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Agri-food sustainable transformative pathways: diving through the evolving territory of Lucca

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Abstract

The aim of the paper is to understand the sustainable transformation on a specific area of Italy, the Plain of Lucca, using an action research methodology combined with service learning to provide an approach for understanding and accelerating. The literature review serves to set the scenes and limitations of several mixed methodologies, leading to the willingness of adopting a territorial case analysis. We start from a socio-historical analysis to then understand the role played by several actors in a specific ecosystem, serving as a basis to identify the main emerging aspects that should be implemented in other cases to accelerate the agri-food sustainable transformation.

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L'obiettivo dell'articolo è quello di comprendere la trasformazione sostenibile in una specifica area d'Italia, la Piana di Lucca, utilizzando una metodologia di ricerca-azione combinata con una di *service learning,* per fornire un approccio atto a comprendere e accelerare la trasformazione. La rassegna della letteratura serve a delineare lo scenario e i limiti di diverse metodologie miste, motivando l'adozione di un'analisi di caso territoriale. Si parte da un'analisi storico-sociale per poi comprendere il ruolo svolto da diversi attori in uno specifico ecosistema, che serve come base per identificare i principali aspetti emergenti che dovrebbero essere implementati in altri casi per accelerare la trasformazione agroalimentare sostenibile.

1. *Introduction*

Today, agriculture is facing the speed of the challenges posed by climate change, as well as the growing risks for ecosystems and human health (decreases in water availability and crop yields, increasing risks of droughts and biodiversity loss, forest fires, and heat waves, etc.) and consequently the negative impacts on global economies.

Agricultural scientists are currently divided between those focusing on the efficiency-substitution-redesign model at the farm level, and those emphasizing the positive role of agroecological transition at a broad, systemic, and multilevel way[1]. Sachet[2] defines this dichotomy as between conformist agroecology, or the "ecological" intensification paradigm, and transformative agroecology, and shed light on the key role of specific social contexts in fostering a fundamental shift in knowledge production for the complete transformation of agri-food systems.

A place-based approach to agroecological transition is also advocated by economic geographers to explain why and how specific agri-food systems more than others exhibit a different speed and direction in the process of change[3]. In this context, it is not just a matter of understanding why transformations occur, but rather how transformations can accelerate and under what conditions in certain territories rather than in others. Other scholars in a very similar fashion investigate the role of Alternative Food Networks (AFN) and the "quality turn" to explain sustainable transition[4]. While the former dedicates a specific attention to the concept of networks while often overlooking the effects of possible interactions between different networks and stakeholders, the focuses on individual quality initiatives that relate to specific qualities

[1] Ollivier *et al.* 2018.
[2] Sachet *et al.* 2021.
[3] Chaminade, Randelli 2020.
[4] Lamine *et al.* 2019; Goodman 2003; Edwards 2016; Sage, Desmond 2003.

of specific products found in specific territories (i.e., collective local brands and geographical indications). Such focus implies the risk of losing sight of the agri-food system as a whole and may therefore lead to a lack of consideration of the social (e.g., justice, equity) and ecological dimensions of rural development.

A potential convergence between all these strands lies precisely in the approach developed by Chaminade and Randelli[5] of Territorially Embedded Innovation Ecosystems (TEIE) when intertwined with a set of structural preconditions (actors, initiatives, and values) and agency (how actors might join forces in networks) and analysed with a clear directionality given by sustainability transformations. Like territorial assemblages, TEIEs matter because they focus on the role of different skills and knowledge, relations and institutional frameworks, and their combined effects in facilitating the speed of sustainable transitions.

Research should integrate the role of local knowledge, practices, and cultural values, and identify to what extent territorial priorities contribute through innovation and bottom-up approaches to accelerating sustainability transformations. This could help generate a shift in knowledge production, improve the scalability of results, and increase policy-level adoption[6].

With this paper, we aim at unravelling the path of sustainability transformation, which proceeds from local innovation ecosystems, in agriculture, forestry, and rural areas by trying to understand what, why, how, when, and where transformation occurs and under what conditions it shows an accelerated dynamic. Based on two case studies in the Plain of Lucca (Tuscany, Central Italy), namely a) the network of *Lucca Biodinamica* and b) the Inter-municipal Food Policy (IFP) *'Piana del Cibo'*, we provide a critical perspective on the effects of structural preconditions and agency in the transformation of specific TEIEs in a dynamic way (over a time span of about 70 years). Since history matters in regional transformations, the opportunity for transformation is path dependent. Through an action research methodology combined with service learning, we analyse the rapid transformations of the Lucca plain from 1950 until today to identify which factors appear to be more significant at different stages in the transformation (structural preconditions, entrepreneurial agency, place-based leadership), how relevant certain government policies are for the development or otherwise of these pathways, what are the innovation potentials and obstacles, and what paradigms and controversies exist in these pathways. Understanding transformation through this place making lens could contribute to enriching the debates over the key questions for accelerating the process.

[5] Chaminade, Randelli 2020.
[6] Migliorini, Wezel 2017.

2. *Literature Review*

2.1. *Concept and frameworks for sustainability transformation*

To ensure a safe operational space for humanity[7] and meet the complex goals of *Agenda 2030*, a transition toward more sustainable agriculture has been prompted by EU policies and strategies such as the European Green Deal, Farm to Fork and the Biodiversity Strategy. Such a transition requires transformative change. While the term "transition" denotes the slow and incremental process of changing from one state to another in each period (i.e., changing to an improved version of the current status without affecting the system's shape or characteristics), 'transformation' is seen as a more radical and nonlinear shift in values, thinking, perception, behaviour, multilevel governance, and management regimes[8]. Transformation designates a significant system change that affects the way individuals make sense of the world and relate to their own internal representations, leading to substantial alterations in external behaviour. Transformational change is therefore the radical change in an organization's culture (norms, values, etc.) that affects the way people within the organization perceive their roles, responsibilities, and relationships. Both concepts are at the core of different research approaches to sustainability transition. Ollivier *et al.*[9] provide a review of sustainability transition framework ontologies and distinguish between two main groups: the Socio-Technical Transition (STT) and the Social-Ecological System (SES). These approaches share a focus on sustainability and emphasize the role of socio-economic and technical interactions in analysing complex systems change, as well as the structure, type, governance, and learning dynamics of the system considered. While the interest in these frameworks is growing, the authors call for caution in using and mixing with other conceptualizations, since there are still many gaps and limitations in the research on how they can be used or integrated for the analysis of agroecological transition[10]. For example, most studies in agroecology conceptualize the transition with the efficiency-substitution-redesign model at the farm scale and fail to capture the systemic and multilevel way of both STT and SES. According to Sachet *et al.*[11], research is still needed to address the agroecological transition in farms while reconnecting agriculture to local agri-food systems. Furthermore, mismatches can occur when trying to mix key concepts that show different meanings in different contexts (e.g., niche, regime, or transition), and difficulties in finding unique criteria to define

[7] Rockström *et al.* 2009; Nyström *et al.* 2019.
[8] Olsson *et al.* 2014; Scheels 2013.
[9] Ollivier *et al.* 2018.
[10] *Ibidem*.
[11] Sachet *et al.* 2021, p. 16.

systems and the entities that compose the systems. But there are also other gaps and inconsistencies related to key dimensions that are not often fully taken into consideration, such as the technical and ecological spheres. Regarding the technical sphere, there is a growing interest in agricultural innovation systems, but the literature on the role of agricultural innovation systems in agri-food systems transformation is poor. Klerkx and Begemann[12] highlight that there is a need to reflect on how agricultural innovation systems relate to transformative concepts and visions at different geographical scales (e.g., agroecology, digital agriculture, etc.).

With respect to the object of the transition, Lamine *et al.*[13] distinguish between the role of "Alternative Food Networks" and "Quality Food Networks". While the former stresses on the terms 'local' and 'alternative' by defining the agri-food system according to multiple facets of proximity between the various actors that raise food-related issues often neglected in traditional supply chains, the latter focuses on the concept of 'local quality' as an attribute that is linked to specific territories (i.e., through geographical indications) and is promoted to market a specific product targeting primarily tourists and distant consumers. By focusing on a territorial agri-food system approach rather than on specific initiatives in isolation, Lamine *et al.*[14] overcome the classical dichotomy between alternative and conventional networks and describe complex and diverse mechanisms of transition. Despite the analysis includes diverse forms of agency, including the action of public policies over time, the conception of unstable boundaries of the territory and the lack of consideration for the innovation mechanism limit the applicability to other regional contexts.

The analysis of the literature, therefore, shows difficulties in limiting agri-food systems within specific boundaries, and potential tradeoffs in tracing inter-scalar pathways. While caution should be used when conceptualizing hybrid approaches, the complexity and diversity of the contexts involved raises the need to borrow from different models that can reveal more about whether and how system transformations might be accelerated instead.

2.2. *Transformation through the place-making lens: the emerging concept of TEIE*

When moving to the governance of sustainability transformations the literature emphasizes the role of agency through intermediaries that can affect

[12] Klerkx, Begemann 2020.
[13] Lamine *et al.* 2019.
[14] *Ibidem*.

the direction and speed of transformations[15]. However, this approach has been criticized by economic geographers, who stress the need to look at the existence of innovative ecosystems embedded in specific territories. To explain the rapid development of the Panzano organic wine district in Italy, Chaminade and Randelli[16] borrow the concept of Territorially Embedded Innovation Ecosystems (TEIEs) and analyse how structural preconditions and agency can affect the speed of transformation. According to these authors, the different structural preconditions at the regional level (e.g., economic specialization, presence of strong networks, formal and informal institutions, and technological regimes) can affect transformation pathways as they are the result of different historical processes of knowledge and social capital accumulation. Knowledge, combined with relations through networks, supports interactive learning, a key factor for continuous innovation in TEIEs. However, within the structuralist perspective, the same knowledge may become a cognitive constraint and hinder the process of change[17]. Then, by building on a shared understanding of the identity of a place and what it could become, the place-based agency (place leadership), which means that the place is seen as the catalyst for change and innovation[18], can shape transformative capacity (i.e., when individuals and organisation have the space and capacity to act independently to make their own free choices). In this context, the concept of agency allows us to understand how different actors might be able to overcome the structural inertia of the system to incremental change and realize transformations. Adding the concept of an ecosystem through this placemaking lens, the TEIE, as an innovation ecosystem, describes an articulated community of various players, stakeholders, and community members that are critical for innovation, and operate within the boundaries of the territory that functions as ecological unit.

3. *Research Design*

In this paper, we employ case study research that allows for an in depth and multifaceted understanding of a complex issue such as sustainable agri-food transition[19]. The sociohistorical analysis explains which local pathways led to the current situation, to provide an accurate description of the present condi-

[15] Köhler *et al.* 2019; Lindner *et al.* 2016.
[16] Chaminade, Randelli 2020.
[17] Winter, Nelson 1982
[18] Ayres, 2014.
[19] Lamine *et al.* 2019.

tions and to imagine new pathways for the future of the initiatives illustrated in the case studies.

3.1. *Data collection and analysis*

We developed an analytical framework organised into different steps followed in the two case studies:

- A long-run historical event timeline to analyse and develop a narrative of the innovation process behind the development paths, knowledge trajectories, and stakeholder interactions at the microlevel.
- An analysis of the socio-economic context configuration within the regional agricultural sector (structural characteristics).
- An identification of complex, emergent, and nonlinear agri-food initiatives at the territorial scale involving many actors across different levels, and of the key agri-food policies in the timeframe considered.
- An analysis of the interactions between successful or failed initiatives and projects carried out and different territorial actors (farmers, farmers associations, local networks, public bodies, etc.), and of the different forms of governance implemented (modes of coordination, cooperation, power relations), and public programs.

The analytical framework allowed us to characterise and compare the agri-food transition pathways of the two case studies in the region under study.

In each case study we used a combination of data collection techniques and sources. Through in depth semi-structured interviews, we captured individual views of the role and perspective of potential key initiator(s) of the innovation process, while desk-based analysis complemented the picture at the contextual level.

For primary data collection, we employed face-to-face semi-structured interviews conducted as part of different research projects between 2016 and 2022 by the authors of this paper as well as ethnographical observations of several events, meetings, and interactions; some of these initiatives were dedicated to organic, biodynamic, and local products. The interviews included key actors in the transformation of the area of the Plain of Lucca, i.e., farmers, food processors, civil society leaders, intermediaries, and local authorities.

Data collection was then complemented with additional research through a service-learning exercise[20], whereby students formulated a marketing action in response to the challenges posed by a key network of producers from the area (i.e., the association *Lucca Biodinamica*). In the first step, a class of 40 students

[20] Selmo 2020; Ruth *et al.* 2019

was divided into three main groups that enquired about available secondary data (i.e., peer-reviewed literature, monographs, dissertations, publicly available projects' results, meeting reports, policy documents, press statements, and newsletters), and elaborated a preliminary report on the key structural conditions of the area. The first report encompasses the area's key productions for the agri-food sector (agricultural and food products, and wine), as well as key events, policies, and what they identified as the main opportunities and barriers for future sustainability. During the second step, the students organised a workshop[21] to obtain a list of five challenges from the area, and validation of formerly analysed drivers in relation to the process of transformation, the role of actors, the sources of knowledge and the impact of the transformation on the economic, social, and environmental sustainability of the area. Eventually, all the information on the transformation was combined and analysed comprehensively, with special attention to the spatial and temporal dimensions of the transformation pathways and related innovations.

This narrative covers all aspects, from the development of a long-run historical event timeline with the major milestones or events identified (sequence of events), to the information regarding the actors involved, their relationships, the knowledge developed and opportunities and barriers to the innovation process. The result is a chronological observation of both structural conditions and agency that in specific territorial systems of the Lucca Plain enabled the transformation.

3.2. *Selection of case studies: The Plain of Lucca*

The selection of two specific case studies is motivated by the two initiatives – the Intermunicipal Food Policy *Piana del Cibo* and the network of *Lucca Biodinamica* – both located in the same locality, namely the Plain of Lucca. It encompasses six municipalities (Altopascio, Capannori, Montecarlo Porcari, Villa Basilica), including the capital city of Lucca, all of which display different characteristics in terms of demography, economic and social dimensions, and geographical features, the latter spanning from urban to peri-urban and rural areas. The Plain of Lucca does not correspond to an administrative unit, which translates into the lack of disaggregated data and the necessity to refer to data at the individual municipality or province level (NUTS 3)[22]. This area is situated in the southern Tuscan Emilian Apennines, and it bor-

[21] The workshop took place in December 2022 at the premises of the Department of Agriculture, Food and Environment of the University of Pisa and involved the *Lucca Biodinamica* network of producers.

[22] NUTS 3, according to the EU nomenclature for territorial units for statistics, corresponds to Italian provinces.

ders the sub-Appennic chain of Monte Pisano and the area of Versilia (West), Apuan Alps (North) and the rest of the province of Lucca and the province of Florence (South-East). It belongs to the province of Lucca, the fifth largest province in Tuscany (1.772,72 km^2), bordered with the provinces of Massa Carrara, Pistoia, Florence, and Pisa. Within the territory of the province, which is composed of coastal, hilly, and mountainous areas, the Plain of Lucca represents a flat area that extends around the city of Lucca and is most suitable for viticulture and olive groves cultivation.

According to the last census, 381.890 people live in the province of Lucca (the third province of Tuscany by the number of residents), of which 169.200 live in the Plain. The amount of population of the area grew a lot in the period from 1950 to 2021, starting from 366.899 (1951 census) and reaching the current number. About 60% of inhabitants are in the 15-64 age range, and the average age is between 44 and 48. According to ISTAT[23], the economic activity is very flourishing, and the annual added value exceeds 10 billion EUR, just under 10% of the overall added value produced within the Region. The latest available report on the economic situation by the Chamber of Commerce of Lucca[24] shows that the tertiary sector contributes most to value-added formation in Lucca, where food and wine, along with cultural tourism, occupy a prominent position. The secondary sector (industry and construction) follows marginal. In this context, the COVID-19 pandemic resulted in a slowdown of all sectors, interrupting the sustained growth that had started in 2016. Characteristic sectors of the local industry are papermaking – constituting one main Tuscan industrial district[25] –, footwear, engineering (divided between production for paper machines and yachts), the extraction and processing of stone materials, and the food sector, famous for some typical products (olive oil, wine, pasta). As the primary sector is concerned, the primary sector, wine production is central in the economy of the area that hosts two Protected Designation of Origin (PDOs), namely *Colline Lucchesi* and *Montecarlo*, and two Protected Geographical Indications (PGIs), i.e., *Toscana* and *Costa Toscana*. Other typical products from the area are milk, meat, and chestnuts.

Although the high morphological heterogeneity gives the Plain of Lucca unique characteristics from a landscape and environmental point of view, the high level of urbanization and the excessive use of resources are seriously threatening the environment, especially if considered in combination with climate change. The management of the water network of the Serchio River (the main river in the area) is complex and causes recurring floods. In addition to hydraulic fragility, the area is characterized by poor soil consistency that re-

[23] ISTAT 2019

[24] CCIAA 2017.

[25] 75% of the national product of paper for hygienic and sanitary uses (7% European) and 45% of paper for corrugated cardboard (5% European) are produced in the province of Lucca.

sults in frequent landslides, determining a concrete risk for the resident population (at least 30.000 units) and all major economic activities. The area is also characterized by a high-level soil consumption, mostly for the paper industry and transport infrastructures. Industry, construction, and transport are the major drivers of air pollution; in addition, the area is subject to high levels of groundwater pollution, linked to the modifications and fragility of the soil.

4. *Explaining the transformation: the evolving territory of the Plain of Lucca*

4.1. *The Role of structural preconditions*

Local identity and culture

Despite the heterogeneity in terms of geography, demography, and socio-economic features in the municipalities encompassed in the area, the Plain of Lucca owns a strong, distinct cultural identity linked to its history, since the time of the *territorio delle VI miglia* (lit. six-mile territory) as this locality used to be designated. We are in a rather different Tuscany, in its own way, distant from the postcard imagery and far from reminiscences of Renaissance glories. Nowadays, the countryside is still showing the signs of the ancient system of villas and courts which punctuated the Plain until the first half of the 1900. After WWII, the pressures from land development have been the main threat to the landscape and agricultural land, posing risks for the area's capacity of self-provisioning. While the population in the Plain of Lucca remained stable or increased since the 60s – except for the smallest, rural towns – a decline occurred in the agricultural sector, with land abandonment, farm disappearance, and consequent loss of income and jobs from agriculture. Even though urban sprawl and land development threaten not only agriculture but the very maintenance of essential ecosystem services like biodiversity and water management, especially around the 1990-2000s, agriculture counts on a relatively small number[26] of small-medium farms which contribute to a rather diversified production and landscape maintenance[27]. Olive groves and vines, after cereals, vegetables, and fodder cropland, occupy most of the cultivated land[28]. Nonetheless, land fragmentation remains in this area one big obstacle to the farm's

[26] In 2019, on a total of 800 farms, 554 were smaller than 5 ha. Farms larger than 59ha were only 24 but occupy almost one third of the cultivated land (Galli *et al.* 2022, elaboration from ARTEA).

[27] Vergamini *et al.* 2019.

[28] Galli *et al.* 2022.

efficiency, increasing production costs, limiting the efficient use of mechanisation, and contributing to the loss of attractiveness of farming activities[29].

In this context, however, in recent years several producers have given rise to a real cultural renaissance of the area, linking these aspects of territorial identity with greener practices, enabling sustainable innovations and the rediscovery of the area. Indeed, a passionate group of winemakers has been able to translate the key aspects of tradition, and the legacies of the international cultural exchanges of the Republic and the Duchy eras into unique natural wines, different from each other. By focusing on the strong territorial legacy and history of these fertile hills, they embraced nature by adopting a chemical-free, biodynamic system, which sees farming holistically, as a balance between plants and animals. In a very short time, they have been able to develop the most important cluster of biodynamic vineyards and farms in Italy. In this process, the way of making wine in Lucca has largely changed, and the quality developed has then determined its subsequent strategy and growth. Individual pathways converge on the search for the link between local identity (place) and new opportunities for internationalization processes of wines that, before this step, were mostly sold in bulk and locally. In addition, compared to the neighbourhood areas where there has been a great focus on French vines with a strategy that targeted international taste, these producers have been able to add value to the reference vines of the area, namely *Sangiovese*, together with *Canaiolo*, *Colorino* and *Trebbiano*.

Triggering events and key actors

Slow Food was founded in 1986 in Bra, Piedmont, by a group of people led by the activist Carlo Petrini, willing to promote a diverse approach to food. The movement played a fundamental role in mobilizing local actors and raising awareness on the disappearance of local food cultures and traditions, being swept away by the fast life, and of the importance of biodiversity, human and animal health, well-being, nature, and their interconnectedness. The local *Convivium* (also known as *Condotta* di *Lucca, Compitese e Orti Lucchesi)* was established on the same year, and has since then been involving activists, citizens, farmers and union of farmers, schools, and restaurants in organizing activities and events. These actors were able, in the last decades, to start two Slow Food Presidia, namely: for the *Lucca Red Bean* and *Canestrino Tomato*. The former had the support of the regional germplasm bank for the recovery of these beans' landraces[30]; the latter involved operators from the whole value chain[31]. The Presidia are meant to protect products or processes, linked to a

[29] *Ibidem*.

[30] Slow Food Foundation for Biodiversity, *Lucca Red Bean*, <https://www.fondazioneslowfood.com/en/slow-food-presidia/lucca-red-bean/>, 21.01.2023.

[31] Slow Food Foundation for Biodiversity, *Canestrino Tomato*, <https://www.fondazioneslowfood.com/en/slow-food-presidia/lucca-canestrino-tomato/>, 21.01.2023.

territory, with the aim of supporting those that are the keepers of such knowledge and provide a commercial value to the Presidia itself. The Presidia are characterized by a specific trademark and present at local retailers (they are also in local supermarkets), and the Slow Food web encourages, though other projects, such as the Ark of Taste, the *Alleanza dei Cuochi*, the Slow Food Markets, and other activities, the use of these products in recipes, generally linked to traditional ones.

Presidia products are also sold at farmers' markets included in the Earth Market network. These are managed by groups of small producers and food processors who sell directly what they produce. The products are local, fresh, and seasonal, and are offered at fair prices for both sellers and buyers. The first Earth market *Mercoledìbio*[32] opened in Lucca in 2018, in the historic centre, where it is attended by residents and tourists. Started with 11 small, organic producers, it extended beyond the "boundaries" of the Plain of Lucca to include producers from neighboring cities and includes overall 18 producers[33]. Overall, 8 farmers' markets are currently in operation in the Plain of Lucca. In addition, direct sales initiatives include a big cooperative of 50 agricultural producers, some of which are seed-savers, who have been in operation since the early '80s. Signalling a growing consumers' interest in local produce and ancient varieties, the products from the Coop *L'Unitaria* are also sold at big retailers and restaurants in the Lucca Plain and beyond.

Other types of bottom-up initiatives emerged in the area, meant to reconnect local producers and consumers with different forms of short food supply chains. Amongst these, there are Solidarity Purchasing Groups, known as GAS (*Gruppi di Acquisto Solidale*), whereby self-organised groups of consumers sharing the same values (the 'solidarity' component) reach out to producers to purchase food and agricultural products directly[34]. The number of GAS is uncertain, due to the informal nature of such arrangements.

The area's image and reputation have been developed across the decades through a variety of initiatives. These reinforced the (positive) connections between people and the place or, in some cases, paid specific attention to promoting local distinctiveness also, but not exclusively, in the tourism market, for instance with fairs and events linked to food culture and tourist trails like the Wine and Oil Route '*Strada del Vino e dell'Olio di Lucca, Montecarlo e Versilia*'.

All these initiatives and networks have been effective in terms of creating and sharing knowledge on food and agriculture, of building momentum

[32] Slow Food Foundation for Biodiversity, *Mercato della Terra Mercoledìbio di Lucca*, <https://www.fondazioneslowfood.com/it/mercati-della-terra-slow-food/mercato-della-terra-mercoledibio-di-lucca/>, 21.01.2023.

[33] Galli *et al*. 2022.

[34] Brunori *et al*. 2011.

around the complexity of food-related issues and the necessity to address them through dedicated policies.

One major step towards greater awareness and civic engagement on food-related matters is the project *Orti in Condotta,* launched in 2004 by *Slow Food* and involving a network of 500 schools and school gardens throughout Italy. In Capannori and Lucca, the project started respectively in 2013 and 2016, and involved a broad range of actors – from municipalities to the *Slow Food Convivium*, from school pupils, teachers, parents, and grandparents – into a "learning community". Within such community, food is promoted as «the ideal instrument with which to experiment and promote an articulated, complex and creative education that gives value to interdependence, the environment and common good»[35]. The role assigned to education is therefore crucial also for ensuring the passing on of the local community knowledge and culture related to food. The project is included within the regional government initiative to create «100.000 vegetable gardens in Tuscany», aimed at expanding the area dedicated to self-production and raising awareness of the value of food and agriculture. In the Plain of Lucca, 21 schools have been involved overall[36].

As winemaking is concerned, a breakthrough event can be traced back to the early 2000s, when there was a generational change at a local level that brought great energy and movement. If before the wines that were produced and mainly sold in bulk in the area presented defects from Brettanomyces, (the classic 'brett', a yeast that gives anomalous scents when it is present in a wine), some producers have decided to change direction and through biodynamics they have given rise to a revolution that has increased the quality of the products and brought great recognition to the area. Since then, things have started to change, plus certainly, there has been a great (generous) dialogue between farmers which has allowed the different wineries to start teaming up, and last but not least, a great book has been produced, 'Lucca Wine Treasure', which has won many international awards and pioneered the communication industry. This was followed by the creation of business networks such as *Lucca Biodinamica*, concrete collaborations in the creation of excellent natural wines, short supply chains, and continuous help between producers in finding new marketing channels. Finally, in recent years Lucca has grown more and more into a large and modern restaurant sector which together with the producers has played a key role in giving life to the small oenological jewel that the area now represents.

[35] Political introduction to the Slow Food Education Manifesto, <https://slowfood.com/filemanager/official_docs/SlowFood_Education_manifesto.pdf>, 22.01.2023.

[36] Comune di Lucca 2019, *Orti in condotta. La festa degli Orti maggio 2019*, <http://www.comune.lucca.it/Orti_in_condotta>, 22.01.2023.

4.2. *The role of agency and the emerging innovation ecosystem*

Inter-municipal Food Policy of the Plain of Lucca 'Piana del cibo' (lit. Plain of Food)

In a context where food security has regained salience in High-Income Countries, the role of cities as best positioned to address complex food system issues has been emphasized at the global level by initiatives like the *UN Urban Food Agenda*, the *C40 Network*, and the *Milan Urban Food Policy Pact (MUFPP)*. Meant to find «local solutions to global challenges», the MUFPP is an international agreement of Mayors to support cities in developing more sustainable urban food systems, by providing a framework for action, with specific recommendations and indicators[37]. It currently counts 250 signatory cities across the globe[38], including the municipalities of Capannori and Lucca (and the Province of Lucca), which joined this global network in 2018.

Food-related issues have traditionally had a prominent position in the public debate in the Plain of Lucca, and many projects, initiatives and networks of actors had contributed to creating fertile ground for novel approaches to the food system's governance. The signature of the MUFPP represents a milestone, in that it gives rise to a whole mobilization from local institutions but is strongly based on civil society. Indeed, many of the well-established networks operating in the area – for the organization of short food supply chains, in the *Slow Food Convivium*, in initiatives of food waste prevention, recovery and redistribution, in actions supporting vulnerable groups, in schools and education initiatives – «have found common ground under the food policy umbrella and, during the preparatory phase of *CIRCULARIFOOD*»[39].

CIRCULARIFOOD was a participatory project, financed by the Regional Authority for Participation and run across the five municipalities of Capannori, Lucca, Altopascio, Porcari and Villa Basilica, which eventually joined to form the *Piana del Cibo* (lit. the Plain of Food), the first inter-municipal food policy in Italy.

Compared to other food policies, the Plain of Food did not result from one individual theme or concern, e.g., food poverty or sustainability, but rather from a holistic view of the food system by the promoters of the initiative[40]. These encompassed a group of very committed people belonging to public authorities, education, food movements, CSOs, food businesses and farms, all with a long experience in actors' mobilization, and projects and activities revolving around food, especially at the local level. This group has been supporting the food policy initiative since the outset, advocating for a unique food

[37] MUFPP 2015.
[38] Number of signatory cities since MUFPP launch in 2015 until December 2022.
[39] Arcuri *et al.* 2022, p. 292.
[40] *Ibidem*.

policy council, and calling for public authorities' commitment. When in 2019 the *Inter-municipal Food Policy Strategy* was launched, as the main outcome of *CIRCULARIFOOD*[41], it embodied shared values, objectives, and the idea that food constitutes a lever to achieve broader sustainability goals. It emphasized the «opportunity to build a new system of responsibilities currently dispersed among municipal sectors and services, to create an integrated policy that deals with agriculture, social and health services, education, environment, territorial and economic planning, putting the creation of a sustainable local food system at the center of public action»[42]. As the governance of the Plain of Food is concerned, this entails an *ad hoc* participatory governance model, with dedicated bodies such as the *Agorà* (the open assembly), the Food Council (the intermediate entity between participation and decision-making), and the Assembly of Mayors (the political decision-making body), and a crucial role for the Food Policy Office, providing overall coordination and support. In January 2020, the five municipalities formalized their food policy commitment as joint management of functions, a specific form of inter-municipal cooperation foreseen by Italian legislation[43].

The thematic tables (i.e., food habits and lifestyle, local food production, access to food and food waste, school and education, and urban agriculture) began their work in early 2020, one month before the COVID-19 pandemic started and mobility restrictions were implemented, deeply affecting the operations of the assembly, food council, and the overall food policy. Nonetheless, even during the pandemic many activities have been carried out in a remote mode, especially focused on health and lifestyles, awareness-raising campaigns on food waste, enhancement of farmers' markets, promotion of local products and traditional recipes (in collaboration with restaurants), and material support and care for vulnerable groups particularly affected by mobility restrictions.

Currently, the actors involved in the IFP are reflecting on the results achieved in the first two years of experimentation and a"lighter" governance is being considered to secure the continuity of the participatory bodies in case of policy reversal and lack of political support.

Lucca Biodinamica

In the case of *Lucca Biodinamica* there are two key dimensions of the structural preconditions of the Lucca food plain that matter: the first concerns the strong sense of identity associated with the place and the second the marked territorial proximity between farms. The network was born informally

[41] *Piano Intercomunale del Cibo Piana di Lucca* 2019.
[42] Authors' own translation from *Piano Intercomunale del Cibo Piana di Lucca* 2019.
[43] Arcuri *et al*. 2022.

around the 2000s thanks to the meeting between three wineries in the area. At that time, they had approached biodynamic agriculture thanks to the courses promoted by the external association 'Living Agriculture' and the teachings of Alex Podolinsky who have been able to ignite a spark by teaching the farmers of Lucca how to actively perceive nature and interact with it. Since then, the first three companies in a pioneering way have been able to develop in a very short time a formal network of 16 companies (13 wineries and 3 farms) based on cooperative relationships and mutual learning. The place-based leadership of these pioneers is therefore evident at this stage, which independently from the system of Geographical Indications (GIs) and other regional brands in use in the wine market focused on their true local dimension and, by addressing ebvironmental concerns, they developed a greater commitment to sustainability. There are no external investors in *Lucca Biodinamica*, the wineries have been able first to add value to local vines and then to develop a space for sharing knowledge, techniques, organic inputs and other essential raw materials. First, this made it possible to lower the costs associated with the transition and favoured the development of the network and its communication also externally over time. The companies in the network mainly deal with wine but have approached a system based on the diversification of production, a choice partly dictated by the biodynamic method, but also partly linked to the need to re-establish direct contact with the local environment and conserve the soil resource. The wineries, therefore, adopt a multifunctional and mixed agriculture approach where in parallel to the vine we found not only legumes, cereals and the production of pasta and oil, but also breeding. Biodynamic products are developed by the network since the sharing of production methods through mutual learning experiences. The reason for the aggregation lies precisely in the spatial proximity and in the social relation between companies but also in the fact that from the outset all the companies shared the goal of restoring the soil resource, which is particularly vulnerable in the Lucca area. The companies have a medium-small size, mainly between 2 and 5 hectares, and some reach 20 hectares of surface. Since about 2016, the network has become a recognized association to access to Regional and European support measures related to promotion. Indeed, the annual peasant festival of *San Giovanni* that the network promotes to raise awareness of the companies and the area is a significant effort in this direction. The *San Giovanni* peasant festival has grown over time involving other actors of the local agri-food supply chain like restaurants.

5. *Discussion*

This paper analysed a territory in which the sustainability transformation took place at a faster pace compared to other territories in the same region. Through a mixed research method, we tried to understand why and how this was the case. We developed a narrative for transition pathways in two case studies in the area, including more significant factors, triggering events, and government policies that, through place-based structural preconditions, facilitated or hindered innovation processes occurring in the area. Specific attention was paid to understanding the role of actors and formal and informal networks and their relations with and within the territory (place-based agency), so how they can affect institutional change at the regional level. The main contribution of this paper is to shed the light on the role of specific territorially embedded ecosystems in accelerating the sustainability transformation process.

Our findings support previous research on the link between structural preconditions and place-based agency[44], which are key elements for sustainability transformations at the different stages and levels of the transformation. Structural preconditions are key for the differentiation and development of networks, fundamental in the early stages of the transformation, while the place-based agency together with the presence of a supportive institutional framework through territorial policies can boost the speed of the process.

In the case of the Inter-municipal Food Policy '*Piana del Cibo*', the latter did not develop in a vacuum: the dense networks of relationship in place since decades have created fertile ground for a higher level of commitment by local authorities. Not only had these local actors contributed to raise awareness and nurtured civil society's engagement and attention over food-related issues in the last decades. Most of them joined the food policy initiative since the beginning and contributed to the creation of a shared food strategy based on common values. One of the merits of the IFP has been identified in the capacity to ensure equal representation to all the municipalities involved, despite their differences in economic and political terms[45], also fostering urban-rural relations between the cities and towns involved. Nonetheless, the complexity of the case lies in the multiple levels of integration encompassed by the IFP: coordination and cooperation are, in this specific case, required between departments and actors at each municipality's level, among the five City Boards, and between the dynamic participatory base and decision-making processes based on politics and often rigid bureaucracy.

In the case of *Lucca Biodinamica*, sharing knowledge through cooperation

[44] Chaminade, Randelli 2020.
[45] Arcuri *et al*. 2022.

and mutual learning patterns was crucial for the speed of the transformation. The pioneers of the informal network of biodynamic producers in Lucca, in collaboration with external advisors from the association Living Agriculture, discovered the innovative approach to biodynamics through Alex Podolinsky's teachings. The organization of courses and the subsequent dissemination of this approach in the Lucca area allowed the spreading of this knowledge to other producers who were organic and conventional at the time and found it a necessary shift to preserve soil conditions and agricultural activities. Thus, social and geographical proximity fostered the sharing of new knowledge and the development of trusted relations and activities (i.e., the promotion and organisation of the San Giovanni peasant festival) and in a short time from 2 producers the informal network grew and aggregated 13 wineries, and 3 agricultural producers (oil, bread, vegetables, cereals, legumes). This result is in line with previous studies that support the positive role of place-based relations to develop innovation ecosystems[46]. The local leadership of the early founders was crucial, they reduced the knowledge gaps, supporting the other farmers in the transition. The key for this process was the idea of producing biodynamic preparations within the network and sharing structures and technical means to make the transition.

The role of such an intermediate actor that through cooperation supports access to knowledge for local farmers is crucial for sustainability transformations. Generally, the shift into new agricultural practices such as organic and biodynamic is costly due to the need for new competencies, materials, and suppliers. In this specific case, the role played by the rural development policies of the Tuscany Region was paramount to favour – for some producers – the transition first from conventional production to integrated pest management and then to smooth the subsequent steps toward organic and biodynamic. In other words, we found here a key role of institutional agency that should be combined with the place-based agency to secure its full potential. Interestingly, while we found similarities with other cases from previous literature (i.e., the case of the bio-district of Panzano), we also found hybrid approaches that show different speeds and directions in the same area, opening a reflection on how to interpret and support the scaling up of such ecosystems at a larger territorial scale. This result partially answers previous research questions about the relevance of a larger area or a mosaic of small territorially embedded innovation ecosystems from Chaminade and Randelli[47], where from our perspective the key aspect is in the synergies that can be activated among the different ecosystems. Here policies can actively play a role in facilitating the

[46] Boyer 2020.
[47] Chaminade, Randelli 2020.

development of such territorial synergies that favour diversification[48]. A territorial approach to policymaking should include relations among different type of networks and discussion on how to accelerate sustainability transformations. For instance, it is worth to point out also the different roles that policies can have in supporting the consolidation of structural preconditions in some regions while in other in fostering cooperation among actors. Our findings support previous research in showing that a strong sense of place facilitates network relations, which in turn allow for knowledge development and diffusion, a critical condition for the innovation ecosystem.

Innovation ecosystems, understood through this place-making lens could be a viable approach for understanding and accelerating transformations. However, the main limitation is that our research is limited to two single case studies in a single area, while the mechanisms behind the transformation should be better analysed in other contexts to see if they can be replicable. Further research should address this gap by means of more systematic approaches that can compare a wide range of different transformations.

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