboration with the other members and being reluctant in collaborating with others having a low commitment to the shared purpose of LAG. Thus, other five farmers were introduced in the sample.

Third, we looked to secure variation in terms of roles and centrality in the ecosystems; hence, we included nine individuals occupying managerial roles in the agency in order to collect their complementary views on the evolution of emerged projects as well as on the participation of farmers. Through additional data collection, we took measures to ensure that various contextual factors, such as the age and profitability of farms and the size of their businesses, did not influence the outcomes. We conducted interviews with similar farms located in the same regions and operating at a comparable level of business activity. Our objective was to choose cases that could either replicate or expand upon existing theories (Eisenhardt, 1989).

As a result, in the first step, we selected cases that were likely to produce similar outcomes, essentially replicating the conditions that enable firms to engage with ecosystems. In the second step, we gathered cases that produced different results, specifically focusing on firms that intentionally chose not to participate in the ecosystem (a theoretical replication). Consequently, our study allowed for within-case and cross-case comparisons, which were instrumental in formulating a novel theory.

Data collected per case and data type are summarized in Table 1 and Table 2. Table 1 includes information about the LAG governance referents. Indeed, as previously mentioned, to better understand the ecosystem services currently provided in the area, we chose to have the referents involved in forming and operating the LAG in our interviews. They could provide insights into the initial mission of the LAG, its evolution over time, the barriers encountered in achieving sustainable transitions, and the ongoing projects in the area.

Table 1. Roles of the LAG governance sample

Label	Role
Referent 1	Definition Local Action Plan 2014-2020
Referent 2	Definition Local Action Plan 2014-2020
Referent 3	Definition Local Action Plan 2014-2020 and territorial marketing plan
Referent 4	Definition Local Action Plan 2014-2020
Referent 5	LAG Daunia Rurale 2020 Director
Referent 6	LAG Daunia Rurale 2020 President
Referent 7	Definition Local Action Plan 2014-2020
Referent 8	"Vazapp" rural hub component
Referent 9	"Vazapp" rural hub component

Instead, Table 2 presents the characteristics of the firms included in the study. This information includes their location, the primary product on which the firm's activity is based, the number of employees, and their association as part of LAG Daunia Rurale 2020:

Table 2. Characteristics of the firms included in the study

Label	Role	Key Products	Municipality	Number of members	GAL MEMBER
Firm A	Farmer	Olive oil	San Severo	11 members	“I don't remember when the consortium of firms was established, maybe in 2018.”
Firm B	Farmer	Olive oil	Torremaggiore	6 members	"I think one year.”
Firm C	Farmer	Olive oil	Torremaggiore	25 to 30 members	"A few years."
Firm D	Farmer	Olive oil	Torremaggiore	14 members	“But we have been members since LAG Daunia Rurale was born, I believe it was in 2013 or 2014.”
Firm E	Farmer	Wine	San Severo	5 to 6 members	"Well, I'd say for several years. I've participated in various events, the first, let's say the most important one, perhaps was in 2015."
Firm F	Farmer	Wine	Torremaggiore	4 members	"For several years."
Firm G	Farmer	Olive oil	San Severo	2-3 members	No member
Firm H	Farmer	Farmhouse	San Paolo di Civitate	5 to 7 members	Unspecified
Firm I	Farmer	Farmhouse-Olive Oil	San Paolo di Civitate	13 members	"Since the LAG was born."
Firm L	Farmer	Olive oil	Torremaggiore	5 members	No member
Firm M	Farmer	Olive oil	San Paolo Di Civitate	2 members	No member
Firm N	Farmer	Olive oil	Poggio Imperiale	3 members	No member
Firm O	Farmer	Olive oil	San Severo	2 members	No member
Firm P	Farmer	Wine	San Severo	4-5 members	Unspecified

3.2 Data collection

Between September 2022 and September 2023, one of us spent considerable working hours at the LAG Daunia Rurale 2020. Being in the governance of the agency, she had access to the agency sites and the management of the agency supported her study (Eisenhardt, 1989). Additionally, between November 2022 and June 2023, we were involved in the collection of semi-structured interviews.

Evolutionary process studies require researchers to engage extensively over time, enabling the development of interactional expertise and facilitating unhindered access to events and processes (Langley et al., 2013). Thus, we collected data relying on primary sources (Yin, 2009): 1) semi-structured interviews, 2) direct observation of the dynamics and events involving the management layer and the local farmers, and 3) archival data from internal documents. Our interviews started with questions related to the informant's role, the presence as a member of the LAG, and of the tensions experienced. They continued with questions related to the commitment the farm had to the shared purposes of LAG and then progressed with questions about the collaboration with the other members of LAG and about the conditions enabling the farm to embrace such collaborative activities together with the perceived value in participating into shared projects. The interview then ended with the examinations of the farm's relations with institutions included the management of the agency.

The interviews were primarily conducted during on-site visits and varied in duration, ranging from 40 to 60 minutes. Some interviews were conducted over the phone. It is necessary to specify that the duration of the interviews was mainly influenced by two key aspects: i) some firms interviewed were not part of the LAG membership; thus, some information was unavailable to them, leading to some unanswered questions; ii) some interviews constituted a second round of consultations, a decision made because some responses had been incomplete or required further clarification. We employed a semi-structured interview protocol, which we had developed using insights gathered from discussions with the agency's management (Fontana and Frey, 1998). In most cases, interviews were recorded and subsequently transcribed. However, in a few instances where interviewees declined to be recorded, we meticulously documented detailed notes immediately following the interviews (Yin, 2009).

Furthermore, we gathered archival data, including meeting minutes, press releases, and regular reports. These archival records served multiple purposes: they aided in preparing for interviews, allowed us to challenge statements made during interviews, and provided corroboration for the information provided. Additionally, archival data were used to validate the timeline and sequence of events as described in the interviews.

Observations made during attendance at management-level meetings served two primary objectives (Yin, 2012): firstly, the direct involvement of one of our co-authors facilitated the establishment of trust, identification of interviewees, and the overall facilitation of interviews; secondly, these observations contributed to triangulating the information obtained from archival sources and interviews, providing additional insights.

3.3 Data analysis

Starting from the individual cases, we started coding a list of empirical themes that acted as the basis for a more extensive discussion among us and to apply some deductive reasoning that led to classify these emerging themes into conceptual categories. These categories included multiple themes and reflected theoretical constructs (Corbin and Strauss, 2015). For instance, according to Smith and Lewis, (2011) we grouped the participant statement about the managerial sense of the ecosystem value for the firm under the theoretical category of "managerial preoccupation with achieving success without others' support". We also performed a cross-case analysis (Eisenhardt, 1989) to identify similar empirical themes and the theoretical categories across cases (Miles and Huberman, 1994) which they clustered into aggregate dimensions (Gioia et al., 2013). For instance, we aggregated the categories "Managerial preoccupation with achieving success without others' support" and "Tendency to assume lack of other viable options for the evolution of their business" into managerial cognition within firms. Additionally, we aggregated the emerging routines for participating into the ecosystem into three capabilities: sensing, sensing, and reconfiguring. At this point, we analysed the cases of farmers having decided to not contributing to the LAG relying on a similar process. The variation between the two groups of cases allowed us to adopt theoretical replication logic (Yin, 2009). We also verified our conceptual categories across these cases.

4. Findings

The empirical findings of our study reveal that the expansion of the LAG ecosystem necessitates a wide range of capabilities within the participating firms. Specifically, we have identified three set of key organizational factors distinguishing firms successfully participating in the LAG from the ones not taking the opportunity:

- **Ecosystem Configurations:** We discover that the configuration of the ecosystem itself plays a pivotal role in enabling firms to create value and gain a competitive advantage. These elements plays a crucial role in facilitating firms' engagement and ensuring they derive value from their involvement.
- **Managerial Cognitions**: Our research highlights the significance of relevant managerial cognitions in driving active participation within the ecosystem.
- **Firm Routines:** we identified the specific routines within firms enabling the identification of value and the mobilization of relevant firms' resources supporting a sustainable participation in the ecosystem.

Figure 1 presents a visual representation of our grounded model, delineating the actions required by ecosystem management to facilitate value creation for firms.

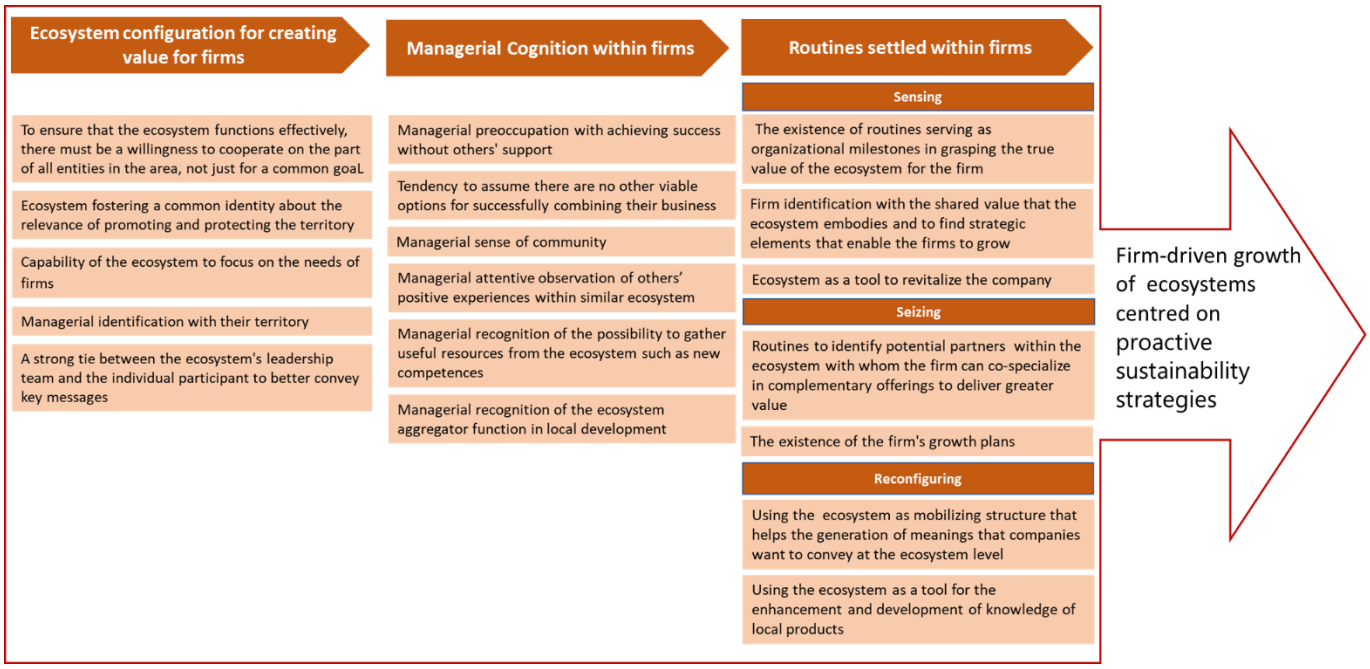

Figure 1. Grounded model: the supply side of ecosystems' growth for sustainability

Within this model, various organizational characteristics are identified as distinct elements that contribute to the successful engagement of firms with local ecosystems. Our research findings underscore the critical roles played by managerial cognitions and organizational routines as fundamental capabilities. These capabilities empower organizations to effectively leverage ecosystem resources, align them with the economic, environmental, and social value creation, and capture logic inherent in their business models. In the following sections, we will provide a comprehensive analysis of the findings pertaining to each of these highlighted categories.

4.1 Ecosystem configuration for creating value for firms

An emerging perspective in our study is the view of firms 'proactive strategies as occurring within the ecosystem of upstream and downstream actors executing some interdependent activities and contributing to boost the sustainable development of the local territory. Our findings highlight the structural elements of the ecosystem that affect firms' search for proactive sustainability behaviour. We found that these elements have an impact on a focal firm 'value creation as through them firms can contribute to the sustainable development and take benefit from the ecosystem. Table 3 summarises the key findings.

Table 3. Ecosystem structural characteristics helping firm in the generation of value

Levels of analysis	Codes	Farmers' quotes interviewed
Ecosystem configuration for creating value for firms	To ensure that the ecosystem functions effectively, there must be a willingness to cooperate on the part of all entities in the area, not just for a common goal	"In the same way, I believe that many don't believe in it all that much and participate in certain initiatives with ulterior motives, you see." (Farmer quotes- interview D)
	Ecosystem fostering a common identity about the relevance of promoting and protecting the territory	"To give value to what is our territory, what our territory does." (Farmer quotes- interview H)
	Capability of the ecosystem to focus on the needs of firms	"So I believe it's one of the somewhat cumbersome structures today due to bureaucratic issues, but actually, I am among those who, so to speak, try to focus more on the needs of the firms." (Farmer quotes- interview E)
	Managerial identification with their territory	"It is the territory that should be the principal character, the territory is not made up of a single firm, the territory is made up of an aggregation of firms, so, returning to the discussion about the LAG, this is a goal, a very important function that truly deserves a lot of attention." (Farmer quotes- interview A)
	A strong tie between the ecosystem's leadership team and the individual participant to better convey key message	"So, in my opinion, the LAG should provide training within the territory, specifically on using certain materials. I believe they should conduct an impactful campaign, not just a communicative one. When I talk about impactful, I mean they should go to the firms." (Farmer quotes- interview C).

4.1.1 Ecosystem configuration: To ensure that the ecosystem functions effectively, there must be a willingness to cooperate on the part of all entities in the area, not just for a common goal

One of the first findings to emerge from this category of analysis concerns the motivations that drive businesses to be part of the ecosystem. Many interviewees reported that the territory has always been characterized by widespread business individualism. Many entrepreneurs who are members of the LAG have found it challenging to collaborate with other firms in the area, which always need clarification on the effectiveness of collaboration. On the one hand, the area is faced with a sense of individualism among entrepreneurs; on the other hand, many have as their only goal to grow their own business, without considering the development of the area and the related benefits this may bring. This view leads to the first element of the ecosystem configuration. According to some entrepreneurs in the area, more is needed to stimulate cooperation among individuals, and it is not enough to focus solely on the development of individual businesses. These two aspects must be combined with a third element: the willingness to cooperate for a common goal. Only by considering these three key concepts simultaneously can the obstacles that plague the territory and limit access to ecosystem services be overcome. Indeed, in an interview, we were told:

"This is one of those unfortunately deep-seated preconceptions that haven't led us anywhere so far. Let's look at our cooperatives; let's also look at many associations that have existed and have been created. However, if we don't get used to living in cooperation, in the sense that all the people who are part of the network, the association, so as to remove governance from the hands of a few and place it in the hands of the real actors, the problem will never be solved."

(Farmer quotes- interview A)

4.1.2 Ecosystem configuration: Ecosystem fostering a common identity about the relevance of promoting and protecting the territory

During the interviews, we collected testimonies reporting illegal situations related to the way others not belonging to LAG behaved destroying natural resources and making them inaccessible to others. In fact, a farmer told us:

"For example, by practicing organic farming, we no longer burn the pruning waste but instead shred or dispose of it as biomass, so we try to avoid those practices that were previously used, given that there are now opportunities to do better. There are many difficulties, especially when the product you have accumulated, for example, in an olive grove, is not picked up. If someone comes by and lights a match, you can imagine how many plants get damaged."

(Farmer quotes- interview I)

In addition, interviewees shared observations about the current environmental situation present in the local area where the LAG operated, pointing out the several problems related to inadequate waste management and the effort some of them had spent in contributing to the local development It is interesting to note that many of these testimonies were followed by statements of willingness to change this situation inspired by the induced ideals of protecting their local area. Several interviewees stated that their firms and others are actively working to enhance the value of local territory with concrete actions:

"And so, it comes naturally to practice certain things to avoid waste. The first rule I have in life, not because someone imposed it on me or suggested it, but the first rule I learned is to try not to create waste, try not to waste, try not to squander. Because the more you waste, the more you consume something unnecessary, and that's when the problem arises of how to reuse these leftovers. So, I try to use as few plastic or other containers as possible, because once you have leftovers, it becomes waste, and then you have to dispose of it somehow and reuse it. So, the mental concept is always to have control and try not to waste and squander what nature has given us."

(Farmer quotes- interview N)

Their experiences highlighted the crucial role that active participation and a common identity on the need to collectively operate in the local territory. Their conceptions about the importance of collective and cohesive effort around such beliefs emerged in many statements:

"In my opinion, then, the LAG should provide the strength of being many and, as always, promote unity. I think aggregation would help. There's a division of tasks, there's a division of costs, there's a division, of course, staying together is more challenging."

(Farmer quotes- interview F)

In other interviews, a deep respect emerged for the LAG, which, through funding and planning, seeks to build a network in the area, overcoming social barriers such as envy and jealousy. In particular, one entrepreneur stated:

"I really like this ability that the LAG Daunia Rurale 2020 has to bring together, to focus on local firms and unite them, keeping them together and overcoming any form of envy and jealousy. Although, I must sadly say that there is still a long way to go in this regard, and it's not an easy task."

(Farmer quotes- interview A)

The entrepreneur reiterated the previous concept multiple times; in fact, he highlighted it again during our subsequent meeting with this sentence:

"However, despite everything, I am pleased to continue being part of the LAG because, well, for one thing, they are friends. At the same time, I appreciate those who are involved in the LAG

management in various capacities, their goodwill, you know, to work and support local firms, especially the virtuous ones, those that are putting in a lot of effort."

(Farmer quotes- interview A)

In addition, some respondents highlighted their genuine attachment to the territory and the conceptualization of LAG as their home. An entrepreneur reported:

"Then the people who today, at least in our LAG, so to speak, are part of the corporate framework, are people who believe in the territory, believe in the project, so I feel like, so to speak, at home."

(Farmer quotes- interview E)

4.1.3 Ecosystem configuration: Capability of the ecosystem to focus on the needs of firms

While LAGs' main goals included territorial development and social inclusion, their attention to the area's business realities has been a constant in their development strategies. Indeed, in many interviews, entrepreneurs stressed the effort that LAGs made to support businesses. When asked about the support for economic dimension of sustainability strategies received from the LAG, one entrepreneur told us thus:

"LAGs, like in our territory, as in many other territories, even in those less backward than ours, are simply means that serve to provide support and assistance to businesses, to bring firms together. So, I don't think that a LAG is necessary to achieve sustainability or to create an ecosystem."

(Farmer quotes- interview E)

This view aligns with the LAGs' new programming, changing their primary objectives. Specifically, these territorial units are not called to achieve only territorial animation objectives, such as organising meeting or festivals, but are called to higher tasks. Nowadays, the development of these areas is not only through the development of the territory but also through the enhancement and support of the activities of local businesses.

Some entrepreneurs saw the support given to businesses as one of the main reasons they became members of the LAG Daunia Rurale 2020. Specifically, It was mentioned:

"The fact that it is a territorial promotion agency that works, in the sense that it allows those who are part of it or want to join it to analyse all the issues and peculiarities of the territory, thus seeking to provide the opportunity for the development of the territory itself, promoting funding for businesses."

(Farmer quotes- interview H)

Many interviewees said that increasing business visibility to promote their firms and products was one of the main reasons they joined the LAG. One entrepreneur told us:
"But also for a matter of corporate visibility, in the sense that having the support of various associations that work in the promotion of the territory and the product means having more visibility, more opportunities, let's say, to embark on certain paths, even from a tourism perspective."

(Farmer quotes- interview C)

4.1.4 Ecosystem configuration: Managerial identification with their territory

Our findings show that one of the ecosystem's main elements concerns the individual identification of the entrepreneur with their territory. Listening to the stories of the firms interviewed, it is evident that the deep dedication to their territory cannot be underestimated:

"It is a means of promoting the territory, but for the territory itself, not so much for the businesses. We help each other, you see, it's not just the firm that benefits, but also the territory in terms of promotion, in my opinion. So, those who join the LAG do so because it's not a commercial channel, I mean, it's obvious that... I believe that everything contributes, especially for both the firm and, most importantly, for the territory. In fact, here we're talking about promotion, a push, and enhancement, but it can be done through one's products and their presence at events, but it's always connected to the territory."

(Farmer quotes- interview F)

Many entrepreneurs began to experience the agricultural reality of their area from childhood. They told us about the transformations of their geographical area over time and the progress made due to the contributions of individual businesses. Many told us how different realities in the area have developed concrete strategies to enhance the area's resources. Despite the complex challenges they have always faced, their dedication to the territory in which they are rooted has always been a constant that has guided them. Specifically, a pivotal prerequisite for maximum benefits from ecosystem services is acknowledging the territory's key role. To elucidate further, several entrepreneurs articulated:

"In short, it was about building together what the territory needs. Well, you know, ensuring safety in the area, enhancing the significant locations, critical points, and we did it together."

(Farmer quotes- interview H)

4.1.5 Ecosystem configuration: A strong tie between the ecosystem's leadership team and the individual participant to better convey key messages

Our findings also indicate that the relationship between the ecosystem management and territorial businesses should be considered an essential component of ecosystem configuration. Among the opinions expressed by the respondents, is the belief that strategies to support firms and territorial development should not be based solely on the dissemination of information via email or digital platform. In particular, although raising awareness among territorial realities remains a key principle for overcoming existing barriers to development, on the other hand, these should be supported by the proximity of key actors in the management layer so to better illustrate the implementation of their strategies with practical actions and concrete examples.
This perspective hypothesises a direct relationship between the LAG and businesses. It was stated in an interview:
"[…] in my opinion, they should have a one on one relationship, not just send a simple email. They should establish a meeting with the firms and say, 'You know, maybe this material you produce without disposing of it can be reused here?"

(Farmer quotes- interview C)

In this conception, the LAG's role is purely practical, implementing concrete actions and a continuous exchange of information, knowledge and needs.

4.2 Managerial Cognition within firms

Our findings reveal the presence of an emerging pattern in the managerial cognitions as essential characteristic of firms joining successfully the ecosystems. These managerial cognition elements seemed to be relevant predictors of the establishment of proper routines to engage with the local ecosystems .Table 4 provides additional illustrative information that will be explicitly explained below.

Table 4. Managerial Cognition within firms

Levels of analysis	Codes	Farmers' quotes interviewed
Managerial Cognition within firms	Managerial preoccupation with achieving success without others' support	"So, I believe in the fact that only in this way, that is, only together, can longer paths be taken... probably, one may arrive faster alone, but together, one might go slower, yet they

		manage to traverse a longer path." (Farmer quotes- interview A)
	Tendency to assume there are no other viable options for successfully combining their business	"I decided to be part of an association now because with my business and activities, I've done everything I could to be in good conscience from an entrepreneurial perspective, for the community, and whatever you want to call it. What I would do with an association is contribute to its creation and make it work because only in that way can we achieve goals that I could never achieve alone." (Farmer quotes- interview A)
	Managerial sense of community	"So, with the latest programming, LAG Daunia Rurale has focused on this very aspect – the ability to network. They aimed to reward territorial promotion activities that could create a genuine network, not just cooperation for show, where only a few are actually managing behind the scenes. Transitioning from theory to practice, however, presents many challenges. The most significant challenge is breaking down the preconceptions and biases held by the people who are actors in the territory. Nevertheless, efforts are being made, and some significant signals have been left on the territory." (Farmer quotes- interview A)
	Managerial attentive observation of others' positive experiences within similar ecosystems	"And also, I think, thanks to an open-minded approach, because we are starting to see other regions and territories as references, with these methods, implementing these cooperative strategies, they are

		succeeding. For instance, when we look at Tuscany, we see other regions, like Umbria. These are the factors for which we are beginning to adopt this model." (Farmer quotes- interview B)
	Managerial recognition of the possibility to gather useful resources from the ecosystem such as new competences	"For instance, the LAG also organized training meetings that were very interesting, and I liked that they covered topics in which I believed and needed support, even from a training perspective." (Farmer quotes- interview A)
	Managerial recognition of the ecosystem aggregator function in local development	"I became acquainted with this organization because I had seen that it supported activities that fostered collaboration among local businesses." (Farmer quotes- interview A)

4.2.1 Managerial Cognition: Managerial preoccupation with achieving success without others' support

One of the first managerial cognitions necessary for effective participation in the ecosystem concerned the awareness gained by local entrepreneurs that to achieve a specific goal, the firm could not go it alone. In fact, the interviewees were asked the first reason for actively participating in the LAG. One interviewee said:

"As a single firm, I can do it, but only up to a certain point. After that, what needs to come out in a territorial promotion activity is that there are many firms like mine doing similar work."

(Farmer quotes- interview A)

The awareness that it is necessary to be in relationships with other entities in the territory has also emerged from interviews that have emphasized this condition:

"On our own, we cannot get anywhere." (Farmer quotes- interview C). Many of the interviewees emphasized the importance of collaborating with the GAL. Some of them specified that the need for cooperation is not due to a lack of material or financial resources but rather to combining efforts to convey a message and pursue a common objective. In one of the interviews, we heard the following: "I said to myself, 'I would like this project, in my opinion, there is no better structure than the LAG

to carry it out. LI cannot reach there alone, not because of economic reasons, but because you need to convey a different message."

(Farmer quotes- interview A)

In addition, other interviews show that the LAG is perceived as an entity capable of bringing together local businesses to use advantages across several activities. In fact, an entrepreneur said:

"We make great use of their structure and their team to ask questions and, above all, to conduct investigations that we might not be able to do on our own."

(Farmer quotes- interview E)

In addition, creating a group of firms within the ecosystem would empower them to conduct strategies and realize economic benefits that a single entity might find challenging. As another entrepreneur reported:

"In any case, by being together, cooperating, you can adopt strategies that you can't implement alone, such as organizing events together, participating in trade shows together to reduce costs, and gain more visibility."

(Farmer quotes- interview B)

Another entrepreneur introduced this concept and told us how the LAG provided him opportunities to develop projects with the hospitality sector to increase his firm's visibility. He told us:

"I'm starting a project this week with the hospitality sector operators through the LAG's funding. Something that, if it were just firms on their own, they wouldn't have been able to implement."

(Farmer quotes- interview F)

An important aspect is the concern voiced by many entrepreneurs regarding the GAL, seeing it as support for initiatives that go beyond the skills and resources of an individual entrepreneur. In one of the interviews, an entrepreneur provided a detailed analysis:

"It's clear that if you want to participate in the LAG or apply for the grant, because you need to get the money to create brochures for your firm, like brochures for any trivial thing, then go do it on your own, try to take advantage of different opportunities, that is, use tools that you wouldn't otherwise be able to obtain."

(Farmer quotes- interview A)

4.2.2 Managerial Cognition: Tendency to assume lack of other viable options for the successful combination of their business

The majority of the firms we interviewed have deep-rooted histories within the region. Many of these businesses have been handed down from one generation to the next, witnessing the evolution of

diverse managerial strategies. The second managerial cognition develops considering the numerous challenges agricultural enterprises had to face, particularly in rural areas such as those within the LAG, such as unlawful activities, countryside pollution, and resource management complexities. Indeed, in alignment with the concept discussed in section 4.2.1, another crucial managerial insight concerns the propensity to explore different avenues for one's firm's success. The distinguishing factor of this specific cognition lies in the current perception of ecosystems as centres for innovation and value generation. Consequently, after exploring various alternative strategies for the success of their own businesses, the interviewees have disclosed that joining the LAG was one of the last strategies that can be developed to enhance their operations through the establishment of meaningful relationships with others. Several interviewees have expressed it as follows:

"I decided to be part of an association now because with my business and activities, I've done everything I could to be in good conscience from an entrepreneurial perspective, for the community, and whatever you want to call it. What I would do with an association is contribute to its creation and make it work because only in that way can we achieve goals that I could never achieve alone."

(Farmer quotes- interview A)

4.2.3 Managerial Cognition: Managerial sense of community

At the managerial level, the ecosystem was perceived as an entity capable of creating networks within the territory. From various interviews, the importance of concepts such as cooperation, aggregation, and network building within the local area has emerged. Specifically, several interviewees have explained to us that they identify the LAG as a third-party entity that fosters networking within the territory. For example, an entrepreneur reported:

"The primary reason was aggregation; we believe in cooperation, in coming together."

(Farmer quotes- interview D)

Furthermore, one of the most frequent responses to questions regarding the motivation to become members of the LAG concerned the desire to be part of a group. For example, one interviewee told us:

"The concept of being together in a group is perhaps one of the real reasons why I have always supported the LAG project." (Farmer quotes- interview E). In addition, another entrepreneur emphasized this concept by saying: "Something that could indeed establish a network within the territory."

(Farmer quotes- interview F)

During the interviews, some entrepreneurs highlighted the role of the LAG in promoting cooperation and networking, for example, by organizing events and meetings that facilitated the sharing of knowledge and products:

"They supported (LAG) activities that promoted collaboration among local businesses. We participated in an event with other firms in San Severo, where I had the opportunity to exhibit. This was in the early stages, around 2015/2016, I don't remember exactly."

(Farmer quotes- interview A)

Finally, working as a group contrasted with the idea of an isolated firm within the territory. When interviews discussed knowledge and building connections with other firms within the ecosystem, one interviewee told us:

"Creating a network within the territory, because we believe in networking, in the sense that networking is essential for us within the territory. It's crucial to establish relationships with other firms and entities, as we are not a firm that operates in isolation. We like to interact, and above all, we enjoy collaborating with other entities, which, to me, is also a matter of comparison, right?"

(Farmer quotes- interview C)

4.2.4 Managerial Cognition: Managerial attentive observation of others' positive experiences within similar ecosystem

During the interviews, it emerged that in some situations, local farmers had a closed mindset regarding certain obstacles to overcome. In fact, some interviewees reported certain entrenched behaviours that were challenging to change. In this perspective, observing the positive results of other enterprises facing similar ecosystem situations can be instrumental in formulating unknown strategies and innovations not currently in practice. An in-depth analysis of ecosystems similar to one's own, related to observing the successful experiences of peer firms, increases the managerial cognitions necessary for active engagement within one's ecosystem. In support of this, an entrepreneur articulated:

"[…] I think, thanks to an open-minded approach, because we are starting to see other regions and territories as references, with these methods, implementing these cooperative strategies, they are succeeding. For instance, when we look at Tuscany, we see other regions, like Umbria. These are the factors for which we are beginning to adopt this model."

(Farmer quotes- interview B)

4.2.5 Managerial Cognition: Managerial recognition of the possibility to gather useful resources from the ecosystem such as new competences

Another necessary managerial condition for delivering ecosystem services is identifying the potential to obtain valuable resources from the ecosystem, such as acquiring new skills:

"They organized meetings, let's say training sessions; they were training moments, I would say, on entrepreneurial activities, on various topics, and so this thing interested me a lot. And then, on that occasion, we also had the opportunity, thanks also to the director, to create and host an event. So, the project that later saw us as protagonists."

(Farmer quotes- interview A)

Moreover, we have heard from several local entrepreneurs that the LAG has organised training sessions on specific topics, such as olive cultivation or new agricultural practices. These training sessions have been positively considered by ecosystem entrepreneurs who have stated:

"Some meetings are held from time to time, depending on the topics; well, they are of interest to us, so we can participate and get the right information."

(Farmer quotes- interview G)

Furthermore, the LAG's role as a unit of information sharing is crucial in supporting businesses in their sustainable transition. In particular, they have described the goal of the LAG as follows:

"To unite entrepreneurs and create events in the territory that can add value to their product. To educate the entrepreneur not only in doing business but also in fostering cooperation among businesses."

(Farmer quotes- interview C)

For instance, a farmer told us what, in his opinion, the LAG should do to promote sustainability. Specifically, the LAG should communicate information and practical knowledge about the new processes used in the area:

"You see, there are these firms that have contracts for disposal. They come to take the material. That is, they facilitate the farmer in this because if the farmer is not supported, they are not motivated to do anything. Farmers, like people in general, if you don't make it easier for them and tell them to go and do this, and maybe I don't have a means to transport the material, right? To be reused and processed. I won't do it."

(Farmer quotes- What the LAG should tell entrepreneurs according to the interview C)

4.2.6 Managerial Cognition: Managerial recognition of the ecosystem aggregator function in local development

We observed that for many interviewees, the LAG's role is closely associated with social sustainability. Many entrepreneurs perceive this entity as a force capable of bringing together regional stakeholders. Specifically, an entrepreneur articulated:

"In my opinion, then, the LAG should provide the strength of being many and, as always, promote unity. I think aggregation would help. There's a division of tasks, there's a division of costs, there's a division, of course, staying together is more challenging."

(Farmer quotes- interview F)

The social inclusivity and the participatory approaches are aligned with the guidelines outlined in policy documents, which emphasise the necessity of drafting strategies based on stakeholder involvement to achieve common objectives. Within this context, one interviewee remarked:

"The territory is composed of an aggregation of firms. So, returning to the discussion about the LAG, this is a purpose, a critical function that deserves a lot of attention. I see it's also aligned with the directives at the community level. Now, I want to say that the community is moving towards forming a network, but we must ensure that this tool is as closely aligned as possible with the ultimate goal and not just a mere cover."

(Farmer quotes- interview A)

Additionally, the ecosystem is seen as a network builder in the region, capable of enhancing the area's visibility. Indeed, from a rural development perspective, its efforts in forming a shared offering could increase tourism in the area, thus contributing to the revitalization of rural areas that do not currently experience high levels of tourism. As it was clarified to us:

"[...] if the objective is to network, to create aggregations, perhaps there, too, we can see a form of circularity. For example, bringing visitors here can attract people who do not live in this area. Doesn't that also mean closing a circle? That is, producing and promoting within the same territory?"

(Farmer quotes- interview A)

4.3 Routines settled within firms

The need to investigate the conditions that enable the utilization of ecosystem services in a territory leads us to analyse the routines at the firm level as essential components that form capabilities. The Table 5 displays the findings obtained from the interviews. In this analysis, we have chosen to categorize routines into three subcategories, namely sensing, seizing, and reconfiguring. We intend

sensing acts as a capability for identifying opportunities, seizing functions as a capability for adapting to new opportunities, and reconfiguration serves as a capability for reconfiguring resources to address emerging opportunities.

Table 5. Routines settled within firms

Levels of analysis	Codes	Farmers' quotes interviewed
Routines settled within firms: SENSING	The existence of routines serving as organizational milestones in grasping the true value of the ecosystem for the firm	"It takes mature individuals to do this, and it also takes mature firms because sometimes another mistake is precisely this: thinking that aggregation, as stimulated, for example, by activities like the LAG on this side, should serve the individual." (Farmer quotes- interview A)
	Firm identification with the shared value that the ecosystem embodies and to find strategic elements that enable the firms to grow	"We approached the LAG to promote the territory itself, but also for our firm's visibility. In the sense that having the support of various associations working on territory and product promotion means having more visibility and more opportunities to pursue specific paths, even in terms of tourism." (Farmer quotes- interview C)
	Ecosystem as a tool to revitalize the firm	"So personally, with the LAG, I do many things, as well as with other initiatives, such as Common Organization of the Wine Market,, RDP, and many other projects where there is the possibility to participate, access, and above all, revitalize our firm." (Farmer quotes- interview E)
Routines settled within firms: SEIZING	Routines to identify potential partners within the ecosystem with whom the firm can co-specialize in complementary offerings to deliver greater value.	"Because if someone wants to create a network, they need to find firms with the capacity for perspective and vision that I have. Otherwise, they will encounter burdens that create problems because they don't understand you. So, only

		if you manage to find people with the same views, the same goals, and the same desire and commitment to put in to reach a certain point, then you can move forward." (Farmer quotes- interview I)
	The existence of the firm's growth plans.	"But the LAG makes resources available to firms that want to grow, improve, and invest. It lends a helping hand because if you have an idea. Someone is telling you, 'Look, I believe in your idea, and I'll provide 50% of the cost of your investment in your idea,' I think that if an entrepreneur doesn't accept such an offer, it means they aren't truly an entrepreneur, or they don't consider the idea worthwhile." (Farmer quotes- interview I)
Routines settled within firms: RECONFIGURING	Using the ecosystem as mobilizing structure that helps the generation of meanings that firms want to convey at the ecosystem level	"I think initially we were members, and we believe that by being inside, we can provide relevant inputs to the local businesses. Often, at the top of the LAG, some people may not fully understand the needs of the different categories within the territory." (Farmer quotes- interview I)
	Using the ecosystem as a tool for the enhancement and development of knowledge of local products	"To try to promote all those. To promote and follow all the techniques and strategies to maximize the value of our products." (Farmer quotes- interview B)

4.3.1 Routines settled within firms: The existence of routines serving as organizational milestones in grasping the true value of the ecosystem for the firm

One of the interview questions focused on when firms decided to become part of the LAG. Many interviewees mentioned that they have been LAG members since its beginning. Some highlighted the positive outcomes achieved through this collaboration, such as improving business facilities and the local landscape. Others expressed their interest in promoting women's entrepreneurship to revitalize

the region. However, it became evident that despite the efforts made so far, the path towards actual sustainability transition in the area is still long. Some interviewees noted the need for a deeper understanding of the LAG's role. It emerged from the responses that maturity is required to fully capture the opportunities the LAG provides. A farmer told us:

"First, ask yourself if you are mature enough to believe that with the association, you can do what you wouldn't do alone. What you can already do alone in a mature manner, you are already doing."

(Farmer quotes- interview A)

4.3.2 Routines settled within firms: Firm identification with the shared value that the ecosystem embodies and to find strategic elements that enable the firms to grow

From the interviews, two key motivations emerged that drove businesses to engage with the ecosystem: the enhancement of the local territory on the one hand and the improvement of their own firm on the other. Indeed, a farmer described to us what motivates him to stay a member of LAG Daunia Rurale 2020:

"The desire to establish a territorial network that can at least give us visibility both at the corporate and territorial levels, so this."

(Farmer quotes- interview C)

Furthermore, interviews emphasized the firm's vision to align with the shared values of the ecosystem, such as territorial development, finding in it a strategic element for growth. Specifically, entrepreneurs are driven by the desire to contribute added value to the local community while also recognizing the ecosystem as a new strategy to enhance the visibility of their own firm:

"We approached the LAG to promote the territory itself, but also for our firm's visibility. In the sense that having the support of various associations working on territory and product promotion means having more visibility and more opportunities to pursue specific paths, even in terms of tourism."

(Farmer quotes- interview C)

4.3.3 Routines settled within firms: Ecosystem as a tool to revitalize the firm

As previously mentioned, in this study, we have linked sensing to the ability to identify new opportunities. Some interviewees emphasized the importance of finding a new strategy for the firm management. While some farmers explored new cultivation methods, such as organic farming, others adopted different approaches to gain a competitive advantage over other firms. From some interviews,

it emerged that one of the main reasons that drove them to become part of the ecosystem was the revitalization of their businesses. This approach evolved into a lasting relationship with other group members, ever for business growth. One entrepreneur mentioned:

"[…] let's say, at the beginning, it was purely, how can I put it? For visibility purposes. But today, however, many collaboration opportunities are opening up with them."

(Farmer quotes- interview C)

4.3.4 Routines settled within firms: Routines to identify potential partners within the ecosystem with whom the firm can co-specialize in complementary offerings to deliver greater value

During the interview, many participants emphasized the importance of the social inclusion objective and the aggregating role that the LAG should play. Consequently, we often asked about the nature of their relationships with other LAG members. In response to this question, positive assessments frequently emerged, recounting the numerous events organized by the LAG to disseminate information and promote community interaction as essential moments of gathering among people. We subsequently investigated whether there were practical and lasting collaborations in the local area with other businesses. It emerged that, at times, it can be challenging to identify entrepreneurs with whom to establish such partnerships in this specific territory. Some interviewees emphasized the importance of identifying entrepreneurial entities with the same vision and corporate mission:

"So, cooperation is a useful way, support, even if you are not part of a project. Just being a part of the LAG means being in a familiar place, a place where you know you can meet other firms that may think like you, have the same issues as you. So, participating in these things means adding value."

(Farmer quotes- interview A)

In this context, the entrepreneurs considered this approach successful, as it helps avoid situations of complex coordination and potential failures:

"Because if someone wants to create a network, they need to find firms with the capacity for perspective and vision that I have. Otherwise, they will encounter burdens that create problems because they don't understand you. So, only if you manage to find people with the same views, the same goals, and the same desire and commitment to put in to reach a certain point, then you can move forward."

(Farmer quotes- interview I)

Furthermore, the role of the relational framework becomes fundamental in creating a network within the GAL. Indeed, in some interviews, it has been highlighted how there must be a willingness to initiate practical cooperation in the territory. To support this, an entrepreneur told us:

"Well, certainly, it must be a firm ready to network in the territory, ready to establish a communication relationship in a bilateral manner, not unilateral because unfortunately, in our territory, there is a tendency to do things very individually, well, even somewhat unilaterally. So, this issue of corporate cooperation and the like, unfortunately, is not a common factor for all firms, and therefore, it is very challenging to work in the territory."

(Farmer quotes- interview C)

4.3.5 Routines settled within firms: The existence of the firm's growth plans

As we mentioned previously, the LAG is an entity with the objective of rural development. Being an entity that can access certain European Union funds, from this perspective, on the one hand, the LAG's task is to outline a spending plan to develop projects to achieve its goal. On the other hand, one of its tasks is to stimulate and incentivize the territory's stakeholders to develop projects. For example, when we asked an entrepreneur what the most significant project conducted with the LAG's contribution was, he replied:

"The measure 6.3, the one for implementing and expanding businesses, so with the possibility of creating exhibition spaces, sales areas, and I participated in this with a very large, very important application. That has been extremely beneficial to me because it was the foundation that will now lead me to become known in the territory, as it's already happening."

(Farmer quotes- interview H)

In this way, the LAG's role becomes supportive in all project phases. This vision of the LAG as a support for investments emerged from some interviews:

"But the LAG makes resources available to firms that want to grow, improve, and invest. It lends a helping hand because if you have an idea. Someone is telling you, 'Look, I believe in your idea, and I'll provide 50% of the cost of your investment in your idea,' I think that if an entrepreneur doesn't accept such an offer, it means they aren't truly an entrepreneur, or they don't consider the idea worthwhile."

(Farmer quotes- interview I)

4.3.6 Routines settled within firms: Using the ecosystem as mobilizing structure that helps the generation of meanings that firms want to convey at the ecosystem level

The LAG is based on a public-private partnership. In its composition, there are, for example, regions and municipalities. This formulation can lead to numerous benefits. Strategies are often formulated without considering the territory's and its stakeholders' needs. In this case, this ecosystem, formed by multiple actors' involvement, can modify some strategic plans to focus on the local situation. An entrepreneur told us:

"Regarding the LAG, I hope that since local administrations are also part of the LAG, the LAG is composed partly of private entities and public entities and administrations. This can help shift the political focus towards the local situation."

(Farmer quotes- interview A)

In addition, many interviewees have highlighted the intermediary role that the ecosystem can have towards entrepreneurs and administrative levels, such as regions. Indeed, being part of the ecosystem allows them to convey their ideas directly to the policymakers, as they have told us:

"We are able to interact directly on the territory, interact directly with them. So, there is an exchange of ideas, and... it's much simpler and, in my opinion, better to focus on those who can already help you on the territory."

(Farmer quotes- interview H)

4.3.7 Routines settled within firms: Using the ecosystem as a structure as a tool for the enhancement and development of knowledge of local products

The majority of interviewees were producers of extra virgin olive oil, a product with a long-standing tradition deeply connected to the territory. In the region, there are numerous wineries that aim to market the product while showcasing its history and the production process behind olive oil. For this reason, an important routine revolved around viewing the LAG as a tool for disseminating information and expertise about olive oil. As a farmer reported:

"Yes, yes, we hold meetings. Topics always related to the promotion of... of products, specifically, as for us, extra virgin olive oil, events related to the promotion of olive oil."

(Farmer quotes- interview B)

Furthermore, considering that extra virgin olive oil has become a standard product in all supermarkets and households, the entrepreneurs in the area have initiated educational programs on olive oil culture, including, for example, schools. In this scenario, the LAG is used as an organization and a tool to promote and develop knowledge of local products:

"Because thanks to the LAG, we can organize events that help us make the world of olive oil known, for example, starting with training events, olive oil knowledge, in schools, events for consumers who want to enter the world of olive oil."

(Farmer quotes- interview B)

5. Discussion

5.1 Theoretical contributions

Our model unveils the convergence of the cognitive characteristics of managers with the capabilities characterizing the routines of their firms. Furthermore, we show that the alignment with the broader ecosystem leads to the creation of substantial value for firms while simultaneously promoting the ecosystem's objectives related to local sustainable development. This synergistic approach suggests that for businesses to thrive and remain relevant, it is not merely about understanding and operating within the market. Instead, it necessitates a comprehensive awareness of - and integration with - the ecosystem. The insights we gather indicate that for managers to navigate this complex landscape successfully, it is not sufficient to merely have a cognitive map of the market or have a set of capabilities. Rather, they must employ these capabilities in forging strategic pathways, guided by the goals set by the ecosystem. This roadmap should ideally be internalized through consistent interaction and immersion within the ecosystem. More specifically, our observations underscore the decisive role of the managers' agentic behaviour in aligning their firms' objectives with the ecosystem's overarching goals. This alignment seems to be significantly influenced by the ecosystem's ability to shape managers' perceptions of existing opportunities. Interestingly, this is not achieved through conventional means like incentives or monitoring but via the creation of power dynamics between ecosystems and firms. This balance of power suggests that while ecosystems have overarching control, the actual operationalization and realization of goals lie within the purview of individual firms.

However, power dynamics alone are insufficient to ensure that firms prioritize the goals of the ecosystem. We find that the ability of firms to heed the pressing demands of the ecosystem is pivotal. This attention-giving capability is crucial as it enables firms to resonate with the objectives of the ecosystem. It is perceived as the conduit through which firms can also derive value. Our empirical data reinforces the importance of this capability and its correlation with managerial cognition. This awareness acknowledges that firms' sustainability is intertwined with their ability to coalesce with other entities within the territory.

Therefore, our findings confirms the relevance of a multilevel analysis of the ecosystem and firms' capabilities and cognitions in order to deeply understand how ecosystems and firm can co-evolve in the direction to encourage the deployment of a proactive sustainability strategy. What our findings also show is that the ecosystem exercises power over firms through the enactment of actions securing the realization of firms' interests such as the allocation of the ecosystems' resources to collect and convey firms' need to the local governments. Some other actions enacted at the ecosystem level aim to leverage the firms' identity with the territory as means to be perceived legitimate by the firms themselves and therefore to enact a legitimate use of power over them. On the other hand, our findings reveal that the ecosystems should also be able to diffuse a sense of urgency by the firms in a way to wake up the collective towards the provisions of their contributions towards the environmental sustainability, with the possibility to mobilize firms against the threat of economic decline of the territory. However, we have also seen the relationship between the ecosystem management and the firms as critical to convey proper messages and therefore we have seen that the act of exposure to firms through strong ties as an important elements that the ecosystem secures. The dynamic relationship between the ecosystem and firms, and their respective contributions to environmental sustainability, emphasizes the necessity for continual assessment and recalibration.

In congruence with Hill and Jones (1992), who view firms as hubs for interactions between stakeholders, with managers as central nodes tasked with reconciling diverse interests, our findings indicate that firms depend on the attention of managers. These managers work to harmonize the goals of the ecosystem with the firm's interests. In our study, the importance of ecosystems depends on managers' perceptions of their firms' potential to thrive independently in their respective territories, their sense of community, and the opportunity to access valuable resources from the ecosystem. Consequently, managerial perceptions of firm potential and ecosystem opportunities serve as moderating factors in the relationship between firms and ecosystems. Basically, our findings reiterate that firms serve as epicenters for stakeholder interactions, with managers at the helm, orchestrating these exchanges. These managers endeavour to strike a balance between the goals of the ecosystem and the aspirations of their firms. The relevance and value of ecosystems hinge on managers' perceptions, shaped by their assessments of the firm's potential, sense of community, and opportunities to tap into resources within the ecosystem.

Our study contributes to diverse streams of literature. Firstly, it delineates the functionalities and capabilities requisite for the growth and sustenance of an ecosystem. While seminal works like Foss et al. (2023) have focused on initial and mature phases of ecosystem establishment and identified the leadership capabilities (sensing, seizing, and reconfiguring) aiming to address coordination and cooperation to avoid failures, we have analysed the capabilities enabling ecosystems to grow and the

main underlying dynamics of co-evolution between firms and ecosystem. Our study reveals that these capabilities enact some key functions towards firms: power, through the establishment of a level of resource dependency on firms based on the managerial perception of firm's failure and of the opportunity to collect relevant advantage from the ecosystem; legitimacy, in claiming attention to managers which relies on the identification of firms with the ecosystems' goals; urgency, for the collective to act cohesively to boost the sustainable development of the local territory which was based on the sense of community of managers.

Additionally, despite the plethora of literature on the significance of ecosystems (e.g., Tee and Gawer, 2009; Tiwana et al., 2010), there is still a relevant gap in understanding how to effectively manage the environmental influence to secure the viability of ecological ecosystems. Moreover, while prior research has investigated the process for mobilizing environmental resources into ecosystems (Ansari et al., 2016; Snihur et al., 2018), these studies often neglect to analyse the subsequent organization of these mobilized resources into structure which aim to serve to specific value proposition (Hou and Shi, 2021). Through the analysis of co-evolution dynamics between the firms and the ecosystem, we have shed lights on how the ecosystem can influence the usage of resource in the environment as it illustrate the factors behind the proactive behaviour of firms towards the local sustainable development (Hou and Shi, 2021).

Answering the call for more firm-centric theories shaping capability development for the ecosystems (Felin and Foss, 2023), our study also contributes to describe how and through which processes the achievement of firm-specific values is needed and is realized ex ante as conditions for the firms to align and to contribute to the development of ecosystem's goals. Indeed, we have shown how unique transactional opportunities in the ecosystem become manifested to firms and how firms designed and organized processes for the identification of these opportunities and for their valorisation. Shrivastava (1995) has presented strategies for organizations to become active participants in various ecological and market niches, ranging from cost-efficient production to pioneering new markets. In their assessment of organizational responses to environmental concerns, Egri and Pinfield (1995) proposed that sustainability also entails aligning organizational structures with larger social and ecological systems in a manner that promotes sustainability. However, only a limited number of these theorists have illustrates the relationship between macro-micro view through which the proactive contribution to sustainability enacts at firm level.

Overall, our study advance theory on environmental sustainability by identifying the micro-level variables – capabilities and cognitive status that firms and managers must have to generate value from the participation to the ecosystem and macro-level variables through which ecosystems influence managers and start co-evolving with firms along their journey towards the sustainable development.

5.2 Managerial contributions

Our research has indeed yielded insights with broader implications that resonate not only within the academic realm but also in practical managerial contexts.

To begin, the deep dive into how firms can optimize the benefits from ecosystem services brings to light the necessity of a more integrated approach. Firms today cannot operate in silos. To thrive, they need to intertwine their strategies with the evolving dynamics of the ecosystem services. For managers, this implies a need to regularly reassess and recalibrate their strategies, ensuring they remain synergized with the offerings and capabilities of the ecosystem. The study reinforces that, for optimal results, managers need to cultivate adaptive routines and focus on continuous learning and reconfiguration.

Another salient insight of our research revolves around the transformative journey of Local Action Groups (LAGs). Historically dedicated to territorial animation and social inclusion, LAGs are now grappling with a wider set of objectives. Our study underscores the pivotal shifts occurring within these groups. For managers associated with LAGs, this is a clarion call to embrace new strategies and rethink their operational paradigms. Recognizing the evolving nature of LAGs and being agile in response is vital for managers if they are to steer these groups towards contemporary sustainable-related goals effectively.

For firms intending to leverage the full potential of ecosystem services, our findings serve as a roadmap. By highlighting the routines and facets pivotal for reaping maximal benefits, managers are better positioned to make informed decisions. Whether it is about resource allocation, capability development, or stakeholder engagement, the insights from our research equip managers with a more nuanced understanding of the interplay between firms and ecosystem services.

For stakeholders involved in the governance of LAGs, the insights emerging from our research are equally enlightening. By illuminating the managerial factors crucial for specific regions and delineating the strategies that yield efficient ecosystem service outcomes, our study acts as a guide. Governance bodies can utilize this knowledge to refine their decision-making processes, ensuring that the LAGs under their aegis are poised for success in their renewed roles.

Finally, beyond firms and LAGs, the policy-making realm can also find value in our findings. By offering a clearer understanding of the metamorphosing role of LAGs, our research can guide policymakers in formulating more informed and impactful territorial and rural development strategies. With the insights based on direct consultation of the territory, there is a significant reduction in the chances of policy misalignment or failure. This ensures that the policies resonate with the ground realities and are poised for success.

Overall, our research not only addresses critical academic gaps but also equips managers and policymakers with the knowledge and tools required to navigate the evolving terrains of ecosystems and LAGs effectively.

6. Limitations and future research studies

Our study, while comprehensive, presents certain limitations that pave the way for subsequent research initiatives. Addressing these challenges and expanding upon them can significantly augment the depth and breadth of understanding in this domain.

The deliberate choice to concentrate our research on a sample from Southern Italy might have introduced geographical and cultural biases to our findings. While this specific focus enriched our insights into this particular region and filled a notable gap in the literature, it does raise questions about the broader applicability of our results. Future researchers could venture into comparative studies encompassing different regions, which would undoubtedly enhance the generalizability and robustness of the findings.

Furthermore, while the limited number of interviews we conducted permitted an in-depth exploration of individual perspectives, it simultaneously might have restricted the breadth of our study. Future research can address this by conducting expansive surveys, complementing them with detailed interviews, and subsequently integrating both data sets. This dual approach can offer a richer, more holistic picture.

The peculiar characteristics of the Southern Italian agricultural sector, marked by an older demographic and lower educational levels, presented unique challenges. The hesitancy and occasional reluctance of farmers to partake in comprehensive interviews, interruptions faced, and reservations about recordings indeed added layers of complexity to our data collection process. Future research can benefit from tailoring the methodology to suit such specific audience characteristics. Techniques like focus group discussions or interactive workshops could be more accommodating and effective in eliciting detailed responses.

Moreover, the constraints faced when trying to engage with entrepreneurs, many of whom were unavailable due to professional commitments or were apprehensive about being recorded, underscore the need for flexible and adaptable research methodologies. A combination of offline and online interactions, or asynchronous methods like questionnaires, might help in casting a wider net and ensuring greater participation in future studies.

Finally, with the learnings from these limitations in view, there lies an exciting avenue for future research. Expanding the sample size, diversifying geographically, and employing varied methodologies can either reaffirm our findings or present contrasting viewpoints. Both outcomes are

invaluable. They either reinforce the existing understanding or introduce newer dimensions, both of which will contribute profoundly to the evolving discourse on the subject.

Overall, while our study has broken new ground and offered fresh insights, the path ahead for future research is ripe with opportunities. By addressing the identified challenges and leveraging them as stepping stones, subsequent studies can delve deeper and broaden the horizons of knowledge in this field.

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Chapter 7

Policy mix formulation for sustainability transition in rural areas: an integrated approach

Naomi di Santo[a], Antonio Lopolito[a], Edgardo Sica[a], Roberta Sisto[a] , Morteza Yazdani[b]

[a] Department of Economics, Management and Territory. University of Foggia

[b] Universidad Internacional de Valencia (VIU)

*Corresponding Author: my.173021@gmail.com

Policy mix formulation for sustainability transition in rural areas: an integrated approach

1. Introduction

The transition towards a sustainable and circular economy has become a central issue in national and international policy agenda. In 2015, UN integrated sustainability transitions and circular economy (CE) among the 17 Sustainable Development Goals (SDGs) as in Goals 15 and 12 (*Life on land*, *Sustainable Consumption and Production,* respectively) (United Nations, 2015). At EU level, the European Green Deal and other Commission's initiatives, focus on inclusive transition towards a fair society (Bieroza et al., 2021; Filipović et al., 2022).

Despite these efforts, the existence of a gap in global circularity persists, showing a reinforcing path with the global circularity that reduced from 9.1% to 7.2% in the last five years (The Circularity Gap Report, 2023). Indeed, high and medium incomes countries consume more than half global materials, whereas the adoption of CE approach can reduce material extraction and usage by a third (The Circularity Gap Report, 2023). Rural areas can provide a relevant contribution in this perspective as they are characterized by resource-based economic activities including agriculture, forestry, fisheries, and energy which significantly give rise to CO2 emissions (Despotović et al., 2021). In this vein, rural areas can play a crucial role as they encompass more than 80% of the total EU territory and 30% of the population (European Commission, 2023). Moreover, CE can help in mitigating the continuous pressure posed by linear economic models in terms of natural resources depletion, socioeconomic disparities, and marginalization of local communities (Mihai, 2023).

To boost the role of rural areas for transition, policies and decision-makers have to address issues as interconnected challenges rather than focusing on single concerns, moving towards a more comprehensive policy design (Cejudo & Trein, 2023). The complexity of sustainability transitions arises from the interplay of socio-technical aspects, which develops into intricate networks where individuals and communities merge with technological artefacts and social elements (Paredis, 2011; Lindberg et al., 2019; Quist et al., 2011; Rogge et al., 2020). According to Geels (2018), socio-technical transitions involve individual behaviours, regulations, cultural significance, infrastructures, and business frameworks along with technology posing a significant challenge in terms of multi-stakeholder dynamics, long timeframes and their intrinsic characteristics. This highlights the need for a comprehensive policy approach based on the design and implementation of 'policy mixes' to transcend myopic decisions and include a long-term view of resources management (Geels, 2019).

Literature on policy mixes for sustainability transitions in and rural areas, are limited at the date. Previous studies explored individual rural challenges like biodiversity conservation (Droste et al.,

2017; Kubo et al., 2019), while only a few contain initial efforts to assess a comprehensive policy mix formulation (Lambin et al., 2020; Uyarra et al., 2016; Falcone et al., 2019; Howlett & Rayner, 2013; Wilts & O'Brien, 2019). Policy formulation is conceived as a step within the policy cycle aimed at designing policy options by involving the combination of possible solutions to address a given issue (Demir and Demir, 2021). This quests the employment of rigorous participatory methods to take into consideration social, environmental, and technological factors, and the inherent complexity of strategic problems (Godet, 2006). Within this context, this study aims to contribute to the literature with the methodological ambition of introducing an innovative path based on an integration of the participatory approach and the new CoCoSo technique. This latter method was developed to simplify the decision-making process in complex scenarios involving different issues and heterogeneous stakeholders. This method has been extensively studied to explore complex topics regarding the environment, the construction sector, the transport and mobility sector, and the circular economy (Dwivedi & Sharma, 2022; Karami et al. 2023; Bouraima et al., 2023; Torkayesh et al., 2022; Cui et al., 2021). To the best of our knowledge, despite the growing interest in this methodology within the academic community, this study represents the first attempt to employ this innovative approach for evaluating policy mix formulation aimed at facilitating sustainability transitions in rural areas. The main contribution of this paper lies in proposing and testing empirically a novel methodological approach to design policy mixes based on the combination of the CoCoSo technique with the engagement of local stakeholders. In this way, the tacit knowledge of stakeholders can be grasped and treated through a scoring method capable of rationalizing the complexity of the gathered information and addressing the intricacy of the policy design process. This approach is expected to favour a policy formulation process based on the shared vision of stakeholders and to enhance therefore the sustainability of the policy action. Moreover, conducting a participatory approach could strengthen researchers' grasp of the real-world situation. This idea is aligned with European Commission guidelines that support evidence-informed policymaking to improve the accuracy of global issue awareness and identify and evaluate various policy choices (Oliver, 2022). We test our methodology on a specific rural area located in the south-east of Italy, by focusing on a Local Action Group which represents a pivotal unit for rural development planning.

The paper is articulated as follows. Section 2 explores the literature on policy mixes for sustainability transition. Section 3 describes the proposed methodological approach. Section 4 illustrates the application of the methodology and discusses the results achieved. Finally. Sections 5 and 6 present the discussion and conclusions, respectively.

2. Literature review

Policy instruments plays a crucial role in sustainability transitions, promoting emissions reduction, providing incentives for adopting new technologies, and investing in R&D (Jacobsson and Lauber, 2006; Rogge and Reichardt, 2016). However, the complexity of transitions requires the adoption of policy mixes capable of addressing various objectives and challenges, including market failures and structural transformation dynamics (Weber and Rohracher, 2012).

The complexity of sustainability transitions raises from the intricate relationships between society and technology (Paredis, 2011). This socio-technical perspective emphasizes the interconnection between the latter two aspects, creating complex networks where individuals and communities combine with technical artefacts and social elements (Adamo and Willis, 2022; Markard et al, 2012). Whitin the socio-technical systems, the fulfilment of social functions, as energy provision, transportation, food production/consumption, emerges as the synergistic effect of the interaction across diverse interconnected elements (actors, institutions, markets, cultural perspectives, and shared norms).

One-fit-all solutions or single-instrument polices are generally unsuited to cause transformative changes of such complex systems (Quitzow, 2015). In this vein, the policy mix approach can provide the means to explore the potential benefits of multiple instruments interaction (Trotter and Brophy, 2022). However, creating an effective policy mix is not trivial as this implies to consider not only the direct influence of each instrument but their synergistic effect (Edmondson et al., 2019; Lindberg et al., 2019; Milhorance et al., 2020).

Policy mixes are a combination of instruments and/or different plans operating at various government levels to achieve a common objective, capable of shaping policy strategies, decision-making and impacts within a specific territorial context (Tønnesen et al., 2022; Vlačić et al., 2018). Rogge and Reichardt (2016) breakdown policy mixes in their fundamental elements and process. At their core there are the combination of instrument mixes and their underlying policy strategies, which are, in turn, shaped by two specific operations, i.e. policy making and implementation, dealing with problem-solving processes addressing societal problems.

The link between socio-technical transitions and policy mix is a reciprocity relationship. On the one hand, policy mixes influence the institutional context of socio-technical systems which in turn affect policy mixes by means of socio-political, administrative, and fiscal feedback mechanisms (Edmondson et al., 2019; Jordan et al. 2004).

In this framework, credibility (i.e. the extent to which the policy action is believable and reliable) is essential to improve the effectiveness and acceptability of policy mixes (Lopolito and Sica, 2022; Rogge and Reichardt, 2016), highlighting the importance of embracing participatory approaches in

policy mixes formulation. According to the literature (di Santo et al., 2023; Jouini et al., 2019; Reed, 2008; Sisto et al., 2018), participatory approaches provide a number of benefits by contributing to: i) reduce the subjective influence of policymakers in strategy formulation, ii) foster a more democratic decision-making process, iii) enhance the transparency of the process, iv) limit the information asymmetry between stakeholders, and v) actively consider different viewpoints from various individuals, thereby raising stakeholders' awareness.

In light of this, we decided to employ a qualitative investigation (i.e. a participatory approach based on the focus group) combined with quantitative methods (i.e. the level-based weights assessment (LBWA) and combined compromise solution (CoCoSo) techniques) (Yazdani et al. 2019) formulate policy mixes, as outlined in the following section. Both methods have been used in applied and analytical complex decision-making problems in various research projects (Torkayesh et al. 2021; Ögel et al. 2023).

3. Research methodology

This section provides all the required operations, materials and formulation to obtain the results. Section 3.1. represents the required fuzzy tools, while 3.2 discusses the Fuzzy LBWA technique, and 3.3 explains the Fuzzy Combined Compromise solution method.

3.1 Required Fuzzy operations

The fuzzy concept has been initially introduced by (Klir and Yuan, 1996) to handle uncertain computing in complex optimization problems. Triangular fuzzy numbers (TFNs) are integrated into uncertain conditions as one of the initial versions of the fuzzy logic which are integrated to address different problems. Some important preliminaries of TFNs are as follows.

Definition 1- A fuzzy number is a special fuzzy set $K = \{(x, \mu_K(x), x \in \Re)\}$, where $\mu_K(x)$ is accepted as a membership function and $0 \leq \mu_K(x) \leq 1$.

Definition 2- A TFN can be shown as $Z = (\alpha, \beta, \gamma)$ where $\alpha \leq \beta \leq \gamma$. The α, β, γ introduce the lower bound value, the center, and the upper bound value, orderly. The triangular membership function of Z is explained as below.

$$\mu_K(x) = \begin{cases} 0, & x < \alpha \\ \frac{x-\alpha}{\beta-\alpha}, & \alpha \leq x \leq \beta \\ \frac{\gamma-x}{\gamma-\beta}, & \beta \leq x \leq \gamma \\ 0, & x > \gamma \end{cases} \quad (1)$$

Suppose $Z_1 = (\alpha_1, \beta_1, \gamma_1)$ and $Z_2 = (\alpha_2, \beta_2, \gamma_2)$ are two TFNs. Some important fundamental

operations are as below.

$$(\alpha_1, \beta_1, \gamma_1) + (\alpha_2, \beta_2, \gamma_2) = (\alpha_1 + \alpha_2, \beta_1 + \beta_2, \gamma_1 + \gamma_2) \quad (2)$$

$$(\alpha_1, \beta_1, \gamma_1) + (\alpha_2, \beta_2, \gamma_2) = (\alpha_1\alpha_2, \beta_1\beta_2, \gamma_1\gamma_2) \quad (3)$$

$$(\alpha_1, \beta_1, \gamma_1)/(\alpha_2, \beta_2, \gamma_2) = (\alpha_1/u_2, \beta_1/\beta_2, \gamma_1/\gamma_2) \text{ for } \alpha_i > 0, \beta_i > 0, \gamma_i > 0. \quad (4)$$

$$(\alpha_i, \beta_i, \gamma_i)^{-1} \approx \left(\frac{1}{\gamma_i}, \frac{1}{\beta_i}, \frac{1}{\alpha_i}\right) \text{ for } \alpha_i > 0, \beta_i > 0, \gamma_i > 0. \quad (5)$$

Definition 3- The graded mean integration representation (GMIR) is the conversion of a TFN to a crisp value. We call this defuzzification process. Suppose $Z_j = (\alpha_j, \beta_j, \gamma_j)$ is a TFN and GMIR $R(Z_j)$ of Z_j is computed via equation (6).

$$R(Z_j) = \frac{\alpha_j + 4\beta_j + \gamma_j}{6} \quad (6)$$

3.2 Fuzzy LBWA

Among the recent weighting based multiple criteria decision making (MCDM) tools, LBWA has become a common and applied technique that attract experts and researchers (Žižović and Pamucar, 2019). This method recently developed as subjective weighting method and gain the weights based on pairwise comparison of criteria through forming non-decreasing strings at criteria significance levels. The method uses a new algorithm for criteria grouping by their significance levels, thus eliminating the need to redefine ordinal scale for pairwise criteria comparison. After grouping by levels, criteria significance is defined with regard to the preferences of DMs. Torkayesh et al. (2021) developed an integrated framework for European healthcare evaluation system utilizing LBWA, best worst method and CoCoSo. In another study Pamucar et al. (2020) proposed a platform for airport access selection through fuzzy LBWA, and WASPAS methods. Growing application of LBWA is extended and experts are taking advantage of that while adopting it to their studies. The following section presents an advanced LBWA algorithm using FTN.

Suppose that in the MCDM model, there is a set of *n* criteria denoted by $C = \{C_1, C_2, \ldots, C_n\}$. Also, suppose that *b* experts participate in the research. Then, based on the above settings, we can evaluate the criteria using the fuzzy LBWA model explained in the following steps:

Step 1. Determining the criteria is the most important in the decision-making process. We will denote such a criterion C_1 and adopt the name best criterion.

Step 2. Grouping criteria by levels of significance. The criteria are grouped by significance levels marked as Q_e ($e = 1,2,\ldots,k$) concerning the following rules:

1) At the first level (Q_1), criteria are grouped whose significance is up to twice less than the best criteria (C_1);

2) At the second level (Q_2) are grouped criteria whose significance is between two and three times less than the best criteria (C_1)

3) At the *k*th level (Q_k) are grouped criteria whose significance is between *k* and *k+1* times less than the best criterion (C_1);

In this way, a subset of criteria is formed for each significance level Q_e ($e = 1,2,\dots,k$).

Step 3. Within each subset of criteria, experts compare the formed subset concerning the best criterion. When comparing the criterion $C_{j_p} \in Q_j$, the value $\chi_{j_p} \in [0,\delta]$ is defined on the basis of which the criterion $C_{j_p} \in Q_j$ is compared with the best criterion. If the criterion C_{j_p} has a greater significance than the criterion C_{j_a} , then $\chi_p < \chi_a$, and if C_{j_p} is equivalent to C_{j_a} then $\chi_p = \chi_a$. The right boundary of the interval $\chi_{j_p} \in [0,\delta]$ is defined by expression (7)

$$\delta = max\{|Q_1|,|Q_2|,\dots,|Q_k|\} \tag{7}$$

Since it is group decision-making, we get comparisons in pairs within a subset (level of significance) Q_e ($e = 1,2,\dots,k$). By applying expression (8), crisp values of expert comparisons of criteria within subsets are transformed into fuzzy values.

$$\tilde{\chi}_{j_p} = (\chi_j^{(l)},\chi_j^{(m)},\chi_j^{(u)}) \Rightarrow \chi_j^{(l)} = \min_b\left\{\chi_{j_p}^b\right\};\ \chi_j^{(m)} = \frac{1}{b}\sum_{e=1}^{b}\chi_{j_p}^e;\ \chi_j^{(u)} = \max_b\left\{\chi_{j_p}^b\right\} \tag{8}$$

where *b* represents the total number of experts.

Step 4. Defining the elasticity coefficient (θ). The coefficient of elasticity is determined by applying the following condition $\theta > \delta$, $\theta = max\{|Q_1|,|Q_2|,\dots,|Q_k|\}$.

Step 5. By applying expression (9), the influence function of the criteria is calculated:

$$\tilde{f}(C_{j_p}) = \frac{\theta}{j\cdot\theta+\tilde{\chi}_{j_p}} \tag{9}$$

where *j* presents the number of the level/subset, θ presents the elasticity coefficient, while $\tilde{\chi}_{j_p}$ presents the fuzzy value assigned to the criterion C_{j_p}.

Step 6. The fuzzy weight coefficients of the criteria are calculated using expressions (10) for the best criterion and equation (11) for the remaining criteria.

$$\widetilde{w}_1 = \frac{1}{1+\tilde{f}(C_2)+\cdots+\tilde{f}(C_n)} \tag{10}$$

$$\widetilde{w}_j = \tilde{f}(C_j) \cdot \widetilde{w}_1 \tag{11}$$

where $j = 2,3, \ldots, n$, and n present a total number of criteria.

Defuzzification was carried out using equation (12)

$$W_j = \left(w_j^{(l)} + 4w_j^{(m)} + w_j^{(r)}\right) \cdot 6^{-1} \tag{12}$$

where $w_j^{(l)}$ and $w_j^{(r)}$ are the left and right distribution trust intervals of the triangular fuzzy number, respectively, while $w_j^{(m)}$ is the value in which the triangular function reaches its maximum value.

3.3 Fuzzy Combined Compromise solution method

In each complex and multi variable decision-making environment, experts and policy makers look for techniques and models which suitably can reach effective and optimal solution with comprehension and less difficulties. In this study, whose focus is on an analytical problem in policy mix, a recent MCDM approach is adopted, in form of multiple-attribute decision making (MADM) approach, which allows to establish rankings the alternative. The CoCoSo or combined compromise solution (Yazdani et al., 2019) has been developed to ease decision making process when sort of variables and experts should participate and a compromise solution is highly demanded. Various type of fuzzy CoCoSo have been established in several and multidisciplinary research projects as Ecer and Pamucar (2020) in supplier performance measurement by Bonferroni concept and best worst method or the work of Kieu et al. (2021) in distribution center in agriculture supply chain. CoCoSo includes a powerful novel approach to handling complicated MCDA problems. The algorithm is based on an integrated exponential weighted product and several combined strategies. It can be replaced by distance-based methods like TOPSIS or VIKOR and undertake more flexible achievements. A novel anatomy of the CoCoSo permits us to rely on three aggregation strategies (scores) to obtain more confidential outcomes and therefore the quality and accuracy of the outcomes are increased (Korucuk et al. 2023). The method delivers a quality results in big or large decision problems (when experts deal with a high number of alternatives) and maintains simplicity and fluency at the same time. In this paper, we apply a fuzzy extension of CoCoSo to deal with uncertainty in policy mix when stakeholders should rate different solution against barriers. The F-CoCoSo method is applied based on the following steps.

Table 1. Linguistic assessment and the associated fuzzy values

Performance	Abbreviation	Linguistic fuzzy values
Absolutely low	AL (1)	[1, 1.5, 2.5]
Very low	VL (2)	[1.5, 2.5, 3.5]
Low	L (3)	[2.5, 3.5, 4.5]
Medium Low	ML (4)	[3.5, 4.5, 5.5]
Equal	E (5)	[4.5, 5.5, 6.5]
Medium High	MH (6)	[5.5, 6.5, 7.5]
High	H (7)	[6.5, 7.5, 8.5]
Extremely high	EH (8)	[7.5, 8.5, 9.5]
Absolutely high	AH (9)	[8.5, 9.5, 10]

Source: Pamucar et al. (2020)

Step 1- Identifying the decision-making matrix including criteria, alternatives, decision-making team, questionnaire preparation, etc.

Step 2- Evaluating the alternatives with regard to each decision criteria by expert opinion and fuzzy linguistic variable according to equation (13).

$$\tilde{X}_{ij} = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \text{ for } i = 1, \dots, m \text{ and } j = 1, \dots, n \tag{13}$$

Step 3- Normalizing the matrix in previous step as equations (14-15) indicate

$$\tilde{r}_{ij} = \frac{x_{ij} - \min\limits_{i} x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}} \tag{14}$$

$$\tilde{r}_{ij} = \frac{\max\limits_{i} x_{ij} - x_{ij}}{\max\limits_{i} x_{ij} - \min\limits_{i} x_{ij}} \tag{15}$$

where equation (14) is used for benefit criteria, and equation (15) is used for cost criteria.

Step 4- Finding the sum of the weighted comparability sequence (SW_i) and the power-weighted comparability sequences (PW_i) for each alternative using the following equations (16-17).

$$\widetilde{SW}_i = \sum_{j=1}^{n} (\tilde{w}_j \, \tilde{r}_{ij}) \tag{16}$$

$$\widetilde{PW}_i = \sum_{j=1}^{n} (w_j)^{r_{ij}} \tag{17}$$

Step 5- Developing the aggregated appraisal scores to calculate the relative weights of alternatives using three strategies:

$$\tilde{Q}_1 = \frac{\widetilde{PW}_i + \widetilde{SW}_i}{\sum_{i=1}^{m} (PW_i + \widetilde{SW}_i)} \tag{18}$$

$$\tilde{Q}_2 = \frac{\widetilde{SW}_i}{\min_i \widetilde{SW}_i} + \frac{\widetilde{PW}_i}{\min_i \widetilde{PW}_i} \quad (19)$$

$$\tilde{Q}_3 = \frac{\lambda\left(\widetilde{SW}_i\right) + (1-\lambda)\left(\widetilde{PW}_i\right)}{\lambda \max_i \widetilde{SW}_i + (1-\lambda) \max_i \widetilde{PW}_i} \quad (20)$$

where $0 \leq \lambda \leq 1$ and is usually considered 0.5 ($\lambda = 0.5$ is taken in this study).

Step 6 – Computing the integrated value for each alternative as equation (21) addresses:

$$\tilde{Q}_i = (\tilde{Q}_1 \times \tilde{Q}_2 \times \tilde{Q}_3)^{\frac{1}{3}} + \frac{1}{3}\left(\tilde{Q}_1 + \tilde{Q}_2 + \tilde{Q}_3\right) \quad (21)$$

In equation 20, varying the value of λ allows us to test the ranking results sensitivity (accuracy). In the results section, after finding the priority and alternative scores, some analysis and sensitivity tests will be performed to check how the results would change.

4. Model implementation and results

In this section, the model implementation will be described. Firstly, a participatory approach based on focus groups was conducted. As mentioned in the previous paragraph, this enabled the territory stakeholders' involvement to reduce the potential risks of failure of future policy mix (Sisto et al., 2016). Given the intricate and multifaceted decision-making context, LBWA and CoCoSo techniques were carried out (Yazdani et al., 2019). This method aligns with the paper's objectives as it has been designed to facilitate decision-making in situations where numerous variables and experts are involved, necessitating the exploration of compromise solutions. Specifically, Section 4.1 describes the selected case study, and Section 4.2 focuses on data collection.

4.1 Case study

In this study, considering the need to understand the role of rural areas in the sustainability transition, a Local Action Group was selected as the investigation unit. LAGs are a fundamental component of the LEADER approach introduced by the European Commission in the 1990s, representing the smallest unit in rural development planning. These units operate as public-private partnerships to promote sustainable development in their rural areas. Moreover, LAGs prioritize economic and environmental sustainability and, more importantly, social sustainability. The core idea is that social inclusion and active engagement of local stakeholders can lead to more effective management of tangible and intangible resources (Nomabandla et al., 2023). Among the various objectives pursued by this LAG are: i) promoting the inclusion of women in the workforce; ii) organizing fairs and events to stimulate local economic activity; iii) establishing thematic working groups to define future projects; iv) promoting participatory approaches to enhance collaboration with the local university; and v) providing support to member firms.

In this paper, the LAG Daunia Rurale 2020 was chosen as a case study. Based in northern Apulia, this organization has been actively engaged in various projects addressing environmental and social sustainability issues. It has witnessed increased participation from various local businesses over time. Moreover, in the current period, when LAGs face the even more challenging task of supporting a sustainable transition, it is increasingly important to investigate their readiness to support this transition.

The LAG Daunia Rurale operates under Measure 19 of the 2014-2020 Rural Development Plan of the Apulia Region and is funded by the European Fund for Agriculture and Rural Development (EAFRD). 80 members constitute this organization, categorized as follows: 69 firms, any trade associations, some private associations and consortiums, and other public and private institutions focused on education and research.

The local economy where the LAG is situated is focused mainly on agriculture and agri-food production. Numerous typical products of the area, such as wheat and extra virgin olive oil, are deeply rooted in local traditions and significantly contribute to national and international agricultural production. In addition, the latter are two crops that, by their nature, lend themselves well to a potential CE scenario, as they generate straw and waste that can be effectively reused (as investigated by Hagman & Feiz, 2021; Principato et al., 2019; Sánchez-Sánchez et al., 2020).

It is worth highlighting that the LAG Daunia Rurale 2020 is highly active in the area, coordinating various initiatives, workshops, informational meetings, and thematic discussions to support local businesses. The dynamism of firms and the LAG Daunia Rurale is a distinctive feature that makes this case study particularly interesting for achieving the paper's objectives.

Considering the positive impact of adopting a participatory approach, we implemented two focus groups to engage two types of participant groups: local entrepreneurs who are LAG members and experts in CE and LAGs. According to Rabiee (2004), a focus group involves interviews with a carefully selected group of individuals who deeply understand the subject matter and have a shared objective to pursue. Moreover, fostering dialogue among stakeholders would stimulate crucial discussions about the future strategies to be implemented in the region (Rabiee, 2004; Redden et al., 2023).

Below is a step-by-step description of how the method was implemented:

> **Step 1:** The first online focus group took place in April 2023, and it involved 11 participants, carefully chosen for their expertise and deep knowledge of Apulia territory. The participants included a rural development expert, a socio-technical transition specialist, an organic chemist, and a representative from the Apulia Region involved in local development funding.

The primary objective of this focus group was to formulate a practical scenario based on sustainability or a CE approach within the LAG Daunia Rurale 2020 area and to identify potential obstacles to its implementation. Their idea was to establish a biomass centre to reuse agricultural waste. Consequently, the idea was to collect opinions to identify potential barriers that impact the implementation of the waste reuse strategy.

Step 2: After that, a second focus group, held in June 2023, aimed to consider the feasibility of the scenario developed by experts and weigh the barriers and needs. This time, the participants were 12 local entrepreneurs present, all of whom were members of LAG Daunia Rurale 2020. For the operational step, participants were split into small groups of 6-7 individuals to manage the focus group better, facilitating discussions about factors to overcome barriers and address weaknesses in the chosen scenario.

Step 3: The results of the focus group with experts and the focus group with stakeholders was used to identify the main barriers and enabling factors. Table 2 shows expert opinion, where 18 solutions (needs or decision alternatives) are extracted from specialist consultation and 17 barriers (criteria). The data has been taken from experts using fuzzy linguistic values sourced by Table 1.

Step 4: The first operation is to formulate the two methods, fuzzy LBWA and fuzzy CoCoSo, to encounter the weights of each criterion and the ranking score of each alternative, respectively. The main entry for each process is the initial assessment from experts. Firstly, we focus on the relative weighting of the assessment criteria (barriers). In the second process, the overall priority of the alternatives will be achieved (Figure 1 presents barriers and alternative labels).

In order to obtain the weights, the F-LBWA method is utilized as the algorithm can be found in section 3.2. We have C={C_1,C_2,…,C_n } of criteria (17 barriers) and four experts (decision makers) which offer us their opinion (step 1 and 2). They agreed to classify the criteria into four groups (Q) of importance as algorithm requests. As is seen in Table 3, the most preferred criterion is B17, and the last one is B15, while the other values are ascending. In Table 3, all other criteria are rated and compared to the best criteria (B17), as the LBWA method explains. In level one 6 criteria, and so on in (step 3). Therefore, the δ value is the max (6, 4, 4, 3) = 6 and the rating scale is [0,6] for all levels under formula 7. This means stakeholders (experts) can rate each value they prefer.

Step 5: Using formula 8, the fuzzy transformation matrix is obtained and the results are tabulated in Table 4.

Step 6: The next step is to define the elasticity coefficient and producing the influence function, $\tilde{f}(C_{j_p})$. This values for all criteria are addressed in step 4 and 5, using formula 9. The results are shown in Table 5.

Step 7: Fuzzy weight coefficients of the criteria are computed using formulas 10 and 11 for the B17 and others.

Step 8: In order to ease the computation process for the next steps (alternative ranking), we apply equation 12 to convert fuzzy values to deffuzzified values. Therefore, the final weights can be observed in Table 6.

Step 9: The second operation (task) is to develop the decision matrix, including the rating and preference of alternatives regarding all the existing criteria. Again, stakeholders participated in this task and delivered their opinions or judgments. They have been asked to evaluate the performance of each solution (need, alternative, we call it) concerning each barrier. The question is how each solution can react to overcome those barriers. Stakeholders know how to rate those alternatives while objecting to the barriers using the fuzzy linguistic values in Table 1. Table 7 shows the initial evaluation matrix demonstrated by stakeholders. In this study, we considered 18 possible solutions and 17 barriers.

Step 10: Data from Table 7 are translated to numerical values as Table 8 explains. The Table 8 is the fuzzy numerical and triangle format converted from Table 7. It can be observed that in Table 7, there are some variations in the number of values associated with different alternatives. This result directly results from our choice to use thematic tables to analyse barriers and enabling factors. There were alternatives where consensus led to selecting a single value to input into the table cell. However, in other cases, active discussions among participants led to the decision to include multiple values. Instead of setting a requirement to choose a single value consistently, we use this variability as part of our decision to a fully participatory approach. Having this matrix allows us to start fuzzy CoCoSo method described in section 3.3 which reflects the equation 13 as the primary decision or evaluation matrix. Following the steps in CoCoSo, the matrix should be normalized using equation 14 and 15. All the barriers are considered as cost orientation; therefore, we use normalization only for cost category. Normalized matrix is shown in Table 9. Due to high volume of computation and extra data or tables, we simply consider the most relevant tables. This helped to avoid a very lengthy results report. In this manner, the final results for fuzzy CoCoSo can be achieved using formulas 18, 19, 20 and 21. For the λ as mentioned before, we keep it 0.5. In total, our model implementation reveals that:

$A_5 > A_3 > A_{13} > A_9 > A_{10} > A_{15} \ldots > A_4 > A_1 > A_2$

demonstrates the priority of the alternatives. A_5 is the best alternative followed by A_3, A_{13} while worst items are A_1 and A_2. Alternative ranking and the final results of the fuzzy CoCoSo are observable in Table 10.

Table 2: Expert Opinions - Solutions and 17 Barriers

LABEL	BARRIERS	LABEL	ALTERNATIVES
B1	Scant territorial size	A1	Upgrading of processing facilities (oil mills and wineries)
B2	Limited financial resources for rural development	A2	Creation of green job opportunities
B3	Substandard infrastructure	A3	Realization of pilot facilities
B4	Low willingness of operators to cooperate	A4	Fund raising
B5	Sociocultural inertia of local workers	A5	Knowledge sharing
B6	Lack of green vision of local operators	A6	Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians
B7	Use of waste in non-legal practices	A7	Participation in exhibitions
B8	Lack of social security	A8	Sharing of machinery and facilities
B9	Lack of territorial identity	A9	Implementation of common infrastructure and logistics platforms
B10	Market uncertainty for new products	A10	Dissemination of technical knowledge
B11	Complexity of technological innovation	A11	Creation of subsidized finance opportunities
B12	Competition in the use of residues from off-site alternatives	A12	Use of winery and oil mill plants and facilities for other closely related production activities
B13	New CAP incentives	A13	Fostering the exchange of waste material within a shared network
B14	Limited institutional networking	A14	Research on market readiness
B15	Central planning unsuited to the needs of the territory	A15	Creating network contracts
B16	Dispersion/overlapping of calls	A16	Generational renewal
B17	Rigorous regulations that place administrative constraints	A17	Specific training for biorefinery technicians
		A18	Value chain organization

Table 3 - Distribution of the criteria by their level of importance

		Expert initial evaluation			
Level	Criteria	Ex_1	Ex_2	Ex_3	Ex_4
1	B17	0.00	0	0	0
1	B4	0.10	1.5	0.5	1
1	B14	2.00	2	2	2.3
1	B1	2.50	2.5	2.5	3
1	B13	4.00	3.8	4	3.5
1	B5	4.10	4	6	5
2	B3	0.00	0	0	0
2	B7	1.00	2	1	2.5

2	B12	2.5	3	3	4.5
2	B16	4	3.8	5	6
3	B2	0	0	0	0
3	B11	3	3	3	1
3	B9	5	5.2	5.5	2.5
3	B6	5.8	6	6	5.5
5	B10	0	0	0	0
5	B8	3.5	4	1	2
5	B15	5.5	5.3	5	5

Table 4 - Fuzzy transformation matrix

Preferences	Triangular fuzzy number	Level/subset
B17	(0, 0, 0)	Level Q1
B4	(0.1, 0.78, 1.5)	
B14	(2, 2.08, 2.3)	
B1	(2.5, 2.63, 3)	
B13	(3.5, 3.83, 4)	
B5	(4, 4.78, 6)	
B3	(0, 0, 0)	Level Q2
B7	(1, 1.63, 2.5)	
B12	(2.5, 3.25, 4.5)	
B16	(3.8, 4.7, 6)	
B2	(0, 0, 0)	Level Q3
B11	(1, 2.5, 3)	
B9	(2.5, 4.55, 5.5)	
B6	(5.5, 5.83, 6)	
B10	(0, 0, 0)	Level Q5
B8	(1, 2.63, 4)	
B15	(5, 5.2, 5.5)	

Table 5 - The influence function for each decision criterion

Functions	Triangular fuzzy number
f(C5)	(1, 1, 1)
f(C7)	(0.914, 0.954, 0.994)
f(C17)	(0.874, 0.885, 0.889)
f(C1)	(0.842, 0.859, 0.865)
f(C22)	(0.8, 0.807, 0.821)
f(C9)	(0.727, 0.77, 0.8)
f(C16)	(0.5, 0.5, 0.5)
f(C15)	(0.464, 0.476, 0.485)
f(C2)	(0.438, 0.454, 0.464)
f(C8)	(0.421, 0.436, 0.447)

f(C20)	(0.333, 0.333, 0.333)
f(C3)	(0.314, 0.317, 0.327)
f(C11)	(0.299, 0.304, 0.317)
f(C12)	(0.296, 0.297, 0.299)
f(C14)	(0.2, 0.2, 0.2)
f(C13)	(0.19, 0.194, 0.198)
f(C23)	(0.187, 0.188, 0.188)

Table 6 – Final fuzzy criteria weights and corresponding defuzzified values

Criteria	Triangular fuzzy number	Defuzzified
B17	(0.11, 0.111, 0.114)	0.11148
B4	(0.1, 0.106, 0.113)	0.10637
B14	(0.096, 0.099, 0.101)	0.09856
B1	(0.092, 0.096, 0.098)	0.09558
B13	(0.088, 0.09, 0.093)	0.09011
B5	(0.08, 0.086, 0.091)	0.08565
B3	(0.055, 0.056, 0.057)	0.05574
B7	(0.051, 0.053, 0.055)	0.053
B12	(0.048, 0.051, 0.053)	0.05051
B16	(0.046, 0.049, 0.051)	0.04854
B2	(0.037, 0.037, 0.038)	0.03716
B11	(0.034, 0.035, 0.037)	0.03545
B9	(0.033, 0.034, 0.036)	0.03408
B6	(0.032, 0.033, 0.034)	0.03316
B10	(0.022, 0.022, 0.023)	0.0223
B8	(0.021, 0.022, 0.022)	0.0216
B15	(0.021, 0.021, 0.021)	0.02093

Table 7 – The initial fuzzy linguistic alternative assessment by experts

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C 16	C17
A1											8						
A2						9											
A3		7	8	5						7	7						
A4		6;7															
A5					8				8;8;8	9	8	3		7	8	6	6
A6				7;7	8;8	8				9							
A7				8	9;9					9							
A8		6						4			6	6					
A9			6	7							7	6					
A10				8;7;7		9;8				8	8					6	6
A11		7;7										4	8				

A12											8	6					
A13				7	7						7	6					
A14										7							
A15	7;7						8	6;5	6;7			7	9	9	8		
A16				7		7;6	8	6;5	6;7								
A17									2		7						
A18												6	8	6			

Table 8 – The initial fuzzy decision matrix transformed by linguistic variables

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A2	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 8.5)	(0, 8.5, 9.5)	(8.5, 9.5, 10)	(9.5, 10, 0)
A3	(0, 0, 0)	(0, 0, 6.5)	(0, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 7.5)	(8.5, 7.5, 8.5)	(7.5, 8.5, 9.5)	(8.5, 9.5, 4.5)	(9.5, 4.5, 5.5)	(4.5, 5.5, 6.5)	(5.5, 6.5, 0)	(6.5, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A4	(0, 0, 0)	(0, 0, 6)	(0, 6, 7)	(6, 7, 8)	(7, 8, 0)	(8, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A5	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 7.5)	(0, 7.5, 8.5)	(7.5, 8.5, 9.5)	(8.5, 9.5, 0)	(9.5, 0, 0)	(0, 0, 0)	(0, 0, 0)
A6	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 6.5)	(0, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 7.5)	(8.5, 7.5, 8.5)	(7.5, 8.5, 9.5)	(8.5, 9.5, 7.5)	(9.5, 7.5, 8.5)	(7.5, 8.5, 9.5)	(8.5, 9.5, 0)
A7	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 7.5)	(0, 7.5, 8.5)	(7.5, 8.5, 9.5)	(8.5, 9.5, 8.5)	(9.5, 8.5, 9.5)	(8.5, 9.5, 10)	(9.5, 10, 0)	(10, 0, 0)	(0, 0, 0)	(0, 0, 0)
A8	(0, 0, 0)	(0, 0, 5.5)	(0, 5.5, 6.5)	(5.5, 6.5, 7.5)	(6.5, 7.5, 0)	(7.5, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A9	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 5.5)	(0, 5.5, 6.5)	(5.5, 6.5, 7.5)	(6.5, 7.5, 6.5)	(7.5, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 0)	(8.5, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A10	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 6.8)	(0, 6.8, 7.85)	(6.8, 7.85, 8.9)	(7.85, 8.9, 0)	(8.9, 0, 0)	(0, 0, 0)	(0, 0, 8)	(0, 8, 9)	(8, 9, 9.75)	(9, 9.75, 0)
A11	(0, 0, 0)	(0, 0, 6.5)	(0, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 0)	(8.5, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A12	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A13	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 6.5)	(0, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 6.5)	(8.5, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 0)	(8.5, 0, 0)	(0, 0, 0)	(0, 0, 0)
A14	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A15	(6.5, 7.5, 8.5)	(7.5, 8.5, 0)	(8.5, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 7.5)
A16	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 6.5)	(0, 6.5, 7.5)	(6.5, 7.5, 8.5)	(7.5, 8.5, 0)	(8.5, 0, 0)	(0, 0, 0)	(0, 0, 6)	(0, 6, 7)	(6, 7, 8)	(7, 8, 0)
A17	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A18	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)

Table 9 – Normalized fuzzy matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
A1	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A2	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.05)	(0, 0.05, 0.15)	(0.05, 0.15, 0)
A3	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.118)	(0, 0.118, 0.235)	(0.118, 0.235, 0)	(0.235, 0, 0.105)	(0, 0.105, 0.211)	(0.105, 0.211, 1)	(0.211, 1, 1.333)	(1, 1.333, 1.667)	(1.333, 1.667, 0)	(1.667, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A4	(0, 0, 0)	(0, 0, 0.059)	(0, 0.059, 0.176)	(0.059, 0.176, 0.294)	(0.176, 0.294, 0)	(0.294, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)

A5	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.05)	(0, 0.05, 0.15)	(0.05, 0.15, 0.25)	(0.15, 0.25, 0)	(0.25, 0, 0)	(0, 0, 0)	(0, 0, 0)
A6	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.333)	(0, 0.333, 0.667)	(0.333, 0.667, 1)	(0.667, 1, 0.05)	(1, 0.05, 0.15)	(0.05, 0.15, 0.25)	(0.15, 0.25, 0.05)	(0.25, 0.05, 0.15)	(0.05, 0.15, 0.25)	(0.15, 0.25, 0)
A7	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.333)	(0, 0.333, 0.667)	(0.333, 0.667, 0)	(0.667, 0, 0.05)	(0, 0.05, 0.15)	(0.05, 0.15, 0)	(0.15, 0, 0)	(0, 0, 0)	(0, 0, 0)
A8	(0, 0, 0)	(0, 0, 0.118)	(0, 0.118, 0.235)	(0.118, 0.235, 0.353)	(0.235, 0.353, 0)	(0.353, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A9	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.211)	(0, 0.211, 0.316)	(0.211, 0.316, 0.421)	(0.316, 0.421, 0.333)	(0.421, 0.333, 0.667)	(0.333, 0.667, 1)	(0.667, 1, 0)	(1, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A10	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.2)	(0, 0.2, 0.55)	(0.2, 0.55, 0.9)	(0.55, 0.9, 0)	(0.9, 0, 0)	(0, 0, 0)	(0, 0, 0.025)	(0, 0.025, 0.1)	(0.025, 0.1, 0.2)	(0.1, 0.2, 0)
A11	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.118)	(0, 0.118, 0.235)	(0.118, 0.235, 0)	(0.235, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A12	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A13	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.333)	(0, 0.333, 0.667)	(0.333, 0.667, 1)	(0.667, 1, 0.15)	(1, 0.15, 0.25)	(0.15, 0.25, 0.35)	(0.25, 0.35, 0)	(0.35, 0, 0)	(0, 0, 0)	(0, 0, 0)
A14	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A15	(0, 0.118, 0.235)	(0.118, 0.235, 0)	(0.235, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A16	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0.333)	(0, 0.333, 0.667)	(0.333, 0.667, 1)	(0.667, 1, 0)	(1, 0, 0)	(0, 0, 0)	(0, 0, 0.2)	(0, 0.2, 0.3)	(0.2, 0.3, 0.4)	(0.3, 0.4, 0)
A17	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)
A18	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)	(0, 0, 0)

Table 10 – Fuzzy CoCoSo ranking score and alternative priorities

	$\tilde{Q}_1$			Crisp value	$\tilde{Q}_2$			Crisp value	$\tilde{Q}_3$			Crisp value	$\tilde{Q}_i$	Alt. ranking
A1	(0, 0.016, 0.028)	(0.016, 0.028, 0.015)	(0.028, 0.015, 0)	0.015	(0, 0.561, 0.785)	(0.561, 0.785, 0.449)	(0.785, 0.449, 0)	0.449	(0, 0.109, 0.114)	(0.109, 0.114, 0.074)	(0.114, 0.074, 0.258)	0.074	0.258	17
A2	(0, 0.015, 0.027)	(0.015, 0.027, 0.014)	(0.027, 0.014, 0)	0.014	(0, 0.356, 0.429)	(0.356, 0.429, 0.262)	(0.429, 0.262, 0)	0.262	(0, 0.1, 0.104)	(0.1, 0.104, 0.068)	(0.104, 0.068, 0.177)	0.068	0.177	18
A3	(0.048, 0.081, 0.146)	(0.081, 0.146, 0.091)	(0.146, 0.091, 3.382)	0.091	(3.382, 5.217, 6.416)	(5.217, 6.416, 5.005)	(6.416, 5.005, 0.356)	5.005	(0.356, 0.578, 0.606)	(0.578, 0.606, 0.513)	(0.606, 0.513, 2.487)	0.513	2.487	2
A4	(0.014, 0.015, 0.027)	(0.015, 0.027, 0.019)	(0.027, 0.019, 0.364)	0.019	(0.364, 0.457, 0.543)	(0.457, 0.543, 0.455)	(0.543, 0.455, 0.099)	0.455	(0.099, 0.105, 0.108)	(0.105, 0.108, 0.104)	(0.108, 0.104, 0.289)	0.104	0.289	16
A5	(0.042, 0.136, 0.246)	(0.136, 0.246, 0.141)	(0.246, 0.141, 2.513)	**0.141**	(2.513, 5.95, 7.506)	(5.95, 7.506, 5.323)	(7.506, 5.323, 0.31)	**5.323**	(0.31, 0.948, 0.997)	(0.948, 0.997, 0.752)	(0.997, 0.752, 2.899)	**0.752**	**2.899**	**1**
A6	(0.04, 0.061, 0.112)	(0.061, 0.112, 0.071)	(0.112, 0.071, 1.678)	0.071	(1.678, 3.005, 4.024)	(3.005, 4.024, 2.902)	(4.024, 2.902, 0.293)	2.902	(0.293, 0.43, 0.457)	(0.43, 0.457, 0.393)	(0.457, 0.393, 0)	0.393	1.555	9
A7	(0, 0.043, 0.081)	(0.043, 0.081, 0.041)	(0.081, 0.041, 0)	0.041	(0, 1.724, 2.701)	(1.724, 2.701, 1.475)	(2.701, 1.475, 0)	1.475	(0, 0.299, 0.33)	(0.299, 0.33, 0.21)	(0.33, 0.21, 0)	0.210	0.809	13
A8	(0.06, 0.064, 0.115)	(0.064, 0.115, 0.08)	(0.115, 0.08, 2.276)	0.080	(2.276, 2.962, 3.637)	(2.962, 3.637, 2.958)	(3.637, 2.958, 0.432)	2.958	(0.432, 0.451, 0.466)	(0.451, 0.466, 0.45)	(0.466, 0.45, 0)	0.450	1.636	7
A9	(0.059, 0.065, 0.117)	(0.065, 0.117, 0.08)	(0.117, 0.08, 2.716)	0.080	(2.716, 4.041, 5.346)	(4.041, 5.346, 4.035)	(5.346, 4.035, 0.427)	4.035	(0.427, 0.461, 0.489)	(0.461, 0.489, 0.459)	(0.489, 0.459, 0)	0.459	2.055	4
A10	(0.042, 0.091, 0.166)	(0.091, 0.166, 0.1)	(0.166, 0.1, 1.427)	0.100	(1.427, 3.886, 5.414)	(3.886, 5.414, 3.575)	(5.414, 3.575, 0.301)	3.575	(0.301, 0.632, 0.675)	(0.632, 0.675, 0.536)	(0.675, 0.536, 0)	0.536	1.980	5
A11	(0.028, 0.046, 0.084)	(0.046, 0.084, 0.053)	(0.084, 0.053, 1.635)	0.053	(1.635, 2.551, 3.127)	(2.551, 3.127, 2.438)	(3.127, 2.438, 0.208)	2.438	(0.208, 0.327, 0.343)	(0.327, 0.343, 0.293)	(0.343, 0.293, 0)	0.293	1.263	11
A12	(0.015, 0.032, 0.058)	(0.032, 0.058, 0.035)	(0.058, 0.035, 0.647)	0.035	(0.647, 1.526, 2.063)	(1.526, 2.063, 1.412)	(2.063, 1.412, 0.108)	1.412	(0.108, 0.225, 0.237)	(0.225, 0.237, 0.19)	(0.237, 0.19, 0)	0.190	0.757	14

A13	(0.058, 0.064, 0.116)	(0.064, 0.116, 0.079)	(0.116, 0.079, 2.712)	0.079	(2.712, 4.092, 5.45)	(4.092, 5.45, 4.085)	(5.45, 4.085, 0.42)	4.085	(0.42, 0.457, 0.487)	(0.457, 0.487, 0.455)	(0.487, 0.455, 0)	0.455	2.068	3
A14	(0.015, 0.016, 0.029)	(0.016, 0.029, 0.02)	(0.029, 0.02, 0.527)	0.020	(0.527, 0.647, 0.765)	(0.647, 0.765, 0.646)	(0.765, 0.646, 0.11)	0.646	(0.11, 0.113, 0.116)	(0.113, 0.116, 0.113)	(0.116, 0.113, 0)	0.113	0.374	15
A15	(0.015, 0.114, 0.21)	(0.114, 0.21, 0.113)	(0.21, 0.113, 0.436)	0.113	(0.436, 3.572, 4.806)	(3.572, 4.806, 2.938)	(4.806, 2.938, 0.105)	2.938	(0.105, 0.786, 0.838)	(0.786, 0.838, 0.576)	(0.838, 0.576, 0)	0.576	1.785	6
A16	(0.044, 0.063, 0.114)	(0.063, 0.114, 0.074)	(0.114, 0.074, 1.863)	0.074	(1.863, 3.069, 3.923)	(3.069, 3.923, 2.952)	(3.923, 2.952, 0.317)	2.952	(0.317, 0.445, 0.465)	(0.445, 0.465, 0.409)	(0.465, 0.409, 0)	0.409	1.591	8
A17	(0.031, 0.033, 0.058)	(0.033, 0.058, 0.04)	(0.058, 0.04, 1.307)	0.040	(1.307, 1.597, 1.884)	(1.597, 1.884, 1.596)	(1.884, 1.596, 0.222)	1.596	(0.222, 0.229, 0.235)	(0.229, 0.235, 0.229)	(0.235, 0.229, 0)	0.229	0.867	12
A18	(0.041, 0.045, 0.082)	(0.045, 0.082, 0.056)	(0.082, 0.056, 1.766)	0.056	(1.766, 2.466, 3.145)	(2.466, 3.145, 2.459)	(3.145, 2.459, 0.295)	2.459	(0.295, 0.32, 0.338)	(0.32, 0.338, 0.318)	(0.338, 0.318, 0)	0.318	1.297	10

4.2 Results analysis

From MCDM perspective we performed several tests to assure the accuracy of the results. Firstly, CoCoSo gives possibility to check the data robustness by changing the λ values from 0.1 to 0.9. Table 11 addresses the obtained ranking for those λ variables. It is confirmed that the ranking of alternatives is not affected by λ alternation. The CoCoSo algorithm delivers a flexibility mode to decision experts due to its uniqueness and having a linear or parametric aggregation. For instance, Ecer and Pamucar (2020) developed a mixture of Fuzzy CoCoSo and best worst method to evaluate the sustainable performance of suppliers, where he effectiveness of the CoCoSo improved the quality of decision making and authors reported a high satisfaction in results comprehension and interpretation among experts participated in the study. CoCoSo enables decision makers to process the complex group information while respecting the interrelationships between parameters and variables. Obviously, we have noticed that the stability of results was approved by changing λ values and no change in ranking occurred. To best of our knowledge, few MCDM tools have such structure.

CoCoSo is a novel technique recently developed to determine the optimal solution for a complex decision problem when there is huge amount of data (mostly when we have considerable alternatives and criteria). In addition, CoCoSo reflects enough efficiency in real time decision problems (Deveci et al. 2021). Deveci et al. 2021 extended a fuzzy CoCoSo to rate the different traffic management methods. The CoCoSo function approved that such a combination of compromise strategies in an evaluation process yields objective and flexible results where the values of the ratings of alternatives are uniform in the main decision table.

In our study, we have seen that equations 18, 19 and 20 which obtain different Q aggregation component for CoCoSo has produced similar ranking and the top alternative remains same as A_5. This is another advantage of using CoCoSo to certify the accuracy of the fuzzy results which is very important for our stakeholders. Table 10 illustrates that the ranking of all Q strategies will remain

same, specially the 1th, 2nd, 3rd and worst alternatives which are more sensitive for stakeholders. This adds value to the quality of the research outcome and guarantee the preciseness of the final decision.

The third point to discuss about the performance of CoCoSo is to compare it with other relevant MCDM tools. Decision making researchers normally use the MCDM comparison to validate the algorithm outputs and check the correlation factor (Yazdani et al. 2020; Mohammed et al. 2023). Therefore, we applied fuzzy MABAC, and fuzzy MARCOS methods to compare with CoCoSo. Table 11 shows the ranking of MABAC and MARCOS. Interesting to mention that MABAC and MARCOS produce same ranking which indicates a complete agreement while the correlation between CoCoSo and them is 80% that is also in high agreement. The Figure 1 draws the CoCoSo ranking for all the solutions comparing to other methods based on Table 11 data.

Table 11– Sensitivity analysis of λ score (Fuzzy CoCoSo) and two MCDM ranking comparisons

	0.1	0.2	0.3	0.4	**0.5**	0.6	0.7	0.8	0.9	MABAC	MARCOS
A1	17	17	17	17	17	17	17	17	17	15	15
A2	18	18	18	18	18	18	18	18	18	16	16
A3	2	2	2	2	2	2	2	2	2	7	7
A4	16	16	16	16	16	16	16	16	16	17	17
A5	1	1	1	1	1	1	1	1	1	2	2
A6	9	9	9	9	9	9	9	9	9	5	5
A7	13	13	13	13	13	13	13	13	13	6	6
A8	7	7	7	7	7	7	7	7	7	12	12
A9	4	4	4	4	4	4	4	4	4	8	8
A10	5	5	5	5	5	5	5	5	5	3	3
A11	11	11	11	11	11	11	11	11	11	11	11
A12	14	14	14	14	14	14	14	14	14	13	13
A13	3	3	3	3	3	3	3	3	3	4	4
A14	15	15	15	15	15	15	15	15	15	18	18
A15	6	6	6	6	6	6	6	6	6	1	1
A16	8	8	8	8	8	8	8	8	8	10	10
A17	12	12	12	12	12	12	12	12	12	14	14
A18	10	10	10	10	10	10	10	10	10	9	9

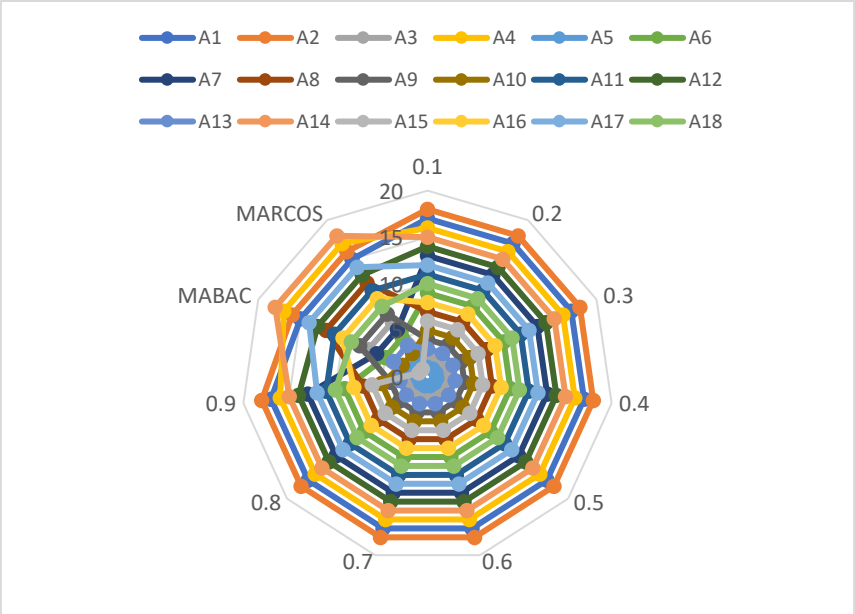

Figure 1 – The visual ranking of the CoCoSo results

5. Discussion and Conclusions

The aim of this paper was to introduce a methodological approach that could improve evidence-informed policymaking. This purpose brings a method to grasp relevant knowledge from stakeholders and treat it in mathematical terms to reach the formulation of policy mixes in supporting the sustainability transition of local contexts. This method is based on a participatory approach combined with CoCoSo technique. We demonstrated this method through an application to the rural context of a LAG, by engaging its stakeholders in a decision-making process related a circular economy scenario, namely the establishment of a biomass center for waste reuse. During the focus group, alternatives, barriers and enabling factors were categorized, analyzed and discussed.

The application of LBWA-CoCoSo returned the following ranking of alternatives: Knowledge sharing (A5), Realization of pilot facilities (A3), Fostering the exchange of waste material within a shared network (A13), Implementation of common infrastructure and logistics platforms (A9), Dissemination of technical knowledge (A10), Creating network contracts (A15), Sharing of machinery and facilities (A8), Generational renewal (A16), Organization of guided tours and/or invitation of highly specialized entrepreneurs and technicians (A6), Value chain organization (A18), Creation of subsidized finance opportunities (A11), Specific training for biorefinery technicians (A17), Participation in exhibitions (A7), Use of winery and oil mill plants and facilities for other closely related production activities (A12), Research on market readiness (A14), Fund raising (A4), Upgrading of processing facilities (oil mills and wineries) (A1), Creation of green job opportunities (A2).

Through this prioritization, it is possible to identify the critical factors and primary objectives for the establishment of an agricultural waste reuse centre within the LAG in a long-term perspective. More specifically, the alternatives requiring the highest priority in the decision-making process belong the social domain. These include knowledge sharing activities (A5), pilot projects delivery (A3), and networking of local actors to facilitate the exchange of material and non-material resources (A13 - A10) and foster relationships within the rural area. Secondly, technical aspects should be addressed, encompassing the improvement of infrastructure (A9), the sharing of machinery to mitigate installation costs (A8) and regional initiatives and exhibitions (A6, A7). Finally, economic and financial aspects - fundraising (A4), processing facilities (A1), green job opportunities (A2) - exhibited the lowest level of priority.

These results reinforce the idea that sustainability transitions represent complex processes and a formidable challenge to conventional social sciences due to their multi-stakeholder dynamics, extended timeframes, and inherent complexities. In this perspective, the increase of the interaction among local stakeholders through participatory approaches plays a pivotal role, enabling a comprehensive assessment of the policy issue from diverse viewpoints.

The utilization of LBWA-CoCoSo delivers a user-friendly platform for experts to determine their opinion and transmit it to the algorithm for mathematical operations. In addition, the proposed decision analysis method can obtain reliable and reasonable outcomes to aid experts in this project and facilitate an effective decision-making model for the complicated alternatives and criteria assessment. Through the consequences and the results, experts are able to rely on the data, make more qualified decision which is the main goal of the entire project.

5.1 Implications

This study has several implications that can be summarized as follows:

- At the local enterprise level, our results emphasize the crucial role of farms in planning future territorial strategies. Furthermore, with a primary focus on the social conditions of the area, these results could have significant impacts, as they could become the central focus for future policy mixes. However, this presupposes the need for a stronger awareness among stakeholders in participating actively in the policy mix design process.
- At the territorial level, our findings provide valuable insights based on the territorial knowledge of stakeholders in addressing the issue of the circular economy and assist evidence-informed policymaking approach. This has allowed the identification of both territorial strengths (e.g. the typical agri-food goods produced in the area), and weaknesses (e.g. the lack of adequate infrastructures).

- At the research level, this study has adopted a new rigorous methodology in a field (I.e. the policy formulation) where there is still a strong need to investigate operational aspects of policy mixes, particularly during the implementation phase.
- At the policy level, the proposed methodology and the results achieved can provide a relevant support to policymakers, reinforcing the idea that policies should be founded on participatory approaches and more effective collaboration strengthened by the research communities for evidence-informed policymaking. The fuzzy MCDM integrates the linguistic and qualitative data with the mathematical models and demonstrates reliable results that is fitted to the research objectives.

5.2 Limitation and future research

This paper encompasses informative insights to the LAG strategists to regulate solutions and practices appropriately. Despite the valuable results obtained, this study has some limitations. For instance, the establishment of a biomass centre for waste reuse may not be the sole possible scenario. At the same time, some specific alternatives could have been excluded from the scenario analysis. Moreover, the decision to focus on a specific LAG may have introduced participant self-selection biases in the focus group composition. Although some of these limitations have been addressed (for instance the use of two focus groups has enhanced the reliability of the results concerning the scenario choice and the alternatives considered), it is important to acknowledge these shortcomings. Future research lines could therefore explore alternative sustainable scenarios in different territorial contexts, broadening thus our findings. Moreover, integration of other uncertainty scenarios into a multiple-criteria framework that enables the processing of neutral information with dynamic interval values will enhance the quality and preciseness of the decision making.

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Concluding Remarks

In the context of evidence-informed policymaking, the thesis aims to address a literature gap by enhancing our understanding of policy mix implementation in rural areas. In several chapters, the focus is on selecting a Local Action Group, which is a unit dedicated to promoting rural development. Specifically, the LAG Daunia Rurale 2020 served as a tool for delving more deeply into the characteristics of rural areas. The study's approach is to investigate a policy mix as a new approach to addressing complex global issues. The traditional sectoral policy view needs to be revised to manage challenges, especially in economic sectors such as agriculture, forestry, and agri-food, which cannot be collected by overlooking their interconnections. Furthermore, the idea of managing linked sectors to achieve sustainable transition goals makes the global situation entangled. In this framework, the role of policies supporting the transition becomes increasingly fundamental and emphasized in the literature. Policies should follow holistic approach, involving multiple actors, sectors, and disciplines. Rural areas play a fundamental role in this complex framework, as highlighted in international policy documents and academic literature. To achieve the goal of the thesis, it was deemed necessary to consider various research strands to construct a intersectoral framework for exploring policy mix sustainability transition in a rural area. The work was structured into several multidisciplinary chapters to support this choice.

The analysis began with a scoping literature review of the links and awareness between policy mixes and rural areas. From this initial analysis, it emerged that the literature was focused on investigating policy mixes based on the specific policy objectives they addressed. For example, it was noted that policy mixes related to gender equality or justice were relatively less than objectives such as climate change, food and health, or responsible production. One of the most crucial results was the need for policy mix evaluation. The latter obstacle regards the difficulty of managing a large amount of data, multidisciplinary information, and different knowledge. Another important result was linked to the significant role that governance could play in the policy mix process. Although this important role of, few academic studies were focused on this topic. This supports investigating elements that good governance should include to support a policy mix in rural areas. The most innovative result was to build a toolbox to build good governance that provides for i) enabling factors, such as general ambition, extension of policy integration, or temporal dynamics; ii) sustainability barriers, such as political fragmentation or different institutional frameworks; iii) governance tools, such as economic, social, or mitigation tools; and finally, iv) the role of stakeholders and area resilience. This toolbox was formalized to support policymakers' understanding of crucial factors to consider to identify governance that could support sustainability transition. One of the key concepts that emerged in this second chapter was the importance of implementing participatory approaches. The results of the third

chapter explored phenomena that can limit the active participation of stakeholders in decision-making processes, especially tokenism. In this regard, social capital and variables like trust, civic engagement, and the relationships among individuals could hinder the spread of obstacles to active participation.
The above literature review had to be in-depth due to the broad and emerging nature of policy mix themes in academic scenarios. Additionally, the concepts and concluding remarks established in these first three chapters were crucial for operationally outlining the policy mix formulation strategy. Indeed, it was deemed necessary to choose a specific territory and use participatory approaches. This was done by analysing a particular innovation adoption for circular economy transition through focus groups and how this could lead to formulating a policy mix. The results of the fourth chapter highlighted various barriers to policy mix adoption, such as economic, financial, technological, and market. The contributions of this chapter concern i) the importance of the territorial identity that can cause obstacles when there is a lack in the area and ii) the definition of an "attitude" that exists to support the transition to sustainable behaviour.
To explore the market barriers and to improve the awareness and transformation of farmers' approach to the circular economy, an econometric model was implemented to investigate the willingness to pay for products certified by the circular economy. The results show a positive willingness to pay that could encourage the farmer's adoption of a circular economy and support the importance of the formation of awareness on topics like sustainability and the circular economy. Furthermore, to investigate the "attitude" that emerged in Chapter 4, it explored the factors and capabilities that a farm should have to receive the best and make the best use of the services offered by the LAG. The results confirm the preliminary result forming a model encompassing ecosystem configuration, managerial cognition, and routines. Finally, the policy mix for rural areas was formulated through a quantitative method of weighing barriers and actions to overcome them. These results can contribute significantly and, indeed, have implications at different level. At the farmers' level, through the study and analysis of market barriers and capabilities, we have highlighted important findings that can help businesses transform their vision into a more sustainable and competitive one. At the Local Action Group level, many results focusing on this case study have collected and examined data that can assist the LAG governance in designing winning strategies for a sustainable transition in the area. At the territorial level, many of the results highlight the need for a vision that is not sector-specific but territorial, based on the genuine needs of the territory and capable of managing the available resources. This study aims to support policy design at the policymaker level and suggests fundamental aspects of policy definition. Furthermore, considering the vision proposed by the European Union, which is based on evidence-informed policy-making, this thesis aligns with the idea that scholars' results and awareness can assist in more informed policies and limit their failures.