

Received: 01/07/2025

Received: 15/07/2026

Accepted: 15/07/2026

Data Availability Statement: Data will be made available by the corresponding author upon request.

Competing Interest: The authors declare no conflict of interest in this manuscript.

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Research article

Biodistricts and local human development: A conceptual framework and an Italian case study

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Abstract

This paper explores the role of biodistricts within local human development and their ability to foster the well-being of a territory by relying on their localised agri-food systems, whose action is based on organic farming principles. First, applying the sustainable territorial evolution for human development (STEHD) framework to biodistricts, this study describes the place-based dynamics that facilitate the expansion of freedom enjoyed by local actors. It investigates how biodistricts activate the dynamics that facilitate territorial opportunities and enhance individual and collective agency. Second, the feasibility of STEHD framework to study biodistricts is tested in a proof-of-concept qualitative case study. It is carried out by interviewing, through purposive sampling of seven relevant actors involved in the ‘Growing Resilient Landscapes’ project in Biodistretto della Valle Camonica (biodistrict of Valle Camonica, Italy). It illustrates how biodistricts convert local resources into territorial functionings, enabling farmers with the means to transform them into individual capabilities, thereby facilitating action for local change. The analysis reveals how the STEHD framework helps pinpoint the place-specific factors that shape people’s real opportunities, by activating participatory processes to support cooperation, access to new markets, knowledge, and

sustainable practices. The findings emphasise the need to evaluate biodistricts beyond indicators to include dynamic aspects such as well-being, empowerment, and cultural identity.

Keywords: Biodistricts, Local agri-food systems, Capability approach, Local human development

JEL codes: O15; Q01

Highlights:

- The sustainable territorial evolution for human development (STEHD) framework illustrates whether, how, and along which directives biodistricts can produce local human development.
- The proof-of-concept case study involving Biodistretto delle Valle Camonica (Biodistrict of Valle Camonica, Italy) demonstrates the ability of the STEHD framework to describe territorial and individual functionings connected to technical choices, market expansion, and access to knowledge.
- The proof-of-concept approach yielded some criticisms about representation and governance.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record.

Please cite this article as:

Sturla A., Guarini G. (2026). Biodistricts and local human development: A conceptual framework and an Italian case study. *Italian Review of Agricultural Economics*, Just Accepted

DOI: 10.36253/rea-16568

1. Introduction

Biodistricts (BDs), or ‘organic districts’, are becoming increasingly important players in European rural areas (Zanasi *et al.*, 2020). Knowing how and in which directions they contribute to local development is therefore very relevant, especially when considering the growing attention that policies are dedicating to them at the European (European Commission, 2021) and Italian levels. In Italy, BDs are defined as areas suited for agriculture where ‘farmers, tourist operators, consumers associations and public authorities enter into an agreement for the sustainable management of local resources, based on organic principles and practices’ (Law 205/2017, art. 1, par. 499). Meanwhile, Law 23/2022 (art. 13, par. 1), which regulates them, establishes that, in BDs, organic farming and connected processing and preparation ‘are significant’¹. They are endowed with tasks connected to local development, beyond primary production, towards the involvement of the down- and upstream steps of the supply chain up to consumers, pivoted around organic farming and aimed at the whole food system (Rete Rurale Nazionale, 2019).

BDs align with the definition of a local agri-food system (LAFS), which combines clustering of production, processing, and marketing activities as well as embeddedness with the local context

¹ Translated from Italian.

that characterises food production. Cooperation is central in LAFSSs because it activates their endogenous potential (Elsner *et al.*, 2025; Van Der Ploeg, Marsden, 2008) and fosters social capital with the connected collective action for achieving common goals (Tisenkopfs *et al.*, 2008), therefore enabling effective management of resources, balance among diverse interests, and a robust socio-economic system (Giovannetti *et al.*, 2021). Integrating organic farming principles into the LAFS model strengthens social networks in a productive community and beyond, enhances economic and knowledge sharing opportunities, favours new market relationships, nurtures farmer-consumer dialogue (Packer, Zanasi, 2023; Zanasi *et al.*, 2020), and serves as a cohesive element for interaction and negotiation, allowing for the construction of a common identity that strengthens collective action (Favilli *et al.*, 2015). The human development paradigm (Sen, 2000), emphasising that there is no true development unless people are given new opportunities to improve their lives in ways they value, is suitable for understanding these democratisation processes, as it prioritises well-being over economic growth (UNDP, 1990).

According to local human development (LHD) research, human development is inherently place based because it requires relationships between society, economy, and institutions that are shaped by the socio-economic and environmental contexts (Biggeri *et al.* 2026; Biggeri, Cuesta, 2018; Biggeri, Ferrannini, 2014; Guarini *et al.* 2018, 2020). This also applies to BDs because they provide the soft and relational factors for human development to thrive. Moreover, through organic farming, they can ensure food security; environmental stewardship; as well as equitable growth, trade, and consumption (Caron *et al.*, 2018). From the LHD perspective, well-being in rural areas extends beyond the usual dimension of livelihood, resilience, and economic viability and health (Bernard, 2018; OECD, 2020; Vazoniene, 2014; Woodhill *et al.*, 2022). It encompasses more place-based values, such as those connected to the relations and practices that bond individuals together and links them to the socioecological landscape (Isaac *et al.*, 2024) and to the opportunity of expressing themselves in collective actions (Fernandez-Wulff, 2019).

This paper examines BDs from an LHD perspective. It applies the sustainable territorial evolution for human development (STEHD) framework and thus enriches the literature on the evaluation of BDs by providing analytical tools that can identify the aspects of their governance that mobilise collective choice towards sustainable outcomes. It is based on the fundamental concept that the real freedoms people enjoy and exercise are shaped by processes that take place within the local community (Biggeri *et al.*, 2018, 2026). It therefore connects to a trend in the literature that aims to understand how grassroots transformation of food systems and incremental improvement feed into each other, adopting a multi-level perspective that explores how participation, coordination, and multi-actor linkages produce capabilities (Blay-Palmer *et al.*, 2026; Vignola, Oosterveer, 2025).

The application of the STEHD framework to BDs helps analyse the shortcomings that have been highlighted in BD-related practices: the risk of ‘superficial’ participation that undermines the trust of stakeholders, the lack of structured governance frameworks, and the weakness of local supply chains that hinder strategic planning and collective action (Guareschi *et al.*, 2020; Klavina *et al.*, 2025; Lagoa *et al.*, 2025). Moreover, by focusing on the elements of development that are more context related, this paper describes how collective choice can mobilise context-specific resources to empower actors in BDs, an aspect that is currently overlooked in literature (Packer, Zanasi, 2023).

The paper is structured as follows. First, the STEHD framework (Biggeri, Ferrannini, 2014), based on the LHD approach is presented and then used to describe BDs action for LHD. Then, the

STEHD framework is applied to the *Coltivare Paesaggi Resilienti* ('Growing Resilient Landscapes' [GRL]) project, using Biodistretto della Valle Camonica as a case study. Qualitative evaluation is employed to test the actual applicability of the STEHD framework to BD actions, thus suggesting a possible tool for evaluating similar experiences.

2. Conceptual framework

2.1. From agri-food systems to BDs

The need to apply the district dynamics observed in industry to agri-food systems emerged in the post-war period, as farms became increasingly specialised, with a tendency to outsource processing and the supply of means of production. Later, with the diffusion of neo-institutionalism, scholarly attention focused on the horizontal and vertical relationships that develop within agri-food systems, thus considering the local context as a factor capable of influencing their development (Brandi, Moretti, 2013). This view of agri-food systems as territorially embedded networks has led agricultural economists to consider agricultural districts as forms of territorial organisation of agriculture where the unique social, economic, and institutional characteristics of place drive production, specialisation, and innovation (Becattini, 2000; del Puente *et al.*, 2026; Iaconi, 1990; Sforzi, Mancini, 2012).

Spatial configurations of agri-food systems are highly diverse, as they reflect the specific organisational and productive features of agricultural activities and their degree of integration with the local food industry, as well as the degree of connection with the socio-economic and environmental context (Assiri *et al.*, 2021; Cecchi, 1994; Collado *et al.*, 2024). The complexity of agricultural production systems in the rural context has led scholars and policymakers to explore and classify agricultural districts, keeping the organisational/productive components separate from socio-communitarian aspects (Toccaceli, Pacciani, 2024). Nevertheless, some elements of the spatial organisation of the agri-food sector make it possible to apply the concept of district dynamics to agriculture (Fabiani, 2000; Iaconi, 1990). Agricultural production is often embedded in a network of relationships that activate external economies and structural integration of agriculture with other local activities, resulting in economic interactions that foster formal/informal networks of knowledge and contribute to innovation and lower transaction costs (Toccaceli, 2015). Connections that arise from such integration require bottom-up consultation and public-private coordination mechanisms to strengthen competitiveness, cohesion, landscape/heritage values, and social capital (Berti, 2005; Iaconi, 2002).

From this theoretical view, the idea of LAFS was introduced in the mid-1990s as a unifying concept to describe networks of production and service activities connected to a specific territory. This perspective emphasises the role of local actors, their activities, and forms of social organisation and agricultural practices in shaping food and beverage production within place (Muchnik *et al.*, 2008). Specifically, the LAFS concept highlights the territorial dimension of food production to stress that, besides being a source of a competitive advantage, it is also connected to values such as sustainability and equity along the entire supply chain (Bowen, Mutersbaugh, 2014; Mantino, Forcina, 2024; Muchnik *et al.*, 2007; Pecqueur, 2024).

There are two major factors that distinguish BDs from LAFSs. First, the spatial clustering of organic farming appears to be a feature of local contexts where agricultural activity is more concentrated, rather than an exclusive characteristic of territories (Franco, 2015). The proximity that develops within the BDs has an organisational nature (Bowen, Mutersbaugh, 2014), as BDs are intended to foster interactions among their members. The significant role of organic production, as recognised by Law No. 23/2022, requires that such interactions be supported by local networks of related services (extension services and input providers) and specialised supply-chain arrangements (Franco, 2015; Zanasi *et al.*, 2020). Second, the principles of organic farming (health, ecology, fairness, and care) and its standards (IFOAM, 2020) steer BDs towards environmental sustainability, fairness, and participation along the supply chain. The involvement of local demand is not merely a means of supporting production but rather a fundamental step toward broader participation (Pomponi *et al.*, 2026; Sturla *et al.*, 2024).

2.2. The STEHD framework

The human development paradigm states that development occurs whenever people gain the freedom to pursue what they value most. Rooted in the capability approach (Sen, 2000), it defines freedom in terms of people's capabilities, that is, their real opportunities 'to do' and 'to be' what they have reason to value and functionings: the realised capabilities (Belda-Miquel, 2022). The ability to convert resources into functionings depends on social, economic, and environmental conversion factors; it is up to institutions to provide/facilitate them (Robeyns, 2017). Moreover, the transformation of capabilities into functionings depends on people's choices. Central to every development process is the concept of 'agency', meaning the ability of individuals/communities to enlarge the set of capabilities (Sen, 2000). Therefore, exploring the role of BDs in local development requires one to acknowledge their capacity to expand actors' freedom of choice and agency in the food system (Nambiar, 2013).

The STEHD framework assumes that capabilities and agency are embedded in local social structures and institutions, which provide the conversion factors. It focuses on the local development system (LDS), an ecosystem where institutions, local communities, and economic actors are connected through shared values, knowledge, and behaviours that are the source of their competitive advantage (Becattini, 2014). This definition highlights district dynamics within the LDS and sees them as meso-spaces between top-down governance structures at the national and supranational levels and the local communities and their democratic expressions, needs, and instances (Anderson *et al.*, 2021). These meso-spaces encompass the local institutional structures that make rules, shape people's habits and values, foster social capital, and reinforce relationships (Biggeri, Ferrannini, 2014).

Central to the LHD perspective is the idea that territories can produce collective capabilities that interact with individual ones and therefore foster human development (Guarini *et al.*, 2018). According to this perspective, interaction among local actors, institutions, and resources are key conversion factors to expand capabilities. LAFSs support the use of the STEHD framework because they foster networks that strengthen collective capabilities by reconfiguring producer-consumer relations and therefore provide social and institutional conversion factors that allow both consumers and producers to transform material means into meaningful freedoms related to food choices. Application of the STEHD framework is particularly relevant given the view of BDs as territorial

structures where economic activities, social relations, institutions, and collective action shape development trajectories.

The STEHD framework (Figure 1) illustrates how local socio-institutional contexts influence a community's development path and individual well-being by impacting conversion factors, capabilities, and choices. This process enhances collective agency and empowerment, driving change in the LDS. It also portrays local development as a multi-level process influenced by continuous interactions with external factors that shape territorial conditions.

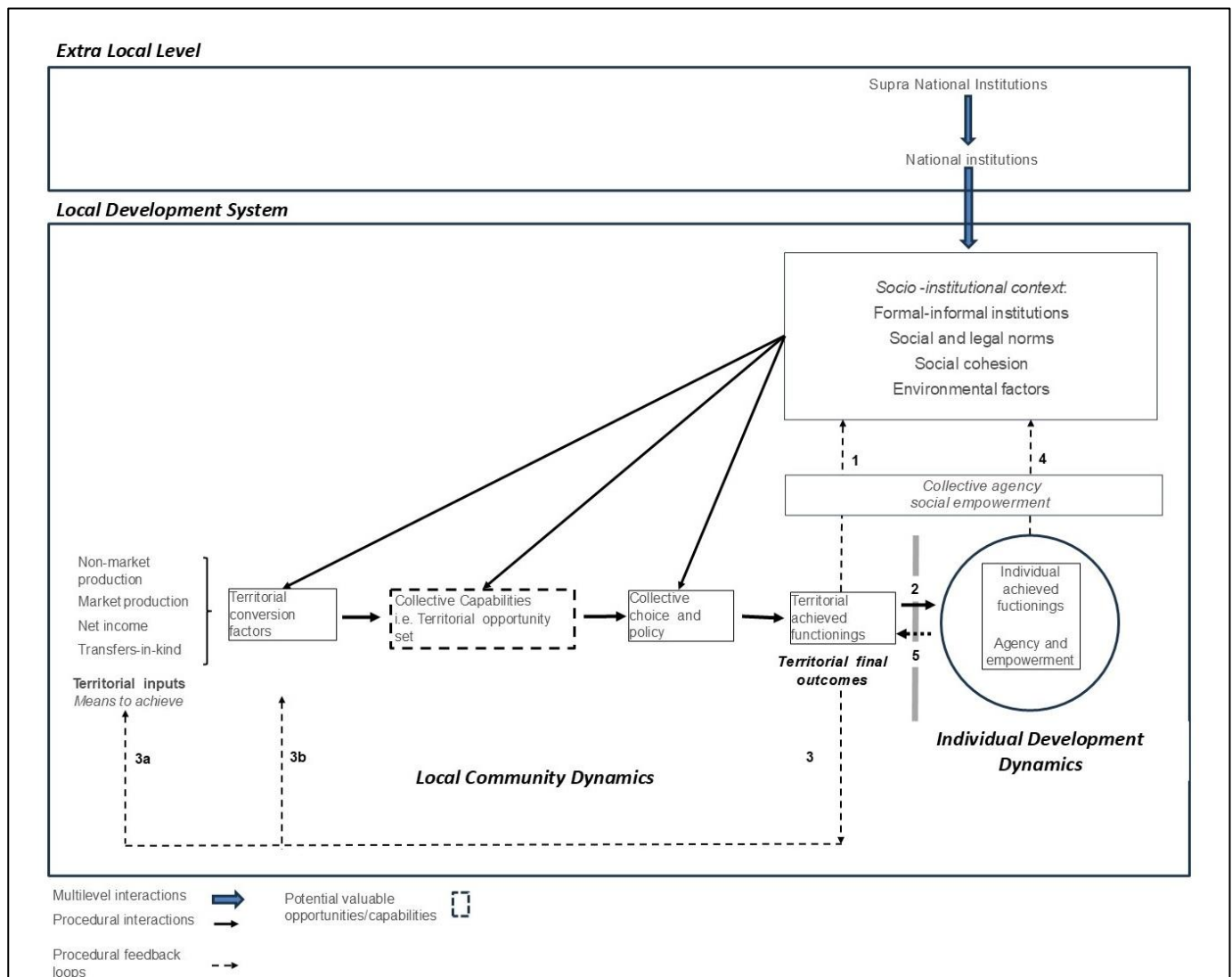


Figure 1. The sustainable territorial evolution for human development framework.

Source: Authors' elaborations based on Biggeri, Cuesta (2021).

The STEHD framework describes local dynamics that move from territorial endowments towards specific territorial functionings and shows how these enable individuals to achieve greater agency. Local resources, on which conversion factors operate, are enabling and disabling and have a diverse nature; they interact with individuals' entitlements to goods and services. They mobilise the social capital needed to activate 'collective capabilities': 'the averages of individual capabilities or as the capabilities that can only be achieved collectively' (Guarini *et al.*, 2018). The process of transforming territorial opportunities into actual achieved territorial functionings (e.g., a supply-chain

arrangement) results from a collective choice shaped by participatory processes, which ensure coherence between achieved territorial functionings and the socio-economic context. Achieved territorial functionings are not final ends in themselves, but they contribute to individual development by enabling people to use their resources to achieve greater agency; they are facilitated by local enablers of inclusiveness, such as trusted networks, structures for participation, and other supporting mechanisms (Biggeri *et al.*, 2018).

The functionings achieved at both the territorial and individual levels contribute to collective agency and empowerment, thus affecting the broader institutional context; a relationship displayed by arrows 1 and 4 in Figure 1. An example is a cooperation initiative that arises from farmers' renewed access to networking and learning. Collective agency is activated closes the loop by fostering institutional and cultural change and building path-dependent and place-based processes for LHD.

The dynamic aspects of the STEHD framework are depicted by the arrows connecting its components, thereby highlighting feedback loops which, anyway, could not be all present or detectable (Biggeri, Cuesta, 2021). Arrow 2 describes the transition from local community dynamics to individual dynamics through the production of public and private goods and services. Arrows 3, 3a, and 3b show how territorial outcomes affect back territorial inputs and conversion factors, to foster new opportunities otherwise not achievable. Arrow 5 illustrates the overall contribution of such individual dynamics on territorial processes of LHD.

2.3. Exploring local BD dynamics through the STEHD framework

We now analyse the dynamics that, within BDs, foster the enabling factors for territorial functionings.

From a multi-level perspective, BDs occupy the meso-space where local and extra-local stakeholders interact and combine resources, institutions, and capacities to foster enabling and disabling factors affecting the evolution of the LDS and the expansion of individual and collective capabilities (Biggeri, Ferranini, 2014). In BDs, this interaction is supported by a continuous dialogue between local actors and institutions, which utilise participatory processes (Passaro, Randelli, 2022a) to integrate exogenous and endogenous resources (Belliggiano *et al.*, 2020; Stotten *et al.*, 2017). Their dialogue also mediates and adapts supraordinate policies and sources of funding to local needs. The potential of BDs to establish meso-spaces of transformation depends on the numerous local and extra-local factors that impact the effectiveness of local actors' involvement (e.g. the commitment of local institutions and the degree of cooperation in the farming community) (Passaro, Randelli, 2022b). Organic farming is central in activating territorial inputs, as it conveys complex cultural and social values to the entire food system from both technical and social standpoints (Migliorini, Wezel, 2017).

The conversion factors achievable in BDs are fostered by processes that facilitate democratisation, focused on the values of organic farming (Froning, Stotten, 2024; Stotten *et al.*, 2017), as they encourage social organisation and greater participation in decision-making (Dias *et al.*, 2021). Accordingly, BDs unite actors with greater integration along the supply chain (Poponi *et al.*, 2021), connecting agriculture with other sectors (tourism, and hotels, restaurants, and catering [HoReCa]), and providing spaces for mutual learning (Passaro, Randelli, 2022a; Stefanovic, Agbolosoo-Mensah, 2023). This includes involving consumers in productive choices and the overall development strategy (Guareschi *et al.*, 2023; Rico Mendez *et al.*, 2021) as well as actions aimed at

enhancing farmers' bargaining power and technical support (Chaminade, Randelli, 2020; Rete Rurale Nazionale, 2019). On the other hand, personal conversion factors (e.g. time and knowledge) often create barriers to participation (Belda-Miquel, 2022), which can be overcome through strong social networks and a clear perception of the benefits (Cascone *et al.*, 2024).

Networking strengthens collective capabilities by reconfiguring producer-consumer relations, thereby operating as social and institutional conversion space, where relational, informational, and participatory resources allow both consumers and producers to transform material means into meaningful freedoms (Belda-Miquel, 2022).

Table 1 summarises the capabilities (translated into functionings when effectively exercised) based on the literature. We follow Motzer (2019) in categorising them according to Alkire's five pre-established capabilities, to which we add 'environment' as an unavoidable element in BDs.

Similarly to LAFs, BDs share the activation of cooperation that nurtures farmers' capabilities connected to opportunities for market expansion, improved access to supply chain infrastructure and planning, which in turn is linked to stable income and more employment opportunities. They also grant consumers increased access to regional food, leading to advances in diet, nutrition, and health (Motzer, 2019). LAFs also contribute to farmers' economic independence and autonomy through shared knowledge (Enomoto, 2020), thereby reducing reliance on external inputs (Jack *et al.*, 2022). Networking initiatives aimed at addressing complex sustainability challenges provide farmers with the organisational capacity to prioritise needs, identify development pathways, and define research priorities (Nelson *et al.*, 2019). These initiatives can enhance farmers' resilience, which is supported by organic farming and is essential for adapting to external shocks, including supply-chain disruptions and climate-related impacts (Jack *et al.*, 2022; Jambor, Nagy, 2022). Moreover, the inclusion of environmental concerns in discussions about sustainable agriculture fosters a sense of care in participants that nurtures access to sustainably managed resources and ecosystems (Belda-Miquel, 2022; Jack *et al.* 2022).

BDs belong to the wide spectrum of grassroots organisations aimed at counteracting the *status quo* in food systems by increasing the autonomy of actors throughout cooperation and networking (Belda-Miquel *et al.*, 2020; Pellicer-Sifres *et al.*, 2017). Cooperation fosters the dynamic capabilities required to take risks when introducing new products, favouring access to innovation and new markets (Sachitra, Padmini, 2021). It highlights the capacity to learn from one another through knowledge sharing and collaboration, thereby easing access to supply chain arrangements and related infrastructure and technologies, as well as to financial opportunities (Jambor, Nagy, 2022; Sachitra, Padmini, 2021). Cooperation initiatives also provide technical/marketing support and planning (Gruchmann *et al.*, 2019), bringing consumers and producers closer (Belda-Miquel *et al.*, 2020) and allowing both to bring forward their own agendas (Rico Mendez *et al.*, 2021) and right to choose (Belda-Miquel, 2022). They elicit participation in food systems (Pellicer-Sifres *et al.*, 2017) and grant equitable access to healthy food (Miller, Thomas, 2020). Renewed farmers-consumer relations strengthen social recognition of farmers' work (Clune, 2021), making their work more meaningful and fulfilling (Motzer, 2019).

Through organic farming, food systems are governed by the principle of social justice (Kalfagianni, 2015), especially when it implies direct producer-consumer relationships in participatory guarantee system (PGS) schemes. They entail cocreation of productive choices and sharing of values (Guareschi *et al.*, 2023), fostering a series of opportunities connected to the direct

relationships with consumers, autonomy, and cultural amelioration and empower customers with awareness of production processes (de Lima *et al.*, 2023).

Collective choice stems from what Dei Ottati defines as ‘conscious governance’ (Biggeri, Ferrannini, 2014, p. 27), that is, the ability to organise consensus around territorial functionings that are more consistent with the development strategy chosen by the LDS. Collective choice facilitates value creation by lowering transaction costs through the management of the value chains and by nourishing a dialogue between institutions and stakeholders (Guareschi *et al.*, 2023; Zanasi *et al.*, 2020). It also relates to building a community in charge of its context-specific development strategy (Wezel *et al.*, 2016). The activation of participatory processes in defining place-based strategies results in interventions tailored to the local context (Sturla *et al.*, 2024), thus removing constraints and strengthening drivers enabling the achievement of specific territorial functionings from the range of achievable opportunities.

Table 1. Achievable capabilities/achieved functionings in biodistricts.

Achievable capabilities/achieved functionings		Target group
Work	Access to new markets	Farmers
	Access to supply chain arrangements, infrastructures and technologies	Farmers
	Access to financial opportunities	Farmers
	Access to planning and support	Farmers
	Reduction of dependency from external inputs	Farmers
	Resilience to supply chain shocks	Farmers
Relationships	Networking	Farmers
	Meaningful employment	Farmers
	Sense of fulfilment	Farmers and consumers
	Direct relationships between producers and consumers	Farmers and consumers
Life/health/ security	Income stability/financial autonomy	Farmers
	Cultural identity	Farmers and consumers
	Access to affordable healthy food	Consumers
Participation/ agency	Political participation/activism and agency	Farmers and consumers
	Autonomy in decision making/right to choose	Farmers and consumers
Knowledge	Access to innovation	Farmers
	Access to shared Knowledge	Farmers
Environment	Access to sustainably managed resources and ecosystems	Farmers and consumers
	Resilience to climate change	Farmers and consumers

Source: Authors’ elaborations.

3. Application of the STEHD framework to a case study

3.1. Methodology

This study applied the STEHD framework to the GRL project, carried out by a BD – Biodistretto della Valle Camonica (Province of Brescia, Italy) – from 2019 to 2024. It adopted a case study approach to provide a proof of concept, an early-stage validation process designed to test whether the STEHD framework could be feasible for BDs (Kendig, 2016). The insights from this

initial testing phase will pinpoint strengths, limitations, and context-specific challenges, facilitating improvements before wider deployment (Elliott, 2021). Its application is not intended to provide confirmatory evidence of causal effects of BDs on LHD, but rather to supply an exploratory understanding of their role for LHD. This study relied on qualitative data from primary sources, complemented by secondary data from dissemination material, project outputs, requests for proposals, and previous research (Dara Guccione, Sturla, 2021; Rete Rurale Nazionale, 2019).

The interviewees were selected through purposive sampling, which is ‘intentional selection of specific units (such as individuals, cases, or events) based on their relevance to the research question, enabling the researchers to gain deep insights into complex phenomena’ (Tajik *et al.*, 2025), p. 1. This choice was driven by the need to approach information-rich participants: a BD representative helped us to identify farmers with a direct and longstanding experience in the project. The selection therefore focused on five of the thirteen farmers who had participated in the project from the beginning. Of these five, four were among the six farmers who had joined the agreement to share use of the mill.

The farms included in this study have a very similar structure: they are mainly dedicated to mixed farming (vegetables, small fruits, and medicinal herbs), except for two cases of specialisation (vineyards and apple orchards). Although variable, the farms are very small, ranging from 1.5 to 6.5 hectares. All farms are located in the mid-mountains and have been members of the BD since its establishment (2014); in 3 out of 5 cases, they are examples of neo-rurality. Only two farms are certified organic, although all must follow organic farming protocols to join the BD. All are multifunctional farms (direct sales, on-farm processing, and agritourism). In addition to the farmers, a representative of the BD and the advisor who oversaw the project were interviewed.

A hybrid deductive/inductive reasoning (De Carlo, 2018) was applied to the primary and secondary qualitative data. In the first step, focused on local dynamics, deductive reasoning was applied to the available information. The empirical evidence underlying the qualitative analysis came from three sources: (1) seven primary qualitative interviews, which provided direct accounts from participants and from which statements used in the analysis to support our claims were extracted; (2) project facts and documented outputs/results, derived mostly from project documents and other secondary data sources, which provided factual descriptions of the case study and were used for triangulation and to strengthen the evidence base; and (3) observed project activities, namely the concrete actions implemented in GRL, documented through primary and secondary data sources. Table A.1 shows how the raw material was systematically interpreted.

We used the primary and secondary data to populate the core components of the STEHD framework, which was therefore used to assess how effectively it helped interpret the empirical evidence. Through this interpretation, we described the conversion factors that elicited the territorial opportunities and the elements that defined collective choices. The list of potential functionings described in Section 2.3 was then applied to the primary data to identify realised territorial opportunities. The individual functionings emerging from local dynamics were inductively retrieved from the interviews and, consistent with the STEHD logic, were considered products of local dynamics. Throughout the process, secondary data were also used for triangulation and to support the interpretation.

Given the interviewees’ high level of commitment to the project and their degree of operational knowledge, the interviews were highly informative. Despite the limited amount of qualitative material, they did not generate new themes and therefore did not provide new insights into achieved

capabilities. This is not unusual in case-study-based research (Ahmed, 2025; Hennink *et al.*, 2017). To minimise the risk of confirmatory bias, the research questions were intentionally formulated in open and general terms to maximise their generative potential (Robinson, Bailey-Rodriguez, 2025), while remaining focused on perceived opportunities and constraints (see Table A.2). Interviews were conducted by phone, with each lasting 30-60 minutes. Information was transcribed verbatim in real time. The qualitative data were then analysed through manual coding.

3.2. *The GRL project*

Beginning in 2019, with funding from a local bank foundation, Biodistretto della Valle Camonica carried out the GRL project with the aim of counteracting forest encroachment and land abandonment between 500 and 1,500 m above sea level (a.s.l.) by restoring local rye and wheat production and promoting intraspecific diversity, while ‘fostering farmers’ empowerment and autonomy in decision-making’ (Biodistretto della Valle Camonica, 2022). A follow-up funding scheme in 2022 extended the project until 2024. The project partnership, led by the BD itself, included Valcamonica Bio (the local association of organic farmers), the municipalities of Cerveneno and Losine, the Adamello National Park, and the Mountain Community of Valle Camonica. Later, the Rural Seed Network (RSN) and a local social cooperative joined.

The project arose from two converging needs: counteracting the abandonment of agricultural land and, promoting crop rotation on small farms, a fundamental practice in organic farming that is often hindered by lack of training and tools. The initial idea emerged from the previous experience of some BD members, who were already growing cereals and legumes on small plots for self-consumption and rotations.

The project required the purchase of machinery suitable for sowing and threshing arable crops on small, terraced plots, as well as a small mill for grain processing. Both the machinery and the mill are shared among farmers who have joined the initiative.

The project also required the definition of specific cultivation protocols and, following the participatory advisory approach promoted by RSN, the selection of a local rye population. Participation extended beyond the involvement of local farmers, engaging consumers in population selection activities during dedicated open days to increase awareness. The project resulted in the establishment of a seed bank in Cerveneno, providing a resource for farmers and the local community.

Co-decision among partners was applied at every stage: from identifying the needs to be addressed through the available funds and related actions, to deciding whether to share machinery and selecting the most suitable mill. Most importantly, the BD developed an innovative approach to sharing machinery and the mill, in which ownership is not concentrated in a single actor and maintenance responsibilities are shared. This arrangement is governed by a specific agreement establishing internal rules, maintenance fees, and schedules for upkeep. The Municipality of Losine supported consumer and producer involvement by making its community oven available for training courses on baking and milling.

The GRL project achieved two relevant results related to processing and marketing. First, milling the grain at the same facility enabled the production of more uniform flour, which was a fundamental step in selling flour and processed products (bread, cookies, and pasta) under a brand associated with a product specification. The specification is managed and enforced by Valcamonica

Bio, which oversees compliance with requirements through a review process that partly resembles a PGS. It is not based on peer-to-peer evaluation; rather, compliance with requirements is verified collectively through discussions among network participants. A second relevant result concerns the reactivation of an alternative food network based on neglected productions, as two local bakeries and three restaurants joined the network and were authorised to use the flour.

The GRL project included supporting actions, such as the purchase of a shared portable oven, farmer training on legume rotations, and training on the use of the mill.

The call for proposals required an *ex ante* impact assessment, which estimated that the BD would recover 14 ha of abandoned land (Biodistretto Valle Camonica, 2019a). To date, together with the follow-up project, the GRL project has contributed to the recovery of 15 ha of abandoned land distributed among 13 farmers operating on the valley slopes; six of these farms are part of the network agreement for the collective milling of grain. The quantity of flour supplied to bakeries remains very limited (60 kg per farm on average), making the supply chain vulnerable to disruption because the product is available only around harvest time.

Because the follow-up project was led by a social cooperative, it was possible to establish eight training internships for vulnerable individuals, all of whom benefited from the training sessions. By the end of the project, these activities resulted in one permanent hire and two collaborations with the social cooperative itself (Fondazione Cariplo, 2022).

3.3. Applying the STEHD framework to the GRL project

The reactivation of the local rye supply chain has elicited a transition towards sustainability in a small, yet deeply territory-embedded, portion of the local food system. Let us apply the STEHD framework to Biodistretto della Valle Camonica and the GRL project, as illustrated in Figure 2.

With reference to the territorial inputs, the entire process is rooted in territorial ‘means to achieve’ of a productive (traditions of rye cultivation and rotation-based cropping systems), environmental (the natural value of local farmland), and social (associationism) nature.

The network of relations nurtured by BD partnership has provided *conversion factors* (Box A), through which territorial inputs have been transformed into new collective capabilities (Box B) concerned with reducing dependence on the dominant agribusiness model and increasing autonomy in decision-making. The main conversion factors with the corresponding general collective capabilities (columns 1 and 2 in Table A.1) are the following:

- *Being a member of the BD partnership* has enabled farmers to join the project and access financing and support for production planning and marketing.
- The *network agreement* and the *specifications for rye production* have enabled new supply-chain arrangements and expanded outlet options while providing opportunities for technical support². The network has been instrumental in reducing transaction costs associated with

² Interviewee 1: ‘The association has adopted internal standards that reflect the requirements for organic farming. Small farms that have difficulty converting can sign up without needing to be certified. The important thing is the method, not the certification.’

collective action by establishing rules for the use and maintenance of machinery, overcoming information asymmetries, maintaining a high level of participation, and supporting logistics³.

- The establishment of the *seed bank* and *pooling machinery* have further enhanced farmers' freedom from external inputs⁴.
- *Participatory advisory and seed selection* have promoted knowledge sharing and access to innovation through direct involvement in sustainable practices⁵.
- *Training activities* have, in turn, increased farmers' autonomy in decision-making. Training and information events for capacity building were planned throughout the project (Rete Semi Rurali, 2022)⁶. These activities also reached processors, who learned new baking techniques through a baking contest (Biodistretto Valle Camonica, 2018).
- The project also included *information and dissemination activities* that contributed to building local awareness and strengthening direct producer-consumer relationships by organising bakery courses, field visits, tastings, and other activities (Biodistretto Valle Camonica, 2019b), thereby fostering freedom of choice among both groups⁷. The training events organised by the university were very attended by non-professional farmers (Leoni *et al.*, 2021).

The specific achieved territorial functionings (Box D) are the realised opportunities generated by actors' collective choice (Box C), elicited through participation and interactive learning, and shaped by the BD strategy and actual territorial constraints, as small-scale productions must be valorised through short supply chains and improved reputation. The entire participatory process provided new networking opportunities, eliciting activism and fostering agency among both farmers and consumers, thereby contributing to more meaningful and fulfilling employment by strengthening the sense of belonging and cultural identity⁸.

The specific achieved territorial functionings (listed in column 3 of Table A.1) are therefore the outcomes of a cooperative endeavour in which the BD acted as a development agent (Biggeri, Ferrannini 2014). By sharing the mill and harvester, farmers have been able to *access a new local food network*⁹. The interactive learning process prompted by participatory advisory sessions and training has enabled the use of *local rye populations*. Moreover, the specification connected to the 'Coltivare Paesaggi Resilienti' brand provides farmers an *alternative to third-party certification*. On

³ Interviewee 2: 'Managing machinery together requires considerable logistics [...]. Each farm contributes a share to the maintenance fund. We place a shared order for seeds [...] We place the order together so that even the smallest farms can access the seeds, because seed companies do not usually sell small quantities.'

⁴ Interviewee 1: 'With this project, we raised the funds to buy machines that farmers could use to work their small plots of land. The large machines used on the plains are not suitable here because of the slope, and cultivating the land by hand would have been too costly.'

⁵ Interviewee 3: 'We do participatory research. Each farmer has provided small experimental fields to try out new varieties. The results benefit everyone. We have catalog fields where we multiply seeds, which are then distributed to anyone who needs them, including hobby farmers.'

⁶ Interviewee 4: 'RSN has filled the technical gaps we had, they introduced us to agroecology.'

⁷ Interviewee 2: 'Within the project, we drafted a book of recipes with the collaboration of the local bakeries and restaurants that use our flour [...] The book is also distributed through the local restaurants' association. It is aimed at local consumers. Small farmers struggle to promote local products within the region, not outside it.'

⁸ Interviewee 6: 'In our view, farmers are guardians of the land and play a role in conserving it.'

⁹ As stated by the motivation for awarding the 'Green flag award' by Legambiente, Biodistretto della Valle Camonica set up a 'network of small producers with strong community ties has reclaimed abandoned mountain land through farming methods that enhance the natural fertility of the soil. The initiative has also laid the foundations for the development of a supply chain of products with high nutritional qualities and for promoting local consumption' (Legambiente, 2020 p. 22).

the other hand, the project has involved farmers and consumers in an *information and training platform on local production* and has provided access to *new local products*.

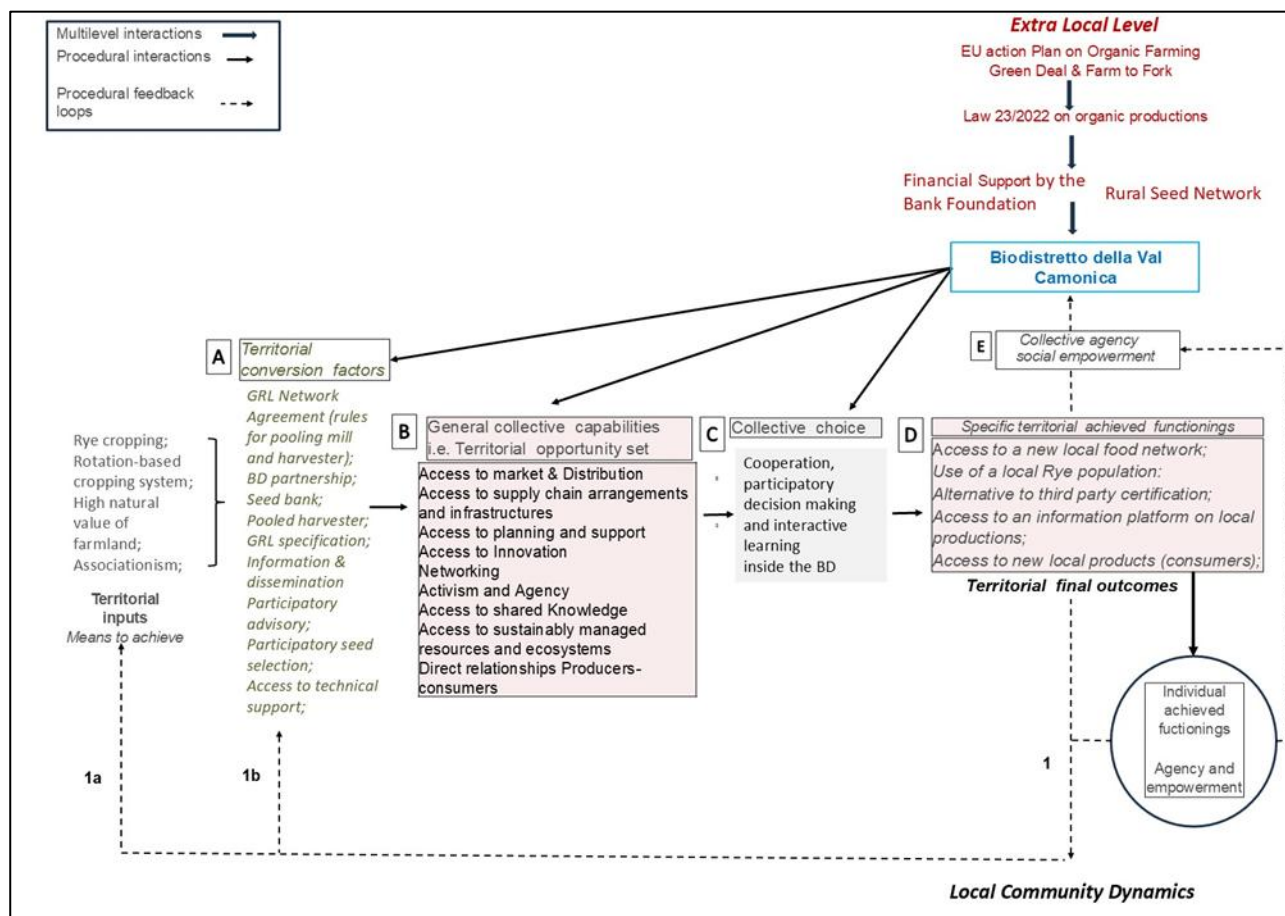


Figure 2. Application of the sustainable territorial evolution for human development framework to Biodistretto della Valle Camonica: local community dynamics.

Source: Authors' elaboration based on Biggeri, Cuesta (2021).

Territorial functionings act as 'conversion factors' endogenous to the LDS (Biggeri, Ferrannini, 2014). Together with individual conversion factors (skills, education, motivation, etc.), they have provided actors with goods and services that have changed their immediate settings, disclosing new opportunities connected to processing, marketing, consuming, and training. The interviews provide insights into how these opportunities translated into individual functionings (Table A.3).

The diversification of farming activities has, in fact, allowed farmers to reach customers with new products, without outsourcing processing. Through networking, farmers have been able to secure a new market that, although still negligible in terms of profitability, has avoided the dispersion of value added. Moreover, they gained access to new functionings. Above all, they have gained access to new knowledge and technical support; interactive learning has contributed to their autonomy in agronomic choices, as they are now less dependent on commercial seeds, more self-sufficient in crop rotations, and therefore less reliant on external inputs. Furthermore, according to the farmers' views, producer-consumer relationships have become stronger, and local consumers have gained new knowledge of production processes and have been granted a more informed right to choose between flours (traditional vs. local rye) and access to healthier food.

Both territorial and individual functionings contribute to collective agency and social empowerment (Box E) by providing local farmers with the means to be more autonomous from regime agribusiness. Consequently, social empowerment concerns increased competitiveness of local niche farming.

The actions described in the case study have already produced relevant feedback effects within the socio-institutional context. There has been a limited impact on the local environment (through a more diversified agricultural landscape) and, according to the interviews, a change in the local market, as new demand for rye products has emerged because of GRL. Through rye products, the local community has become more familiar with the BD. This is not a secondary outcome, given that BDs often struggle to achieve local recognition (Triantafyllidis *et al.*, 2019).

A positive feedback loop has been established between territorial functionings and territorial inputs (arrow 1a), since local productions have been enriched with rye, which has been valorised in innovative supply chains, such as pasta production, and may be marketed beyond the boundaries of Valle Camonica. The socio-economic impact at the territorial level remains negligible; nevertheless, the GRL project has enriched the farming community with additional social conversion factors (arrow 1b), connected to the specification for the 'GRL' brand, which can be exploited within alternative food networks, such as direct sales and farmers' markets.

Acting as a meso-space, Biodistretto della Valle Camonica has been able to activate exogenous resources (the financial support for the project) and agents (the bank foundation and the RSN), demonstrating its capacity to integrate extra-local elements in pursuit of local interests. The expert contribution of RSN, for instance, enabled the project to overcome constraints that could have brought it to an end, namely the legal vacuum that prevented shared use of the mill, by establishing a network agreement designating Val Camonica Bio as the sole owner.

The entire project is rooted in a collective choice that has leveraged organic farming to address a local need, thereby enabling access to economies of scale through networking and knowledge sharing. Besides being consistent with the view of BDs as LDSs, this demonstrates the place-based nature of capabilities (Biggeri; Ferrannini, 2014) and, albeit on a very small scale, confirms that successful district dynamics are based on social cohesion (Ramazzotti, 2010).

In this context, Biodistretto della Valle Camonica has functioned as a meso-space mediating between external elements and skills, and between local resources and actors. This outcome was not guaranteed, as it is essentially linked to the maturity of social capital (Passaro, Randelli, 2022a), as evidenced by successful cases (Packer *et al.*, 2025; Stefanovic, Agbolosoo-Mensah, 2023). In the GRL project, social capital has been nurtured by collective action based on mutual control, knowledge exchange, and the sharing of capital and labour. This was effective because it involved a small, homogeneous group of small farmers. This enabled unanimous agreement and gave voice to small farmers, thereby avoiding power imbalances that often exclude them from planning endogenous development initiatives (Dias *et al.*, 2021; Packer, 2025). Consistent with the literature on social capital in food systems, this finding stresses the importance of social bonds (whether formal or informal) in providing small farmers with material and immaterial goods (Schreiber *et al.*, 2023). Access to new knowledge, as well as shared equipment and seeds, are among the main outcomes of the reciprocal relationships that have developed among network participants. Therefore, as observed in initiatives involving networking among farmers, the GRL project has shown that through the

development of social capital, participants gain both tangible and intangible resources that strengthen their adaptive capacity (De Grandpré *et al.*, 2022; McDaniel *et al.*, 2021).

On the other hand, the initiative is based on a specific group of small farmers and therefore excludes many others with different productive settings. Despite its positive intentions, as already observed in LAFs developed in contexts characterised by strong social capital and structural constraints, this creates a problem of limited representation (Crespo *et al.*, 2014; López Cifuentes *et al.*, 2026). This issue, combined with governance based solely on part-time voluntary commitment – a situation common to many BDs (Rete Rurale Nazionale, 2019) and also identified by the interviewees – represents a major caveat that partially undermines the BD's function as a meso-space. While Biodistretto della Valle Camonica has successfully linked a grassroots initiative to external institutions and actors, these limitations undermine coordination and mediation among different actors and interests, as well as its capacity to support both the scaling up and scaling out of sustainable practices. These limitations are common among BDs, as they experience a constant tension between the need to remain appropriate to local contexts and the aspiration to achieve broader diffusion and systemic impact (Iovino *et al.*, 2023; Passaro, Randelli, 2020).

3.4. Strengths, caveats, and limits from the proof of concept

Despite the limited information available due to the scarcity of primary data, this study, through integration with secondary data, was able to identify the elements of collective decision-making that mobilised local resources towards territorial functionings. It was also possible to discuss how these, in turn, acted as conversion factors activating individual resources towards personal capabilities.

The findings from the application of the STEHD framework are also reflected in the literature on BDs, suggesting that the characteristics of LDSs that constitute sources of collective and individual capabilities (their multi-level and multi-actor nature, and conscious governance-driven collective choice) can be found in the governance of BDs and LAFs more generally. In fact, these frameworks provide the context within which processes that activate social innovation can develop: cooperation, sharing of knowledge and experiences among actors, provision of technical support and advisory services, and knowledge generation (Elsner *et al.*, 2025). It is therefore no coincidence that these elements are also found in the case study analysed here. They shape collective action towards context-specific objectives aimed at creating more sustainable and resilient agricultural systems (Gava, Vanni, 2026) and foster tacit knowledge that empowers farmers in productive choices (Hinzpeter, 2025).

Most importantly, the application of the STEHD framework to Biodistretto della Valle Camonica has shown the 'non-neutrality' of territories. Collective choice, and therefore the entire LHD process, has been driven by territorial features, farm characteristics, and pre-existing social capital. This is highly relevant for BDs and LAFs in general, as it makes embeddedness a constitutive component of their nature and analytically tractable.

Furthermore, although the case study focuses on a micro-level action whose territorial and community effects are difficult to identify, the framework served as a conceptual guide for mapping feedback loops and facilitating the identification of virtuous cycles. It is precisely its focus on the vertical and horizontal articulation of governance that makes the STEHD framework a diagnostic tool consistent with the operational gaps often found in LAFs: low levels of interconnectedness (Rico Mendez *et al.*, 2021; Ure *et al.*, 2026) and power asymmetries deriving from resource imbalances among actors, lack of incentives to participate, and antagonism between actors (Kang *et al.*, 2022). It

can identify these issues, detect affected actors, and potentially reveal their effects in terms of unachieved capabilities.

Another strength of the STEHD framework, although only partially verified by the case study, is its ability to connect local dynamics with higher-level processes. The application to Biodistretto della Valle Camonica, although documented only in terms of the involvement of external actors (the RSN) and the constraints imposed on the project by regional legislation, supports the view that the STEHD framework can be applied to BDs from a multi-level perspective, in which collective capabilities are shaped by the interaction between endogenous and exogenous resources (Belliggiano *et al.*, 2020; Stotten *et al.*, 2017).

On the other hand, the conceptual richness of the STEHD framework makes it analytically powerful but empirically demanding. The first consequence is that some categories of actors may be excluded from the analysis, thereby making the results of its application at least partial. Previous applications of the STEHD framework show that territorially based approaches may generate positive effects, but these effects can be unevenly distributed among groups, especially where inequalities of various kinds persist (Biggeri *et al.*, 2018; Biggeri, Cuesta, 2021). Identification of the groups affected by the development process is therefore crucial.

Biodistricts are cases in point: the expansion of the capabilities of organic farmers could result in constraints on the capabilities of conventional farmers (Coq-Huelva *et al.*, 2017). In Biodistretto della Valle Camonica, efforts have been made to address the power imbalance resulting from small farmers' difficulties in obtaining certification through a self-managed certification system, but in other areas inequalities may increase (Górska-Walczak *et al.*, 2025). A comprehensive assessment of the individual and collective capabilities affected by territorial enabling and disabling factors would therefore require access to a large amount of information on stakeholders and their power relations, local resources, institutional arrangements, and other contextual elements. Such information may not be fully available in standard datasets.

The high level of context specificity of the STEHD framework does not allow its use for prescriptive purposes, but rather positions it as an interpretative and diagnostic tool (Biggeri, Ferrannini, 2014). An application for evaluating BDs could therefore become feasible, for example, by gathering qualitative information through focus groups and integrating it with the indicators specified in BDs' evaluation plans, where available. In this way, the actions described in the evaluation plan itself could, within the STEHD framework, serve as expressions of collective choice. In the case of Biodistretto della Valle Camonica, we did not consider the temporal perspective and therefore could not verify whether changes in context had led to new territorial dynamics. However, the STEHD framework is designed to adopt an evolutionary perspective on LHD (Biggeri, Ferrannini, 2014). This suggests that the application of the STEHD framework could become part of the ongoing evaluation of BDs, allowing the evolutionary nature of capabilities to be explored.

4. Concluding remarks

This paper has applied the STEHD conceptual framework to a BD – Biodistretto della Valle Camonica (Province of Brescia, Italy) – and has provided a proof of concept of its applicability to BDs more generally. It contributes to the literature on BDs by suggesting that evaluation should go

beyond the ‘impact chain’ to recognise their ability to activate individual freedoms consistent with the contexts in which they operate. The application to Biodistretto della Valle Camonica suggests that the re-embedding of small supply chains, although not sufficiently impactful to produce substantial changes in farming businesses, generates territorial functionings connected to networking, knowledge exchange, and technical support. These contribute to the achievement of individual capabilities while also eliciting virtuous cycles of new territorial conversion factors, for instance those connected to production or market expansion.

The democratisation processes activated within GRL appear to enhance farmers’ agency, that is, their ability to make choices outside the dominant agri-food system (HLPE, 2019). This shows that, at least within small groups, co-decision allows benefits to reach all actors involved in the action. Although exclusion cannot be completely avoided, it is often a consequence of social and economic constraints. The GRL project has demonstrated viable and potentially scalable solutions, such as the pooling of resources and co-creation processes, to make innovation accessible to the broader farming community.

The project has, in fact, succeeded in integrating modern techniques with traditional knowledge, making the required technologies available to a group of farmers who otherwise would not have been able to access them without incurring additional costs. It thereby reiterates the importance of cooperation among small farmers in gaining greater autonomy in marginal contexts (Rosset, Martínez-Torres, 2012) and the need to connect territorial needs with those of farming communities. It also stresses that successful technical support must be developed in close collaboration with local farmers, avoiding top-down approaches to consulting, as an effective way to foster collective agency in BDs (Chaminade, Randelli, 2020). Taken together, these elements constitute the two pillars on which the strong social capital required to activate territorial and individual functionings and collective agency has been built in Valle Camonica.

This study has limitations. The main limitation is design-related and stems from the low number of interviews, which were primarily conducted with farmers and therefore reflect a specific perspective that does not consider, for instance, how the project is perceived beyond its direct stakeholders. Moreover, purposive sampling excluded the point of view of those who, having joined the GRL network, nevertheless decided not to participate in the agreement for shared use of the mill. This may have excluded perspectives on disabling factors affecting the development of new capabilities. Consequently, the findings should not be interpreted as representative of all firms in the territory, but rather as an in-depth account of the perceptions and experiences of selected participating farms. This is, however, consistent with the exploratory rather than confirmatory nature of this contribution.

Another limitation is methodological and concerns the difficulty the STEHD framework faces in capturing impacts, in terms of capabilities, on categories that are not directly affected by the development process examined (Biggeri, Cuesta, 2021; Biggeri, Ferrannini, 2014). Its integration with other, more quantitative, evaluation frameworks could inform future research. Attempts of this kind have already been made, although not in relation to food systems (Biggeri, Cuesta, 2021), and have succeeded in establishing cause-and-effect relationships and connecting outcomes to achieved capabilities. The evaluation scheme based on Porter’s diamond elaborated by Zanasi *et al.* (2020) seems particularly relevant in this instance, as it shares with the STEHD framework a grounding in the notions of cooperation and embeddedness. This framework could connect capabilities to sources

of local competitiveness, thereby broadening the quantification of impacts through the evolution of actors' agency. On the other hand, integration with tools for evaluating agroecological approaches (e.g., FAO's TAPE) should also be considered in order to frame these approaches within the broader perspective of food-system democratisation processes. Moreover, the quantification of ad hoc indicators could address specific issues identified by the STEHD framework. For instance, indicators related to society and welfare (Packer, Zanasi, 2023) could address specific problems connected with the loss of empowerment and agency among certain categories (e.g. small farmers) (Robeyns, 2017). The analysis of quantitative economic factors involved in the BD is outside the scope of this study, but their integration into the STEHD framework represents a necessary area for future research to strengthen the validation of BDs as agents of local development.

Future research should broaden the analysis to consider the impact of BDs on territorial functionings and related individual capabilities beyond the farming community. For instance, consumers should be considered in their dual role as final recipients of food-system initiatives and as key drivers of change through their choices. Moreover, capabilities related to access to secure, nutritious, and safe food should be explored, consistently with the mission of BDs.

Author Contributions

A.S.: Conceptualization, Methodology, Writing- Original draft preparation; G.G.: Supervision, Conceptualization, Methodology, Writing- Reviewing and Editing.

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Appendix

Table A.1. Coding logic and underlying data.

Local dynamics			Data-near codes from Interviews	Supportive secondary data	Individual dynamics
Conversion factor	Achievable Territorial Capability/ achieved territorial functioning in Val Camonica (deductive codes)				individual functioning (inductive codes)
(1)	(2)	(3)	(4)	(5)	(6)
GRL network agreement; BD partnership	Access to market and distribution	Access a new local food network: new local outlets	Changes in productions; changes in marketing outlets; role in the network agreement; perceived opportunities	Communication/dissemination initiatives; training material	Diversification of the outlets
	Access to supply chains arrangements and infrastructures	Access a new local food network: shared mill/machinery			Enhanced market opportunities
					Access to processing
GRL network agreement; BD partnership	Access to planning and support	Access a new local food network: planning and design	Source of technical support; investments required by the project	Project documents	Access to Technical Support
Participatory advisory; participatory seed selection	Access to innovation	Use of a local rye population	Source of technical support; description of the process that led to the cereal being incorporated into the farm's productions; origin of the seed	Project documents; communication/ dissemination initiatives; training material	Access to new crop management techniques and crop rotation
					Product diversification

GRL network agreement; BD partnership	Networking	Access to a new local food network	Role in the network agreement; origin of the involvement in the project	Call for proposals; project documents; communication/ dissemination initiatives	Access to cooperation
Participatory advisory; participatory seed selection	Activism and agency	Access to an information platform on local productions: participation and knowledge co-creation	Source of technical support; role in network agreement; communication/dissemination activities towards consumers	Project documents; communication/ dissemination initiatives; training material	Autonomy in decision-making
GRL network agreement; BD partnership; Participatory advisory	Access to shared knowledge	Access to an information platform in local productions: technical support and tailored knowledge			Access to valuable knowledge
					Peer-to-peer knowledge exchange
Pooled harvester; seed bank	Access to sustainably managed resources and ecosystems	Use of a local rye population: sustainable land management	Changes in productions	Communication/ dissemination and training initiatives	Support for local sustainability
					Landscape diversification
GRL network agreement; BD partnership; information and dissemination	Direct relationships between producers and consumers	Access to an information platform on local productions	Communication/dissemination activities towards consumers	Communication/ dissemination initiatives	Consumer's Awareness
GRL network agreement; BD partnership; information and dissemination	Direct relationships between producers and consumers	Access to new local products			Right to choose

GRL specification; information and disseminatio n	Access to innovation	Alternative to third- party certification	Perceived opportunities and future wishes		Enhanced product reputation
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Table A.2. Questions used to guide the interviews.

Guiding questions	Target respondents
How did you get to know the project?	Farmers
Which role do you recognise to the biodistrict in the project?	Farmers, advisor, and BD representative
How does the network agreement work?	Farmers, advisor, and BD representative
What is your role in it?	Farmers, advisor, and BD representative
Were any investments or specific competences required from you, during the project? Who supported you in that?	Farmers
Did the project give access to markets otherwise unreachable for you? Which ones?	Farmers
Did the project change your productions? How?	Farmers
Are you involved in communication activities towards consumers/other farmers? Which ones?	Farmers, advisor, and BD representative
Which kind of issues did you meet during the project, who helped you in facing them?	Farmers
Beside those market and production related, which opportunities did you get from joining the project?	Farmers
What are the main flaws of the project?	Farmers, advisor, and BD representative
What do you wish for the future?	Farmers, advisor, and BD representative
How did you involve the farmer?	Farmers and advisor
How did the project start?	Farmers and advisor
How did you look for the competences needed?	Farmers and advisor
Could you describe the process that brought to the drafting of the GRL specification?	Farmers and advisor

Table A.3. Individual functionings activated in Biodistretto della Valle Camonica.

Individual functionings	Coded material
Diversification of the outlets (farmers)	‘Our flour is sold through local Purchasing Groups, directly to consumers that visit the farm, to 2 local bakeries.’ ‘We rely on an external workshop (in nearby Valtellina) for rye pasta.’
Access to processing (farmers)	‘In addition to the connection with the bakers and craftsmen, a mill was purchased, and a portable oven was built for baking bread and pizzas.’ ‘We have set up a supply chain from field to table and with high quality products.’
Access to technical support (farmers)	‘Through the institutionalisation of the network we aim at rationalising costs by integrating processing, services, and the exchange of labour and equipment.’
Access to new crop management techniques and crop rotation (farmers)	‘We grew potatoes, but we had been experimenting with cereals for a while. So that when we heard of the project we joined gladly. Thanks to it we had access to the machinery that allow us to start a more structured rye cultivation.’ ‘The technical support of the rural seed network helped us in discovering local varieties suited to the area, we share training days where we discuss local values, such as rotation, which is a cornerstone of organic farming.’
Access to cooperation (farmers)	‘Ours it is not nostalgia, but practical sense: if we work alone, we can't do everything we would like to do. We didn't start from scratch: we leaned on the biodistrict network and some municipalities helped us with their spaces: Cervenò gave us the space for meetings and seminars, free of charge. Losine gave us the space for the community mill. It saves the farmers a lot of money, as they no longer must process the product themselves.’ ‘The network agreement was the simplest way to collaborate while remaining completely independent. According to the agreement, farms can pool goods (machinery, tools) and products, both raw and processed, are common ownership. According to the agreement we can also share workers.’ ‘If we have good practices to share, we put them together so that no one thinks about his own little field anymore. The idea is that the fields belong to everyone. Ownership remains with the farm, but we put together the patches and the workforce.’
Support to local sustainability (farmers and consumers)	‘We are aware that mountain farming is a challenge to verticality, a strenuous path with uncertain results and low profitability, but we are also aware that the conventional agricultural model has come to the end of the line and that only local production and consumption can set us on the path to the sustainability that many are talking about but which still seems too far away on the horizon.’ ‘The pizza is made exclusively with local flours. So when you eat it, not only you are eating a pizza with all the properties of the grains that are grown in the mountains, but you are also encouraging the cultivation and recovery of abandoned territories in our Valley and thus also supporting local farmers. It is not just food, but a product whose consumption has effects on the recovery of our territories.’
Enhanced market opportunities (farmers) Consumer's awareness (consumers) Baking skills (consumers)	‘The seed certification process is open to everyone. For local consumers is a way to get in contact with the producers and to get a better understanding of the whole supply chain.’ ‘We have good feedback by our clients: the flour is of a better quality than common flour.’

	‘We involve consumers and school children in bakery workshops with our mobile oven. We teach people how to make rye pizza, and also some of our clients have the rye pizza in their menu. We disseminate the culture of ‘non-commercial’ cereals and also we describe their properties from a nutritional standpoint.’
Right to choose (consumers)	‘Soon after having participated with my father to one of the training courses on sourdough promoted by the biodistrict, I began making and selling bread with flours from farms in Val Camonica, finding consumers highly appreciative of both the quality and origin of the product. At first consumers were wary, but then they tried the product and learned about its origins, and now it is in high demand for its uniqueness and authenticity.’
Enhanced product reputation (farmers)	‘Before joining the project, everyone was making flour his own way. Now everyone brings the grain to just one mill, as a result the quality and characteristic of the flour is much more constant.’
Autonomy in decision-making (farmers)	‘The main positive impact is not of an economic nature, but it’s about the capacity of building a new network, The project has allowed the farmers to collaborate while keeping their autonomy in decision-making.’
Product diversification (farmers) Landscape diversification (farmers and consumers)	‘Before ‘GRL’ the rye was harvested by hand, now mechanisation has enhanced the yield and the chance of processing the grain, it has also encouraged us to seed more patches.’
Access to technical support (farmers)	‘RSN helped us a lot! They gave us their qualified technical support and provided training for those of us who were not expert in growing cereals and to whoever was interested in the topic, also farmers outside the Valley. They have been very helpful in selecting the rye populations!’
Access to valuable knowledge (farmers) Peer-to-peer knowledge exchange (farmers)	‘We adopted a ‘participatory advisory’ approach in all the phases of the project: the mill have been chosen together with farmers, we choose one with a small grinder, much more feasible for the quantities we process, The mill required a modification; anyway with the collaboration of the University of Florence we organised the training for the farmers so that they had the chance to decide whether buy it or not.’

Source: Authors’ elaborations.