

Food procurement and short food value chains

AN ANALYSIS OF CASE STUDIES
IN PUBLIC AND PRIVATE REALMS

Edited by
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Design International series

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Preface

This book is one result of the *OnFoods* project, which represents a significant research collaboration within the Italian food system. *OnFoods* is a research project coordinated by the *OnFoods* foundation and built thanks to the substantial *PNRR* funding provided by the Ministry of University and Research (MUR) in the context of Extended Partnerships, i.e., large public-private alliances dedicated to fundamental research on specific topics.

The *OnFoods* project is made up of 26 partners, including seven private companies (Barilla, Bolton Food, CIRDOOD, De' Longhi, Sacco System, Tecnoalimenti, Confcooperative), twelve public entities supervised by the MUR (Alma Mater Studiorum Università degli Studi di Bologna, National Research Council, Politecnico di Milano, Università degli Studi di Roma La Sapienza, Università degli Studi di Bari Aldo Moro, Università degli Studi di Catania, Università degli Studi di Milano La Statale, Università degli Studi di Milano Bicocca, Università degli Studi di Parma, Università degli Studi di Pavia, Università degli Studi di Napoli Federico II, Università degli Studi di Pisa), and seven universities and research institutes not supervised by the MUR (ENEA, CREA, Edmund

Mach Foundation, Mario Negri Pharmacological Research Institute, Neuromed Mediterranean Neurological Institute, Libera Università degli Studi di Bolzano, Università Cattolica del Sacro Cuore di Milano.

OnFoods aims to promote new models of sustainable nutrition and generate a tangible impact on the well-being and health of communities. It also seeks to preserve the planet, contributing to the need to guarantee access to adequate nutrition for all. The project involves more than 600 researchers across Italy, more than 300 of whom have been recruited thanks to the funding received, who work following seven specific research directives, ranging from the socioeconomic sustainability of food systems to food safety, from improving the quality of food products to the promotion of healthy diets, from the prevention of diseases to the improvement of the population's eating habits, also through the definition of public policies based on strong scientific evidence.

One of the most important research directions, led by the Università degli Studi di Parma, focuses, among other things, on food procurement and short food value chains. This book intends to discuss the relationships between food procurement and short food value chains, demonstrating how these two dimensions can coexist, creating a virtuous mechanism capable of generating spillover benefits for citizens and consumers.

The book offers a reflection on the results of the project *Public and Private food Procurement and short food supply chain in Urban areas (PPP-URB)*, which is one of the 30 projects that constitute the research activities of *OnFoods*. The set of projects developed within *OnFoods* have the general objective of providing elements to improve the efficiency of food value chains by combining productivity and sustainability, favoring technology transfer, and access to sustainable food by the weakest members of society. The slogan *Fair food market for healthy citizens* summarizes the ambition of the entire project developed within Spoke1 of *OnFoods*.

To achieve this result, the entire Spoke1 is organized into three macro-themes, each of which is articulated into twelve more specific sub-themes. The macro-themes are:

- the promotion of sustainability in food systems that produce and manage the food supply;

- the promotion of sustainability in food environments to make food more available and affordable while creating opportunities for social innovation;
- increasing adherence and compliance with more sustainable food systems.

The three macro-themes are interconnected and share a common element: the study of local food systems, short supply chains, local supply chains, and coordination mechanisms that lead to the management of food procurement by those public entities that are mandated to provide food to the various food environments within the territorial consumption basin. The activities of Spoke1 are carried out by the Università degli Studi di Bari, Catania, Parma, Pisa, Milano La Statale, Politecnico di Milano, and Roma La Sapienza. Following a unified theoretical framework, they share case studies and best practices demonstrating how different formulas and approaches exist to improve food supply and access in the interest of the community.

This book aims to be a preliminary document showcasing the wealth of experiences in the field and the methodological approaches that can be used for the development of local food policies. It is within this logic that the *PNRR* project aims to contribute to achieving its objectives in the service of citizens and taxpayers.

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Introduction

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PPP-URB: Public and Private food Procurement and short food value chains in Urban areas is a project within *OnFoods*, a national research initiative aimed at introducing new models of sustainable nutrition. The project seeks to positively impact community well-being and health, protect the planet, and ensure everyone has access to adequate nutrition.

The coordination of this project is managed by the Design Department of the Politecnico di Milano, in collaboration with seven other universities: Università degli Studi di Parma, Politecnico di Milano (Management Engineering Department), Università degli Studi di Milano La Statale, Università degli Studi di Bari, Università degli Studi di Napoli Federico II, and Università degli Studi di Catania.

As the coordinator of *PPP-URB*, alongside my research team (Annalinda De Rosa and Irene Bassi), we approached the heterogeneity and multidisciplinary of the partners with a systemic design perspective. This approach aimed at considering each partner as part of a complex system where interactions are encouraged, and each component is valued.

This book is the result of the first year's activities, focusing on the initial deliverable outlined in the project call: a report on good practices in public and private procurement. This deliverable serves as a foundational step towards the subsequent reports, which will focus on strategies to improve the affordability of sustainable food in universities through public and private procurement, and on strategies and experiments to enhance food quality and affordability.

The book mirrors the complexity of the topic through ten chapters. Chapter 1 provides an overview of the first deliverable of the research, detailing the structure of activities assigned to all partners. Chapters 2 to 8 delve into analyses of selected case studies, presented through the unique lenses of each university partner's area of expertise, and include relevant theoretical frameworks. Chapter 9 is a multidisciplinary collaboration among the partners, beginning with insights derived from the transversal analysis of the 36 case studies presented. Chapter 10 concludes the book by reiterating the project's results and highlighting the interconnections between the various areas of expertise, listing insights that will inform the next steps of the research.

1. Public and private food procurement and short food value chains in urban areas: a case studies analysis

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ABSTRACT

This chapter explores the *PPP-URB* (Public and Private food Procurement and short food value chains in Urban areas) project within the *OnFoods* PNRR research. It details how the project has been organized through a system design approach by the coordinator (Politecnico di Milano, Design Department) to embrace the diversity of disciplines and various points of view and approaches to the topic. It outlines the overall organization and dives deep into the first deliverable on the analysis of case studies through the different expertise lenses of the partners. The project focuses on the food ecosystems within small territorial units, specifically tailored to university campuses, to understand their role in local food systems.

The first deliverable of the *PPP-URB* is related to the analysis of case studies useful for approaching the second deliverable, which concerns strategic approaches to the topic, and the third, related to in-field experimentation. The author describes how the partnership has been organized and how the case studies

analysis has been approached, providing key insights for the following chapters that dive deep into the case studies through the expertise lenses of the partners.

1.1 Introduction

Public and private food procurement serve as crucial policy tools aimed at enhancing the quality, variety, affordability, and sustainability of local food systems. This is achieved through the various stages of food production and distribution, consumption, and waste management. The research aims to accomplish a set of specific goals. The first one is about *quality and variety*. The objective is to stimulate the production of Km 0 and locally sourced products, regional varieties, and traditional agrifood products. Additionally, the focus is on cultivating highly nutritional and climate-resistant crops. By prioritizing these aspects, the research seeks to enhance the diversity and nutritional value of food available to local communities (Morgan & Sonnino, 2008; Lang & Barling, 2012). The second one is on *accessible distribution channels*. Here the research promotes short food supply chains and alternative food networks. These strategies are designed to enable small farmers to compete in the global market and strengthen urban-rural linkages. This approach aims to create a more equitable and efficient food distribution system, making it easier for local producers to reach consumers (Renting, Marsden & Banks, 2003; Sonnino & Marsden, 2006). The third one is about *Affordability*.

There is a need to address the trade-off between the increasing consumer demand for organic, local, healthy, and ethic food and the necessity to contain procurement costs. The research seeks solutions that make high-quality food more affordable without compromising on sustainability or nutritional value (O'Hara & Stagl, 2001; Bacon & Baker, 2017).

As fourth there is *sustainability* by ensuring environmental, social, and economic sustainability throughout the products' life cycle is a key goal. This includes sustainable farming practices, reducing food waste, and promoting fair labor practices. The research emphasizes a holistic approach to sustainability that considers the entire food

system (Pretty *et al.*, 2010; Garnett, 2013).

To guide the initial steps of the research, several key terms and concepts have been identified:

- *research programs*: developing and implementing research initiatives focused on sustainable food procurement;
- *future scenarios*: exploring potential future developments and trends in food procurement and sustainability (Trencher *et al.*, 2014);
- *service models and experiments*: designing and testing new service models and conducting experiments to improve food procurement practices (Sonnino, 2009);
- *awareness programs*: creating programs to raise awareness about the importance of sustainable food systems among consumers, producers, and policymakers (Harmon & Maretzki, 2006);
- *guidelines and policies*: formulating guidelines and policies that support sustainable food procurement practices (Barling, Lang & Caraher, 2002);
- *scaling/replicating strategies*: developing strategies to scale successful initiatives and replicate them in different contexts (Smith, Fressoli & Thomas, 2014);
- *company strategies*: engaging with businesses to align their strategies with sustainable food procurement goals (Wiskerke, 2009).

These keywords has been used in the following mapping of the areas of expertise and case studies. Infact a detailed map of the partners' areas of expertise has been created to highlight the diverse disciplines involved in the research. This interdisciplinary approach ensures that various perspectives and areas of knowledge are integrated into the research process, laying the foundation for comprehensive analysis and innovative solutions.

The research is structured around three main deliverables, scheduled at the end of each year over three years.

The first year is focused on a report on *good practices*. This report will document existing good practices in food procurement and sustainable food systems. It will provide a benchmark for the current state of the art and identify areas for improvement.

The second year is about a report on *strategies*. Building on the first year's findings, this report will outline strategies for enhancing food procurement practices. It will include recommendations for policy changes, new initiatives, and best practices for implementation.

The last year will be about a report on *experimentations*: the final report will present the results of experiments and pilot projects conducted throughout the research period. It will evaluate the effectiveness of different approaches and provide guidance for scaling successful initiatives. Through these deliverables, the research aims to create a comprehensive framework for improving food procurement practices, ultimately contributing to more sustainable and resilient local food systems.

1.2 Knowledge sharing of background expertises, strength and relevant research projects

In view of a systemic approach to the research background, each partner has been asked to outline a list of their research expertise, highlighting their *specific strengths*. To facilitate this process, partners were provided with a form where they could list up to five *areas of expertise* along with their associated strengths. Additionally, to validate and better describe these areas of expertise, partners were asked to include relevant case studies based on their research projects. This first screening process has resulted in identifying the following areas of expertise:

- *alternative food network and sustainability Indicator LM3* (Università degli Studi di Parma). Partner specializing in this area focus on developing and analyzing alternative food networks that support local economies and promote sustainability. The LM3 (Local Multiplier 3) indicator is used to measure the economic impact of these networks within local communities;
- *spatial and service design through participatory approach* (Politecnico di Milano, Design Department). This expertise

involves designing spatial and service solutions for food systems using participatory methods. By engaging stakeholders, such as community members, farmers, and policymakers, in the design process, more effective and inclusive solutions are developed;

- *qualitative and quantitative impact evaluation of public procurement management* (Politecnico di Milano, Management Engineering Department). This area focuses on evaluating the impacts of public food procurement policies and practices using both qualitative and quantitative methods. Researchers assess the effectiveness, efficiency, and broader social, economic, and environmental impacts of these policies;
- *Life Cycle Assessment (LCA) and ecodesign* (Università degli Studi di Milano, Agricultural and Environmental Sciences Department). Experts in LCA and ecodesign analyze the environmental impacts of food products throughout their life cycle, from production to disposal. They also develop ecodesign strategies to minimize negative environmental impacts;
- *biodiversity preservation and innovation acceptability* (Università degli Studi di Bari, Law, Soil, Plant and Food Sciences, Chemistry, Rural Economics and Appraisal Departments). This expertise focuses on preserving biodiversity within agricultural systems and evaluating the acceptability of innovative practices and technologies among stakeholders. Researchers study the integration of traditional knowledge with modern agricultural practices to enhance biodiversity;
- *territorial marketing policies* (Università degli Studi di Napoli Federico II, Economics, Management, and Institutions Department). Specialists in this area develop and implement marketing strategies that promote local food products and enhance the reputation of regions as sources of high-quality, sustainable food. This involves understanding and leveraging the unique characteristics of a region's food culture and production methods;
- *alternative food network and social farming* (Università degli Studi di Catania, Agriculture, Food and Environment, Geography and Agricultural Economics and Rural Appraisal

Departments). This expertise combines the development of alternative food networks with social farming initiatives, which use agricultural activities as a means to achieve social inclusion and therapeutic benefits. Researchers explore how these initiatives can support vulnerable populations and foster community cohesion.

Through this detailed mapping of expertise and strengths, the research aims to leverage the diverse knowledge and experience of the partners. This collaborative approach ensures a comprehensive understanding of the challenges and opportunities in food procurement and sustainability, ultimately contributing to the development of effective strategies and solutions.

1.2 Refining the topic

Since the start of the research, the partnership has endeavored to refine the topic to align with the three main deliverables across the three years of activities. The direct involvement of partners in sustainable policies within their institutions, the insufficient study of the relationship between food procurement and universities, and the variety of expertise among the partners have led them to narrow the topic from Public and Private food Procurement and short food value chains in Urban areas to exploring the relationship between the food ecosystem and university campuses. University campuses are viewed as systems with several interconnected components related to urban, peri-urban, and rural contexts. Procurement, consumption, production, transformation, awareness, and education are just some aspects of food connected to the university system.

There are three levels of interaction between campuses and off-campus areas: micro (neighborhoods), meso (the city as a system of neighborhoods), and macro (peri-urban/rural areas). Examining the links between university campuses and these three levels allows the partners to explore *PPP-URB* (Public and Private food Procurement and short food value chains in Urban areas) through their areas of expertise and receive direct feedback from real-world applications.

From an academic perspective, this exploration opens new avenues for research and practical implementation. Scholars like Lang and Barling (2012) emphasize the importance of sustainable food systems in educational institutions, arguing that universities can serve as living laboratories for sustainable practices.

The integration of food systems within the campus not only supports local economies but also fosters a culture of sustainability among students and staff (Morgan & Morley, 2014). Moreover, the relationship between food procurement policies and university campuses is an emerging field that offers significant potential for innovation. According to Morgan and Sonnino (2013), public food procurement can be a powerful tool for promoting sustainable agriculture and healthy eating habits. By focusing on university campuses, the partnership can explore how these procurement policies can be tailored to meet the specific needs of academic institutions while supporting local food systems.

The involvement of universities in sustainable food practices also aligns with the concept of *third mission* activities, which extend beyond teaching and research to include social engagement and community development (Trencher *et al.*, 2014). By embedding sustainable food practices within their operations, universities can play a pivotal role in fostering resilient food systems that benefit both the campus and the surrounding communities.

Furthermore, the multi-level approach (micro, meso, macro) to analyzing the interaction between campuses and off-campus areas provides a comprehensive framework for understanding the complexities of food systems. This aligns with the work of scholars like Sonnino and Marsden (2006), who advocate for a holistic approach to food policy that considers the interconnectedness of different scales and sectors.

In conclusion, the partnership's focus on the relationship between the food ecosystem and university campuses not only addresses a gap in current research, but also offers practical solutions for promoting sustainability in higher education. By leveraging academic expertise and real-world applications, this initiative has the potential to create lasting impacts on both the academic community and the broader society.

1.3 Case studies selection

To establish a solid background rooted in the multidisciplinary fields related to each partner, a comprehensive selection of best practices and case studies has been collected by all involved. This collection marks the initial step in framing the forthcoming research deliverables and offers valuable inputs for defining future intervention strategies and insights for the planned experimentations.

A total of 36 case studies have been meticulously collected and analyzed through the lens of the partners' diverse areas of expertise. This thorough analysis has enhanced a systemic view of the project by providing multiple interpretations based on the various disciplines involved. Such a multifaceted perspective ensures a well-rounded understanding of the challenges and opportunities within the scope of the research.

The collection process was systematically organized using a detailed template to facilitate transversal reading and comparison. The template required partners to specify whether the case studies were selected from their own research projects, local best practices, national best practices, or international best practices. This categorization helped in identifying the breadth and scope of the collected data. Furthermore, each case study was rigorously analyzed using two main criteria:

1. *ID card*: this section included essential information such as the location of the project, the activity period, the action area, the website, predefined keywords relevant to the project (as outlined in paragraph 1.1), the actors involved in the project. This standardized format ensured consistency and ease of reference across all case studies;
2. *project description*: each case study was accompanied by a detailed description, including an abstract and relevant references. This section provided a comprehensive overview of the project, highlighting its objectives, methodologies, outcomes, and significance within the context of the research.

The analysis of these case studies through the partners' specialized lenses allowed for a rich and varied interpretation of the data.

This structured and detailed approach not only strengthened the systemic view of the project but also ensured that the subsequent research deliverables would be grounded in real-world applications and diverse disciplinary perspectives. The insights gained from this comprehensive collection and analysis will be instrumental in defining effective strategies for future interventions and designing impactful experimentations.

1.4 Case study analysis and conclusions

The 36 case studies collected by the 7 partners form the core of the subsequent chapters. These chapters will describe the case studies through the lenses of the specific areas of expertise highlighted in the previous sections. The analysis presented here aims to provide a comprehensive overview of the research conducted by all partners, using the predefined criteria to guide the interpretation from both quantitative and qualitative perspectives (Patton, 2014; Creswell & Creswell, 2017).

The primary project keywords associated with the case studies are company strategies, service modeling, and awareness programs. These keywords reflect the focus areas of the research and the strategic approaches taken by various initiatives (Figure 1). In terms of location, the case studies predominantly refer to the national context, with 31 out of 36 situated within the country (Figure 2). This prevalence is largely due to the direct connections between the partners and some of the projects, which facilitated in-depth insights and access.

Regarding the actors involved, five categories were considered: universities and/or research institutions, other public institutions/ authorities, producers, procurers/distributors, citizens and vulnerable

Figure 1.
The graphic representation is proportional, accounted for the number of times the keywords can be associated with the 36 case studies.
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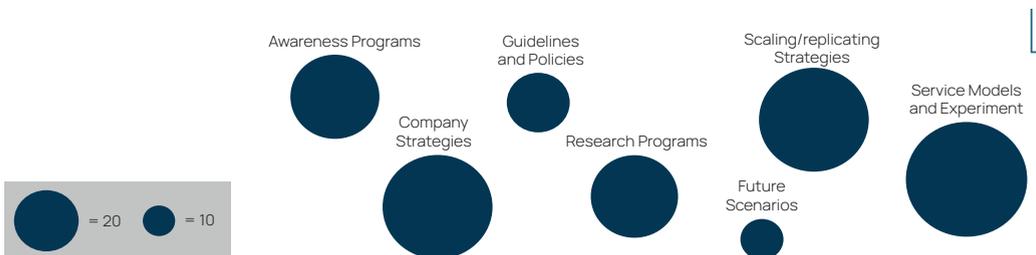




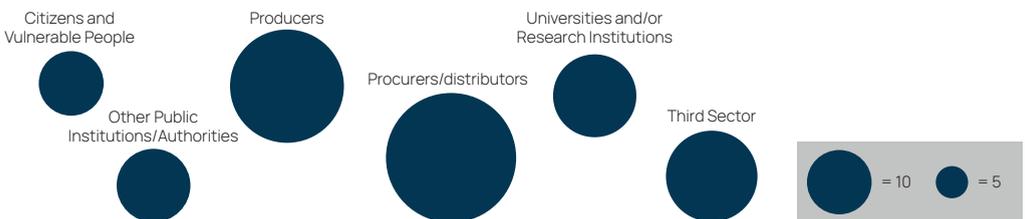
Figure 2.
Case studies located in Italy, 31 out of 36.

people, and the third sector. Most of the case studies identified producers/procurers as the primary actors (21 out of 36) and producers alone (19 out of 36). Universities were also frequently involved (15 out of 36), highlighting the significant role of academic institutions in these projects (Bryman, 2016; Yin, 2018).

This detailed analysis underscores the importance of multi-actor and multi-level governance in addressing the complex issues within the agri-food system. By involving a diverse range of stakeholders, from producers to academic institutions, the case studies demonstrate the potential for collaborative approaches to enhance sustainability, resilience, and inclusivity in food systems (Denzin & Lincoln, 2018) (Figure 3).

Moreover, from a qualitative point of view, several insights emerged. These insights will be the core of the last chapter of the book but are listed here to provide key readings for the next chapters. While the main topic was about food procurement related to the urban context and connected with public/private institutions

Figure 3.
The graphic representation is proportional, accounted for the number of times the actors are involved into the case studies.
Ph. Polimi DESIS Lab.



with a strong focus on the supply chain, the case studies revealed a variety of insights thanks to the multidisciplinary approach in their narration. These insights are intended as transversal topics that relate the different areas of expertise, aiming at achieving a multi-faceted comprehension of the main research theme to approach the following steps (Maxwell, 2012).

Insights are related to:

- the fight against food waste;
- enhancing the short food chain through the local food system.
- public procurement as an educational tool;
- legislation/policies leading to procurement sustainability criteria;
- multi-level governance improving sustainable practices
- access to fresh food alongside processed food;
- instantly visible place-based food chains;
- transforming unconventional spaces into production places;
- involving vulnerable people in the supply chain;
- cross-fertilization between universities and producers;
- environmental assessment.

These insights have been considered for approaching the second deliverable related to strategic approaches to food procurement, which is the focus of the second year of the ongoing research.

The second deliverable will leverage the quantitative and qualitative analyses by translating the insights to the university campuses realm, aligning with the refinement of the main topic, and addressing the in-field experimentation expected for the final year of the program.

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2. Food as relational practices: reflecting on alternative food networks for university campuses

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ABSTRACT

In recent decades, food procurement programs in the Public and Private Sectors (PPSs) have increasingly been used to improve food quality and reduce costs in public and private institutions, promoting social and environmental sustainability.

This chapter explores how PPSs can create innovative and accessible distribution networks in small urban areas. Focusing on university campuses, it examines how newly designed Alternative Food Networks (AFNs) can enhance distribution systems and foster community building through interconnected service nodes. Can AFNs act as catalysts for systemic transitions in urban neighbourhoods marked by gentrification and social tensions and in peri-urban areas of production and distribution? From the spatial and service design perspective, the physical environment plays a key role in shaping relational and functional dynamics through interconnected places that amplify relationship-building. Food exchange creates a web of commercial, social, and productive connections that transcend geographic boundaries. Cities ad-

dress this through policy tools involving universities, integrating AFNs into larger distribution networks. The goal is understanding how these systems can shape territorial identities and strengthen social bonds.

2.1 Place, proximity, and food systems for sustainable community development

The research builds on reflecting on the cultural, social, and political role of *place* (Casey, 1993, 1997), emphasizing its situated and ontological relationality. This concept encapsulates the cultural, historical, and ritual meanings of beings and things. It serves as a critical instance for meaningful social regeneration of communities within the dynamics of culture, power, and economy. By examining it as more than a geographical location, the research underscores its multifaceted dimensions, including the lived experiences and collective memories that shape community identity. This approach permeates places with cultural meanings and historical narratives, forming a framework that connects individuals to their heritage and traditions. This ontological relationality of place highlights how social structures and power dynamics are reflected in and influenced by the spatial configurations and meanings ascribed to different locales. The research posits that acknowledging and harnessing a place's rich, interconnected meanings is essential for addressing contemporary challenges related to cultural sustainability, economic development, and social justice.

This approach plays a crucial role in the regeneration of commons, involving the careful navigation of complex interdependencies (Escobar, 2018) – a concept implying the recognition of a complex relational matrix between all living beings, human and nonhuman – tied to shared identities within urban environments. As cities and neighbourhoods undergo transformations, including social frictions, patterns of immigration, and processes of marginalization, these interdependencies manifest in various forms. Also, understanding temporalities tied to place shows how historical events, collective memories, and evolving cultural practices shape and are shaped by

the spaces communities inhabit. This perspective emphasizes that the commons – shared resources and spaces – are not static but are continually redefined through the interactions and experiences of the people who engage with them. Therefore, the regeneration of these commons requires addressing the layered histories and diverse temporal dimensions that influence current social dynamics. This involves recognizing the impacts of past injustices and current socio-economic challenges while fostering inclusive and participatory approaches to urban development. By doing so, it becomes possible to create environments that not only reflect the multifaceted identities of place-based identities but also promote resilience and equity among different communities. This is fundamental to any community-based participatory approach for understanding the communal bonds and shared resources that sustain urban life, particularly amidst complex challenges such as social friction, immigration, and marginalization.

The physical environment acts not just as a backdrop but as an active determinant of relational, functional, and spatial relationships. There is no proximity (Howe & Dillon, 2003; Manzini, 2022) without a network of interacting multiple nodes of interconnected places where the potential for relationship-building is amplified. This conceptualization emphasizes that proximity is not merely about physical closeness but the dynamic and intricate web of connections that link various locales. In such a network, each node, representing a distinct place – not space –, interacts with others, fostering a robust and resilient social interaction and relationship-building framework. These interconnected places become vibrant hubs where cultural, social, and economic exchanges occur, allowing for the continuous flow of ideas, resources, and people. The multiplicity of nodes ensures that relationships are not confined to bilateral interactions but are part of a larger, more complex system where each connection strengthens the overall network. This amplification of relationship-building potential is critical in creating inclusive communities where diversity is embraced and collective identities are formed and reinforced through shared experiences and mutual support. The networked nature of these places facilitates bridging gaps between different groups, promoting understanding and cooperation. It allows

for a more comprehensive and nuanced approach to community development, emphasising fostering connections that transcend geographical boundaries. Therefore, in this context, proximity is redefined as an active, relational concept dependent on the vibrancy and efficacy of the network of places and the interactions within them.

Focusing attention on sustainable food systems, the flow of food into territories and cities is a critical material aspect that significantly influences relationships and the physical scale of space. Food exchange generates a complex web of commercial, convivial, and productive relationships that transcend geographical boundaries, creating interconnected networks that bind diverse communities. It may reveal underlying power structures rooted in colonial-patriarchal roots, which continue to shape contemporary food systems. An intersectional approach is essential to unpack these layers, as it allows for a deeper understanding of how various forms of oppression and privilege intersect in the context of food production, distribution, and consumption.

Design culture has a critical role and responsibility in this realm, as it can either perpetuate these inequities or contribute to more equitable and sustainable practices. By redesigning an alternative flow of food, for example, we may enhance cultural exchange and social interaction. Also, by rethinking design strategies, it is possible to create food systems that foster social justice. This involves considering the entire lifecycle of food, from cultivation and harvesting to distribution and consumption, and ensuring that each stage promotes environmental health, economic viability, and social equity. In essence, sustainable food systems are not just about the efficient flow of food but also about responsible transformations, making it a vital area of focus for fostering resilient and equitable communities. The research investigates how such systems can shape the identity of these territorial units and act on relationships towards increasing social bonds. These could be explored as testing environments, generating and supporting collective activities while enhancing new relations, materialities and preferable futures.

Territories, whether specific neighbourhoods in cities or more fluid and diversified areas, often face significant challenges such as gentrification and social stratification. Over the past 25 years,

there has been notable growth in bottom-up initiatives such as, for instance, neighbourhood solidarity networks for food production, recovery, distribution, and the valorization of food surplus. These initiatives have been supported by forms of design activism (Mouffe, 2007; Thorpe, 2008; Buser *et al.*, 2013; Fuad-Luke, 2013; Markussen, 2013; Cassim & M'Rithaa, 2015), which have played a crucial role in fostering community resilience and sustainable practices. This lineage of design practice has been activated through democratic experimentalism, which manifests in acupunctural interventions – small, targeted actions aimed at creating significant impact. These interventions serve as forms of resistance to global issues, such as climate change and social inequality, by promoting localized, community-driven solutions.

However, despite their potential, such experimentalism often results in practices that primarily involve the privileged – those who can afford to dedicate time and resources to imagining and developing alternative futures in designated co-creation spaces. This dynamic tends to further entrench existing inequalities, as marginalized communities, already burdened by economic, class, gender issues, and caregiving demands, are frequently excluded from co-creation spaces that are ostensibly meant to benefit them (Fry & Nocek, 2020). As a result, these well-intentioned initiatives may inadvertently perpetuate the disparities they aim to address.

To truly transform how we develop and live in neighbourhoods, there is an urgent need to reframe design politics and embrace a more radical and intersectional approach to justice design (Tassinari *et al.*, 2025). This involves recognizing and addressing the barriers preventing marginalized groups from participating in these initiatives and actively involving them in the design and decision-making processes. By doing so, we can ensure that the benefits of design activism and bottom-up initiatives are more equitably distributed and that these efforts genuinely uplift and empower all community members. This rethinking requires a commitment to inclusivity, equity, and justice at every stage of the design process, from conception to implementation, and a willingness to challenge and dismantle the systemic structures that perpetuate inequality. Only by adopting an intersectional approach can we support truly sustainable and

resilient communities that are capable of thriving in the face of contemporary global challenges.

2.2 A multilevel systemic approach

In the *OnFoods* framework, we are analyzing what is and what could happen at small territorial units – both urban neighbourhoods and small towns in rural contexts – in relation to how existing and newly designed alternative food networks (AFNs) can innovate distribution systems towards environmental sustainability and act as promoters of community cohesion through interconnected service-provider locations. These territorial units have the potential to leverage their unique local contexts as service strengths by weaving together existing relational networks and organizational systems.

This approach allows for developing early-stage innovations that are structurally connected with social actors, facilitating the ability to scale initiatives up and down, deep and broad, to suit varying community needs. The discussion will be supported by referring to some case studies analysed during the first year of the *Public and Private food Procurement and short food value chains in Urban areas* project (PPP-URB), part of *OnFoods* strategy.

Addressing food systems within small territorial units requires a multilevel systemic approach that can operate across different scales, from macro to micro and *vice versa*, due to the common



Figure 1.
Erba Brusca interiors.
Ph. Erba Brusca website.

organizational proximity inherent in these units. This approach acknowledges that sustainable food systems are not only about efficient production and distribution but also about fostering resilient communities through localized networks of cooperation.

In this direction, AFNs are amplified by a novel conceptual framework called Values-based Territorial Food Networks (VTFNs). It focuses on three key elements: the values guiding agricultural-food initiatives, their place-based dimensions, and the cooperation networks steering their governance (Reckinger, 2022). The VTFN framework emphasizes the importance of aligning food systems with the core values of environmental sustainability, social equity, and economic viability. By grounding agricultural-food initiatives in these values, VTFNs can create more resilient and equitable food systems attuned to local communities' specific needs and resources.

The place-based dimension of VTFNs highlights the significance of local contexts in shaping food networks, recognizing that the success of agricultural-food initiatives depends on their ability to adapt to and integrate with each territory's unique cultural, historical, and environmental characteristics.

An example is the Erba Brusca restaurant (<https://erbabrusca.it/>), an entrepreneurial initiative in the South Agricultural Park in Milan (Figure 1). While it may not transform the local agricultural system, it fosters dedication within a small network. The restaurant's owners, recognizing the benefits of the location, established a network of local producers and committed suppliers and began developing a small vegetable garden close to the restaurant with fruits and vegetables for their recipes. Together with constant testing in crop choices and land preparation, this small system is increasing procurement self-reliance and has a significant impact on its territory.

The network of cooperation element of VTFNs underscores the importance of collaborative governance in managing food systems. This involves building partnerships among diverse stakeholders, including farmers, consumers, policymakers, and community organizations, to ensure that food networks are inclusive and participatory. Such cooperation can enhance the resilience of food systems by pooling resources, knowledge, and expertise and by fostering a sense of shared responsibility for the sustainability of local food networks.

Implementing VTFNs within small territorial units involves creating interconnected service-provider locations that act as nodes within a broader network. These nodes facilitate the distribution of locally produced food, support local economies, and strengthen community ties by providing spaces for social interaction and cooperation. By integrating these nodes into the existing fabric of urban neighbourhoods and rural towns, VTFNs can enhance the accessibility and affordability of healthy, sustainably produced food while promoting environmental stewardship and social justice.

SOSpesa – Equity and resilience around the corner (2020–ongoing) (Figure 2) and *Coltivando – The convivial garden at Politecnico di Milano* (2011–ongoing) (Figure 3) are relevant cases of this integration. Both were developed or implemented by researchers of Politecnico di Milano and are community-driven initiatives based in Milan neighbourhoods. SOSpesa supports vulnerable populations by distributing surplus food recovered from municipal markets and local groceries through a collaborative system with local stakeholders, promoting cultural integration and social empowerment. The initiative provides essential food assistance and fosters community support. It establishes local networks: local restaurants use recovered food to create discounted meals, with a portion of profits supporting the project; the Municipal Market sells fresh vegetables at reduced prices; Recup, an organization focused on redistributing food waste, provides unsold commodities from municipal markets. *Coltivando* is a community garden within the Bovisa Politecnico Campus. It allows the neighbouring community to uncover a hidden public location – becoming an essential communal space for the area – and cultivate their products.

Overall, the *OnFoods* framework, through the lens of VTFNs, offers a comprehensive approach to rethinking and redesigning food systems within small territorial units. By focusing on values, place-based dimensions, and cooperation networks, this framework provides a pathway for developing sustainable, resilient, and equitable food systems deeply rooted in local communities' specific contexts. This systemic approach recognizes the interconnectedness of food systems and community development, highlighting the potential for AFNs to act as catalysts for broader social and environmental change.

Figure 2.
SOSpesa during food
distribution.
Ph. Polimi DESIS Lab.



Figure 3.
Coltivando
The convivial garden
at Politecnico di Milano.
Ph. Polimi DESIS Lab.



Figure 4.
Copenhagen House
of food cooking activity.
Ph. Madhus website.





Figure 5.
REWE Green Farming
interiors.
Ph. © Jürgen Arlt.

Two other cases are good examples of this: the *Copenhagen House of Food* (Figure 4), a non-profit foundation founded by the City of Copenhagen that, since 2007, has been substantially restructuring the food preparation techniques to incorporate organic products for the 900 municipal kitchens (canteens, day-care centres, and nursing homes); and REWE, a new model of supermarket in Germany (Figure 5). The project reimagines the conventional grocery shop with a low-energy building, incorporating an aquaponic system and rainwater collection for restrooms and irrigation. The store entry features a dedicated space for local producers, with about 20% of products sourced locally from 150 regional producers. This initiative, part of REWE Green Farming, helps stabilize prices by mitigating market fluctuations.

Therefore, AFNs and VTFNs can be seen as magnifying lenses for mapping and enabling systemic transitions within urban neighbourhoods – characterized by gentrification and social stratification – and remote areas – characterized by relational remoteness and depopulation. In urban neighbourhoods, gentrification often leads to the displacement of long-standing communities and the erosion of local cultural identities. AFNs can counteract these effects by fostering community cohesion and resilience through localized food initiatives, creating cooperation networks among diverse stakeholders and strengthening the cultural and social fabric. Conversely, in remote areas where relational remoteness and depopulation are pressing issues, VTFNs can act as critical interventions to revitalize these communities.

By leveraging local agricultural practices and integrating them into broader food networks, VTFNs can create new economic opportunities with other stakeholders. This approach can help offer economic stability and foster a sense of community and belonging.

This research also challenges the traditional city-periphery dualism, which often associates cities with being welcoming, safe, and liberated spaces, while rural locales are traditionally deemed inhospitable to socio-political activism. By questioning this dichotomy, the study highlights the potential for urban and rural areas to foster vibrant and active communities. AFNs and VTFNs provide a framework for a systemic transition that transcends geographical boundaries. In practical terms, AFNs and VTFNs can facilitate mapping existing food systems, identifying areas where interventions are needed, and opportunities for collaboration and innovation exist. They can help create platforms for knowledge exchange and capacity building, enabling communities to learn from each other and implement best practices. Additionally, these networks can advocate for policy changes that support sustainable food systems and community development, ensuring that local initiatives are recognized and supported at higher levels of governance, enabling systemic transition within urban neighbourhoods and remote areas. The study aims to understand how rural locales can relationally rebuild their proximity networks, grappling with the complexities of visibility, safety, and resource access in their rural communities and devising a public-private politics that effectively engages communities noticeably marginalised in the regeneration of their public realm. This is approached from a situated thinking perspective (Haraway, 1988), effectively addressing the power structures that generate ecosystemic and social injustices.

2.3 How can we re-interpret the role of university campuses as part of broader territorial systems?

On university campuses, AFNs can be pivotal in promoting sustainability, fostering community engagement, and serving as microcosms

Place-centered systems:

- University campus
- Campus neighbourhood
- City
- Sourranding rural area

Nodes:

- Existing and interconnected service-providers
- Activated alternative connections and initiatives

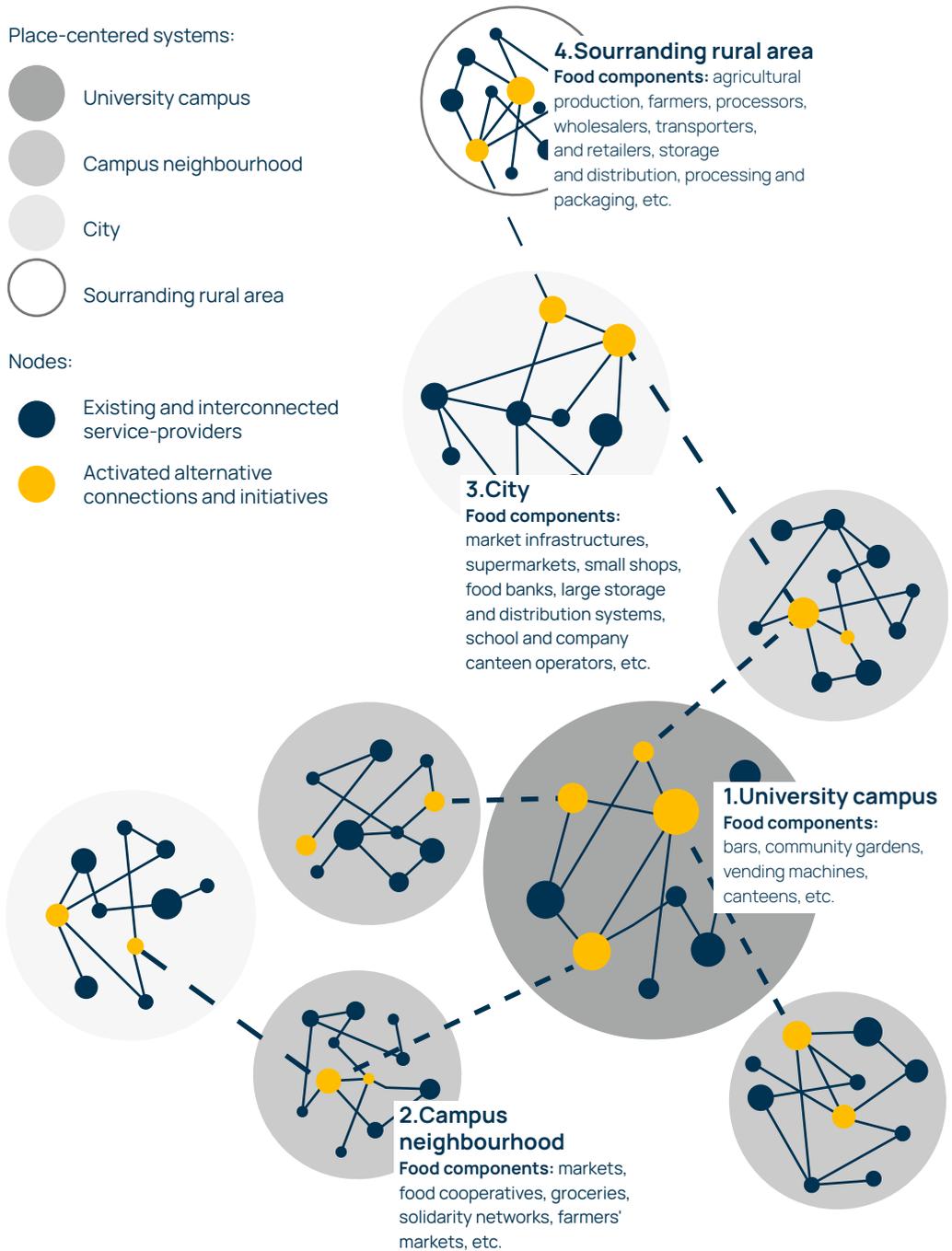


Figure 6. The possible impact of AFNs in university campuses within the broader territorial systems. © Irene Bassi.

for systemic transitions within broader urban and rural contexts (Bruning *et al.*, 2006; Valluri, 2010; Barlett, 2011; Trencher *et al.*, 2014; Fassi, Galluzzo & De Rosa, 2016; Fassi, Galluzzo & Rogel, 2016; Balducci, 2018; Torrijos *et al.*, 2021). Universities, often situated at the intersection of diverse demographic groups and equipped with significant intellectual and material resources, are ideal for implementing and studying AFNs (Figure 6). Campuses can serve as living laboratories where innovative food distribution systems are tested and refined, demonstrating the feasibility and benefits of sustainable practices for students, faculty, and staff. By establishing networks that connect local farmers and food producers with – for instance – campus canteens, universities can ensure a steady supply of fresh, nutritious, and sustainably produced food. These networks can also include initiatives such as campus/community gardens – intended for the inhabitants of the campus and the neighbourhood as one community bound together by the place itself –, farmers' markets, and food cooperatives, which provide hands-on learning opportunities for students and foster a sense of community and shared responsibility.

Furthermore, universities can act as catalysts for broader community engagement by extending the reach of campus-based AFNs to surrounding neighbourhoods and rural areas. Through partnerships with local organizations, municipalities, and other educational institutions, universities can help scale up successful initiatives and disseminate best practices. This outreach can foster stronger connections between campuses and local communities, promoting a more integrated and cohesive approach to regional food systems. By leveraging their resources and influence, universities can play a critical role in driving the systemic transitions advocated by AFNs and VTFNs, creating more sustainable and equitable food networks locally and globally.

This chapter presents the positioning of the research, and the approach identified for the redefinition of the food system in a relatively small but powerful system such as a large university: promoting and activating better models can serve as an example and a stimulus for sustainable agreements between the actors involved.

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3. The impact of Alternative Food Networks on local economy

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ABSTRACT

This book chapter explores the application and significance of the Local Multiplier 3 (LM3) methodology in the context of Alternative Food Networks (AFNs) within the agrifood sector. AFNs, originating from the social movements of the 1960s, emerged as countermeasures to the standardised and globalized industrial economy system. Their core objective is fostering social cohesion and promoting a sustainable, ethical, and community-oriented food system. Although AFNs propose a shortening and simplification of the food supply chain to reinforce the local economy, the literature lacks empirical research assessing their effective positive impact. For that reason, the LM3 tool, developed by the New Economics Foundation (NEF), emerges as a valuable tool for estimating the economic impact of AFNs. It provides insights into the flow of expenses and economic value within local communities, thereby offering a systematic approach to assess the real economic implications of AFNs. Underscoring the importance of AFNs in fostering economic resilience, supporting local economies, and

preserving rural communities, LM3 plays a crucial role in informing policy design, guiding decision-making for supply chain actors and policymakers, and serving as an economic indicator for farmers to communicate the positive impacts.

3.1 Alternative Food Networks: principles and potential benefits for local communities

Alternative Food Networks (AFNs) originated as independent collectives of individuals or groups often within civil society (Allen *et al.*, 2003), in response to the social movements of the 1960s. This period was marked by widespread discontent regarding globalization and industrial standardization, resulting in social riots against the economic system. Among the food systems, AFNs emerged as a bottom-up response to the dominant paradigms of food production and distribution, embodying a vision of food systems rooted in autonomy, diversity, and social justice (Goodman, 2004). Thus, they are community-oriented and prioritize locality, sustainability, and community empowerment, fostering a sense of belonging and shared purpose.

In the 1980s, AFNs began gaining public attention as external circumstances occurred, negatively influencing consumers' perception of the industrial food supply chain's safety. Moreover, the growing environmental emergency started to be recognised as an urgent matter even by political entities in developed countries (Renting *et al.*, 2003; Mancini *et al.*, 2021) and to highlight the role of agrifood systems. Those events increased the customers' propensity to buy locally and establish direct relationships with producers. Therefore, transparency became a key concern (Goodman, 2004). Currently, AFNs include Farmers' Markets (FMs), Community Supported Agriculture, farm shops and alternative food retailers, and consumers and producers' cooperatives (Renting *et al.*, 2003; Mancini *et al.*, 2018, 2021; Arfini *et al.*, 2019; Michel-Villarreal, 2019).

Emerging from community aggregations, AFNs are distinguished by their strong social nature, fostering direct connections between final

consumers and supply chain actors, establishing relationships built on trust and mutual recognition, and increasing producers' awareness of their bargaining power (Malak-Rawlikowska *et al.*, 2019). They serve as channels for social interaction, community integration, and cultivating a sense of shared responsibility towards food production and consumption among all stakeholders. AFNs often organize as Short Food Supply Chains (SFSCs) and can leverage regulated production systems such as organic agriculture and Geographical Indication (GI) schemes (Mancini *et al.*, 2018; Arfini *et al.*, 2019; Michel-Villarreal, 2019; Mancini *et al.*, 2021), thereby embedding a quality value. These diverse manifestations of AFNs share an emphasis on food systems localization and proximity, aiming to develop sustainable and community-oriented economic frameworks within the agrifood sector (Maysels *et al.*, 2023).

In this context, one notable example is the Farmers' Market model, which is highly widespread (Arabska, 2018; Filippini *et al.*, 2023) and well-studied in the literature (Michel-Villarreal, 2019). These markets typically attract *conscious consumers* who are sensitive to local and healthy food and willing to adopt consistent purchasing habits (McEachern *et al.*, 2010) (Figure 1).

Figure 1.
Information box of
MercaTiAmo – Create a
community around food.

MercaTiAmo – Create a community around food

MercaTiAmo is a project initiated by a group of consumers and producers aimed at creating a farmers' market founded on mutual trust and quality. The market involves nearly 30 producers and operates weekly in three market squares throughout the city. MercaTiAmo farmers, mostly family-owned, are committed to environmentally friendly agriculture that avoids chemical fertilizers and pesticides and respects the natural biological farming cycle. Market's producers must have organic production certification and/or adhere to the Participatory Guarantee System promoted by the Solidarity Economy District of Parma and Solidarity Purchasing Groups. One overarching goal is to create a Solidarity Economy system, as per Regional Law no. 19 of 23rd July 2014, meeting consumers' and producers' needs in a context of solidarity, transparency, ethics and fairness. To achieve this, a business-to-business (B2B) strategy is integrated with the short supply chain approach, reducing intermediaries and improving sustainability and transparency. It involves restaurants interested in purchasing MercaTiAmo products and using high-quality, local, and sustainable ingredients, promoting efficient and sustainable production and distribution among businesses.

In conclusion, considering AFNs' social and economic aspects, a core action is concentrating value added towards the upstream level (Marsden *et al.* 2000) to resolve the conventional food system's unfair turnover imbalance. Moreover, AFNs can bridge the geographical gap between the producers, processors, and consumers by providing physical spaces and not for facilitating interaction and engagement, which otherwise would be difficult (Blasi *et al.*, 2015). However, this re-connection process requires a regulation system through rules and association bodies to guarantee their fairness (Mancini *et al.*, 2019; Guareschi *et al.*, 2020). In this regard, organic districts represent a concrete example of governance systems harmonising production methods and sales and promotional strategies (see Guareschi *et al.*, 2020; Guareschi *et al.*, 2022). Therefore, AFNs can be crucial in redesigning food systems due to their economic, social, and environmental impacts on local areas (Kneafsey *et al.*, 2013; Malak-Rawlikowska, 2019; Michel-Villarreal, 2019). Despite the potential benefits of AFNs to the local economy, quantifying their actual economic contributions remains elusive (Benedek *et al.*, 2020; Kłoczko-Gajewska *et al.*, 2023). This underscores the importance of holistic research approaches to assess AFNs' effectiveness in reshaping food systems and promoting sustainable local economies.

3.2 The Local Multiplier 3: a methodology to assess the economic return of the value chain within the local area

The Local Multiplier 3 (LM3) is a Keynesian-based approach rooted in the concept of multipliers, emphasizing the importance of stimulating local demand to spur economic growth and employment. The concept of multipliers refers to a numerical measure that helps economists estimate how changes in one part of the economy can affect the entire economic landscape at a local level (Wilkinson & Kirkup, 2009). Multipliers can quantify the economic linkages between a specific industry or sector and the broader regional economy, with their strength determining the multiplier size: the larger the multiplier, the

greater the economic impact. In economic development analysis, various typologies of multipliers exist:

1. output multiplier, in terms of increased local demand;
2. employment multiplier, due to the rise in demand and thus new workplaces;
3. income multiplier, related to local economy or industry employers' income;
4. value added multiplier (Benedek *et al.*, 2020).

LM3 highlights the multiplier effect by tracking the flow of money within a local economy through three rounds of spending. Initial local spending generates additional rounds of spending, leading to increased economic activity and job creation. The first stage is indeed defining the *local* area within which the economic multiplier effect is analysed. Consequently, the model examines three rounds of different expenditure types (Malak-Rawlikowska *et al.*, 2019), based on the subject analysed, whether it is a firm, an industrial sector, or a public entity (Wilkinson, 2007). The mathematical application is based on an equation aggregating the three rounds, as shown in the equation below.

$$LM3 = \frac{(R1+R2+R3)}{R1}$$

The first round (R1) identifies the subject's total budget. In R2, the budget spent inside or outside the local area is defined by the subject. Finally, R3 tracks the amount re-spent locally by the stakeholders. In that way, LM3 provides an understanding of the local economic flow and the return generated by the subject, thereby stimulating local demand and spurring economic growth and employment. Considering the businesses involved in a sector, the method provides an idea of the economic multiplier effect at the local level, as LM3 incorporates the spending that exits and returns to the local area. The resulting value of the LM3 application ranges from 1.00 to 3.00, where the higher the score, the more money is returned within the local area and vice versa (Sacks, 2002).

The R3 is crucial to comprehend how much money that exits the local area in R2 may return through stakeholders' spending, leading to understanding the economic benefits generated within the local

Sustainability of school canteens in Parma: the economic dimension

The study, part of the EU Horizon 2020 *Strenght2Food Project*, focuses on the Parma procurement model for primary school canteens. It aims to analyse the food procurement model of a sample of 33 schools in the Parma area and collect logistic information, proposing good practice solutions to increase sustainability in its economic, environmental, social, and nutritional aspects. To assess the impacts of this Procurement Model, an integrated sustainability analysis was conducted using a Multi-Objective Mathematical Programming approach, considering economic, environmental, social, and nutritional dimensions. The Local Multiplier 3 was applied to evaluate the economic impact and extra-value generated within the local area. The results were unexpectedly low due to the lack of a minimum threshold in the contract for local sourcing and the broad boundaries defining the *local area* (Donati *et al.*, 2021; Tregear *et al.*, 2022). This confirms the economic impact that public policy on public procurement choices can have on the local economy. The study underscores the need to establish clear and stringent award criteria to bridge the gap between ambition and the actual local economic impact of public procurement strategies (Tregear *et al.*, 2022).

area by the subject. However, it represents the most critical stage of the process, as gathering the necessary data can be particularly challenging, especially for small-scale farmers (Sacks, 2002; Filippini *et al.*, 2023). Consequently, one limitation of the LM3 tool is its strong dependence on the availability and accuracy of data from the actors involved, potentially compromising its effectiveness and reliability. Indeed, both R2 and R3 are based on specific categories of costs: R2 includes costs such as payroll, spending on core and non-core inputs, and other direct costs; R3 includes spending on salaries and suppliers' spending on core, non-core, and other local inputs (Filippini *et al.*, 2023).

LM3 methodology can thus assist policymakers in designing economic development strategies and policies. For instance, within the *Strenght2Food Project*¹, an analysis of the impact of public procurement of school canteens on the local economy of Parma exemplifies LM3 as a supportive tool for the community's well-being (Figure 2).

In conclusion, LM3 serves as a valuable decision-making tool, whether optimising supply chain operations or crafting policies to support local businesses. It enables the assessment of the economic

Figure 2.
Information box of Sustainability of school canteens in Parma.

Note 1.
Strenght2food Strengthening European Food Chain Sustainability by Quality and Procurement Policy is a project founded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 678024.

implications of various strategies and offers valuable insights to promote sustainable economic development. Moreover, LM3 provides farmers with an economic indicator that can be communicated to consumers and stakeholders to raise awareness about their positive impacts on the local economy (Filippini *et al.*, 2023).

3.3 The application of Local Multiplier 3 to AFNs: an opportunity to assess their economic impact on local areas

AFNs, due to their aim of re-localizing the food system, suggest adopting a Localized Agri-Food System (LAFS) approach to emphasise the integration of agri-food production to local territories (Muchnik, 2006; Muchnik *et al.*, 2007; Sanz-Cañada & Muchnik, 2016). LAFS examines the food supply chain embedded in a specific territory, considering its environmental, social, and economic components, and is managed through cooperative governance actions by local stakeholders aimed at avoiding conflicts, enhancing innovations, and valorising local resources, such as environmental diversity, quality of agri-food products, and local development dynamics (Muchnik, 2006; Arfini *et al.*, 2019). This approach is a tool to study the link between small local agri-food systems and community development (Nalubowa *et al.*, 2024), considering the impact that localised value chains rooted in a territory (López-García & González de Molina, 2021) can have in terms of economic (e.g. support to local economy), social (e.g. employment creation, generational change, training and education impact), and environmental effects (e.g. sustainable use of natural resources, biodiversity maintenance, landscape preservation). Thus, as AFNs are embedded in a LAFS, the system can generate and manage food value chains, providing governance tools and highlighting agricultural and endogenous resources to boost territorial development, considering both farmer's and consumers' needs and perspectives (Mancini *et al.*, 2021) in the interest of the local community.

The shift towards localized-focused food systems addresses various challenges, including the need for sustainable financial

models for small to mid-sized farms (Mancini *et al.*, 2019; Cvijanović *et al.*, 2020; Stein & Santini, 2022).

The injection of financial resources into local systems not only bolsters investment capacities but also catalyses local economic flows, thereby enhancing the overall well-being of communities through improved lifestyle, health, and education opportunities, other than «providing market access and sustainable financial models for small and mid-sized farms» (Shideler & Watson, 2019:165). However, challenges persist, such as consumer affordability and the scalability of local food systems. The demand for local products may be constrained by consumers' willingness to pay higher prices, potentially resulting in sales stagnation. Additionally, the small scale of local systems and the sourcing of inputs through shorter supply chains may limit producers' ability to reduce production costs (Stein & Santini, 2022). Despite these challenges, the literature suggests an important impact on the local economy driven by these localised systems inducing multiplier effects (Mancini *et al.*, 2019). LAFS are increasingly recognised as drivers of economic development, particularly in rural areas, where they can enhance the value-added within local economies (Rossi *et al.*, 2017).

Therefore, ensuring robust economic sustainability becomes crucial in validating the effectiveness of LAFS and AFNs, considered food systems embedded in LAFS, even if their efficacy cannot be taken for granted. By critically evaluating their economic viability and leveraging local support, AFNs can emerge as catalysts for sustainable economic development, promoting resilience and prosperity within local communities. In this sense, AFNs can contribute to achieving the Sustainable Development Goals (SDGs), with a special focus on SDG 8 linked to economic growth and local development. Specifically, SDG 8 underscores the importance of development-oriented policies that foster productive activities, job creation, entrepreneurship, and innovation, particularly in micro, small, and medium-sized enterprises (MSMEs). Indirectly, AFNs can support the objectives SDG12, which emphasises responsible consumption and production, advocating for sustainable procurement practices aligned with national policies. Within this context and the debate regarding the economic sustainability of AFNs, the need to adopt methodological tools and introduce

new sustainability indicators that can detect the economic impact of AFNs at the local level emerges (Chiaverina *et al.*, 2023).

This would also allow to measure the AFNs' contribution to satisfying SDGs. LM3 responds to this necessity, as it has demonstrated its applicability within the food and agriculture sectors, owing to rigorous testing conducted by the NEF during its implementation phase (Sacks, 2002). In the EU Horizon 2020 *Strength2Food Project*, a list of indicators aiming to describe the impact of food systems on sustainability was developed (Bellassen, 2019), where LM3 was identified as an economic variable to describe LAFS' economic and structural features (Arfini *et al.* 2019). Specifically, it was considered the only economic indicator which enables the calculation of the local economic impact of the agrifood firms operating in a local area, and more specifically, the volume of euros remaining in the local area for each euro of output sold on the market (Sacks, 2002; Arfini *et al.*, 2019; Wilkinson *et al.*, 2020; Donati *et al.*, 2021).

However, broader application to AFNs has remained relatively underexplored in academic research. More recently, studies that apply LM3 to analyse the local economic impact of ANFs or, more in general, of SFSCs emerged. Filippini *et al.* (2023) applied the LM3 method at the farm level and considered the AFNs context of MercaTiAmo (Figure 1), providing precise information and data on farmers' upstream supply chain use. The results indicate that farmers participating in AFNs positively impact the local food system. The positive impact is detectable, especially in the farms' direct spending and along the core input and service supply chain. Moreover, Kłoczko-Gajewska *et al.* (2023) applied the LM3 method to a dataset of 122 commercial farms from five European Union countries (France, Hungary, Italy, Poland, and the United Kingdom) which participate in 305 market chains (both short and long food supply chains).

According to the study results, the retention of revenues from agricultural production at the local level appears to be successful, resulting in a multiplier effect for the local economy by these producers. This outcome is mainly due to sourcing both materials and labour inputs locally and to the re-expenses of suppliers also concentrated locally. A significant result concerns the overall similarity of the abovementioned factors in both short and long-supply

chains, confirming that SFSCs can also generate positive multiplier effects for the local economy.

Such studies demonstrate the adaptability of LM3 to AFNs and SFSCs and suggest its potential success in assessing the economic sustainability and contributions of AFNs within local economies. Moreover, they show how empirical analysis of the contribution of AFNs to the local economy and rural development can be a useful driver for policymakers in planning actions that support such initiatives, but also a tool for increasing consumer awareness of the multiplier effects that their spending can have on the economy of their local area (Filippini *et al.*, 2023; Kłoczko-Gajewska *et al.* 2023).

In sum, applying LM3 to AFNs represents a crucial step towards comprehensively assessing and promoting their economy viability. As AFNs continue to evolve and expand, leveraging tools like LM3 can provide invaluable insights into their role in fostering sustainable, resilient, and inclusive food systems that benefit communities, producers, and consumers alike.

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4. LCA and ecodesign

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ABSTRACT

This chapter explores the integration of Life Cycle Assessment (LCA) and ecodesign in promoting sustainable practices within the food industry, particularly focusing on the catering sector. LCA evaluates the environmental impact of products throughout their life cycle, aiding companies in setting and achieving environmental goals. Ecodesign incorporates environmental considerations into product design to mitigate adverse impacts. The food industry's logistics and supply chains are crucial in ensuring quality, safety, and sustainability. Key case studies highlight the ability to reduce raw material use and waste by showcasing the use of reused navy containers for street food, a 95% reduction in environmental effects when compared to traditional structures. Boxes made of expanded polypropylene (EPP) provide a 37% impact reduction. The reCIRCLE project emphasizes how reusable packaging helps reduce waste and advance circular economy principles. Using LCA analysis, the chapter also contrasts the nutritional and environmental ef-

fects of vegetarian and meat-based burger patties. In conclusion, innovative materials and sustainable practices in food logistics and packaging, supported by LCA and ecodesign, can significantly reduce the environmental footprint of the food industry. This holistic approach fosters a sustainable future by aligning food production and consumption with environmental stewardship.

4.1 Introduction

Life Cycle Assessment (LCA) and ecodesign are two interconnected concepts that play a significant role in the food industry and food distribution (Silva *et al.*, 2023). LCA is a methodology used to evaluate the environmental impact of a product throughout its entire life cycle, from raw material extraction to disposal or recycling. It is a tool that helps companies/individuals set and measure environmental improvement targets and make efficiency and transparency improvements. Ecodesign, on the other hand, is an approach that integrates environmental requirements into product/service design and development to reduce adverse environmental impacts (Leonardi *et al.*, 2022).

The food industry is a significant contributor to the global environmental impact, with logistics and supply chains playing a crucial role in managing quality, safety, sustainability, and efficiency. Catering is rarely considered when thinking about the food chain, but it plays an important role in the food logistics chain (Ke-xin, Ke-ming, Dong & Bo-hui, 2014). The European catering sector serves billions of meals yearly, employing two main methods: conventional and deferred.

The deferred approach, with time gaps between preparation and consumption, involves three chains: cook-warm, cook-chill, and cook-freeze (Manzini & Accorsi, 2013). In recent years, there has been a growing focus on sustainability in the food industry, with initiatives like the Green Public Procurements program setting new environmental criteria based on food processing practices (Manzini & Accorsi, 2013). This chapter aims to discuss the role of Life Cycle Assessment (LCA) and ecodesign in promoting sustainable catering services. LCA and ecodesign emphasizes the proactive design of products and systems

to optimize their environmental performance, guiding sustainable decision-making and fostering a deeper understanding of the interplay between food choices, health outcomes, and environmental sustainability within the food industry.

4.2 Case study analysis

The case studies discussed in the chapter give an overview of sustainable food service operations, progress to specific aspects like packaging and logistics, explore innovative solutions, and finally integrate nutritional considerations with environmental performance. Beginning with Casson *et al.*, 2020, the case study evaluates the environmental impact of utilizing repurposed shipping containers for street food operations, focusing on scaling strategies to expand their sustainable application across urban areas. Subsequently, Casson *et al.*, 2021, explore the environmental implications of Expanded Polypropylene (EPP) box production, highlighting its potential to enhance sustainability in catering services through innovative service models and controlled experiments.

An observatory study by reCIRCLE (Recircle Italia, n.d.) presents an innovative perspective on sustainable food packaging, showcasing its role in mitigating packaging waste and negative environmental effects through effective company strategies. Finally, under the *Le.Ge.Re.Te project*, the case study integrates nutritional analysis with environmental performance assessment, emphasizing the importance of awareness programs in promoting the symbiotic relationship between food choices, health, and environmental sustainability. Collectively, these case studies inform strategic decision-making and foster a deeper understanding of sustainable practices within the food industry.

Sustainable street food catering

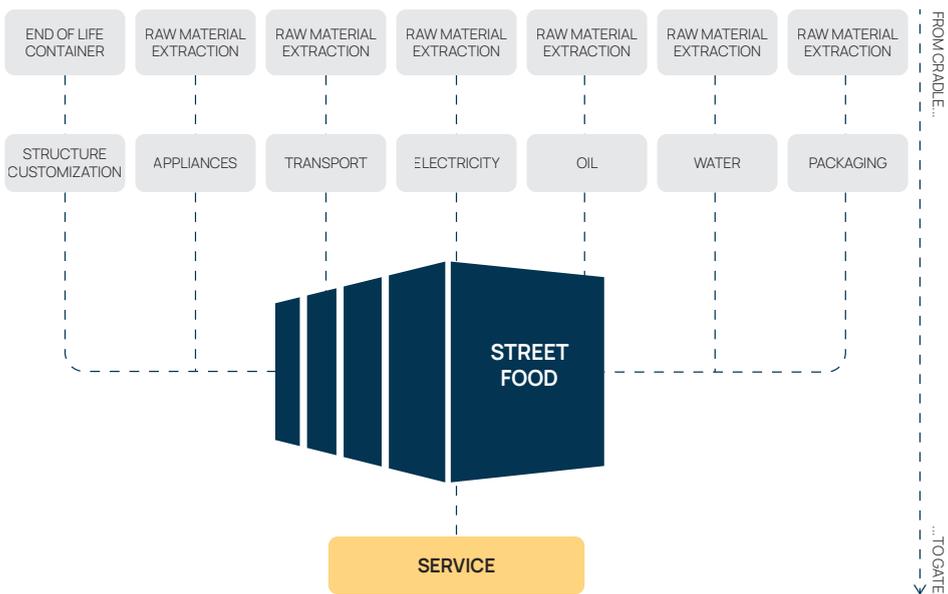
Consuming street food is on the rise, with about 2,5 billion people enjoying it daily (Abrahale *et al.*, 2019). Street food is valued for its immediate consumption, convenience, and cost-effectiveness (Calloni, 2013). Innovative structures like reused shipping containers

have emerged in this industry. Repositioning empty containers within seaborne shipping networks or intermodal transportation networks can be a systematic approach for managing and relocating these containers (Song & Dong, 2012; Li *et al.*, 2014).

An effective way to reduce supply chain environmental impact, cut costs, and save time is by reusing empty containers instead of building new ones. This approach, also demonstrated in healthcare during crises, not only benefits the environment but also improves overall performance while saving time and money.

The primary objective is to assess the environmental sustainability of a food service that utilizes a repurposed shipping container customized for street food operations. The study employs Life Cycle Assessment (LCA) as a decision-making tool to quantify the environmental impact of various choices made during the service design phase, as advocated by Hauschild *et al.* (2018). This approach aligns well with the principles of the circular economy, as reusing naval shipping containers can potentially reduce the need for raw materials when compared to constructing new street food facilities. Additionally, this solution has the potential to lower the environmental footprint of the food service compared to conventional street food services available in the market.

Figure 1. System boundary for the analysed food service. Casson *et al.*, 2020.



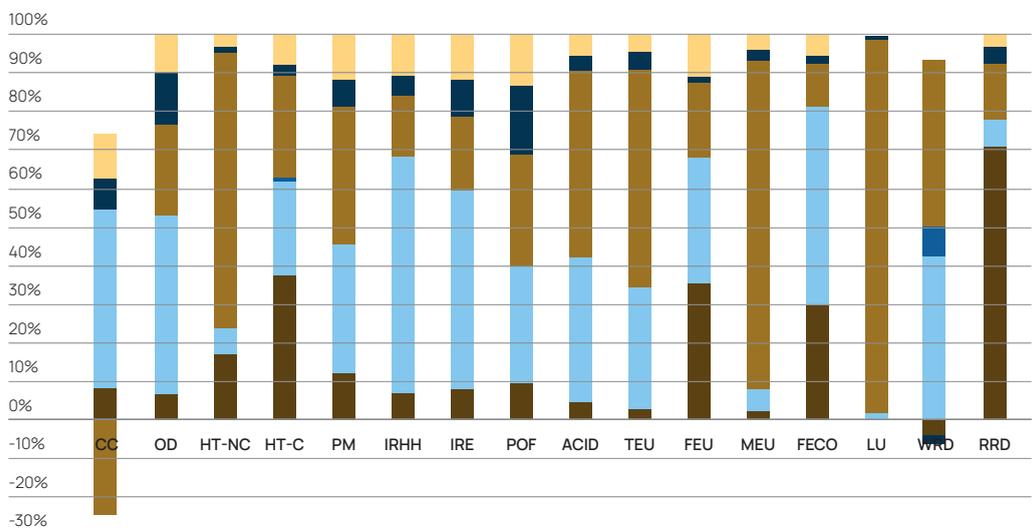


Figure 2.
Environmental impact hotspots coloured by a factor to provide FU.
 Casson *et al.*, 2020.

The study defines its functional unit as the food service itself, encompassing three food products: pasta, sandwiches, and french fries. Using a *from cradle to gate* approach, the analysis considers factors such as customizing the shipping container for street food use, constructing, and operating appliances, managing logistics, and food preparation (Figure 1).

The functional unit FU, defined as the reference unit of the system analyzed (ISO 14040, 2006; ISO 14044, 2006), in this study, was identified in the food service to provide three food preparations: a dish of pasta (P) equal to 100 g of served pasta, one 150 g sandwich (S) and one portion of fries (F) corresponding to 200 g. Figure 1 shows the system boundary for the analysed food service.

The food service considered several factors when providing catering for events, including event-specific service requirements, container travel distances associated with each event, various food preparation needs, structural considerations, appliance requirements, transportation logistics, electricity supply, fryer oil, water resources, and packaging considerations. Additionally, provisions were made for electricity and appliance allocation (Figure 2).

The Life Cycle Assessment (LCA) study shed light on the key contributors to the environmental impact of street food services

as seen in Figure 2. Electricity consumption for appliances and the use of oil for frying emerged as the primary drivers of this impact. Among various impact categories, the preparation of fried foods was identified as the most environmentally detrimental (53%), followed by pasta preparation (27%), and sandwich preparation (20%).

Overall, when quantifying the environmental footprint, the findings underscore the potential of reusing naval shipping containers as a means to substantially reduce the overall environmental impact of the street food service. This approach can help mitigate the need for disposal or the construction of new structures, leading to a remarkable 95% reduction in environmental impact.

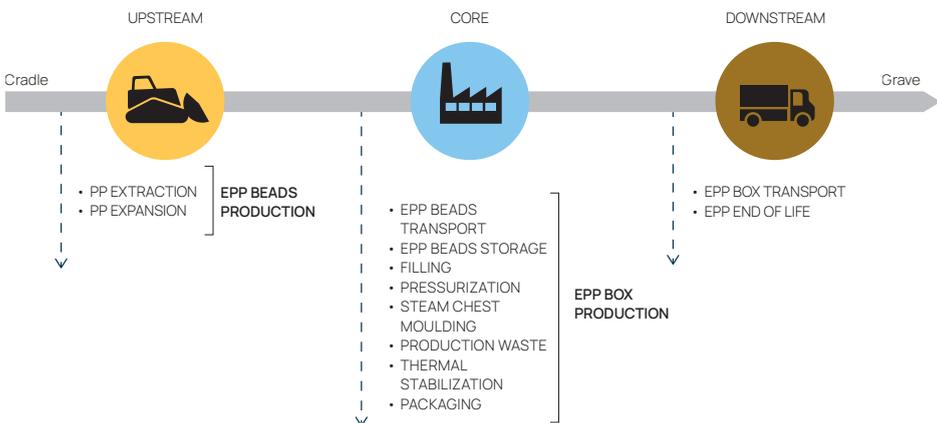
Modern catering trends focus on sustainability, adopting energy-efficient equipment, tap water use, eco-friendly transportation, and reduced packaging. Initiatives like the Green Public Procurements program set new environmental criteria based on food processing practices.

In the food industry, logistics and supply chains manage quality, safety, sustainability, and efficiency. Manzini and Accorsi's 2013 approach comprehensively assesses the food supply chain, aiming for holistic management.

Sustainable food packaging

Innovative materials replace traditional logistics equipment. European Union Regulation EC No. 1935/2004 emphasizes resource-efficient tertiary packaging that enhances food preservation. Expanded

Figure 3. Modules and relative phases considered in the studied system according to the cradle-to-grave boundary system. EPP, expanded polypropylene. Casson *et al.*, 2021.



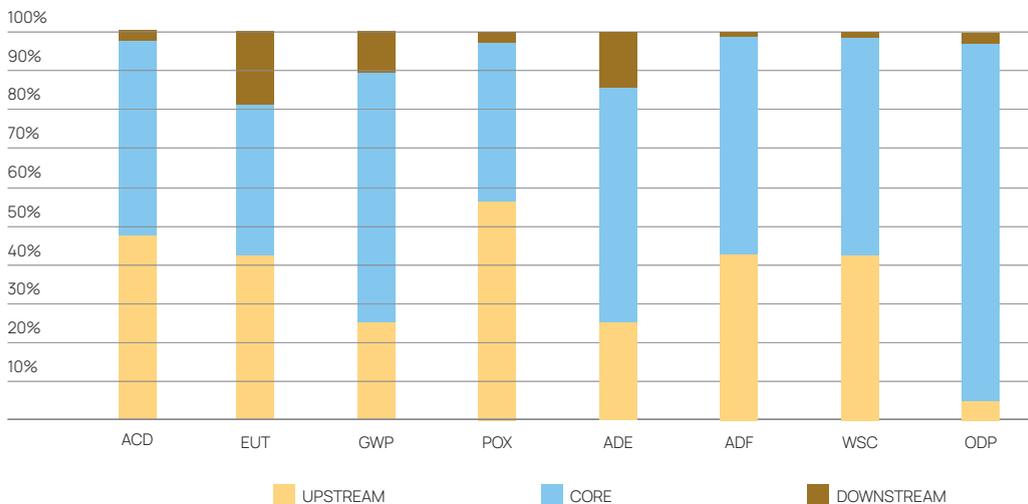


Figure 4. Contribution analysis of the expanded polypropylene box for the upstream, core and downstream modules. ACD, acidification; EUT, eutrophication; GWP, global warming (GWP 100a); POX, photochemical oxidation; ADE, abiotic depletion elements; ADF, abiotic depletion, fossil fuels; WSC, water scarcity; ODP, ozone layer depletion. Casson *et al.*, 2021.

polypropylene (EPP), well-documented (Xu *et al.*, 2007; Zhai *et al.*, 2010, 2011; Yu *et al.*, 2013), replaces conventional materials in catering logistics, offering mechanical strength, suitability for delicate items, food-grade quality, and thermal insulation.

The case study evaluates EPP box production's environmental impact and its potential to improve sustainable catering services. A Life Cycle Assessment (LCA) quantifies the benefits of switching to EPP boxes, offering a promising path to reduce environmental impact and promote sustainability in catering services.

The results refer to the investigation of the environmental performance of the expanded polypropylene box from cradle to grave without considering the catering service phase (EPP box life cycle), Figure 3 shows the system boundaries. Finally, the engineering aspects of designing a sustainable catering service were considered. Impact categories and units of measures available in the EPD (2018) method are used.

The results underscore the potential of EPP boxes in revolutionizing food delivery practices, offering a remarkable 37% reduction in overall environmental impact compared to conventional boxes. Figure 4 shows the contribution analysis of the EPP box. This transition holds the potential to spare the atmosphere from the release of 88,93 kg of CO₂ eq. emissions. Moreover, by reconfiguring the energy sources in the EPP box production process and adopting a fully

recyclable EPP box approach, we can further fine-tune and optimize the environmental sustainability of catering services.

In essence, our findings illuminate a promising path forward, where innovation in materials and logistical strategies can lead to a harmonious coexistence of population growth, increased food production, and reduced environmental impact, ultimately fostering a more sustainable future for all.

Sustainable shared food packaging

In an observatory case study, the next version of sustainable food take-away packaging is discussed. In the past years, food delivery and takeout services have experienced a remarkable surge in demand. These are considered megatrends, with an expected annual growth of 11% in deliveries in the EU until 2027 (Renub Research, 2022). Furthermore, takeaway food is gaining popularity, reflecting its appeal for consumers due to its flexibility and convenience. However, this growth has also brought forth a new challenge – managing the packaging materials required to uphold food hygiene standards. Europe disposes of 16 billion disposable cups annually (Seas at Risk, 2017) and 2 billion disposable food containers annually (Schmid *et al.*, 2018).

The environmental impact of products is significantly shaped by consumer behaviour. For instance, takeaway food and beverage packaging, where consumers directly impact its disposal or littering, in the case of reusable packaging, the rate of reuse.

Opting for reusability presents a compelling case for businesses as well. It not only significantly reduces the escalating costs associated with disposable packaging but also enhances the overall quality of the products offered, elevating the customer experience. Furthermore, embracing reusability allows businesses to effectively communicate their innovative spirit and environmental commitment through network communication campaigns, fostering customer loyalty and increasing brand visibility. This strategic choice not only benefits the bottom line but also positions the business as a forward-thinking and environmentally responsible leader in the industry.

reCIRCLE uses products, designed with a focus on reusability, that feature high-quality plastics and glass fibres for durability. reCIRCLE containers are stackable for space efficiency and compatible with

microwaves and dishwashers (reCIRCLE Italia, n.d.). From the report (Deloitte, 2020), pizza was the highest-ordered take-away dish in Italy, most by the millennials (58%) for the fact that it's delivery-friendly. In a move to cater to the requirement, reCIRCLE has introduced PIZZA BOX, durable in high temperatures up to 160°, and easy handling options. This elevates the user experience and providing such alternatives is way ahead for sustainable practices (reCIRCLE Italia, n.d.).



Figure 5.
Customer journey
in *reCIRCLE* service,
ReCIRCLE Italia, n.d.
Accessed
24th September 2023.
Adaptation
Polimi DESIS Lab.

reCIRCLE has kept a simplified procedure to opt for the reuse of packaging both for service and purchase. In Figure 5, customers are required to go through the following steps to facilitate the service:

1. consumer requests preferred food in a reCIRCLE container: the consumer places an order for their preferred food to be served in a reCIRCLE container; they have the option to leave a cash deposit or use the reCIRCLE mobile app for this purpose;
2. consumer enjoys their meal with freedom: the consumer can enjoy their meal at their convenience, knowing they have chosen an eco-friendly reCIRCLE container;
3. consumer returns the container to any reCIRCLE network point: After finishing their meal, the consumer is encouraged to return the reCIRCLE container to any designated *reCIRCLE* network point. In return, they receive a refund of the deposit (if paid in cash). The container is then professionally cleaned and made available for reuse within the reCIRCLE network;
4. replacement and recycling of damaged containers: in cases where a reCIRCLE container is damaged beyond use; it is promptly replaced. Containers that are no longer viable for reuse are responsibly recycled.

This process highlights the sustainability and environmental benefits of reusable food containers, promoting a circular economy by reducing single-use waste.

There have been previous LCA studies assessing the environmental impacts of single-use and reusable packaging for take-away food, but it lacks the consideration of user behaviour indicating a clear undervalue of the importance of the metrics (Caspers, 2023).

reCIRCLE has reached out to Università degli Studi di Milano (DiSAA) for a collaboration and it would be interesting to investigate the environmental impacts of user behaviour in take-away packaging, comparing conventional packaging and different reusable packaging as seen in Figure 6. Moreover, conventional pizza take-out packaging raises concerns not only for potential compromises to the food quality but also for reduced recycling efficiency when the packaging becomes contaminated with food residue.

The LCA results could shed light on the concerns of environmental impacts considering user behaviour of disposal, littering, or reusability rate of take-away food packaging.

Nutritional impact assessment

In food nutrition, a significant realization has taken hold and more evidence of the harmful effects of food systems on ecosystems, natural resources, and our own health has been taken a reassessment. Researchers are now looking beyond the basic role of food

Figure 6.
Different products in the reCIRCLE service. reCIRCLE Italia, n.d. Accessed 20th September 2024.



systems in providing nutrition and examining their broader impact on society, beauty, pleasure, and the economy (Springmann *et al.*, 2018; Willett *et al.*, 2019).

With this interest, different stakeholders from various backgrounds are involved in finding ways to create sustainable food systems that balance the needs of people with the need to protect the environment. With LCA methodology some researchers have started to explore alternative approaches by using nutrient-based functional units (n-FUs) instead of the conventional mass or volume (Schau & Fet, 2008; Clune *et al.*, 2017). These alternative FUs can be based on individual nutrients, such as protein, or they can incorporate multiple nutrients through the use of nutrient indices. Considering this scenario, this study aimed to assess the nutritional aspects of the food with respect to their environmental performance.



Figure 7.
System boundary of the
burger patties.

The goal of this study is to quantify and compare the environmental profile of three burger patties, two of them meat-based (chicken and beef) and one vegetarian, mainly made from pulses using LCA methodology and following the ISO 14040 and 14044 standards (Figure 7).

The comprehensive Life Cycle Assessment for three different types of burger patties, employs various functional units for comparison, these functional units include mass, energy, nutritional parameters, and a nutrition index. The aim was to provide a well-rounded evaluation of the environmental impacts associated with each patty.

By assessing mass, the case examined the environmental consequences related to the physical weight of each patty. The energy functional unit allowed to gauge the energy consumption across the entire life cycle of each patty, from production to consumption. Furthermore, the study considered nutritional parameters to understand how the composition of each patty impacted resource use and emissions. The inclusion of a nutrition index aimed to evaluate the nutritional quality of the patties, going beyond environmental concerns. This involved factors such as protein digestibility, amino acid composition, and overall nutritional balance.

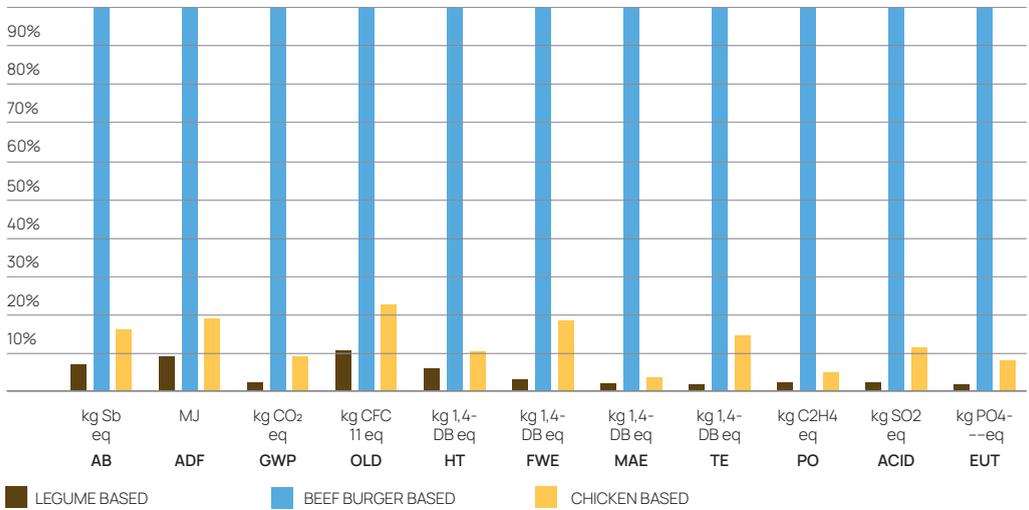


Figure 8. Normalised chart extracted using CML baseline method.

The environmental impact results are associated with different stages of the burger patty production process.

The operations involve the raw materials, packaging, processing, heating, and consumption for each of the burgers i.e., legume-based, chicken-based, and beef burger patty.

From the results seen in Figures 8 and 9, the identified hotspots are the raw material acquisition and cooking stage of the ingredients in the burger patties. This includes the sourcing of ingredients such as beef, poultry, vegetables, and other ingredients. Additionally, the energy required for farming, irrigation, and transportation of raw materials also contributes to the overall environmental impact.

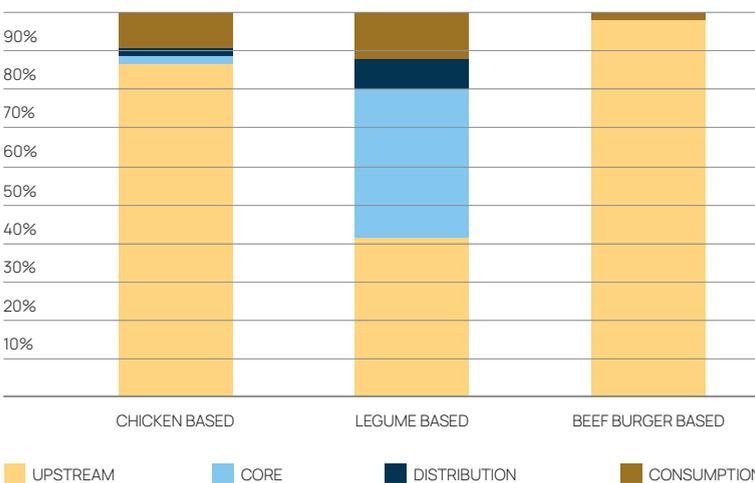


Figure 9. Global warming potential GWP (CO₂, eq) environmental profile of burger patties along with Climate change impact indicator.

The commercial mass unit gives prominent evidence that the burger patty based on beef emits higher emissions than the other two patties.

4.3 Conclusions

In conclusion, the widespread practice of consuming meals outside one's home has evolved into a global habit, particularly evident in the diverse street food systems. Recent efforts within the street food industry to adopt more sustainable practices include repurposing structures to serve as street food establishments.

This shift towards sustainability aligns with the pressing need to address the significant environmental footprint of food production and the expanding reach of street food services.

Amidst a backdrop of population growth and increasing food production, there is growing concern over the environmental impact. Mitigating this impact requires decoupling strategies to minimize environmental harm while meeting the essential need for food. Innovations in materials, such as expanded polypropylene (EPP) and reuse of naval containers, show promise in fostering environmentally sustainable catering services due to their durable properties and insulation capabilities. Using life cycle assessment (LCA) as a decision-making tool, it is possible to quantify the environmental impacts of various catering service design options. This analysis highlights the potential of EPP and similar materials to reduce environmental impacts in the food industry's logistics. Furthermore, the rise in food delivery and takeout presents sustainability challenges, but solutions like reCIRCLE's reusable packaging offer environmental benefits while enhancing customer experience. The simplified process of reCIRCLE's packaging encourages circular economy practices, emphasizing the role of consumer behavior in achieving sustainability goals.

Lastly, this study advances the field of life cycle assessment by considering the nutritional functional unit in assessing the environmental impacts of burger patties. By focusing on nutritional parameters, it provides a more comprehensive evaluation of meals and dietary choices, representing a significant step towards holistic sustainability assessments in the food industry.

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5. The role of social innovation and biodiversity preservation in public and private food procurement in urban areas

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ABSTRACT

This chapter analyses the case studies identified by the Università degli Studi di Bari within the area of expertise *biodiversity preservation and innovation acceptability*, with the aim to outline the role of social innovation and biodiversity preservation in public and private food procurement in urban areas. In the first part, the analysis of the case studies Semi di Vita and Avanzi Popolo 2.0 focuses on on the main activities/actions inside different social agriculture projects that create training and job opportunities to disadvantaged people, and initiatives for the redistribution of unsold food and reduction of food waste. The second part analyses the case studies Biosolequo Coop AR.L., Azienda Agricola Pasquale Ferrara and Azienda ortofrutticola Egnathia, highlighting the main activities/actions carried out to enhance preservation of biodiversity and diffusion of local/typical products. The third part analyses the case study Altereco in order to outline the role of social cooperatives implementing a legal model for agrifood production from innovative and alter-

native supply chains, through the the management of assets confiscated to the mafia. Finally, main conclusions and research perspectives are presented.

5.1 Models of social innovation favouring public and private food procurement in urban areas

In recent years, social innovation has gained increased attention by the food systems actors, because it is a mobilisation-participation process that leads to actions improving social relations and food security (Milley *et al.*, 2020; Cattivelli, 2022). Bouchard *et al.* (2015, pp. 12-13), defined social innovation as

[...] an intervention initiated by social actors to fulfil an aspiration or need, provide a solution or seize an opportunity for action in order to modify social relations, transform a framework for action or propose new cultural orientations. From this perspective [...], social innovation aims to modify the institutional frameworks that shape relationships in society.

In urban food systems, private and public food procurement can determine the way food is produced, transported and marketed, and can shift food consumption patterns towards sustainable and healthy diets (Swensson & Tartanac, 2020; Gaitán-Cremaschi *et al.*, 2022; Parsons & Barling, 2022). Depending on the social innovations adopted, changes in food systems driven by public and private food procurement may contribute to achieve sustainability goals and food and nutrition security objectives (Morley, 2021; Vasile, 2022).

Social innovations in urban food systems mainly focus on the self-organization of local actors promoting bottom-up approaches to overcome the lack of food procurement or to improve existing public services (De Schutter, 2015; Cattivelli & Rusciano, 2020; Swensson *et al.*, 2021). There are two main types of social innovations emerged from recent scientific literature:

1. social agriculture projects that create training and job opportunities to disadvantaged people;
2. initiatives for the redistribution of unsold food and reduction of food waste (Genova *et al.*, 2020; Lombardi & Costantino, 2020; Musolino *et al.*, 2020; Elsen & Fazzi, 2021; Zhao *et al.*, 2023; da Silva *et al.*, 2024).

Hereafter we explored two case studies in Apulia region (Southern Italy) that implemented these two types of social innovations. The first case study is *Semi di Vita*, a cooperative operating since 2011 in some municipalities in the province of Bari. It is one of the first examples of social agriculture in Apulia region, involving disadvantaged people in projects for enhancing the quality and biodiversity of local agricultural products. Particularly, in 2011 Semi di Vita created a urban social garden of 2.000 m² in the municipality of Casamassima, managed by producers who involved children with disabilities; a further garden of about 2 hectares was set up in 2014 in the Japigia suburb of Bari. In 2019, the cooperative started a project of social agriculture and urban regeneration named Fattoria dei primi in the municipality of Valenzano, to offer training and job opportunities for young people with disabilities or troubles with the law. In this project, about 26 hectares of land confiscated to the mafia were recovered and cultivated under organic agriculture.

At the end of 2021, the cooperative started the project *La Cardoncelleria Fornelli* thanks to a fund from the Italian Ministry of Justice, to involve young people hosted in the juvenile criminal institute

Figure 1.
Organic dried cherry tomatoes produced by Semi di Vita and sold in its e-shop.





Figure 2.
Social pantry
in an elementary
school in Bari.

Nicola Fornelli of Bari. Here a greenhouse and a packaging laboratory were created; the greenhouse is used in autumn and winter for cultivating the local mushroom *cardoncello*, while during spring and summer the greenhouse is used to dry organic vegetable products (tomatoes, chili, spices, etc.) (Figure 1).

The second case study is *Avanzi Popolo 2.0*, a social innovation dealing with the redistribution of unsold food and reduction of food waste. It was developed by the no-profit association Farina 080 in Bari, for promoting actions to contrast food waste through the connection between sites of waste generation and food consumption (e.g. household, food retailers and restaurants). *Avanzi Popolo 2.0* is an evolution of an experimental activity started in 2014 based on fair trade and solidarity. The association collaborates with various donors and local organizations that carry out food withdrawal and redistribution, since they are close to sites where food surplus takes place. Moreover, within the processes of reduction of food surpluses and waste prevention, *Avanzi Popolo 2.0* creates relationships with local producers, food networks and groups of solidarity purchase. Over the years, about 900 actions have been developed with more than 45.000 kg of food surpluses recovered from agri-food businesses, restaurants, agricultural cooperatives and donated to about 80 associations and organizations involved in contrasting poverty. In addition, for the first time in Apulia region, a web platform was tested for sharing food surpluses and food close to expiry, building an inclusive and sustaina-

ble community fighting poverty and contrasting food waste. A further social innovation was the *Frigo Solidale*, which contributed to combat food poverty through the installation of seven solidarity refrigerators and pantries in the city of Bari and its province. Finally, the association carried out the *School Sharing* project in three elementary and secondary schools in Bari, where playful teaching and laboratories were tested to increase the awareness of students about food waste generation, prevention and reduction. This project enabled to implement a social pantry for students, teachers and school staff to share food at risk of waste (Figure 2); students were invited to establish the rules of use of the school pantry starting from the observation of their own home pantry, thus experiencing food sharing practically.

5.2 Local food products and biodiversity preservation as a lever for public and private food procurement in urban areas

Sustainable agriculture and the valorisation of local resources serve to foster fair economic development that prioritizes both environmental preservation and community well-being. This principle is exemplified by three notable cases: Bio Solequo Coop, Ortofrutticola Egnathia and Azienda Agricola Pasquale Ferrara. They demonstrate how primary production can integrate social, environmental and economic sustainability to create effective and successful models.

Bio Solequo Coop is an agricultural cooperative located in the municipality of Ostuni (province of Brindisi) (Gonnella *et al.*, 2015). It fosters fair trade practices and promotes the rich culinary heritage of Apulia region through the cultivation of organic, locally-sourced vegetables. The cooperative primarily operates within the peri-urban vegetable gardens (Figure 3), covering about three hectares.

These gardens have a significant historical background, tracing back to medieval times and built upon the remnants of an ancient Messapic village dating back to the 5th-6th centuries BC. The area, which features terraced distribution and ancient wells known as Aquariums capable of holding up to 500.000 litres of water, was



Figure 3.
Overview of peri-urban
vegetable gardens
of Bio Solequo Coop
placed in Ostuni.

levelled in ancient times to optimize agricultural use. In recent years, Bio Solequo carried out extensive restoration both in terms of architectural-landscape preservation and soil productivity. The area, once abandoned and overgrown with wild vegetation in the 1970s, was revitalized through the enrichment of soil with organic matter and the adoption of green manure techniques. Since its birth, the cooperative preserves and valorizes local varieties of Apulian vegetables. Since December 2016, Bio Solequo collaborates with the Soil, Plant, and Food Sciences Department (Di.S.S.P.A.) of the Università degli Studi di Bari Aldo Moro, particularly through its involvement in the *BiodiverSO* project (*Biodiversity of Horticultural Species of Apulia*).

Initially serving as a custodian of local varieties, the cooperative became a partner also in the *BiodiverSO* Karpos project (*Biodiversity of Apulian Horticultural Fruit Species*) from 2022 onwards. This project focuses on the recovery, characterization and promotion of native plant genetic resources, assessing their productivity, response to traditional cultivation methods, and production costs for subsequent reintroduction into the local agricultural landscape and regional food market. Bio Solequo is actively engaged in knowledge dissemination and sharing

within the community. Over the years, the cooperative established collaborations with various institutions, schools, cultural associations, local farmers, and Slow Food Apulia. This partnership served for implementing an ongoing project aimed to establish the first Apulian Seed House preserving and promoting local vegetable varieties.

Ortofrutticola Egnathia is one of the two companies within the Miss Freschezza group. It was established in 1970 in Monopoli (Bari) and specializes in the cultivation of vegetables and fruits. It focuses on quality and food safety, ensuring traceability of their products. In 2000, a new production facility covering an area of 2.500 m² was built; it is equipped with storage units for raw materials and state-of-the-art machinery for processing fresh fruits and vegetables. In 2015, a significant modernization effort expanded the storage capacity and processing area, incorporating ozone technology for washing and storing raw materials, as well as a hydrocooler for rapid product temperature reduction. Over the years, the company expanded its land holdings from 30 to 100 hectares to meet growing products demand. Currently, the company employs approximately 120 people (both seasonal and permanent) and boasts an average annual turnover of about 10

Figure 4.
Fruits of Barattiere,
marketed by the
Miss Freschezza group
with the Baratti brand.





million euros. Recently, Ortofrutticola Egnathia focused on cultivating immature melons (*Cucumis melo L.*), specifically *Barattiere* (Renna *et al.*, 2020), *Scopatizzo*, and other local varieties of *caroselli*.

These varieties have excellent shelf-life, so that they are suitable for national and international markets under the brands Miss Freschezza and Baratti (Figure 4).

Baratti is the brand dedicated to *Barattiere*, recognized as a Traditional Food Product (PAT) of the Apulia region in 2006.

Miss Freschezza markets Baratti throughout Italy with major retail outlets such as Megamark, Famila, AandO, and DOK. Moreover, an entrepreneurial project launched in 2018 led to the sale of *Barattiere* in the Netherlands under the name *Cumelo* (contraction of the English words *cucumber* and *melon*). *Cumelo* is a remarkable case of commercial success, transforming *Barattiere* from a local variety at risk of extinction into a product representing Apulian traditions and appreciated in northern Europe for its exceptional taste and nutritional qualities.

Azienda Agricola Pasquale Ferrara is an organic farm of about 12 hectares in Conversano (Bari), which produces vegetables, fruits,

Figure 5.
Taproots of a local variety of carrot (*Dacus carota L.*) called *Carota di San Vito* harvested at Azienda Agricola Pasquale Ferrara.

olive oil and wine for Ferrara s.r.l. Ristorazione collettiva e catering involved in the catering business for over 30 years, serving schools, hospitals, social canteens and catering services. As part of its continuous policy of business improvement, the farm cooperates with the Department Di.S.S.P.A. of the Università degli Studi di Bari Aldo Moro in the production of organic vegetables for mass catering, also using local varieties. The cultivation of local varieties under organic agriculture allows the users of Ferrara s.r.l.'s canteen service (mainly school-age children) to include in their daily diet preparations based on local and organic fruit and vegetable products (rich in nutrients and without pesticide residues), and to identify typical local fruits and vegetables as food and cultural heritage to cultivate and spread (Figure 5) (Bellomo, 2024). Ferrara s.r.l. manages the school canteens of ten municipalities in southeastern Bari, employing about 550 people and producing around 1,2 million meals a year.

5.3 Social cooperatives and the management of assets confiscated to the mafia: a legal model for agrifood production from innovative and alternative supply chains

Among alternative models of social innovation within the food supply chain, social cooperatives managed with assets confiscated to the mafia acquires a growing relevance in the national scenario. The prevention and suppression regulation of mafia phenomena is extremely complex and it concerns European and national regulatory interventions. According to the Law no. 109 of 1996 the assets confiscated from mafias can be reused for social purposes as they are valuable assets to be returned to the community. In recent years, there has been an increasing number of cases of custody of seized land to communities, entities, associations, social cooperatives and other types of non-profit entities and to operators of social agriculture. With regards to food production from farms dealing with social

activities, including the reuse of land confiscated to the organized crime, a significant implementation of the provision laid down by Law no. 109/96 crosses with the legislative rules on social agriculture, laid down in Italy by the Law no. 141/2015 (Canfora, 2017). The law laid down a national definition of welfare activities carried out in rural areas, pointing out their content as well as the legal entities involved in them. Thus, it introduces a change into the activities qualifying agricultural business, for the purpose of the Civil Code article no. 2135 establishing the extension of the application of special rules applicable to agricultural business. It recognizes the welfare services offered by the agricultural business falling within the scope of the law as a part of multifunctional farm activities, by widening the framework of public goods production.

The analysis focuses on the case study of the social cooperative *Altereco* in Cerignola, within the management of land confiscated from the mafia. Attention has been drawn to the role that agriculture can play in the re-use of confiscated land. The Law no. 109 of 1996 was promoted, through a campaign to collect signatures, by the association *Libera*. The main objective was to remove the assets accumulated by criminal organizations with their illicit activities and return them to society. In order to do this, however, it was necessary to act on different rules of anti-mafia legislation. The law Rognoni-La Torre (Law no. 646/82) introduced into the penal code the crime of association of a mafia type (article no. 416 bis Penal Code) and the seizures and confiscations for those convicted (Guerrini, 2020).

The Anti-mafia Code (Lgs. Decree no. 159/2011 amended by the Law no. 161/2017 and Law Decree no. 77/2021) provides two separate cases of reuse of property confiscated. The first hypothesis contemplates the transfer of the property to the unavailable assets of the local authority where the property is located, with the constraint of re-use of the proceeds for social purposes. Local authorities will be able to directly administer the property or grant it free of charge to communities, associations, social cooperatives and other types of non-profit entities and to operators of social agriculture (including not only social cooperatives but also farmers) (Costantino, 2021).

Altereco is an example of social cooperative in which is practiced social and reparative agriculture, in accordance with the Law no.

141/2015 on social agriculture and the Apulian regional Law no. 9/2018. The social cooperative deals with the inclusion of people in a fragile condition on land confiscated from the mafia, organic production, education to active citizenship and social anti-mafia as well as reintegration into the world of work for restorative justice. The idea was born from the need to generate a legal economy through the reuse of confiscated lands. Since 2008, Altereco works also in close contact with U.e.p.e. of Foggia, Foggia Court and Ser.T. and it welcomes about 20 people per year from the criminal area, from drug addiction and migrants in fragility situation with paths of reintegration into the world of work based on respect for people. All reintegration activities are in stark contrast to all forms of oppression, ill-treatment and, above all, against the gangmaster system who takes away dignity from the exploited workers. The aim of this activity is to practically demonstrate, through the care of the supply chain, the respect for workers and the enhancement of the product, that social agriculture generates a sustainable and clean economy.

The double level of governance on the re-use of assets provided for by law, requires compliance with a series of obligations by both public bodies and assigned private entities. It is essential that the assets are adequately mapped and that local authorities advertise the characteristics of goods and the prospects for re-use. Moreover, the assignees will bear a very significant initial cost for the restoration of the places (environmental remediation operations, analysis of the state of the land and the productive characteristics of the same) (Costantino, 2021). The social use of assets confiscated from the mafia appears to be both a model and a problem. In fact, there are many confiscated assets that remain unused or, worse, illegally occupied by the old owners. Often it takes several years to get assignments. A common problem in the experiences of confiscated assets is the difficulty in finding the needed funding. Even in the field of transparency there are many problems.

The reports drawn up by Libera note that many municipalities do not publish the list of assets confiscated in their possession or omit information relating to assets. Finally, it should be pointed out that the article 60 bis of the Law Decree no. 77/2021 has introduced interventions in order to accelerate the procedures about the

confiscated assets, to usefully lead the confiscation provisions to the implementation of valorization measures of the aforesaid assets. With regard to funding, a National Strategy for the Valorization of Confiscated Property has been envisaged, implemented through cohesion policies that allocate specific funds to the enhancement and management of confiscated assets. This funding is essential, especially in sight of the long period from the start of the judicial procedure to the final destination of the property.

Concerning to the problems that have emerged, it is necessary to point out also the need to take as a principle that the valorization of confiscated assets must be guided by a logic of entrepreneurship. In this way, the goods produced on confiscated land could become the subject of a system of supply chain that involves other companies, aimed to enhance the reuse of land in a productive key. The reference is to ethical certification tools linked to legality indices, respect for rights, recognition of the value of the product and fair price, which provide adequate information to the consumer about the value of the product, contributing also to the fight against agromafias and the spread of the culture of legality (Costantino, 2021).

5.4 Main conclusions and research perspectives

Food systems cannot be resilient to crises if they are not sustainable. The aim of Farm to Fork strategy is to redesign food systems, which today account for nearly one-third of global GHG emissions, consume large amounts of natural resources, result in biodiversity loss and negative health impacts. The profound changes that have characterized food systems in recent years have also strongly influenced public and private food procurement.

There are many examples of reorganisation of supply patterns especially in urban food systems, which contribute to achieve multiple goals of sustainability and food and nutrition security. In particular, are worthy of mention:

- initiatives to collect and redistribute unsold food and reduce food waste;

- farms involved in social agriculture projects training and employing disadvantaged people;
- farms devoted to the conservation and enhancement of local resources inside sustainable farming practices.

In projects aimed to recover, characterize, and promote local genetic resources, it resulted of crucial importance the partnership with research institutions, supporting farmers in the selection and production of local varieties of organic vegetables for mass catering, and the consolidated relationship with the final recipients of innovative products and services (schools, hospitals, social canteens, catering services). Also, these farms usually develop recreational and educational activities, healthcare services, integration of disabled workers, demonstrating how primary production can integrate social, environmental and economic sustainability to create effective and successful food models. The analysis of legislative framework regulating the re-use of assets seized and confiscated from organized crime and provided for by law, puts in evidence the difficulties of granting the compliance with a series of obligations by both public bodies and assigned private entities. In particular, it was highlighted the lack of an adequate mapping of the confiscated assets on the basis of which the municipalities can give timely evidence and publicity of the availability of land to be allocated. This, together with the difficulty of access to funding for the restoration of the places, severely limits the possibilities of allocation for reuse so that many confiscated assets may remain abandoned or illegally occupied by the old owners.

Authorship attribution

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model for agrifood production from innovative and alternative supply chains is the result of research activities of the group coordinated by Irene Canfora and including Vito Leccese and Claudia Gesmundo. In particular Claudia Gesmundo wrote the paragraph.

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6. Beyond social agriculture: rehabilitation and sustainable practices in penitentiary contexts

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ABSTRACT

Social Agriculture (SA) represents a co-production model using agricultural resources to provide innovative personal services and enhance the quality of life for individuals facing difficulties. SA involves revising agricultural missions, visions, and business practices to include vulnerable populations and foster community development. This research explores the opportunities offered by SA, focusing on its potential for individual and community growth. Methodologically, it includes a literature review on SA, assessments of relevant policies, and case studies from metropolitan area of Catania. Especially, one case study involves urban gardens as tools for social integration of inmates. Interviews with project promoters provided insights into the operational aspects and impacts of these initiatives.

The expected results include identifying new functions of urban agriculture (sociability, active citizenship, therapy) refers to new target populations, mechanisms for creating collective urban space meaning, and the role of public policies in reducing socio-economic marginalization and improving social services.

6.1 Introduction

Public Food Procurement involves government or public institutions purchasing food for public programs such as schools, hospitals, and prisons. The aim is often to support local agriculture, ensure food security, and promote healthy eating habits within the community.

Agriculture has always played a relevant role within society. In the long run such role has renewed despite the crisis of the primary sector, and today it has been further revitalized also thanks to the explicit and formal consideration of the agriculture's role as multifunctional for the economy and society (Van Elsen *et al.*, 2006). In this context, Social Agriculture (SA) is a specific form of co-production of personal services using non-specialized agricultural resources to organize innovative personal services; also, to improve the quality of life for people facing increasing difficulties (Di Iacovo *et al.*, 2013; Scuderi *et al.*, 2014). SA involves a radical revision of missions, visions, and business attitudes in agricultural practices (Di Iacovo, 2013). It promotes activities that aim to include vulnerable population segments and develop local communities to improve living conditions and foster social and labour inclusion (Carbone *et al.*, 2007). In this context, the main objective of this research is to explore the opportunities offered by social agriculture, highlighting the potential for individual and community growth.

Some best practices will be briefly analysed as examples of the application of Public Food Procurement. In particular, the focus will be on the disadvantaged, particularly inmates within prison spaces, places an emphasis on finding innovative ways to promote their social reintegration and rehabilitation. In fact, SA is increasingly emerging as an effective means of fostering the social inclusion and rehabilitation of people with relational problems who require therapeutic activities and support for physical and/or mental rehabilitation processes.

The methodology used to achieve the set objectives involves an in-depth analysis and a preliminary review of relevant literature on SA, an assessment of Italian and EU policies, and the analysis of case studies settings in Sicily, in the South of Italy.

Particularly, a case study of urban gardens as tools for social integration of specific target groups (the inmates in prison). Inter-

views were conducted with privileged witnesses such as the project promoters, in order to gather first-hand accounts and delve into the operational aspects and impact of the agriculture initiatives and good practices that have emerged.

6.2 Social Agriculture: a literature review

In recent years, Social Agriculture has taken on various roles in Italy and Europe, adapting to local realities and governance systems (Giarè *et al.*, 2022). It integrates agricultural practices with social services to diversify rural activities (Borsotto & Giarè, 2020).

These initiatives, led by individual farmers or social cooperatives, aim to provide social and welfare services to disadvantaged populations (Di Iacovo, 2014). SA is based on a new model of multifunctional agriculture characterized by low environmental impact and a strong ethical and social connotation. This model shapes new scenarios of local and rural welfare by fostering meaningful relationships among local actors (Giarè *et al.*, 2022).

The growing demand for agriculture-related socio-educational and welfare services underscores the multifunctionality of agriculture, offering opportunities for the enhancement of agriculture in a social context, as well as income and employment for farms and new operators (Ascani & De Vivo, 2016).

Multifunctionality encompasses the diverse functions of agricultural companies beyond traditional production for the market, contributing to the transformation and development of rural areas (Belletti, 2010). This redefines the rural world as a space with varied functions and activities influenced by complex economic, social, and ecological dynamics, tailored to the specifics of the territory and its rootedness (Brunori *et al.*, 2020).

SA, especially in Italy, is set against a backdrop of deep crisis and tries to tie together, through real production processes, land management, local food production, and personal service delivery, in the most fragile rural areas, as in peri-urban areas (Di Iacovo, 2013). With respect to the country's geography, social agriculture is widespread throughout the country, although predominantly in

northern regions (52.4 % of experiences) compared to central (21.5 %) and southern (26.1 %) regions. The regions where SA appears most present are Piedmont (hosting 23 % of practices), Apulia (9%), Tuscany and Veneto (8%) (Galasso & Paolini, 2020, p. 71).

The operators of social agriculture (agricultural enterprises, social cooperatives) registered in the regional lists activated in eleven regions are 327 (Ismea, 2024).

The diverse experiences of SA encompass interventions targeting various groups such as the elderly, minors, individuals with physical or mental disabilities, psychiatric or oncological patients, and educational activities promoting a connection with nature.

Additionally, co-therapeutic practices aim to stimulate the abilities of people with autism, psychiatric and mental disabilities, and cancer patients, while also facilitating social and labour integration for disadvantaged individuals like the disabled, drug addicts, and prisoners.

SA's potential as an innovative model for territorial development is significant, bringing together needs, identities, and forms of protection, attributing value to work as a foundational element of an inclusive, sustainable, fair, and solidarity-based society, thus contributing to the transformation of the agricultural and rural world (Nicolosi *et al.*, 2021).

6.3 Exploring Social Agriculture in Italy. Regulations, community policies, and roles

Regulation and scope of Social Agriculture: an overview

In Italy, SA is regulated by Law 141/2015, as an aspect of the multi-functionality of agricultural enterprises. The law aims to develop social, social-health, educational, and socio-occupational integration interventions and services to ensure uniform access to essential services for people, families, and local communities, especially in rural or disadvantaged areas. It defines social agriculture and identifies the four areas of its activities, emphasizing the protection of the person's dignity and creating a positive synergy between economic objectives and social responsibility (Giarè *et al.*, 2022).

These actions involve integrating disabled or disadvantaged workers into social and labour activities, providing social and service support to local communities, offering services for medical, psychological, and rehabilitative therapies, and conducting projects for environmental and food education, biodiversity conservation, and local knowledge promotion. The resulting social benefits, as evidenced in some cases, are substantial (Cattivelli *et al.*, 2019). Additionally, there are territorial benefits, including the revaluation of areas, lands, and structures with illegal origins. For instance, some companies are working to restore value to marginalized territories, even those confiscated from criminal organizations such as the mafia, resulting in positive economic impacts on the involved territories.

The law prioritizes the social and labor integration of disadvantaged individuals, as defined in Law 381/1991, Art. 4, as amended by Law 193/2000 (Smuraglia Law). This definition encompasses physically, mentally, and sensory disabled individuals, former psychiatric hospital inpatients, those undergoing psychiatric treatment, drug addicts, alcoholics, minors in family difficulties, individuals detained in penitentiary institutions, convicts, and internees admitted to alternative measures to detention and outside work. Furthermore, the law introduces various incentives to promote the employment of prisoners, such as tax relief for social cooperatives and businesses that hire or provide employment opportunities to these individuals.

The role of community policies in Social Agriculture

The European Commission highlights farmers as custodians of natural resources and food production systems, recognizing the rural system for its pivotal role in land production, protection, and preservation of natural heritage and biodiversity.

A key document in this context is the European Green Deal of 2019, which aims for Europe to become the first climate-neutral continent. Aligned with this vision, the European Commission subsequently introduced two strategies: the EU Biodiversity Strategy for 2030, aimed at enhancing societal resilience to future challenges like climate change, forest fires, food insecurity, and epidemics (European Commission, 2020a); and the Farm to Fork Strategy,

which seeks to foster fair, healthy, and environmentally friendly food systems (European Commission, 2020b).

In June 2021, the European Commission approved the Common Agricultural Policy (CAP) regulations for 2023-2027, focusing on ten key objectives spanning social, environmental, and economic aspects. Through Commission Implementing Decision C (2022) 8645 final of December 2nd, 2022, Italy's CAP Strategic Plan for 2023-2027 was adopted, encompassing 173 interventions and a budget nearing 37 billion euros (European Commission, 2022). This ambitious strategy aims to enhance competitiveness, environmental sustainability, territorial balance, and food quality (Tarangioli *et al.*, 2022).

The plan prioritizes four main objectives alongside a cross-cutting goal: promoting resilient and diversified agriculture for food security, strengthening environmental protection and climate resilience, revitalizing rural areas, and fostering knowledge, innovation, and digitalization.

The Commission established eight specific objectives to achieve its overarching goals: ensuring fair incomes for farmers, boosting competitiveness, enhancing farmers' role in the food chain, mitigating climate change impacts, safeguarding the environment and biodiversity, promoting generational renewal, fostering vibrant rural communities, and ensuring food quality and health. Supporting social farming initiatives under the Italian CAP 2023-2027, two key priorities emerge: promoting employment and social inclusion in rural areas through new enterprises and multifunctional practices, focusing on youth and women (E3.3); enhancing rural quality of life by improving social inclusion, access to services and infrastructure, including digital services, to counter depopulation and foster entrepreneurship and social cohesion (E3.6).

Support for SA is also facilitated by rural development policies through Rural Development Programs (RDPs) sub-measures 16.9, promoting diversification of agricultural activities into health, social integration, environmental, and food education, and 6.4, encouraging investment in the creation and development of non-agricultural activities. Finally, SA is supported by regions through European Structural and Investment Funds, notably the European Social Fund (ESF).

6.4 Best practices: a path to community well-being and environmental sustainability

As part of the PNRR *OnFoods* (Spoke 1) project, the research group from the Università degli Studi di Catania analysed five best practices insights concerning the Public Food Procurement, especially on social agriculture, highlighting their positive impact on society and the environment.

The fight against food waste emerges as an opportunity to create virtuous circular economy initiatives that can limit socio-economic and environmental impacts. In this context, a project called *Cuore Generoso* referring in Catania redistributes surplus food from the fruit and vegetable market to reduce waste and support the most vulnerable people. Initiated in 2020, it collects and donates unsold fresh produce to associations that provide meals to those in need, promoting sustainable practices through tax incentives and waste management benefits. The primary entity overseeing the collection process is Banco Alimentare, an association whose goal is to reduce food waste and help people in need. Incentives, including tax relief as per Law 166/16 (Gadda Law) and other additional benefits for differentiated waste disposal, are available to operators.

Private and public food procurement strategies show the relevance of adopting multi-level and multi-actor governance and policy approaches to include a wide-range of actors operating in the agri-food system to facilitate the integration of sustainable practices, promotion of food produced locally; also transforming unconventional spaces into vegetables and fruits production places. In this context, in Modica, the *Social Garden Square* allows users of the Mental Health Department to cultivate agricultural products, enhancing their well-being and social reintegration. This initiative provides fresh produce and fosters practical and social skills, improving mental health and a sense of belonging catalysing city regeneration. The Municipality of Modica has provided, on a free lease basis, a small urban agricultural plot, adjacent to the Psychiatry Service. In particular, the social agriculture project aims at socio-rehabilitative activities for

psychiatric patients. The aim is to make use of plots of land owned by the municipality, which are reclaimed from degradation and cultivated by residents, promoting the development of an ethical economy for the direct benefit of local communities.

Other best practice is alternative agri-food networks, such as *Le Galline Felici*, connect rural and urban communities, promoting sustainable local development and strengthening social capital. These networks meet the demand for organic products and facilitate the exchange of people, knowledge, and capital, building trust and resilience in rural areas. In particular, in 2008, the Sicilian Consortium *Le Galline Felici* officially came into existence, where the inspiration originated from the chickens liberated in Roberto's – the creator – countryside. The mission is to support the different members of their own community, meaning that the involved farmers conceive the concept of a new, solidarity-based rural economy and establish the relationships among themselves. *Le Galline Felici* represents a social entity that manages to influence the behaviour of people (consumers and small farmers) and provide support tools for the rural development of farmers, initiating virtuous paths towards poverty reduction and increasing self-sustainability opportunities.

Observing the involvement of vulnerable people in the supply chain as a mean of offering them training, job opportunities, psycho-physical well-being, positive self-perception, and improved quality of life. Good example is the *Orti e Arte* project that engages residents in urban gardening over 50.000 m². The project is localized in Librino, a degraded district of Catania, Sicily, built in the mid-1960s as a satellite city and today it has more than 70.000 inhabitants. It provides fresh produce and has educational, therapeutic, social, and environmental benefits, promoting urban regeneration and social cohesion through categorized garden plots for various community groups. Most of the area involved in the project was in the past destined to abandonment and degradation.

The prominent aspect of the symbolic meaning of community gardens is their role as carriers of knowledge within the city. Indeed, various aspects of culture are realized through a rich experience that involves aesthetic preferences, culinary traditions, rituals, customs, foodscape, and social interactions.

Lastly, in the prison of Ragusa, *Social Agriculture* aids inmate reintegration and well-being through garden cultivation. This project will be further explored in the next section, where its details and specific impacts will be analysed.

6.5 Insights: Experiences of Social Agriculture in prisons

In the spring of 2020, the *Libere Tenerezze, Laudato si – Orto Umoristico Rigenerativo* project began spontaneously in Ragusa Prison when volunteers from the clown therapy association Ci Ridiemo Su gave inmates seeds to plant, one of whom asked the prison administration for permission to plant them on an area of the facility grounds. Following a 2021 agreement between the Prison Administration and the association, the project was incorporated into the prison's annual plan and later included in the Regional Proveditorate of Prison Administration's three-year plan for 2021-2023.

Two inmates admitted to outside work are involved in the project on a voluntary basis, although additional inmates with specific skills in the relevant field of work are involved in carrying out certain tasks, such as building fences or other specialized tasks.

The vegetable garden consists of 3 plots of land: the smallest of 280 m² and 130 m² intended for the cultivation of seasonal vegetables; the largest, covering an area of 2500 m², has been allocated for the creation of an arboretum.

As emerged from the interviews conducted, the project aims to facilitate the social reintegration of prisoners by developing skills in regenerative agriculture, emphasizing environmental and socio-economic sustainability. Unlike industrial agriculture, it promotes improved soil conditions, biodiversity, and polycultures using probiotics and seasonal rotation. *Those who follow these paths do good not only to nature, but also to those who consume, those who feed on these products* and this also allows the person who is incarcerated in prison to recognize his or her self-efficacy, we can work on self-esteem that the inmate can feel useful with an objective to achieve and complete useful for their daily life in prison.

The initiative blends agriculture with comic therapy, creating a *humorous vegetable garden* that integrates agronomic and relational aspects. Participants learn agricultural skills, connect with nature, and produce sustainable food. Comic therapy adds a fun element, fostering a safe environment for free expression, meaningful relationships, and emotional well-being.

The project serves as a bridge between the prison and the outside community through awareness-raising activities aimed at students, parents, and teachers. These efforts promote a social ethical message, improve perceptions of prisoners, and enrich their lives.

By fostering open dialogue, understanding, and solidarity, the initiative aims to dispel prejudices and reshape attitudes. Involving these social networks is crucial as they can significantly contribute to shifting mindsets.

Finally, marketing the garden's products creates economic opportunities, potentially establishing a social enterprise that supports charitable causes and solidarity initiatives. For instance, *Libere Terezze* extends its support to other sectors within the association, generating economic benefits for inmates and the wider community while promoting general welfare. This dual-purpose approach drives positive change and sustainable development across the community.

6.6 Short Conclusions

In recent years, urban agriculture initiatives have taken root in Italian cities, ranging from urban gardens to guerrilla gardening and vertical farming. Also, other initiatives have given rise to what is known as social agriculture. Interest in this topic is demonstrated by both third sector entities (cooperatives, associations) and, increasingly, by agricultural enterprises that affirm their multifunctionality by engaging in activities with social impacts. Social activities carried out in and by agricultural businesses can generate additional income and employment if appropriately integrated into the real economy, creating shared value for all stakeholders, starting with the territories and communities in which they operate. The results of the research lead to the proposal to set up a model of practices related to social

agriculture, especially case study on prisons taking on the role of a project to bring people back to work, self-produce for the prison canteens and share the value of the knowledge that each of them has gained in their own life experience prior to their prison term. This contributes to the general welfare of the community and promotes equitable and sustainable development.

SA within correctional institutions offers opportunities beyond just the agricultural setting. In fact, these initiatives not only provide prisoners with practical and theoretical training in agriculture, but also an opportunity for personal and professional growth. Working in the agricultural environment can provide a feeling of accomplishment and self-efficacy, thus contributing to their rehabilitation process and reintegration into society. Furthermore, the integration of the agronomic aspect with the relational aspect, through activities such as comic therapy and group work in the garden, fosters the development of interpersonal and communication skills, contributing to the creation of a sense of community and solidarity among inmates. This can help reduce violence and conflict within the prison and improve the overall social climate. In addition, involving the outside community in these initiatives can help raise awareness of issues related to the prison system and promote a better understanding of prisoners. This can help combat entrenched stereotypes and prejudices and promote a culture of inclusion and acceptance.

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7. Territorial marketing in university canteens to enhance local products: a review of case studies

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ABSTRACT

In a competitive global context, where territorial differentiation is essential to attract investments and support sustainable development, territorial marketing plays a crucial role in enhancing a region's attractiveness. The following contribution analyzes territorial marketing strategies aimed at promoting local products, with particular attention to the context of university canteens. The review highlights five distinctive initiatives: *Berkeley Dining* at the University of California, *Cornell Dining* at Cornell University in Ithaca, the *Edible Campus* at the University of St. Andrews in Scotland, *Cirfood* in Italy, and *Don Alfonso 1890 Boutique Hotel and Restaurant*, each adopting innovative approaches to integrate local products and sustainable practices. The cases examined demonstrate how territorial marketing is a key tool for implementing public and private procurement projects and how it can not only promote local economies and cultural heritage but also support sustainability principles through responsible practices and the active engagement of local communities.

7.1 Introduction

Territorial marketing policies are strategies developed by both public and private entities to promote a specific territory, aiming to attract investments, tourists, new residents, and economic activities (Grubor *et al.*, 2019). These policies aim to enhance local resources, improve the territory's image, and promote sustainable development (Matos Silva *et al.*, 2022), implemented through territorial marketing efforts. Literature offers various definitions of territorial marketing, one of which is proposed by Gollain (2017), who defines it as

[...] the collective effort to promote and adapt territories to competitive markets, in order to influence, in their favour, the behaviour of audiences targeted by a different and attractive offer whose perceived value is sustainably higher than that of competitors (Gollain, 2017, p. 244).

This concept relies on applying diverse marketing strategies to highlight a territory's unique characteristics and distinctive resources, positioning it effectively in a competitive market to attract investors. Unlike traditional marketing, which primarily focuses on products and services, territorial marketing aims to enhance a territory's attractiveness by showcasing its resources, culture, traditions, and local peculiarities (Rainisto, 2003). Territorial marketing is becoming increasingly crucial in a global context marked by intense competitive dynamics among territories. Globalization has reduced physical distances and intensified competition among different geographical areas, making it essential for each territory to distinguish itself and promote its unique features. Territorial marketing activities are carried out by various stakeholders including local administrations, non-governmental organizations, public and private organizations, collectives, and individuals. The coherence of activities and collaboration among all promoters and facilitators of marketing in a given area help achieve set objectives more effectively and efficiently (Soteriades, 2012). To effectively utilize territorial marketing knowledge and tools, it is essential to develop an appropriate action plan and coordinate marketing managers effectively. Defining the needs and objectives of

a specific area should be based on a detailed analysis of its strengths, weaknesses, potential, and public expectations (McDonald & Wilson, 2016). A well-developed and implemented marketing strategy can bring numerous benefits to an area, particularly by enhancing its competitiveness (Slater & Narver, 1996). Territorial marketing goes beyond promoting an area and includes a range of tools influencing the market, such as defining the characteristics of a territorial product, its proper distribution, effective communication with the target audience, and creating a positive image and identity linked to the territory (Braun, 2008). Among the tools used in territorial marketing is *territorial branding* or *place branding*, which involves creating brands for geographic places such as regions, cities, or communities with the typical goal of evoking positive associations and distinguishing the place from others (Foroudi *et al.*, 2016).

In the context of the PPP URB project, local territorial marketing expertise is crucial for several reasons:

- identifying local assets: experts in territorial marketing can identify and leverage unique local assets, such as traditional food products and cultural practices, to create distinctive and appealing offers;
- facilitating stakeholder collaboration: territorial marketing professionals can effectively coordinate between various stakeholders, including public institutions, private companies, and community groups, ensuring that efforts are aligned and objectives are met efficiently.

The integration of these elements in the case studies underscores the vital role that local territorial marketing expertise plays in the success of public and private procurement projects.

7.2 Territorial marketing applied to university canteens and restaurants

Focusing on territorial agri-food products, these are used in territorial branding strategies to create a distinctive and positive image of the territory. Local products are an integral part of the economic and cultural fabric of communities (Ramsay, 1996), carrying with them

history, tradition, and identity. The strength of territorial products lies in their origin, closely tied to the places where they are produced, and this territorial connection provides them with specific quality attributes that differentiate them in the global market (Russo *et al.*, 2021).

Over the years, emphasizing the geographical origin of agricultural and food products has become a well-established marketing strategy, offering an alternative to mass production (Watts *et al.*, 2017). This emphasis on geographical origin can be seen as a factor encouraging the purchase of food products (Figueiredo *et al.*, 2022). The importance of local products and the increasing demand from consumers have prompted the European Union to introduce regulations: Regulations EC 2081/92 and 2082/92, that protect food product names based on their origin: Protected Designations of Origin (PDO), Protected Geographical Indications (PGI), and Traditional Specialities Guaranteed (TSG) (Becker, 2009).

Specifically, PDO certification ensures that products are made in a specific geographical area using traditional methods, PGI certification indicates that at least one production, processing, or preparation phase takes place in a specific area, and TSG certification protects traditional production methods without geographical limitations. Promoting local products not only benefits the local economy but also contributes to biodiversity conservation, protection of cultural heritage, and socio-cultural development of communities (Marsden & Smith, 2005). In this context, the FAO report titled *Linking people, places and products* underscores the need to strengthen ties among local actors, places, and agricultural and food products. These relationships not only help solidify the identity of territorial products but also create value within a global market. It is crucial for farmers, processors, local consumers, public institutions, and non-governmental organizations to collaborate in preserving and promoting territorial products (Vandecastelaere *et al.*, 2009). Applying territorial marketing to university dining means promoting local products and culinary traditions from a specific geographical area within the menus offered (Boyne *et al.*, 2003). This approach not only enhances the quality and uniqueness of the meals served but also contributes to promoting the territory, supporting the local economy, and raising consumer awareness about the importance of local products. Below,

five case studies will be presented that adopt territorial marketing strategies to enhance local products and promote sustainability initiatives and community engagement.

Berkeley Dining implements a nutritional policy aimed at combating obesity and improving dietary habits within the campus community. This policy ensures the availability of wholesome foods and beverages across various campus locations, including retail dining points, markets, vending machines, sports concessions, and university-sponsored events. Particularly, Berkeley Dining commits to providing nutritious and sustainable food options, with a strong emphasis on ethical and eco-conscious practices. Through the Menus of Change principles, Berkeley Dining promotes transparency, freshness, and seasonality of ingredients, a plant-forward approach, and the use of whole foods.

The principle of transparency is manifested in informing customers about the product origin, farming practices, animal welfare, and environmental sustainability. Freshness and seasonality of products are ensured through the use of seasonal ingredients sourced from sustainable farms, while the plant-forward approach enriches the food offerings with plant-based options. Additionally, whole and minimally processed foods are preferred to ensure delicious and healthy meals. Sustainability commitment is also demonstrated through numerous initiatives such as waste reduction, use of reusable utensils, food donations, recycling of cooking oil, and sustainable packaging. Berkeley Dining promotes community engagement by creating common spaces in dining areas to encourage socialization and a sense of community among students. The organization actively seeks student feedback and makes changes based on their needs and preferences, ensuring continuous improvement of the culinary experience. Moreover, Berkeley Dining hosts special events and themed nights such as cultural food festivals and chef competitions to make the culinary experience more exciting.

Cornell Dining is recognized as one of the top university dining services, thanks to numerous initiatives promoting sustainability and reducing food waste. In 2022, it relaunched the Reusable Mug program and revitalized a consumer waste education initiative, both aimed at enhancing campus sustainability. In previous years, Cornell

Dining has shown strong commitment to the environment. In 2019, it adopted eco-friendly cleaning chemicals and reduced plastic waste, while in 2018, it introduced plant-based menu options. Studies on food waste were initiated as early as 2016, and in 2015, collaboration with Menus of Change led to further sustainable practices.

In 2014, partnerships were launched to recover and redistribute surplus food, significantly reducing waste.

The practice of composting food scraps dates back to 1998. Cornell Dining not only promotes composting within its kitchens but also encourages customers to compost their waste at various campus locations. Organic waste is collected by Farm Services and used for Cornell's industrial composting, which is then used for campus beautification and university experimental farms. Recycling is also a fundamental component of Cornell Dining's sustainability initiatives. In various campus restaurants, recycling of glass bottles, plastic, aluminum cans, and paper is encouraged. Where utensils are not recyclable or compostable, appropriate disposal containers are provided, with an encouragement to use reusable utensils. Cornell Dining has implemented other measures to conserve resources, such as trayless dining, which has proven to reduce waste, and support for the *Take Back the Tap* initiative, a student-led project aimed at reducing bottled water use. Cornell Dining provides access to purified tap water throughout the campus and sells reusable stainless-steel bottles, promoting the use of tap water that exceeds federal quality standards. Another important aspect is the connection with the local community. Through the *Local Food Growers* initiative, approximately 27% of the products used come from regional suppliers. Cornell Dining collaborates with over 25 regional growers to obtain a wide range of fresh and seasonal products, including dairy, meat, poultry, and bakery items. Cornell Dining's commitment to excellence is reflected in the numerous awards and recognitions received. In 2018, it received the Best Food Allergy Program award from AllerTrain, and the quality of its service has consistently been praised. The culinary team has achieved success in culinary competitions, such as a recent silver medal in a competition akin to the television show *Chopped*, demonstrating the high quality of cuisine offered.

The *Edible Campus* initiative at the University of St Andrews is a fascinating project aimed at creating a deeper connection with local food and promoting sustainability within the campus. The project's core idea is to bring people closer to the food they consume, while simultaneously reducing the city's carbon footprint. One of the main goals of Edible Campus is to rekindle people's skills and knowledge of locally produced food.

This involves not only theoretical learning but also practical aspects, through the implementation of numerous initiatives aimed at involving the community in consuming locally produced food, thus helping to reduce pollution from goods transportation. Edible Campus has transformed St Andrews into a hub of sustainable food production, managing a network of 14 community gardens and offering ample space to grow various plant varieties. These spaces are not just gardens but active hubs where various cultivation operations such as sowing, weeding, mulching, and harvesting take place. One of the most beautiful aspects of this project is its focus on community building. Daily gardening sessions are organized that not only assist in garden management but also provide opportunities for local residents to meet, socialize, and work together. This creates a strong sense of unity and shared purpose among participants. Edible Campus serves as an example for other universities looking to intertwine sustainability, education, and community involvement because it demonstrates how a university campus can effectively reduce its carbon footprint, enhance the educational experience, and strengthen community ties. It is a best practice model that other institutions can follow to promote community well-being and environmental sustainability.

Cirfood is one of the largest Italian companies in the commercial and collective catering sector, serving businesses, schools, and healthcare facilities. The company is working intensively to create a sustainable supply chain by centralizing purchasing volumes on distribution platforms, such as the Quanta Stock and Go platform, which ensures a short food supply chain, reducing the number of commercial intermediaries. Cirfood is a complex ecosystem involving various stakeholders linked to the territory and has a strong commitment to the circular economy. To further improve its processes, Cirfood has decided to apply artificial intelligence (AI) algorithms in meal planning

and raw material procurement. This decision was made to create virtuous practices that make business processes more efficient and sustainable. For the implementation of these systems, Cirfood has relied on Ammagamma, a data science company specialized in AI solutions for businesses. In the first year, the AI solution developed by Ammagamma for Cirfood has led to significant results: it has reduced food waste by 15% and decreased raw material storage by 111 tons. The collaboration between Cirfood and Ammagamma represents a significant innovation. The application of artificial intelligence has helped reduce food waste, ensuring that products move more quickly from producer to consumer. This prevents deterioration and minimizes the amount of food discarded due to prolonged shelf life.

Don Alfonso 1890 Boutique Hotel and Restaurant represents another virtuous example within the context of the *Zero Waste Hotel (ZWH)* project, thanks to its initiatives for waste reduction and promotion of sustainability. This hotel has adopted an innovative and responsible approach to waste management that goes beyond simply reducing the amount of waste produced. A key aspect of Don Alfonso 1890's contribution is the use of Km 0 products. The hotel is committed to using locally sourced products, thus reducing carbon emissions associated with long-distance transportation. These case studies are coherent with the principles of public and private procurement (*PPP-URB*) as they demonstrate successful collaboration between public institutions, private enterprises, and local communities. The integration of local products and sustainability initiatives in these case studies highlights the importance of territorial marketing expertise in the procurement process. The involvement of university administrations (public) and dining services (private) in implementing sustainable practices shows a strong alignment with PPP principles.

For instance, Berkeley and Cornell Dining's initiatives involve both university policies and private food suppliers. By sourcing products locally, as seen in the University of St. Andrews' Edible Campus and Cirfood's short supply chain, these case studies support local economies, creating a beneficial cycle of investment in local communities. The use of AI by Cirfood and the waste management practices at Don Alfonso 1890 illustrate how innovative solutions can be integrated into public and private procurement to achieve sustainability goals.

Initiatives such as the community gardens at St. Andrews and the social dining spaces at Berkeley Dining foster a sense of community and local engagement, which are critical aspects of successful territorial marketing and PPP projects.

7.3 Conclusions

Territorial marketing policies are fundamental for promoting the economic, social, and environmental development of a specific territory. Through targeted strategies, these policies succeed in enhancing local resources, improving the territory's image, and attracting new economic activities. The concept of territorial marketing goes beyond the simple promotion of products and services; it highlights the unique characteristics and distinctive resources of a territory, which is essential in a context of globalization and intensified competition among geographical areas. Territorial marketing initiatives applied to university dining services and restaurants involve the enhancement and integration of local agri-food products into menus, with the aim of creating a distinctive and positive image of the territory. Products with PDO and PGI certifications not only improve the quality of the services offered but also reinforce the identity and uniqueness of the territory. The enhancement of traditional local agri-food products is a complex activity, as it requires the collaboration of numerous different stakeholders, among whom it is necessary to reach a consensus on common values and goals. It is a process that goes beyond the mere commercialization of local products, allowing for the preservation and regeneration of local resources, while simultaneously bringing broader benefits to the development of the community and the surrounding territory.

The case studies examined are an example of how territorial marketing policies play a fundamental role in the realization of public and private procurement projects and highlight the importance of collaboration between public and private institutions. Cooperation among public administrations, private companies, and local communities is essential for successfully implementing territorial marketing strategies, as it ensures that efforts are aligned and objectives

are achieved efficiently. Each case study, despite having different peculiarities and initiatives, demonstrates that territorial marketing strategies enhance local products, promote sustainability initiatives, and engage the local community.

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8. Food procurement in mass catering services: the relevance of short supply chains in the public and private sector

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ABSTRACT

In recent years, mass catering companies have increasingly engaged local producers and promoted short food supply chains to incorporate socio-environmental considerations in their food procurement programs. This strategy aims to provide sustainable alternatives and limit the externalities generated by the industrialized food system. To better understand how these companies operate in fostering local food sourcing, this chapter examines two cases: Sercar Spa, a contracting-authority providing catering services to public schools in Bergamo through La Buona Mensa project, and cirFOOD, a cooperative specialized in mass catering services for a wide-range of institutions. Aiming to highlight the benefits and challenges of local food procurement in mass catering, findings show that the engagement of local suppliers and the purchasing of organic and certified foods are mainly influenced by compliance regulations in the public sphere, while markets demand play a key role in the private sector. Although the promotion of quality food and reduction of negative impacts emerge as positive aspects of

the programs, challenges such as limited production capacity of local farmers and communication issues also characterize them. The establishment of solid partnerships, use of digital management tools, and information exchanges can facilitate progress. Additionally local food policies and community engagement contribute to the adoption of sustainable procurement practices.

8.1 Introduction

Over the past decades the globalized industrial food system has provided greater availability and choice of food at lower prices year-round. However, these systems are also recognized as a major driver of negative externalities, including biodiversity loss, soil fertility reduction, food insecurity, malnutrition, and food waste generation (Krivašonoka & Silina, 2015; Holden *et al.*, 2018; Paciarotti *et al.*, 2022). In response, many consumers are increasingly turning to local food systems and short food supply chains as more sustainable and equitable alternatives. The local dimension of the food systems emphasizes reconnecting with local farmers, promoting organic and healthy foods, and supporting local businesses and communities (Duram & Cawley, 2012).

In this endeavour, companies are reshaping their supply chains by integrating social and environmental considerations in supplier management practices (Zimmer *et al.*, 2016; Paciarotti *et al.*, 2022). Engaging local suppliers through procurement programs promoting short food supply chains (SFSCs) is one effective strategy to address sustainability issues for food companies. While several food companies have successfully implemented such programs, further research is needed to understand their benefits and challenges for different actors in the supply chain.

To conceptualize food procurement involving local suppliers as a strategy towards sustainability in food systems, an analytical framework can be adopted. It includes the most relevant variables shaping these programs: actors involved; the effects of drivers and barriers; key phases, activities and tools of the process; and the-outcomes achieved (Figure 1). Actors involved in these processes can

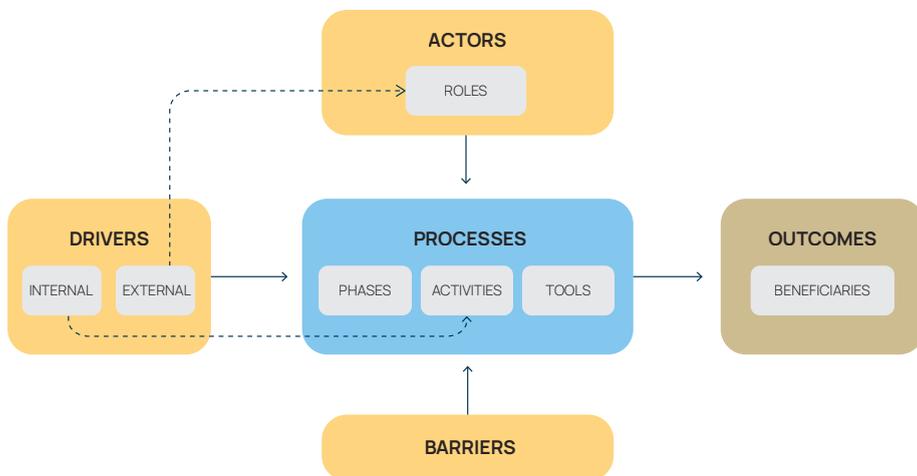


Figure 1. Conceptual scheme of the sustainable food procurement's analytical variables.

be classified into three main categories: supply side, intermediaries, and demand side.

On the supply side, the primary actors are food producers, primarily farmers and other food processors (e.g. fishermen, aquaculturists, cheesemakers). Producers and transformers are essential in providing the raw materials needed for the food supply chain. Despite SFSCs aiming to minimize middlemen, intermediaries are often present to foster the process (Berti & Mulligan, 2016). They typically include local food hubs, mainstream retailers as wholesalers and supermarkets, and non-conventional retailers such as e.g. farmers' cooperatives. These intermediaries play a crucial role in connecting producers with consumers and ensuring the smooth flow of goods. The demand side is primarily composed of food service organizations, such as restaurants, catering companies, and agritourism facilities that decide to procure food locally, and public institutions which are increasingly integrating local food products in their procurement programs (Raj *et al.*, 2022).

Barriers and drivers for local food procurement include several key aspects. Price is a major barrier, as locally produced foods are often more expensive due to small-scale production, regulatory constraints, and certification costs (Harrison *et al.*, 2019).

However, food service companies can target niche markets willing to pay a premium for high-quality, sustainably sourced food, where quality, often associated with better taste, outweighs cost concerns

(Török *et al.*, 2022). Logistics pose another challenge, with small, frequent orders and high transportation costs (Harrison *et al.*, 2019). Buyers often need to invest in delivery infrastructure and cold storage (Duram & Cawley, 2012). Seasonality and limited local suppliers make it difficult to ensure a consistent variety and quantity of products, especially for companies relying on pre-processed foods (Harrison *et al.*, 2019; Török *et al.*, 2022). Local food hubs can aid information flow and transparency, but the risk of relationship termination is significant, especially for farmers without a diversified customer base and for food hubs excluded from the supply chain (Harrison *et al.*, 2019). Nonetheless, food service companies opting for local procurement can attract clientele willing to pay a premium for locally sourced ingredients, offering an opportunity for differentiation in a competitive market through innovative cooking methods as well.

Regarding practices, food service companies can adopt two strategies to support SFSC: the relational approach and the metrics-based approach (Barlett, 2017). The former refers to building personal ties with local farmers and cooperatives, favoring direct deliveries, cooperative deliveries, and traditional distributors. Direct relationships between farmers and buyers facilitate knowledge exchange and create sales opportunities. Trust and effective communication between producers and buyers are crucial. Forming farmers' cooperatives or local food hubs can consolidate freight and reduce costs while maintaining quality. Expanding *local* to national boundaries can also help by using centralized distribution systems. Maintaining strategic intermediary roles is essential for the stability of the local food system. The relational approach also emphasizes seasonal products and value-added goods to expand regional economic activity. Seasonal availability can spur culinary creativity, and encouraging farmers to diversify crops can enhance supply. This strategy supports new ventures and guides growers through crop adaptation, potentially scaling up to regional impact by involving other businesses and organizations. It often includes social concerns about farmers' working conditions and may extend beyond local boundaries. The latter, instead, focuses on purchases that meet sustainability criteria verified by third-party certifications. It requires the buyer to adopt an effective tracking system for and advanced sus-

tainability metrics. Nowadays, those metrics focus on environmental concerns, with fewer certifications addressing labor justice issues.

A relevant aspect lies also in the outcomes achieved through local food procurement programs. They can foster farmers' development by increasing sales and cash flow, enabling land purchases and infrastructure improvements, and encouraging sustainable practices and organic certifications. Furthermore, also environmental sustainability improved through food procurement by increasing organic production, reducing CO₂ emissions through shorter transportation distances, and enhance crop diversification (Harrison *et al.*, 2019). Shorter distances can also reduce the need for packaging, processing, and refrigeration, with high-quality standards prompting organic and sustainable practices, leading to a lower carbon footprint. From a social perspective, these programs enhance transparency, especially in public sectors, and emphasize local collaboration and cooperation. They can improve farmers' skills and abilities through training, positively impacting human capital. Additionally, social inclusivity can be improved through job opportunities (Cervantes-Zapana *et al.*, 2020).

Adopting these variables (see Figure 1), this chapter investigates the local food procurement strategies of two mass catering companies to highlight the main similarities and differences between private and public domains. To exemplify this, we used two case studies from the *OnFoods* project: Bergamo's *La Buona Mensa* and CIRFOOD's food procurement strategy.

8.2 A hybrid local food procurement model: Bergamo's *La Buona Mensa*

In recent years, the municipality of Bergamo has demonstrated increasing sensitivity towards the strengthening of the sustainability of its food system, exemplified by signing the Milan Urban Food Policy Pact (MUFPP) in 2019. This commitment led to the establishment of the Food Policy Council (FPC) in 2020 aimed at promoting urban agriculture, tackling food waste, strengthening relationships between local farmers and city markets, and raising citizens' awareness on food-related issues. Further advancing these goals, the municipality

partnered with the Cariplo in 2021 to develop the Bergamo Food Policy emphasizing sustainability across food production to waste management (City of Bergamo, 2023).

In this context, among the various initiatives implemented, one of the most significant was the launch of a new food procurement tender for the period 2021-2025. It focuses on outsourcing and innovating the management of public canteens serving primary and secondary schools, kindergartens, and nursing homes. In this regard, the municipality decided to entrust food provision for schools to a private company, thus depicting a hybrid structure. This process was fostered by the municipality's involvement in the EU project *Food Trails*¹, which provided the required economic and knowledge resources and allowed to launch a pilot project called *La Buona Mensa* (The Good Canteen) (City of Bergamo, 2023). This pilot was developed to achieve a twofold objective. Firstly, it involves students, parents, and teachers in multiple activities aimed at raising awareness and educating on responsible food consumption. Secondly, it aims to innovate school canteen's menus with lower presence of animal-source foods while favouring local sourcing and short supply chains (Food Policy Bergamo, 2022). To achieve these objectives, in line with the National Procurement Code (L.D. 50/2016), National Guidelines for School Catering (Official Journal no. 134/2010) and the Criteria and requirements for organic school canteens (Interministerial Decree no. 1477/2017), the municipality set specific requirements to be met by the contracting authority² in order to obtain the Organic School Canteen certification:

- providing educational programs on healthy diets and quality local and plant-based food for sensitizing and informing pupils also through the engagement of teachers and students' families (art. 16);
- developing a monitoring system to measure the amount of food waste generated in providing the service, assessing the meals quality also by involving the users, and ensuring the redistribution of surplus food to the neediest (art. 17);
- promoting the purchase of organic food and Fair-Trade products through an incremental approach and in line with the Minimum Environmental Criteria (MEC) set at national level³

Note 1.
Cfr. <https://foodtrails.milanurbanfoodpolicy.pact.org>

Note 2.
Cfr. <https://www.comune.bergamo.it/node/359764>

Note 3.
Ministerial decree no. 90. (04/04/2020) *Minimum Environmental Criteria for the Canteen Service and Food Supply*. Available at: <https://www.gazzettaufficiale.it/eli/id/2020/04/04/20A01905/sg>

(art. 18); Fostering the adoption of food procurement models mostly relying on short food supply chains (art. 18).

Key actors involved in this hybrid food procurement model include the municipal European planning office managing the *Food Trails* project, and particularly the *Buona Mensa* pilot, municipal managers responsible for implementing the Bergamo Food Policy, and the mass catering company awarded the municipal service contract, Sercar Spa. Concerning the latter, bolstered by collaboration with the Bergamo bio-district, in the last two years it intensified ties with local organic suppliers, facilitated by a social cooperative consolidating products sourced from different suppliers and deliver them directly to the cooking center or school kitchens (Bio-Distretto dell'Agricoltura Sociale di Bergamo, 2022; IN.N.E.R. Association – International Network of Eco Regions, 2016).

Central to the procurement strategy is tailoring menus to local geography and production capacities, starting within the bio-district and expanding the search in other areas as needed. Potential suppliers undergo an on-site visit to verify the quality of raw materials, and orders are managed through a dedicated computerized system, ensuring efficiency across multiple suppliers if necessary.

However, several challenges persist in the procurement process, including small local producers' capacity limitations, often exacerbated by extreme weather events, and geographic constraints on certain products such as ocean fish and carrots.

Addressing these challenges involves strategic menu planning based on seasonal availability, sourcing supplies from multiple producers, and fostering communication with suppliers through collaborative initiatives.

Despite these efforts, user acceptance of healthier menus remains a challenge, countered by ongoing food educational initiatives and chef training supported by municipal and European partnerships.

Finally, concerning results achieved, in the initial two years of collective catering provision, Sercar Spa attained the following outcomes: serving a total of 59 local schools; conducting educational activities for 51 classes, including two meetings, a theater workshop, and a field visit; transitioning menus to significantly increase the proportion of plant-based meals in place of animal protein-based

dishes; and sourcing 50% of food locally and 95% organic products during the period 2022-2023.

8.3 Private procurement fostering local food sourcing: the case of CIRFOOD

CIRFOOD is an Italian cooperative company specialized in mass and commercial catering and employee welfare services for businesses. It operates across various sectors, providing catering services to schools, hospitals, nursing homes, and corporate clients through a network of 120 establishments nationwide.

The company acknowledges the pivotal role of sustainable practices in supply chain management, driven by findings from its carbon footprint analysis revealing significant greenhouse gas emissions originating from raw material purchases. In this regard, CIRFOOD has implemented food procurement strategies aimed at minimizing environmental impact, with a particular emphasis on sourcing practices involving local food producers. Procurement decisions rely primarily on client specifications, whether from public institutions subject to specific legislations or private clients. Compliance with MEC is mandatory in public tenders, shaping FOOD's definition and implementation of zero-kilometer and short supply chain strategies (CIRFOOD, 2023). However, besides regulatory compliance, CIRFOOD prioritizes sustainability, animal welfare, and the support of local businesses. Initiatives include sourcing 100% cage-free eggs, despite higher costs, and partnerships with organizations like Fileria Agricola Italiana and Federbio Servizi. The former promotes Italian agricultural producers, ensuring traceability and sustainability in the supply chain, while the latter supports organic sector businesses through growth and development initiatives. Moreover, CIRFOOD conducts risk assessments focusing on social aspects of the supply chain, verifying supplier compliance with fair working conditions.

Concerning actors involved, CIRFOOD's procurement activities are managed by the purchasing and logistics departments, with buyers spearheading supplier engagement. Procurement starts with the identification of new suppliers, driven by evolving contract

requirements, market competitiveness, or contingency planning for business continuity. Supplier qualification involves registration on a dedicated portal, where suppliers complete detailed questionnaires to determine eligibility. Successful qualification allows suppliers to join CIRFOOD's accredited roster and participate in procurement processes. Order management, handled separately, involves receiving kitchen orders and transmitting them to suppliers through an artificial intelligence-supported system. Logistics are managed through streamlined approaches, either via CIRFOOD's distribution platform for some materials or direct supplier delivery for others, balancing efficiency and sustainability goals.

Also in this case, challenges persist in procurement operations, particularly with local suppliers who may lack the infrastructure of larger counterparts. Small-scale producers pose also food safety concerns due to limited control processes, prompting CIRFOOD to tailor qualification procedures to accommodate these suppliers. Supply chain resilience is another issue, with local suppliers sometimes unable to respond to unexpected disruptions effectively. Logistical complexities arise from regional disparities in defining *local* products across CIRFOOD's expansive operational footprint. Customer preferences heavily influence menu planning and procurement decisions, where environmental considerations often compete with other factors.

Despite the above challenges, local sourcing enhances CIRFOOD's competitive edge in tender processes, aligning with environmental sustainability goals. However, quantifying environmental benefits remains challenging due to data gaps and logistical constraints inherent in assessing local suppliers' environmental impacts.

In commercial catering, CIRFOOD retains autonomy in procurement decisions, prioritizing environmental criteria despite varying degrees of local sourcing feasibility at provincial levels. We can argue that CIRFOOD emerges among the leader in promoting sustainable practices within the catering industry as it actively educates customers on sustainable choices while supporting small suppliers through collaborative supply chain initiatives. The company's commitment to shared value creation underscores its role in fostering long-term partnerships and customer satisfaction.

8.4 Conclusions

The study of local food procurement in mass catering highlights the complex interplay of drivers and outcomes in the transition towards more sustainable food systems. The necessity to comply with tender requirements and national regulations, coupled with local political initiatives, drives catering companies to develop various initiatives to engage local suppliers. This shift in the organization, public or private, is motivated by the complementary goals of supporting small agricultural businesses, enhance higher quality and seasonal products, and reducing environmental impact.

Key strategies such as promoting seasonal menus, encourage collaboration among multiple producers, and timely planning have proven effective, although several challenges remain. These include small producers' limited production and transportation capacity, communication issues, and even consumer's acceptance of certain variations in the menus. Despite these barriers, strong partnerships and two-way information exchanges have facilitated progress.

This research draws attention to the meaning and configuration of short food supply chains as potential alternatives towards more sustainable food systems. The mass catering service companies, at the demand side of the supply chain, demonstrate how buying local also implies to redesign their supply chain structure and get involved with producers, cooperatives, logistics providers to overcome the challenges regarding lack of capacity and limited communication. These examples evidence the need to keep a minimum number of intermediate steps in the supply chain, in the form of cooperatives or associations that can strengthen the system and ensure the minimum criteria established by norms or certifications.

This research underscores the importance of local food policies and community engagement in fostering sustainable procurement practices. It has been evidenced how, in the public and private sector, the change of policies is a crucial driver for actors in the food supply chain to adapt and develop initiatives not only enhance the resilience and sustainability of food systems but also contribute to social and economic development at the local level. By addressing these critical factors, mass catering companies can better align with consumer

demand for sustainable, locally sourced food, ultimately benefiting both producers and consumers.

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9. Cultivating sustainability: transforming food waste into circular economy solutions

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ABSTRACT

Food waste is a significant global problem with extensive social, economic, and environmental impacts. According to the United Nations Environment Programme, food waste includes both edible and inedible parts removed from the human food supply chain. Despite substantial global food production, billion people face hunger, while food waste incurs considerable environmental, economic, and societal costs. Reducing food loss and waste is crucial for sustainability. Circular economy principles offer a promising approach to address this issue, as highlighted by the EU's circular economy action plan, which aims to double circular material use and halve residual waste. The European Commission prioritizes prevention in its hierarchy of food surplus strategies, followed by recycling, recovery, and disposal. Adhering to this hierarchy helps stakeholders minimize waste and enhance resource efficiency. Implementing a circular economy framework and prevention strategies can significantly reduce food surplus while promoting sustainability. However, achieving these goals requires collabora-

tive action, innovative solutions, and systemic changes in consumption and production patterns. This chapter reviews scientific literature to examine the impacts of logistics in the agri-food supply chain and identifies best practices and strategies for sustainable development. Addressing food waste is not only a moral and environmental necessity but also an opportunity to develop circular economy solutions that mitigate negative impacts and foster a sustainable future.

Keywords: Agri-food supply chain, circular economy, sustainability, prevention, reuse, recycling, strategies, food waste.

9.1 Introduction

Food waste is a global issue with significant socio-economic and environmental impacts. The scale of food wastage has reached unprecedented levels, with 14% of the world's food lost after it is harvested and before it reaches the shops (FAO, 2019). Despite the substantial global food production capacity, over than 3,1 billion individuals face persistent challenges in accessing an adequate and healthy diet, and more than 690 million people experience chronic hunger (FAO, 2022). This situation not only represents missed opportunities to improve food security but also incurs an annual cost of 2,6 trillion USD for the environment, economy, and society (Gustavsson *et al.*, 2011; FAO, 2020).

Reducing food loss and food waste (stands as a fundamental imperative in the pursuit of sustainability (Zarbà *et al.*, 2021). Most of the global hunger occurs in low-income countries, while the largest share of food waste occurs in middle- and high-income countries. However, food insecurity and food waste can coexist within countries and regions (FAO, 2021). For instance, in developed regions such as Europe and North America, annual food waste accounts for 168 Mt, while a significant portion, up to 12% of the population, continues to confront challenges related to food insecurity (Caldeira *et al.*, 2019a).

As the world grapples with the challenges of sustainability and resource management, the concept of a circular economy presents a promising solution to the problem of food waste. A circular economy is a regenerative system designed to minimize resource input, waste,

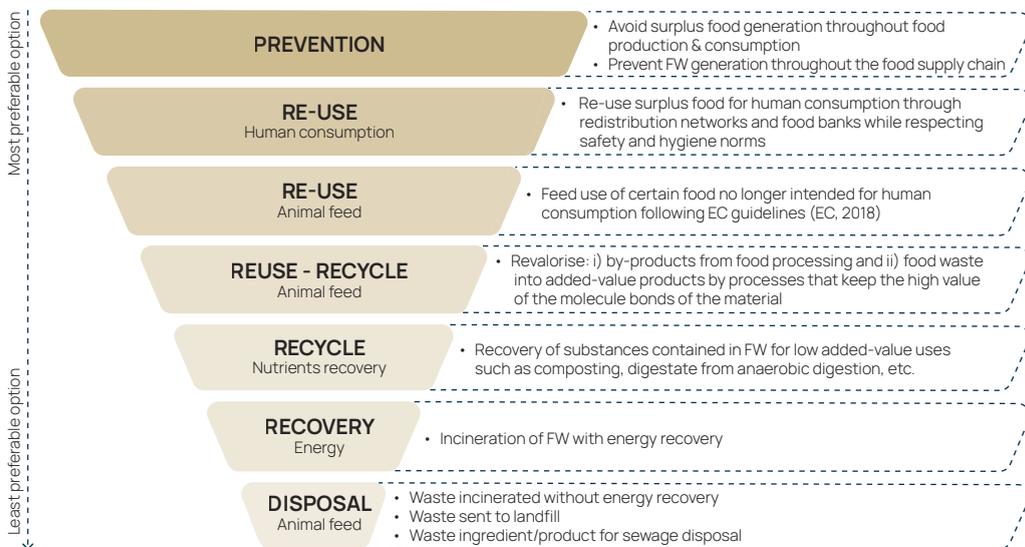


Figure 1.
Hierarchy for
prioritisation of food
surplus, by-products,
and food waste (FW)
prevention strategies.
 European Commission,
 2021.

emission, and energy leakage by slowing, closing, and narrowing material and energy loops.

The hierarchy pyramid (Figure 1) illustrates the preferred strategies for prioritizing food surplus, by-products, and food waste prevention (European Commission, 2021). At the top of the hierarchy is prevention, emphasizing actions aimed at minimizing or avoiding food waste generation through improved production, distribution, storage, and consumer behaviour. Next are recycling and recovery methods, including composting and anaerobic digestion, which help divert waste from landfills but are less preferable due to resource requirements. At the bottom is disposal, considered the least desirable option due to its environmental impact and failure to address the root causes of food waste.

By following this hierarchy, policymakers, businesses, and individuals can prioritize actions that have the greatest potential for reducing food waste and maximizing resource efficiency throughout the food supply chain. The European Commission and Eurostat have established a framework for monitoring progress toward achieving a circular economy using available statistical data. This framework primarily targets aspects of resource utilization and waste management within the circular economy. However, it currently does not encompass elements aimed at prolonging the value of products and materials,

such as designing for circularity, repair, and reuse. Implementing this framework will necessitate a significant overhaul of the production and consumption models. It will also require a fundamental shift in how to perceive resource utilization and disposal, along with the adoption of new consumer behaviours, such as opting for car sharing instead of individual vehicle purchases. Additionally, the EU has outlined several objectives in its circular economy action plan. Specifically, the plan aims to double the rate of circular material use and halve the EU's residual waste (European Environment Agency, 2023).

Recognising the urgency of this issue, several initiatives have emerged that aim to tackle food waste while promoting sustainable circular economy solutions. Developing appropriate initiatives to reduce food loss and waste formation is essential. Activating circular models for valorising food waste and managing irreducible waste sustainably requires a clear understanding of the existing amount of food waste. To achieve the goal of reducing food waste, a collaborative approach involving institutions, governments, private entities, and households is needed. Successful reduction efforts would yield numerous benefits, including economic savings, environmental protection, and social improvements by contributing to the fight against food insecurity. This chapter aims to review the scientific literature to examine the economic, environmental, and social impacts, highlighting best practices, strategies, and potential contributions to sustainable development.

9.2 Material and Methods

The literature review was performed based on a specific scientific literature-searching procedure. To carry out this study, the authors performed bibliographic research looking for articles that reflect the scope of the review. Once the research phase was completed, the authors carried out a selection based on some specific criteria correlated to the expertise area.

The thematic research area of the present chapter was identified in the distribution phase of the agri-food supply chain. The research was carried out by investigating the three hierarchy strategies (prevention or reduction, reuse, and recycling) identified by the

European Commission (European Commission, 2021) for food waste management considering the three pillars of sustainability, through the collection of articles by using the Google Scholar databases, searching the following combination of keywords:

1. for economic aspects:
 - distribution phase AND economic sustainability AND food waste reduction OR food waste prevention;
 - distribution phase AND economic sustainability AND food waste reuse;
 - distribution phase AND economic sustainability AND food waste recycling;
2. for environmental aspects:
 - distribution phase AND environmental sustainability AND food waste reduction OR food waste prevention;
 - distribution phase AND environmental sustainability AND food waste reuse;
 - distribution phase AND environmental sustainability AND food waste recycling;
3. for social aspects:
 - distribution phase AND social sustainability AND food waste reduction OR food waste prevention;
 - distribution phase AND social sustainability AND food waste reuse;
 - distribution phase AND social sustainability AND food waste recycling.

The literature review was conducted between April 2024 and June 2024. No limitations were placed on language, time, or publication status, and duplicate entries were not included in the final analysis.

9.2 Results and Discussion

Literature analysis

The literature has been arranged by the European Commission's waste policy, which focuses on prevention and reduction rather than disposal (prevention, reuse, and recycling), taking into account the three pillars of sustainability (economic, environmental, and social) (table 1).

Sustainability pillar	Economic	Environmental	Social
Prevention	Cristóbal <i>et al.</i> , 2018 Huang <i>et al.</i> , 2021 Annosi <i>et al.</i> , 2021	Bottani <i>et al.</i> , 2018 Leal Filho <i>et al.</i> , 2023 Read and Muth, 2021 Diaz-Ruiz <i>et al.</i> , 2019 Sagi and Gokarn, 2023 Chroni <i>et al.</i> , 2021 Loiseau <i>et al.</i> , 2020 Ottomano Palmisano <i>et al.</i> , 2021	Lombardi and Costantino, 2021 Sgroi <i>et al.</i> , 2024 Mazzucchelli <i>et al.</i> , 2021 Fassi and Meroni, 2023 Benge, 2017
Reuse	Goossens <i>et al.</i> , 2019 Bottani <i>et al.</i> , 2019 Colombo de Moraes <i>et al.</i> , 2020 Huang <i>et al.</i> , 2021 Cristóbal <i>et al.</i> , 2018	Bottani, et al., 2018 Aramyan <i>et al.</i> , 2017 Adedeji, 2022 Ekren and Kumar, 2022 Wani <i>et al.</i> , 2024	Hebrok and Boks, 2017 Secco <i>et al.</i> , 2024 Mura <i>et al.</i> , 2019
Recycle	Cristóbal <i>et al.</i> , 2018 Sarker <i>et al.</i> , 2022	Tuni and Rentizelas, 2022 Bottani <i>et al.</i> , 2019 Bottani <i>et al.</i> , 2019	Lombardi and Costantino, 2021

Table 1. Scientific bibliography collected and grouped according to the three pillars of sustainability and considering the management of food waste at the distribution stage.

To achieve effective sustainability in all three stages of the hierarchical pyramid – prevention, reuse, and recycling – it is essential to consider the three pillars of environmental, economic, and social sustainability in an interactive and entwined synergy (Annosi *et al.*, 2021; Huang *et al.*, 2021; Lombardi & Costantino, 2021; Ottomano Palmisano *et al.*, 2021). This integrated approach is supported by the scientific literature emphasizing the importance of the European Commission's hierarchical rules (Loiseau *et al.*, 2020; Huang *et al.*, 2021). However, some authors pointed out that the European Commission's framework highlights mostly the environmental focus. Although this pillar is represented as the fundamental basis. When considering other criteria, such as economics, other tools are needed to pursue the optimization of the circular process (Cristóbal *et al.*, 2018). Indeed, to achieve the most environmentally sustainable results, when programming a prevention program, the scarcity of economic resources has to be considered. Also, the economic perspective helps maximize the social benefits and mitigate the social impacts associated with food waste (Moraes *et al.*, 2020; Sgroi *et al.*, 2024). Moreover, the potential insights that might result from the present research intend to try to

be as general as possible to apply to a variety of cases that could also exceed the European Union context. Other Countries, not part of the European Economic Space, face the food management issue (Sarker *et al.*, 2022; Graham-Rowe *et al.*, 2014).

Figure 2.
Trends in scientific research on the management of food waste at the distribution stage concerning the three pillars of sustainability.

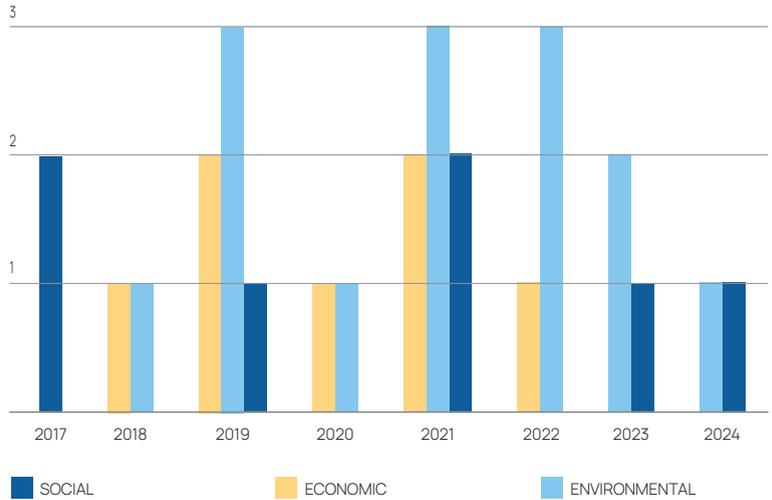


Figure 2 presents the evolution of the scientific landscape on food waste management. In particular, it shows that the scientific interest focused on the distribution stage perspective started recently, for environmental and economic, from 2018, only the social sustainability publication increased from 2017. The interest in this topic is remarkable and it shows an increase in the number of publications, in the period from 2017 to 2024, 7, 14, and 7, for the economic, environmental, and social pillars respectively.

Economic consideration and best practices identifications

The European Council (2024) highlighted that almost 59 million tonnes of food waste is generated in the EU annually, corresponding to about 131 kg per person. More than half of food wasted occurs in households (53%), while considerably fewer shares come from processing (20%), production (11%), restaurants and services (9%), and retail and distribution (7%). In economic terms, about 132 billion euros is lost every year because of food waste.

According to the Circular Economy (CE) Action Plan (European Commission, 2015), food waste prevention is a crucial topic within

the European political debate, so food waste is included among the *priority areas* that should be considered to strengthen the circularity of the European economy.

Best practices for reusing food waste have been described by several scientific papers. Perishable food and/or close to expiring at the retail stage can be redistributed by charitable organizations (Goossens *et al.*, 2019). The redistribution of unsold food still suitable for human consumption is certainly an ethically preferable option that involves the adoption of appropriate management systems that ensure food safety for the final recipients and the economic sustainability of the redistribution process. Specific channels dedicated to the *reverse* logistics of unsold food are still underdeveloped in Italy.

According to Bottani *et al.* (2019), the most challenging problems to be addressed to ensure the economic sustainability of redistribution are related to the efficient design of the routes of the vehicles collecting the food from retail outlets, and to the number and location of food distribution centres. To facilitate the adoption of efficient redistribution schemes, best practices such as collaboration with food donation NGOs are proposed to better define the location of stores and distribution centres and to know the quantities of food offered and demanded (Colombo de Moraes *et al.*, 2020).

Best practice in food reuse is also related to the possibility to reprocess food, by retailers that transform the surplus fruit nearing the end of its shelf life into juices, fruit cakes, or pies (Huang *et al.*, 2021). Food unsold by retailers can be resold by specialised discounts, as observed particularly in the U.K. and Denmark, or by retailers themselves through platform apps such as *Too Good To Go* (EU) and *Flashfood* (U.S. and Canada), which allow consumers to buy extra discounted food packaged by retailers at the end of the day. Another way of managing unsold food is to offer it free or at a reduced price to staff at the point of sale or to use it for meals in the staff canteen (Huang *et al.*, 2021).

According to Cristóbal *et al.* (2018), food waste can be reused for feeding animals after it is heat-treated and dehydrated and either mixed with dry feed or directly fed. Recycling strategies can maximize the value of food wasted contributing to achieving a circular economy model. Currently, there is no extensive scientific literature

suggesting best practices for recycling food waste generated at the distribution phase.

However, Cristóbal *et al.* (2018) and Huang *et al.* (2021) pointed out the following best practices: i) transport food waste to a centralized plant where it is converted into compost; ii) perform anaerobic digestion, a process in which microorganisms can break down food waste in the absence of oxygen resulting in two end-products: biogas and digestate. Also, Sarker *et al.* (2022) and Huang *et al.* (2022) highlighted that the development of innovative technologies can convert food waste into high-value items, such as bioactive compounds (e.g. pectin, polyphenols, and carotenoids) bioplastics, and biofuels (e.g. biodiesel, biogas, and electricity).

Environmental consideration and best practices identifications

To implement sustainable food systems that ensure food and nutrition security, it is crucial to make all components of agri-food systems sustainable, efficient, and resilient (Ottomano Palmisano *et al.*, 2021). This approach involves addressing both product supply and consumptive demand elements to achieve sustainable food consumption and production patterns. Reducing food losses and waste is a key strategy in this context, which can be addressed through various measures. Beretta *et al.* (2013) found that 48% of the total calories produced are lost across the whole food value chain, with half of these losses being avoidable given appropriate mitigation measures. This emphasizes the need for accurate data collection to monitor and target strategies to reduce food waste.

Tuni and Rentizelas (2022) applied an eco-intensity-based method to assess the environmental sustainability performance of a multi-tier food supply chain. They found that the method was able to support the improvement of the supply chain environmental performance and contribute to the wider green supply chain management field. This study demonstrates the potential of eco-intensity-based methods for assessing and improving environmental sustainability in agri-food supply chains (Tuni & Rentizelas, 2022).

According to Bottani *et al.* (2018), the best practices could search involve finding ways to reuse agri-food waste by upcycling it into valuable products and integrating circular bioeconomy prin-

principles. At the same time, there's a need to encourage changes in behaviour and improvements in food labelling practices to support these initiatives. Additionally, when looking closely at the environmental impacts of different situations, such as the duration of storage for perishable food waste, the urgency becomes apparent. For example, limiting storage to 5 days can increase environmental impact by 25% (average across different impact categories), a significant finding that needs attention (Bottani *et al.*, 2018). Exploring alternative paths, such as using perishable food waste as animal feed, is also important. It's something to be explored in future research, especially when considering longer storage times or different uses. Furthermore, the European Commission's push to reduce landfill sites in the EU adds another layer of importance (Bottani *et al.*, 2019).

Loiseau *et al.* (2020) suggest that logistics play a significant role in environmental impact and there's room for improvement. They emphasize the need to evaluate how short and local supply chains can enhance their environmental performance compared to traditional ones. The results indicate that optimization of logistics in short-supply chains could lead to better performance than conventional ones. Consumers also impact environmental sustainability through their food purchasing habits, especially in urban areas. The findings can be applied to fresh products like fruits and vegetables, but further research is needed to understand supply chain organization for different food categories.

Further to optimize food redistribution and maximize its positive impact, proposing the Life Cycle Assessment (LCA) study for the redistribution centre would be beneficial. This study would involve assessing the environmental impact of recovered fruit and vegetable products throughout their life cycle, including production, transportation, storage, and distribution processes. By quantifying environmental impacts and identifying areas for improvement, such as reducing emissions or optimizing transportation routes, the redistribution centre can enhance its sustainability practices and contribute to greater environmental benefits.

Social consideration and best practices identifications

Food waste reuse could be done at different points of the food chain:

- directly from the wholesale markets (e.g. Recup);
- from markets and supermarkets food overflow (e.g. Food Hub Milan);
- from the private and public catering system, such as *Avanzi popolo 2.0* (Lombardi & Costantino, 2021);
- from physical or digital Neighbours networks of local markets, e.g. *To Good To Go* (Mazzucchelli *et al.*, 2021; Sgroi *et al.*, 2024), *SOSpesa Nolo* (Fassi & Meroni, 2023);
- sharing among community-based fridges from local businesses and households food overflow (Benge, 2017).

People may not necessarily establish the connection between food waste and environmental issues (Graham-Rowe *et al.*, 2014).

Although it seems clear, from the theoretical point of view, what are the consequences of personal actions, this seems, in practice, to be not sufficient to change individual habits and customs (Hebrok & Boks, 2017). The significant proportion of domestic leftovers in Italy, 74% of the total food waste in the supply chain (Eurostat, 2021), highlights the lack of awareness among people in their homes regarding the impact of their actions. Further, the role of the individuals could affect the community they are in by bringing their concerns about the topic into their social circles, families, and jobs. It is crucial to enhance personal awareness towards these issues by starting an educational process in the young generations to enhance the sense of responsibility towards their relationship to food production, consumption, and its end of life, having the chance to establish a deep link between their dietary decisions, and the ecosystem they are a part of. Therefore, starting within the educational system (schools, universities) and intertwining with the related food system it is possible to implement these strategies:

- providing a didactic laboratory where students can physically engage with food waste;
- awareness related to the monitoring systems to measure the amount of food waste generated (e.g., Bergamo Food Policy, 2023; Secco *et al.*, 2024);
- reducing portion sizes to minimize food waste;

- training catering staff to improve food presentation (Ferreira *et al.*, 2014);
- training staff to prepare meals from scratch while paying attention to food waste and leftovers (EatingCity, 2014; Martinez, 2015);
- assessing the quality of meals by involving the users (e.g. Berkley_Dining);
- involving students in the meal preparation process (Romani *et al.*, 2018; Willet *et al.*, 2019);
- ensuring the redistribution of surplus food to those in need at short and medium distances (i.e. charity associations).

In this way, the weaknesses in the food system, that result in food waste within the supply chain, might be transformed into a chance to tackle inequalities, promote consciousness, and develop a sense of responsibility towards individuals and their everyday actions. Addressing food waste as a valuable resource creates a virtuous circular economy, may turn socio-economic dynamics, and promote a fairer and more empowered community, implementing economic growth and enhancing resilience (e.g. *SOSpesa Nolo, Avanzi Popolo 2.0*). Effective management of food overflow can assist vulnerable people while fostering a culture of social innovation that promotes awareness about food and its wastage (Mura *et al.*, 2019).

Food no longer edible for human consumption is useful for composting, following a circular economy approach that prioritizes efficient material and waste management to promote community co-operation and openness (e.g. *Coltivando*). The process also facilitates the construction of new services that reduce environmental negative impact, taking care of green areas and engaging communities (Slater *et al.*, 2010; Fassi *et al.*, 2012), helping to create a consistent network among people.

9.4 Conclusion

The interest in food waste management, particularly at the distribution stage, and from the perspective of the three pillars of sustainability, has gained significant attention in the scientific literature.

Despite being relatively new, this trend has shown consistent growth, suggesting that it will continue to increase in the coming years. The emphasis on sustainability in scientific studies is reassuring, as this issue has widespread impacts on many fundamental aspects of daily life (Hebrok & Boks, 2017). Additionally, empowering collaborative actions among stakeholders can lead to more sustainable approaches in social, economic, and environmental aspects. The European Commission principles constitute a driver framework for the best promising approach, recognizing the importance of the role of the involved parties and the need for concerted and uniform rules and standards within the European Union.

In this perspective, the analysis performed in the chapter demonstrated the power of collaboration between stakeholders, including non-profit organizations, local businesses, government bodies, and communities. These initiatives employ innovative strategies such as food redistribution, awareness campaigns, technological solutions, and circular economy principles to minimize waste, redistribute surplus food to those in need, and foster sustainable practices. From intercepting surplus food at wholesale markets to launching food-sharing platforms and implementing life cycle assessments to quantify environmental impacts, each case study showcases unique approaches to addressing food-related challenges while promoting social inclusion and environmental stewardship. Collectively, these initiatives highlight the importance of holistic, community-driven approaches to tackling complex issues surrounding food waste and insecurity.

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10. Case studies on private and public food procurement: a transversal analysis

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ABSTRACT

This chapter builds upon the previous one by offering additional reflections on the central theme of private and public food procurement, based on the comprehensive case study analysis conducted by the seven partner organizations.

The authors begin by providing an overview of the findings presented in the previous chapter, using this foundation to delve deeper into the topic. They discuss and highlight a series of conclusions, drawing out key insights that showcase the multidisciplinary approach of the research. The chapter emphasizes the importance of integrating various perspectives to fully understand the complexities of food procurement systems. By examining the economic, environmental, social, and local dimensions of the case studies, the authors identify overarching themes that cut across different areas of expertise. These themes not only enrich the discussion but also demonstrate how interconnected these aspects are in the context of sustainable food systems.

Although this is the initial phase of a three-year project, the

insights and results discussed in this chapter are significant. They establish a solid foundation for the future stages of the research, guiding the subsequent definition and exploration of the project's deliverables.

10.1 Introduction

This book delves into the *PPP-URB* project, which involves 7 university partners from different disciplines, aiming to find innovative solutions over three years, organized into three main deliverables: case study analysis, strategic approach, and in-field experimentation.

The project is within *OnFoods*, a collaboration between universities, research centers, and companies, uniting the work of 26 public and private organizations focused on scientific research and sustainable food system innovation. It falls under the National Recovery and Resilience Plan (PNRR) of the Italian Government, part of the Next Generation EU program, and is one of 14 partnerships selected under the Education and Research mission for sustainable nutrition models.

In this chapter the authors underscore that these early findings coming from the case study analysis are crucial for setting the direction and objectives for the remaining duration of the project. They pave the way for a deeper investigation into the best practices and innovative strategies in food procurement that can be adopted by both private and public sectors. Moreover, this chapter highlights the collaborative effort of the seven partners, whose diverse expertise and perspectives have been instrumental in shaping the research outcomes thus far. The synthesis of their work in this chapter reflects a concerted effort to address the multifaceted challenges of sustainable food procurement and to propose viable solutions that are informed by real-world case studies.

10.2 Chapters analysis

The chapter *Public and private food procurement and short food value chains in urban areas: A Case Study Analysis* by Davide Fassi

(Politecnico di Milano, Design Department) explores the *PPP-URB* project within the *OnFoods* PNRR research. It details the project's organization through a system design approach to incorporate various disciplines and perspectives. The focus is on small territorial units, like university campuses, to understand their role in local food systems. The first deliverable, case study analysis, is foundational for the subsequent deliverables on strategic approaches and in-field experimentation. After this framework chapter, the 7 partners deep dive into the case study analysis through the lenses of their area of expertise that let emerge 7 different sub-topics.

The first one is about *Alternative Food Networks (AFNs)*. In *Food as Relational Practices: Testing Alternative Food Networks (AFNs) in University Campuses*, Annalinda De Rosa (Polimi, Design Department) discusses how public and private sectors use food procurement programs to improve food standards and costs, achieving social and environmental sustainability. This chapter explores innovative and accessible distribution networks in university campuses, examining how AFNs can drive systemic urban transitions and enhance social bonds through spatial and service design.

The second one is about *AFNs and Local Economy*. In the *The Impact of Alternative Food Networks on Local Economy* chapter by Teresa Tugliani, Marianna Guareschi, and Filippo Arfini (UniPR) the Local Multiplier 3 (LM3) methodology within AFNs is evaluated. Originating from 1960s social movements, AFNs aim to foster social cohesion and sustainable food systems. This chapter highlights the LM3 tool's value in estimating AFNs' economic impact and informing policy and decision-making, supporting local economies and rural communities.

The third one is about *LCA and ecodesign*. In this chapter by Abhishek Dattu Narote, Valentina Giovenzana, Andrea Casson, and Riccardo Guidetti (UniMi) it is emphasized the importance of Life Cycle Assessment (LCA) and ecodesign in the food industry. The chapter discusses the environmental impacts of food logistics and supply chains, including sustainable innovations like reusable packaging and energy-efficient practices. Holistic LCA assessments are essential for integrating sustainability into product design and catering services.

The fourth one is related to *Social Innovation and Biodiversity*. In *The role of social innovation and biodiversity preservation in public and private food procurement in urban areas*, Annalisa De Boni, Giovanni Ottomano Palmisano, Rocco Roma, Adriano Didonna, Onofrio Davide Palmitessa, Massimiliano Renna, Pietro Santamaria, Irene Canfora, Vito Leccese, and Claudia Gesmundo analyze case studies from the Università degli Studi di Bari. The focus is on social agriculture projects that create training and job opportunities for disadvantaged people and initiatives to reduce food waste and preserve biodiversity.

The fifth one is *Social agriculture in prisons*. In the chapter *Beyond social agriculture: rehabilitation and sustainable practices in penitentiary contexts* by Donatella Privitera, Alessandro Scuderi, Irene Selvaggio, and Carla Zarbà (UniCT). It explores social agriculture's role in rehabilitating inmates. The research highlights vocational training, social reintegration, and the potential for individual and community growth through agricultural activities within prison settings.

The sixth one is *Territorial Marketing. Territorial marketing in university canteens to enhance local products: a review of case studies* by Giovanna Del Gaudio, Elena Lupolo, and Fabiana Sepe (UniNa) and it reviews territorial marketing strategies in university canteens. Case studies from institutions like Berkeley Dining and Cornell Dining illustrate how promoting local products supports sustainability, local economies, and cultural heritage.

The seventh one, *Food procurement in mass catering. Food procurement in mass catering services: the relevance of short supply chains in the public and private sector* by Stefano Quaglia, Verónica León-Bravo, and Camilla Borsani (Polimi DIG), examines local food sourcing in mass catering. The chapter highlights benefits and challenges, such as engaging local suppliers and ensuring compliance with regulations, using case studies from Sercar Spa and CIRFOOD.

The eighth one is *Food waste and circular economy. Cultivating sustainability: transforming food waste into circular economy solutions* by Valentina Giovenzana, Abhishek Dattu Narote, Andrea Casson, Riccardo Guidetti (UniMi), Irene Bassi (Polimi, Design Department), Giovanni Ottomano Palmisano, Annalisa De Boni (UniBA), Alessandro Scuderi, and Carla Zarbà (UniCT) addresses the global

challenge of food waste. It proposes circular economy principles and innovative solutions to reduce waste, enhance resource efficiency, and promote sustainable development.

10.3 Insights from the transversal reading

Each chapter offers a distinct perspective on sustainable food systems, addressing critical aspects such as economic impact, environmental sustainability, social innovation, and local food sourcing. This is achieved through an in-depth analysis of 36 case studies, with their quantitative and qualitative assessments thoroughly explored in Chapter 1. The subsequent chapters delve deeper into the findings from this quantitative analysis, uncovering insights that emerge as cross-disciplinary themes. These themes integrate various areas of expertise, fostering a comprehensive understanding of the primary research topic. This holistic approach aims to inform and advance the next steps in the development of sustainable food systems.

The fight against food waste

The fight against food waste presents a significant opportunity to create virtuous circular economy initiatives capable of limiting socio-economic and environmental impacts. Initiatives analyzed, such as *SOSpesa*, *Avanzi Popolo 2.0*, *Logistica Solidale*, *Cuore Generoso*, and *Foody – Food Waste*, illustrate how food waste is considered a resource to implement effective systems of redistribution, transformation, and logistic efficiency. These initiatives demonstrate the potential to not only reduce waste but also to create new value streams and support social welfare by providing food to those in need (Papargyropoulou *et al.*, 2014).

Enhancing the short food chain through the local food system

The capacity to shorten the food chain by transforming the local food system and ensuring increasing sustainability in all of its stages, from food production to food waste management, is crucial. For instance, initiatives like *REWE* and *Erba Brusca, Don*

Alfonso 1980, CIRFOOD, Parma Organic District, Milano Ristorazione, Bergamo Food Policy, Dussmann Service, CAMST Group, and Pellegrini emphasize the importance of logistic sustainability in catering services. Establishing direct connections between producers and consumers can streamline the distribution process, reduce costs, and facilitate better communication. By eliminating intermediaries, these initiatives effectively bridge the gap between food production and consumption, promoting a more direct and transparent exchange that benefits both producers and end-users. This approach not only enhances the efficiency of the supply chain but also strengthens local economies by supporting small-scale producers (Marsden *et al.*, 2000).

Public procurement as an educational tool

Public procurement plays a key role as a nutrition education tool for students, providing awareness about the importance of sustainable food and a balanced diet. It also emerges as a key strategy to foster the implementation of short food supply chains and alternative food networks. Examples include *Milano Ristorazione, Bergamo Food Policy, Copenhagen House of Food, and Avanzi Popolo 2.0*. These programs educate students about the origins of their food and the benefits of consuming locally sourced, seasonal produce, fostering a culture of sustainability from a young age (Morgan & Sonnino, 2008).

Legislation/policies leading to procurement sustainability criteria

European and national legislations and policies enacted in recent years have prompted public institutions and private companies to increasingly include sustainability criteria in their strategies for sourcing food and providing collective catering services. Examples such as *CAMST, Dussmann, Pellegrini, Milano Ristorazione, Bergamo – La Buona Mensa, Logistic Sustainability, and CIRFOOD* illustrate this trend. These policies encourage organizations to consider environmental impacts, social equity, and economic viability in their procurement practices, leading to more sustainable and responsible food systems (Morgan, 2008).

Multi-level governance improving sustainable practices

Private and public food procurement strategies show the relevance of adopting multi-level and multi-actor governance and policy approaches to include a wide range of actors operating in the agri-food system. These strategies facilitate the integration of sustainable practices, the promotion of locally produced food, the implementation of short food supply chains, and the provision of nutritious and balanced diets in collective catering services. Examples include *MercatoTiAmo*, *Biodistrict*, *Logistica Solidale*, *Milano Ristorazione*, *Bergamo*, *Foody*, and *Edible Campus in St. Andrews*. These approaches create synergies between various stakeholders, fostering collaboration and innovation in the agri-food sector (Sonnino, 2009).

Access to fresh food alongside processed food

The option to get fresh food alongside processed food promotes healthier dietary choices, allowing consumers to opt for unprocessed, whole foods that contribute to their overall well-being. Initiatives such as *REWE*, *Coltivando*, *Copenhagen House of Food*, *SOSpesa*, and *Berkeley Dining* have incorporated fresh produce into their offerings, enabling individuals to access a variety of nutrient-rich foods essential for maintaining a balanced diet and promoting good health. Prioritizing the availability of nutritious meals and making them accessible at reasonable prices or even free of cost is especially crucial in addressing food insecurity and ensuring that individuals have access to wholesome food options regardless of their financial status (Lang & Heasman, 2015).

Instantly visible place-based food chains

The traceability of the food chain is place-based and instantly visible. By establishing transparent and place-based supply chains, initiatives such as *REWE*, *Coltivando*, *Erba Brusca*, *Cornell Dining*, and *MercatoTiAmo* have instilled confidence in consumers regarding the origins and quality of their food. This transparency fosters a sense of trust and encourages conscious consumption, empowering individuals to make informed decisions about their dietary choices. It also helps in monitoring and improving food safety standards, thereby ensuring that consumers receive high-quality products (Pretty, 2001).

Transforming unconventional spaces into production places

Transforming unconventional spaces into vegetable and fruit production places is another innovative approach. Projects like *Coltivando*, *Edible Campus in St. Andrews*, and *Modica* involve local communities (university students and staff, citizens) in the process of defining the spaces and services and in maintenance, to get fresh produce at zero mile. These initiatives not only increase local food production but also enhance community engagement and social cohesion by involving residents in urban agriculture activities (Bell *et al.*, 2016).

Involving vulnerable people in the supply chain

The involvement of vulnerable people in the supply chain offers them training, job opportunities, psycho-physical well-being, positive self-perception, and improved quality of life. Initiatives such as *Semi di Vita*, *Altereco Cerignola*, *Libere Tenerezze Orto Umoristico Rigenerativo*, and *Orti e Arte* focus on including vulnerable categories of people in processes of rehabilitation, reintegration, knowledge transfer, and capacity building in urban and rural contexts by applying social agriculture principles and covering several steps of the supply chain. These programs help marginalized individuals gain valuable skills and re-enter the workforce, thereby enhancing their social and economic integration (Di Iacovo & O'Connor, 2009).

Cross-fertilization between universities and producers

The cross-fertilization between universities and producers fosters innovation in processes and species preservation, characterization, and valorization of local varieties, and market placement. Examples include *Ferrara s.r.l.*, *Ortofrutticola Egnathia*, *BioSolequo*, *Parma – Una Montagna di Qualità*, and *Parma Schools Canteens*. These initiatives connect academic knowledge and labs to virtuous producers and companies, creating multi-level innovation that covers the universities' expertise. These are opportunities for knowledge transfer, linking academia to the production sector, and fostering the development of new, sustainable agricultural practices and products (Renting *et al.*, 2003).

10.4 Conclusions

In conclusion, the project addresses key themes such as Alternative Food Networks (AFNs), economic impact through the Local Multiplier 3 (LM3) methodology, Life Cycle Assessment (LCA) and ecodesign, social innovation and biodiversity, social agriculture in prisons, territorial marketing, mass catering services, and food waste management through circular economy principles. Each chapter provides practical solutions for both public and private sectors, rooted in real-world applications and case studies. Public procurement emerges as a powerful tool for nutrition education and fostering sustainable food habits among students. Legislative and policy frameworks are crucial in embedding sustainability criteria into procurement practices. The project emphasizes community engagement and social welfare by involving local communities and vulnerable groups in food-related initiatives, which supports social cohesion and empowerment. Cross-fertilization between universities and local producers fosters innovation, preserves local varieties, and enhances market placement, bridging the gap between academic research and practical implementation. The project aligns with broader sustainability goals, aiming to reduce socio-economic and environmental impacts, support local economies, and ensure access to nutritious food. Through its interdisciplinary approach, the *PPP-URB* project offers comprehensive insights and practical solutions for developing sustainable food systems.

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Rocco Roma: Associate professor of Agriculture Economics at the Soil, Plant and Food Sciences Department of the Università degli Studi di Bari Aldo Moro. His studies focused on: i) the relationship between the agri-food production systems and the environment, studying the environmental profiles of innovative production techniques and the productive solutions that combine the profitability of the company and the protection of the environment; ii) the effects of sector policies, and governance system in general, on the development of primary productive sectors in rural areas, with particular reference to the fisheries

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Pietro Santamaria: Full professor in vegetable crops at Università degli Studi di Bari. He teaches: i) *Vegetable crops* for the Master Degree Course *Agricultural and Environmental Science*; ii) *Advanced vegetable crops* for Master Degree Course *Plant medicine*. Principal Investigator in many research projects (*Agrobiodiversity of vegetable crops, Soilless*, etc). Won two scientific awards: Bram Steiner Award 2016 on Soilless Culture for the article *A targeted management of the nutrient solution in a soilless tomato crop according to plant needs* (Signore, Serio & Santamaria, *Frontiers in Plant Science*) and Vegetable Publication Award 2014 for the article *Grafting Improves Tomato Salinity Tolerance through Sodium Partitioning within the Shoot* (Di Gioia, Signore, Serio & Santamaria, *HortScience*).

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Carla Zarbà: Researcher in Rural Economics and Estimates at the Agriculture, Food and Environment Department of the Università degli Studi di Catania on the project: *OnFoods - Research and innovation network on food and nutrition Sustainability, Safety and Security - Working ON Foods. Spoke 1: Global Sustainability*. Her research interests include international trade analysis, business sector analysis, consumer behaviour analysis, animal welfare, etc. She teaches Food Legislation within the Bachelor's Degree in Food Science and Technology and Agri-food Markets and Distribution Systems within the Bachelor's Degree in Management of firms for sustainable economy - 2nd Year Program. She is a member of the Italian Society of Agri-Food Economics and the Italian Society of Agricultural Economics.



Research and Innovation
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The PPP-URB project (Public and Private Procurement and Short Food Value Chains in Urban Areas) is a key initiative within the Onfoods PNRR research program, aimed at reimagining urban food systems. This volume showcases how the project, coordinated by the Design Department of the Politecnico di Milano, implemented a systemic design approach to integrate various disciplines and viewpoints, addressing the complexity of the topic. By analyzing case studies, the project investigates the role of food ecosystems in small territorial units, with a particular focus on university campuses, to understand their influence on local systems. The research's first deliverable concentrated on this analysis, establishing a foundation for future strategy development and practical experiments. Input from six Italian universities highlighted how interdisciplinary collaboration among project partners encouraged critical thinking about food systems in urban environments, opening the door to innovative models and strategies for tackling food challenges in future cities.