

## Article

# Multi-Actor Governance for a Circular Economy in the Agri-Food Sector: Bio-Districts

Stefano Poponi <sup>1</sup>, Gabriella Arcese <sup>2</sup>, Enrico Maria Mosconi <sup>1</sup>, Francesco Pacchera <sup>1,\*</sup>, Olimpia Martucci <sup>3</sup> and Grazia Chiara Elmo <sup>2</sup>

<sup>1</sup> Department of Economics, Engineering, Society and Business (DEIM), Tuscia University, I-01100 Viterbo, Italy; poponi@unitus.it (S.P.); enrico.mosconi@unitus.it (E.M.M.)

<sup>2</sup> Faculty of Economics, Niccolò Cusano University, I-00166 Rome, Italy; gabiella.arcese@unicusano.it (G.A.); graziachiara.elmo@unicusano.it (G.C.E.)

<sup>3</sup> Department of Business Studies, Roma Tre University, 77-00145 Rome, Italy; olimpia.martucci@uniroma3.it

\* Correspondence: francesco.pacchera@unitus.it

**Abstract:** The transition of the European agri-food sector towards a sustainable production and consumption model is a key element of the Green Deal. The new European “Farm to Fork” strategy aims to make the food system fair, healthy, and environmentally friendly. The consolidation and development of the organic model are two of the main objectives. In Italy, this development can be achieved through the Bio-District model. This model, which was born in the last ten years in Italy, is characterized by innovative multi-actor governance. From an explorative perspective, this study analyses the background literature on Bio-Districts and the context of the development of the Etruscan Roman Bio-District to understand the potential and the factors that allow the application of the principles of the Circular Economy. It focuses on multiple comparative analyses by using a qualitative–quantitative approach. The analysis of the context highlights the potential for expansion linked to an integrated short supply chain through three scenarios.

**Keywords:** Circular Economy; Bio-District; short supply chain; business model; agri-food; organic; BS 8001



**Citation:** Poponi, S.; Arcese, G.; Mosconi, E.M.; Pacchera, F.; Martucci, O.; Elmo, G.C. Multi-Actor Governance for a Circular Economy in the Agri-Food Sector: Bio-Districts. *Sustainability* **2021**, *13*, 4718. <https://doi.org/10.3390/su13094718>

Academic Editor: Luis Jesús Belmonte-Ureña

Received: 9 March 2021

Accepted: 19 April 2021

Published: 23 April 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

Districts are characteristic elements of the Italian productive model. They have been configured as a reality based on an aggregation of small and medium-sized enterprises that have specialized in determined productive activities. These aggregations are phenomena that are difficult to define or replicate from an economic perspective [1]. This has been an often-treated topic in the literature, where scholars have contributed to explaining the success factors, limits, and nature [2–8]. Productive specialization, division of labour, and exploitation of economies of scale are some of the factors that best qualify this development model [2,3]. The territorial agglomeration of small and medium-sized enterprises reflects the specialization of a chain organized in a reticular system, where vertical agglomerations of economies of scale are a function of the geographical proximity of enterprises [9]. The internationalization and global vision of the markets have de-spatialized economic activity and brought the role of the territorial dimension to the surface, which has returned to dealing with national cultures of territorial specificities and local variants [7,10]. Therefore, this view, according to many theorists, should gradually disappear. The economy that aspired to universalize localization has been reduced by the progressive affirmation of a conceptual framework of different theoretical inspirations, which is linked to the problems of the productive organization and is focused on the benefits and opportunities that can be created by a greater integration/interaction between the enterprises of the territory in which production takes place. The success of this approach can be expressed not only by the link between productivity and proximity, but by a combination of forces that help to explain the

concentration of productive activities, which originate from the rivalries of companies and competition of products on the market [11]. On the other hand, the scalability of the model is demonstrating how it is possible to replicate successful experiences in non-traditional sectors, such as the agri-food or agro-industrial sectors [12]. The agri-food chain is a production system that is defined territorially by nature [12], where, beyond the physical and spatial dimension, the agricultural territory has a nature made of relations [13], and is therefore not so far from industrial districts [14]. The use of districts in the agri-food sector is a fundamental point for overcoming international challenges, which have put at risk the production and the local dimension of the products [15]. Socioeconomic and environmental “crises” in cities can be mitigated by developing areas that are dedicated to traditional crops that contribute to biodiversity and local culture [16,17]. This can be achieved with agri-food districts. Their development has followed a threefold characterisation that passes through the definitions of a purely agricultural district, a processing district, and one linked to food development poles [18]. These areas welcome differentiation as added value, which is first obtainable from the characteristics of the territory (i.e., soil, climate, local traditions), second, through the presence of integrated supply chains that contribute to an improvement in the internal performance of companies, and, finally, from the pursuit of a development model based on productive specialization and the ability to integrate stakeholders with sustainable development goals. Alongside these forms, a new development framework is being established in Italy that uses the organic model in production and consumption: the Bio-District. For this paper, we consider the following definition of a Bio-District “a territory naturally devoted to organic, where farmers, citizens, public authorities, realize an agreement aimed at the sustainable management of local resources, based on the principles of organic farming and agroecology” [19]. This model can be encouraged by the new CAP and the European regulation on organic production (EU Reg. 848/2018) [20], where agriculture takes on a role of local development [21], and legislation facilitates organic certification for groups of companies (cons. 85 and Art. 36) [22]. For this model of management of organic farming, Italy is at the forefront, and the first Bio-District (Cilento) is taken as an example of the best practise for the sustainable development of this sector [23]. The agri-food sector is one of the main fields in which sustainable development is required [24–26] and where attention to the environment [27–30] and working conditions [31–35] have received more attention in recent times. The transition of the agri-food sector towards a more sustainable system can be achieved with certifications that assess the efficiency of the resources used [36]. The application of the Circular Economy and the 3Rs (reduce, reuse, recycle) in the agri-food sector is key to transforming society and making production systems and communities more circular [37–39]. The concept of the Circular Economy (CE) can be defined as an “economic system that replaces the concept of ‘end of life’ with the reduction, reuse, recycling and recovery of materials in the production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim of achieving sustainable development, simultaneously creating environmental quality, economic prosperity and social equity, for the benefit of current generations and future. It is empowered by new business models and responsible consumers” [40]. The agri-food sector suffers from various environmental impacts (e.g., waste, use of chemicals, soil degradation) due to its linear production model. The application of CE principles can ensure that these criticalities are overcome. A circular approach in this sector creates value through the recovery of resources, which can take place within a supply chain by closing the loop [41] or between different chains by sharing resources that can be complementary (e.g., livestock and agriculture) [42]. Following the logic of industrial symbiosis in the agri-food sector, animal/vegetal waste can be recovered and valorised to generate energy and new materials [43]. The switch to a more sustainable and innovative model is given by the “high valorisation of waste” [44], where agri-food by-products are used as secondary raw materials for the creation of high-value-added products in an open-loop system (e.g., cosmetics). For companies that want to adopt a

circular business model, the use of certifications, such as the BS 8001 guidelines [45] and the XP X30-901 standard [46], has been a reference point so far; now, the development of the new ISO standard for the Circular Economy (ISO/WD 59004) will become the new benchmark.

Given the relevance of the topic at the national and international levels, this work contributes to the actual scientific discussion focusing on the role that Bio-Districts assume in the Italian productive context and the sustainable development of the sector. In addition to clarifying the function of this governance model, this study aims to increase knowledge on the use of Circular Economy principles in agri-food districts, a field that needs more investigation.

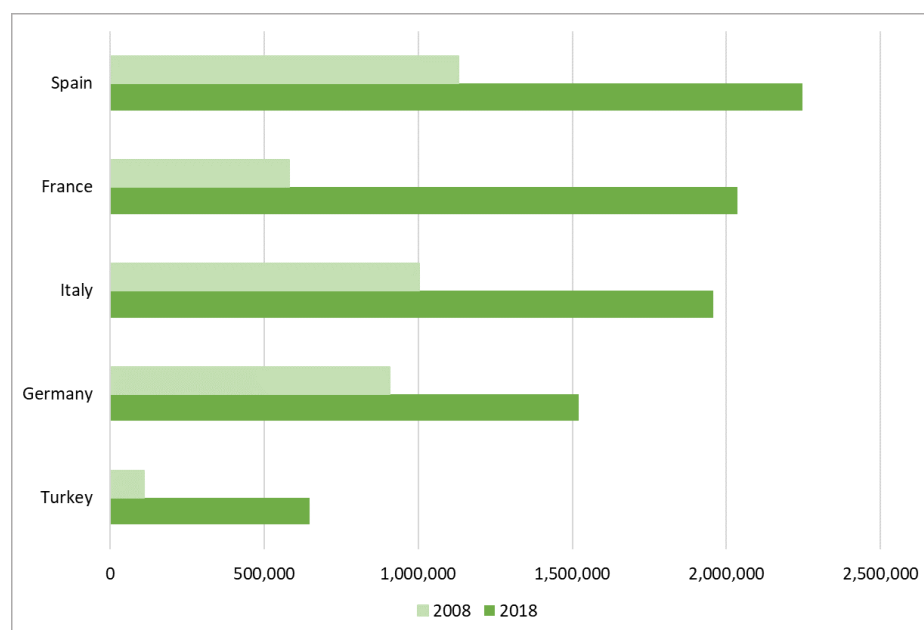
This research work considers a recent Italian Bio-District, the Etruscan Roman Bio-District, which is located in the territory of the Lazio Region, as a case study for analysis. The aim of the study is to create a reference model for the application of the principles of the Circular Economy in the Bio-District, taking the standard BS 8001:2017 as a reference. The objective of this study is to contribute to the literature on Bio-Districts and to highlight the nature and benefits that this model can bring to the agri-food sector. The work is organized as follows: The first section presents the reference context; the second section explains the materials and methods used for the analysis. In the next section, data and results are presented. Some final remarks conclude the paper.

## 2. Context

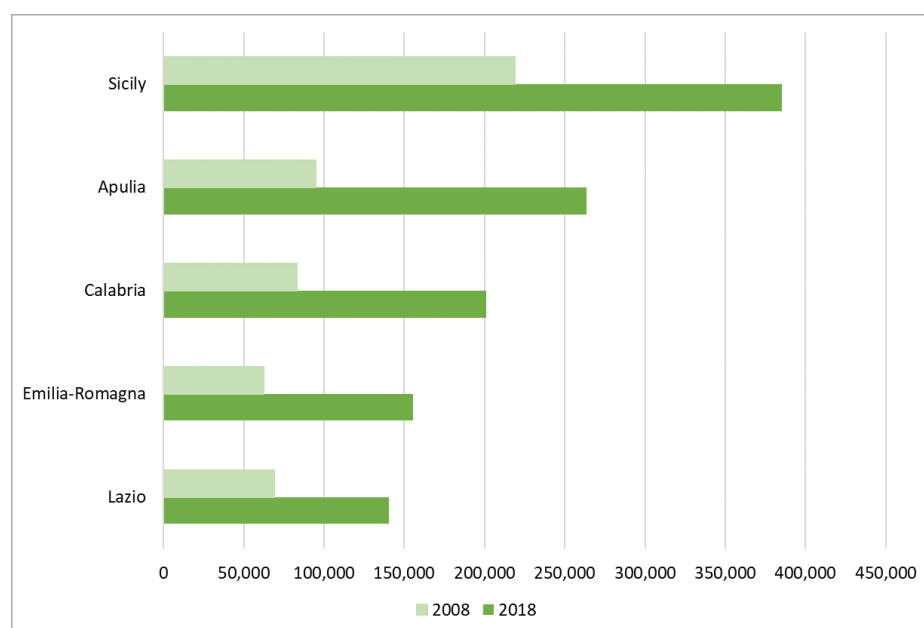
### 2.1. Organic Agriculture

The transition of the European agri-food sector towards a sustainable production and consumption model is a key element of the Green Deal [25]. Europe aims to do this through different models, such as precision agriculture, agro-ecology, agro-forestry, stricter animal welfare standards, and organic farming [25]. The new European “From Farm to Fork” strategy aims to make the food system fair, healthy, and environmentally friendly. The consolidation and development of the organic model are two of the main objectives (transforming 25% of agricultural land into areas for organic farming by 2030, reduction of pesticides by 50% and fertilizers by 20%) [47]. The reasons for this are linked to the benefits that organic farming can bring in terms of sustainable development (e.g., biodiversity, job creation, attracting young people, food safety, and health).

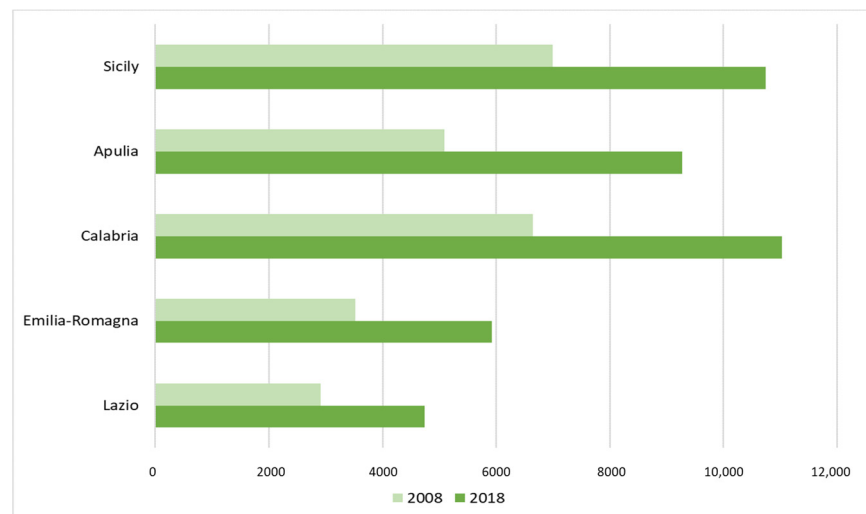
In the world, in recent decades, this production model has had a constant increase. From the latest available worldwide data (2018), the percentage of land dedicated to organic production is 1.5%, and there are 2.8 million operators dedicated to this practice [48]. In Europe, this number has risen to 3.1% for dedicated land and 418,000 organic operators. Although the numbers are still far from the set goals, the trend at both the European and global levels has always been growing, and the latest regulatory and policy developments (Green Deal, Farm to Fork) can be a lever for achieving these goals (incentives, limitations) in Europe. Italy is the third European country in terms of the extent of organic land (Figure 1), where 15.8% of the total productive land is organic, which is well above the European average (8%) [48]. The affirmation of this productive model in Italy can also be seen in the constant increase in organic operators; in the last ten years, there has been an increase of 69%. The Italian market is worth 3.3 billion euros (excluding the ho.re.ca., school canteens, and exports), and it is constantly growing (+4.4% compared to 2019) [49]. The Lazio Region is the fifth Italian Region in terms of the extent of biological territories, with more than 144,000 hectares for such practices and 5122 biological operators [49] (Figures 2 and 3). Agri-food is one of the areas of specialization on which the region intends to focus its development strategy (Smart Specialization Strategy—S3) [50]; organic farming and Bio-Districts can be a source of innovation and development in this sector.



**Figure 1.** Top five European countries for organic agricultural land (2008–2018) (hectares). Source: Author’s elaboration on [48,51].



**Figure 2.** Top five Italian regions (Nuts 2) for organic agricultural land (2008–2018) (hectares). Source: Author’s elaboration on [49,52].



**Figure 3.** Number of organic operators in the top five Italian regions (Nuts 2) for organic agricultural land (2008–2018). Source: Author’s elaboration on [49,52].

## 2.2. History of Bio-Districts in Italy

In Italy, Bio-Districts have found a fertile ground on which to grow. The reasons that have allowed such a development are linked to three factors: the significant presence of areas dedicated to organic farming and the size of enterprises (small and medium-sized), the spread of the use of the instrument of districts, and the national financial support for recognizing the development of a Bio-District [22].

The presence of a regulatory commitment aimed at recognizing Bio-Districts and supporting their development is another aspect that has encouraged the development of this instrument in Italy.

The attention towards this district “form” appeared for the first time in the draft of the a legislative decree for the reorganization of the biological sector [53]. It gained more prominence in 2007, where it was included in a draft law related to organic agriculture [54]. Here, a specific article was dedicated (Art. 7) to defining Bio-Districts and the objectives of their constitution. Their recognition was formalized with the law of 4 February 2009: “New provisions for the development and competitiveness of organic agricultural and agri-food production” [55].

After a few years of absence in the discussion on the subject, in 2014, the Bio-Districts returned as a key element in the development of organic farming and its competitiveness.

In the draft law “Provisions for the development and competitiveness of organic agricultural and agri-food production” (n.302), an article was dedicated to Bio-Districts (Art. 8), inserted into Title III: “Provisions on the organization of production and the market” [56].

At the national level, the most recent legislative version that attempted to legislate on Bio-Districts can be found in draft law no. 988: “Provisions for the development and competitiveness of agricultural, agri-food, and aquaculture production with organic methods” [57].

In the draft law, which identifies organic farming as an activity of national interest with social and environmental functions, there is a wide regulation on Bio-Districts (Art. 13). The dimension that it assumes is that of an innovative “territorial entity”.

Innovation is guaranteed by the presence of research institutions and universities and is aimed at “design and innovation for a circular economy”, “reduction of the use of plastic”, “promoting and implementing participatory research projects with companies, and the dissemination of innovative practices”. This highlights the close relationship between these new “territorial entities” and the worlds of research, innovation, and the management of the territory, which reflects the principles of a Circular Economy from the perspective of environmental and economic sustainability.

The constitution of the agricultural districts is due to economic choices in order to support the reorganization of local agricultural and agri-food production systems and promote the development of rural communities. The social aspect strongly affects this set-up, where historical and cultural identities become some of the distinctive features on which the process of valorisation is based, alongside the product and the brand [18]. Compared to the Bio-District, the agricultural district is traceable to the 1980s, when an academic and political interest in the subject was aroused, which pushed the subsequent regulatory evolution.

At the regulatory level, several phases distinguish the qualitative and legal evolution of these entities [18]. The first provisions concerned industrial districts; in 1996, the concept of a local production system was introduced, and public–private consortia for their management were created. The implementation of the Guideline Law in 2001 was intended to boost the development of rural areas and increase the competitiveness of agricultural enterprises (the instruments of the Rural District and the Food Quality District were defined). Regions were also included to recognize such districts on a normative level. The concept of the “production district” was introduced later in 2006 to emphasize the aggregative aspect, but at the same time, to support innovation and growth. In this torturous journey, the concept of the district changed from the qualitative point of view, taking on the role of supporting the quality of products and territories thanks to the establishment of the first Bio-District. Finally, 2017 saw the introduction of a further declination of the district through the presentation of Food Districts by the Ministry of Agricultural Food and Forestry Policies. This new tool, which, in part, includes the characteristics of the districts recalled above, identified: quality rural and agri-food districts (already recognized or to be recognized), districts located in urban or peri-urban areas with a significant presence of agricultural activities (aimed at the environmental and social regeneration of the areas), districts characterized by the integration of agricultural and neighbourhood activities, and Bio-Districts.

In this new and district idea, two key concepts emerged.

The first was the ability to take action on a national basis with stimulus tools, such as a district contract, “to foster processes of the reorganization of relations between the different subjects of the operating chains in the territory of the district” [58]. The second was the ability to overcome the paradigm of the linear economy and converge towards the more virtuous approach of the Circular Economy by defining a specific tool to make the territories priority areas for the transfer of innovation in regional contexts. The Bio-District is an innovative model that can be used as an effective tool to improve some aspects of economic and environmental sustainability. Their establishment is an opportunity for the development and growth of local economies through better environmental protection, biodiversity conservation, and multi-level exploitation that integrates agriculture with all sectors of the local economy [21]. Finally, the biological district can be a model of eco-innovation that is able to efficiently manage the natural resources that are essential for the agricultural production [59]. Since 2009, the year of the constitution of the first Italian Bio-District in the Campania Region, there have been many initiatives thanks to the support of associations or foundations that have promoted the constitution of districts.

Some of these districts have been recognized by regional law, while others were created by aggregation forms aimed at promoting organic and sustainable agriculture (not legally recognized at this stage).

The framework that has been delineated has turned out to be extremely heterogeneous in terms of the overlap of the various district types (quality agri-food district, rural district, rural productive district, quality agri-food or agricultural productive district, supply chain district, agro-industrial productive district, agro-industrial district), including Bio-Districts (legal recognition or voluntary aggregation). This comes from the difficulties in automatically identifying a Bio-District and associating it with a precise district typology. Table 1 highlights the general legislative measures for rural districts and quality agri-food districts, referring specifically to those involved in the recognition of a Bio-District. To date,



the only regional law on Bio-Districts that regulates the matter in a specific manner is that of the Lazio Region, L.R. of 12 July 2019, n. 11, which was born from the proposal of law n. 56: “Provisions for the discipline and promotion of Bio-Districts” [60]. Before that date, within the region, the recognition was a function of L.R. 30 June 1998, n. 21: “Standards for organic farming”. The other Italian regions intervened by decree for recognition, while the Tuscany Region started the process of defining the “Discipline of Bio-Districts” with draft law 350 of 12 March 2019.

**Table 1.** Italian regional measures on agricultural districts and special measures on Bio-Districts.

Region (Nuts 2)	General Legislative Measure	Specific Legislation on Bio-Districts
Piedmont	L.R. n. 26/03 Establishment of quality rural and agri-food districts L.R. n. 29/08 Identification, establishment, and regulation of quality rural and agri-food districts	
Sardinia	L.R. n. 16 of 7/08/2014 Agricultural and rural development standards: agro-biodiversity, collective label, districts Chapter III—Establishment, identification, and regulation of rural districts, quality agri-food districts, bio-districts, and quality fisheries and aquaculture districts (Art. 25–36)	
Veneto	L.R. n. 40/03 New rules for interventions in agriculture Title III—Rural districts and quality agri-food districts	
Lombardy	L.R. n. 1/2007 Competitiveness instruments for enterprises and the territory of Lombardy (Art. 4: Region Lombardy favours free-aggregation enterprises (including agri-food) in districts (thematic–sectoral links/territorial))	
Liguria	L.R. n. 66/2009 Regulation of development assistance and the protection, qualification, and enhancement of Ligurian organic production (Art. 8. Organic districts and districts)	DGR N. 379 of 05/04/2013 Identification and recognition of the biological district called “Biodistretto Val di Vara Valle del Biologico” pursuant to Art. 8 of L.R. n. 66/2009
Tuscany	L.R. n. 21/04 Discipline of rural districts	Draft law 350 12/03/2019 “Discipline of Bio-Districts”
Lazio	L.R. n. 1/06 Establishment of quality rural and agri-food districts	L.R. 30 June 1998, n. 21, modified by L.R. 14 August 2017, n. 9 Bio-District Constitution: - “Comino Valley Bio-District” - “Etruscan Roman Bio-district” (BURL 10 October 2019) L.R. 11 of 12 July 2019 “Provisions for the regulation and promotion of Bio-Districts”
Marche	L.R. n. 11 of 02/05/2012: Regulations of Rural Districts and Food Districts	
Abruzzo	L.R. n. 18/05 Establishment of rural districts L.R. n. 5/2011 Promotion and recognition of quality agri-food districts (DAQ) L.R. 9 June 2015, n. 14 New regulation for the establishment of the rural districts of the Abruzzo Region and amendment to the Regional Law no. 25 of 3 March 1988 (Norms in the field of civic uses and land management—Exercise of administrative functions)	

Table 1. Cont.

Region (Nuts 2)	General Legislative Measure	Specific Legislation on Bio-Districts
Calabria	L.R. n. 21 of 22/04 Establishment of quality rural and agri-food districts L.R. n.6/2009 Amendments and additions to L.R. No. 21/04	
Campania	L.R. n. 20 8/8/2014 Recognition and establishment of rural districts, quality agri-food districts, and supply chain districts	DGR n. 1491 of 25/09/2009 Approval of the Memorandum of Understanding for “The implementation of the Bio-District of the National Park of Cilento and Vallo di Diano”
Basilicata	L.R. n. 1/01 Recognition and establishment of industrial districts and local production systems DGR N. 1931/03 Rural districts and quality agri-food - Procedures for their identification	
Sicily	L.R. n. 20/05 Measures for the competitiveness of the production system	

Source: Authors' elaboration based on the integration of [61].

### 2.3. Background Literature

The innovative and little-diffused nature of Bio-Districts is reflected in a fragmented literature, in which authors with various contributions have tried to characterize and promote this new instrument [15,18,21,22,55,59,61–69]. Their contributions focused on different contexts, as shown in Table 2.

**Table 2.** Contexts analysed in the Bio-District literature.

Context	Authors
Regulation	[15,18,62]
Classification	[22,55,63,70]
Business model	[59,64,67,68]
Case study	[23,65,66,69]
Census	[21,61]

Source: Authors' elaboration.

A significant contribution was made in the regulatory field, where there are still no common frameworks at the national level [18] or common parameters for identifying a Bio-District [61]. Several studies had a systemic view of the topic [15,18,62]; they aimed to map the realities of present districts and the regulations adopted. Evidence from these studies shows that the national framework is very heterogeneous at the moment; the recognized agri-food districts are linked to seven formal types (quality agri-food district, rural district, rural production district, quality agro-food production district, supply chain district, rural and quality agro-food district, and agro-industrial district) [15,62]. This also demonstrates, however, the interest in creating district forms in the agri-food sector in Italy, where the use of forms such as the Bio-District can meet the European directives for sustainable development (e.g., resource management, social inclusion, partnerships) [18].

The interest in such a district model is evidenced by the ever more present involvement of institutions that are engaged in the development of the norms and the tracing of the cases in Italy, as well as analysing the potential impacts in terms of the competitiveness and local development that this model may have [21,61]. The Italian commitment to the dissemination of this model can be noted in the different studies of the first Bio-District (Cilento), which was used as a case study at the national and international levels to promote the model and disseminate best practices [23,65,66,69].



The heterogeneity and difficulty in the identification of Bio-Districts have resulted in various studies that have attempted to fill this gap [22,55,63,70]. At the national level, in Italy, the “BIOREG” and “BIODISTRICT” projects were developed by the commission of the Italian Ministry of Agricultural Food and Forestry Policies (MIPAAF) to identify a methodology that is capable of classifying potential territories on which to establish a Bio-District [55,63,70]. These, however, focused mostly on environmental indicators, and did not consider crucial aspects according to other authors [22]. They did not consider the critical aspect of the multidimensionality that a Bio-District has, and therefore ignored the necessary conditions that could best be used to express its potential. The “positive externalities” that a Bio-District generates are not only related to the improvement of the environmental conditions of the territory, but also to the ability to create a culture of sustainability in society and bring the development of sustainable and responsible tourism [22]. To fill this gap, the authors developed a composite indicator—the “Ecoregional Vocation Index”—that is able to assess the vocation of the territory by considering not only the environmental context, but also the economic and social contexts.

The Bio-District is considered as a business model that is possibly able to promote the sustainable development of a territory and a biological production model. In the literature, however, it has emerged that the use of this form is still under development, and the advantages that it might have are still limited by the behaviour of the companies that are part of it [67]. This means that some advantages, such as environmental (e.g., sustainable practices) and social (e.g., enhancement of the place and culture) advantages, are positively received, while others—i.e., the economic one—are not fully developed given the poor sharing of resources and knowledge.

This shows that the governance of this entity is the fundamental element of its proper functioning.

Governance, which is considered a success factor, can make a Bio-District a tool for achieving territorial benefits [68]. This type of governance, however, which is characterized by a multi-actor model (public and private sector), guarantees territorial innovation only if there is an actor with strong leadership that moves the narrative towards common principles and plays the role of facilitator [64].

Therefore, this new model of governance, which is difficult to apply, assures that the advantages of Bio-Districts are brought to the territory under an economic (development of a local economy), environmental (responsible management of the resources), and social profile (prosperous community) [59].

### 3. Methodology

From an explorative perspective, this study analyses the background literature on Bio-Districts and the developmental context of the Etruscan Roman Bio-District in order to understand the potential and the factors that allow the application of the principles of the Circular Economy (CE).

It focuses on multiple comparative analyses by using a qualitative–quantitative approach based on the study protocol of a descriptive case study by Yin [71] and supported by semi-structured interviews [72].

The multiple analyses are based on a selected sample of the main players in the Etruscan Roman Bio-District. Each company was analysed, taking the critical success factors defined by the standard BS 8001:2017 as a reference. The aim is to reconstruct the organic production of the companies in order to highlight the potential and define a model for the development of the Circular Economy.

#### 3.1. Data Source

The Bio-District analysed here was formed by six companies that are engaged in organic production. The data were collected through interviews and allowed the identification of the production and activities of individual companies along the value chain.

The activities carried out by the companies are heterogeneous (cultivation, livestock, transformation, direct sale of products, catering, reception services).

The companies cover an area of about one thousand hectares (ha) and have an average annual turnover of 4.5 million euros with about 70 employees. The companies are in the Lazio Region, in the Cerveteri and Fiumicino Municipalities, in the protected areas of the State Nature Reserve of the Roman Coast, and in the areas of the Regional Landscape Territorial Plan (Figure 4).



**Figure 4.** Localization of the study area. Source: Authors' elaboration with SW QGIS.

Considering the three factors that enabled the development and creation of this governance model in Italy [22], it is possible to find these characteristics in the Bio-District analysed here.

The first factor concerns the presence of territories dedicated to organic farming and the size of the companies involved (SMEs). As seen in Figure 2, the Lazio Region is one of the Italian regions with the largest extents of land dedicated to organic farming. Concerning the size of the companies, it is possible to affirm that they are small enterprises. Their classification was taken from COM 2003/361/CE [73], which was implemented at the national level by the Ministerial Decree of 18 April 2005 [74]. According to this classification, enterprises with less than 50 employees are to be considered small enterprises. In spite of their large territorial extension, none of these companies have more than 50 employees, and therefore, they fall into this category of enterprises. With regard to the spread of districts, as mentioned above, this is a national feature, but at regional level, there are also several (eight) districts in the agri-food sector [75]. Concerning the support for the development of Bio-Districts at a regulatory level, as reported in Section 2.2, the Lazio Region is the only one to date to have a specific law on Bio-Districts. This has allowed the quick development and recognition of the Etruscan Roman Bio-District.

The analysis of the cases has the aim of identifying the potential of the Bio-District compared to the activities put in place, the potential circularity, and the possible links between the different actors expressed in terms of symbiosis.

These factors and their relationships will provide data for the construction of a first reference model in order to configure and describe the most relevant aspects of the considered context, in which conceptual and theoretical factors are linked to empirical aspects. In terms of the methodological procedure, the production process of each of the companies considered was reconstructed by identifying the production, extension, stakeholders, raw materials, waste, energy consumption, and water resources. In the end, the actual and potential means that can be applied within the district were studied by identifying the main factors that influence the potential for activation–attraction of industrial symbiosis. A brief description of the companies is given below (Table 3).

**Table 3.** Description of the companies of the Etruscan Roman Bio-District.

Company	Description
1	The farm operates in the wine sector and the field of quality catering. It produces cereals and vegetables. It has an area of 150 hectares and has about 20 employees (seasonal and permanent). It produces 400 tons of grapes annually. The marketed products are organic white and red wines. Its main customers are private consumers. The type of sale is direct and is carried out at the point of sale present in the structure, through online channels, and at the restaurant of the property.
2	The farm has a long tradition in the livestock sector and the sale of organic products. It operates using its brand, giving rise to an integrated short-chain project since 2005. It is directly involved in the production, processing, and sale of dairy products and meat. There is a dairy and a laboratory for the packaging of organic meat. Direct sales are made by mobile vans or through home delivery (with online booking options). They cater to local purchasing groups, critical consumers, organic markets.
3	The area is about 30 hectares, and is divided into two different nerve points. The former is strategic in terms of preparation for sale. Cold greenhouses are also used on this site. The second site, which is larger, is concentrated on the substantial part of the entire organic production. The marketed products are the traditional horticultural of the territory, with attention to those that do not find a place within the supermarkets.
4	The farm operates in the field of organic farming and covers an area of more than 300 hectares, of which approximately 250 are cultivated. The products are mostly cereals (barley, field bean, forage). The annual production is around 1500 tons, and the main customers are private (breeders) and feed factories.
5	The farm produces cereals and vegetables, and houses a small pig farm. It is integrated with the catering and hospitality sector, and is equipped with reception rooms and agritourism with about 47 rooms. The total area is about 110 hectares, of which 30 are reserved for a forest environment.
6	The farm covers an area of about 180 hectares and produces meat, milk, cereals, fodder, and olive trees. It specializes in organic farming, beef cattle, sheep, pigs, and poultry. It deals with residual horticulture and oil production. It is equipped with a small internal oil mill, and uses direct sale of the organic meat produced and other products, such as eggs, agricultural craft beer, and jams. In addition, it uses a farm for the organization of banquets and ceremonies.

Source: Authors' elaboration on interviews.

### 3.2. Data Collection

The data were collected by conducting semi-structured interviews [72] with a qualitative approach. The study focused on the Roman Etruscan Bio-District, and specifically on the promoter companies.

Six direct interviews were carried out with the owners of the companies; in Table 4, it is possible to identify their profiles. The data were collected from May to June 2019. We conducted face-to-face interviews within the workplace, and the data that emerged were processed iteratively by the authors.

Each of the interviews lasted between 30 and 60 min and was conducted by one of the authors, using issues shared with the workgroup as a baseline. The interviews were recorded with the consent of the interviewees, and the audio was subsequently transcribed.

The interviews focused on different aspects concerning the type of company, the economic activities carried out, the territorial extension of the companies, the annual production, the consumption of resources (energy, water), the type and quantity of waste produced, the stakeholders, the idea of Circular Economy, and the involvement of certifications.

Table 4. Profile of interviewees.

Company	Gender	Type of Relationship	Role in the Company	Type of Company (Legal Form)	Activity (Agriculture/Livestock/ Agritourism)
1	Male	Owner	Management	Ordinary partnership	Agriculture/ Agritourism
2	Male	Owner	Production and management	Ordinary partnership	Livestock
3	Male	Owner	Production and management	Cooperative	Agriculture
4	Male	Owner	Production and management	Individual company	Agriculture
5	Male	Owner	Production and management	Limited partnership company	Agriculture/Livestock/ Agritourism
6	Male	Owner	Production and management	Ordinary partnership	Agriculture/Livestock/ Agritourism

Source: Authors' elaboration.

#### 4. Discussion

The data from the interviews allowed us to reconstruct the value chain of the companies of the Etruscan Roman Bio-District. For each company, data on the annual production, energy and water consumption, and type and quantity of waste produced were collected.

The context that emerged from the data was heterogeneous, but, at the same time, extremely significant and suitable for representing a favourable situation for the development of the Bio-District toward a circular form.

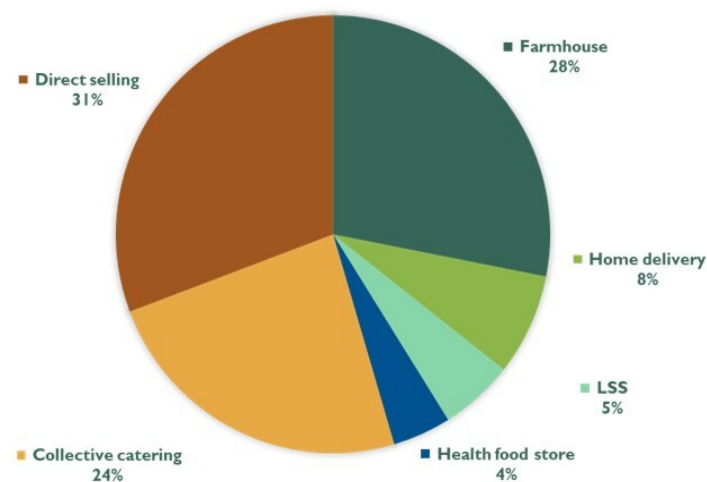
The analysis shows three main production chains: the agriculture, livestock farming, and wine sectors, as well as a category for "other activities" (eggs, ice cream, oil, cheese). The first aggregation of the data highlights the complexity of the Bio-District compared to the number of actors, as well as the important quantities produced and diversified in different fields. This leads to a series of considerations ranging from the possibility of optimizing production along the entire supply chain to the management of energy resources and production waste. For the latter aspect, the main processing waste was mapped for each supply chain.

The possibility of activating inter-organizational symbiosis is one of the potentials that can be activated within the Bio-District.

A more in-depth analysis of the activities carried out by the companies and their main stakeholders allowed us to reconstruct the flow of the products of the individual production chains. Figure 5 shows the sales channels for food products (excluding cereals and forage). This allows us to highlight the opportunities and potential in which to invest to encourage the development of the Bio-District towards a circular form.

The data show the existence of a structured short supply chain (SSC) through various sales channels.

This distribution model has been challenged for a long time by several factors, such as consumer purchasing behaviour (e.g., availability of out-of-season products), the evolution of the food industry (e.g., logistics and product preservation), and the adoption of aggressive pricing policies by retailers [76]. The latest European policies (Farm to Fork) can encourage their consolidation, particularly through a strategy for revising the animal welfare legislation and ensuring minimum mandatory criteria for sustainable food procurement [77–79]. The SSC is spread mostly in a local context, where the organoleptic qualities and the knowledge of the provenance of a product are some of the main factors that influence consumer choices [80–83].



**Figure 5.** Channels of food sales. Source: Authors' elaboration on interview data.

This model, which is characterized by a direct sale of the product in a short chain without intermediaries [84], is part of the phenomenon of “alternative food networks” (AFNs), which are defined in the literature as alternative forms of sale with a direct relationship between the consumer and producer [85]. Four factors define an AFN: proximity (between the consumer and producer), size and business practice (small and medium-sized enterprises; organic), point of sale (farmers' markets, local purchasing groups, food cooperatives), and commitment to sustainability (production and consumption) [86].

These characteristics are reflected in the Bio-District and are identified with its nature, as it is an innovative model that gains advantages from such factors.

When analysing the sales channels in the Bio-District, we noticed that most products are shared through “direct selling” (31%) (Figure 4). The direct sale of products in the agri-food sector is carried out in different ways, among which the most developed are: farm shops and farmers' markets, delivery of vegetable boxes through subscriptions, mail orders, producer cooperatives, solidarity purchasing groups, and community-supported agriculture (CSA) [87].

Most of these types are present in the Bio-District, wherein the “direct selling” category includes shops located on farms, local purchasing groups, and farmers' markets. This shows the high proximity between the consumer and producer, as a result of which a direct relationship is established in the spaces where the production process takes place.

The use of such forms of sales allows for sustainable development of the business activities, the sector, and the territory. This translates into economic, environmental, and social benefits.

From an economic perspective, the companies succeed in having an advantage thanks to the complete control of their own productive decisions [88].

This allows companies to better manage operational and managerial practices (marketing, supplies, customer relations) [89] and to have full autonomy over their choices (e.g., selling price decisions) [90]. The social benefits that are generated are linked to the development of the territory (enabled by the farmer–consumer relationship) [91], and are manifested in the creation of jobs (involvement of young people) [92,93] and a culture of sustainability [92]. At the environmental level, these models preserve the biodiversity, landscapes, and resources of the territories [90,94,95], and are driven by a demand for quality, sustainable, and varied products [96].

The development of the field and the use of technologies are aspects of the continuous growth of the Bio-District. Technologies are mostly used for orders, but some products are starting to be marketed on online business platforms. Another popular aspect is home delivery, which is a service related to perishable products (fruit, vegetables, cheese, ice cream) (8%). The use of e-commerce and home delivery can have positive impacts on



the food chain and can ensure greater sustainability through greater transparency and knowledge sharing [97].

This, however, is bound to the efficiency of the transport system, which conditions the environmental impacts [98]. The distance is one of the factors that has a greater influence. For this reason, home deliveries from the companies of the Bio-District are made only in adjacent zones.

Another important sales channel is the farmhouse (28%), which allows the development and diversification of business activities.

In addition to being a key tool for selling products and ensuring a high value of production (especially processed products, such as meat), it is an element that is able to increase relationships with customers and allows their preferences to be better known. The development of farms by these companies has generated an increase in sustainable tourism in these territories.

Sharing of products also takes place via collective catering (24%). This category includes biological dining halls (public and private) and hospital cafeterias (private clinics). These relationships generate increased awareness of the purchase and consumption of sustainable products within the territory. A residual percentage is shared through health food stores (4%) and large-scale systems (LSSs) (5%), which are mainly for wine products and residually for fruits and vegetables.

#### *Reference Model*

The above data showed that the strengths of the Bio-District are its structured short supply chain and the diversification of the businesses that comprise it. This has allowed companies to be independent in their production choices and to create a strong relationship with consumers by generating trust and awareness. The creation of a Bio-District brand can consolidate this relationship and transfer value through local identity. The development of the local area is closely linked to the definition of strategies by the district that are capable of influencing local policies towards sustainable development. The inclusion of new companies in the district is linked to the acceptance of a sustainable production/distribution model, which can be a key element in the transition of companies in the area towards sustainability.

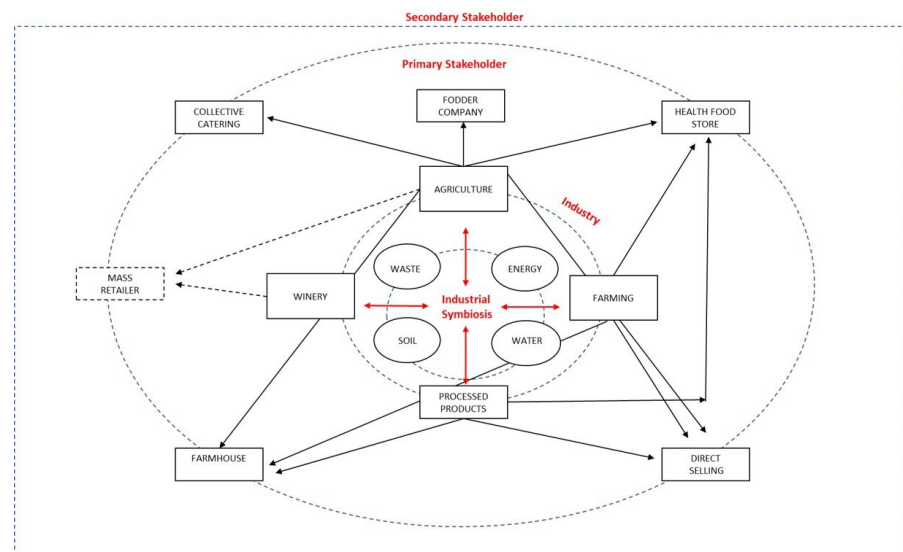
This qualitative analysis shows that companies are inclined to adopt CE principles. This is an opportunity to optimize the use of resources, reduce business costs, and generate a culture of sustainability.

The model (Figure 6) that emerged from the Bio-District analysis highlighted three scenarios.

The first scenario is related to the context of secondary stakeholders.

The relationship with secondary stakeholders (municipalities, the region) was crucial in the initial phase of the Bio-District's development. Through these relations the following were defined: the process of legal recognition of the Bio-District, political-administrative governance, the policies of development, and the modalities of participation and involvement of new companies. The productive specialization of the operators and the involvement of the public agencies that represent the territory generated a strong image of the district with respect to a specific area and productive vocation. This can guarantee recognition and reliability (brand identity) to companies located in the area that wish to join the Bio-District. The development of these factors should be linked to the use of certification or traceability systems to guarantee the origin and quality of production (definition of a specification that is linked to a collective brand). The use of local products reinforces the community by highlighting a local and cultural identity [99]. A study of some Welsh geographical indications (GIs) showed how stakeholders (e.g., public authorities, regions, producers), through reflexive governance and the use of GIs, enable the sustainable development of territories. Stakeholders, through their attachment and involvement in the area, guarantee the development of GIs, which are capable of leading towards sustainability [100].





**Figure 6.** Stakeholders of the Etruscan Roman Bio-District. Source: Authors' elaboration on interviews.

The second scenario concerns the relations between the primary stakeholders.

The products in the Bio-District (agriculture, livestock, wine) demonstrate how the adopted model of vertical integration manages to overcome the criticalities of the industry (e.g., low prices, fluctuation of demand). The Bio-District will be able to assume the role of a catalyst of exchanges between organizations and to create short supply chains (horizontal). It could also be a stimulus for the development of sustainable tourism. The presence of farmhouses should be accompanied by the development of a strategy that systematically enhances the cultural and landscape resources of these areas. The promotion of local food enables the development of tourism in these areas [101] by strengthening their image and local economy [102] with the sustainable and inclusive development of companies [103].

The first two scenarios that emerged from the analyses were related to stakeholder relations and stakeholder theory [104–106]. Several studies in the agri-food sector have analysed the relationships between stakeholders and their ability to influence an organisation's goals (e.g., the supply chain [107,108]). To overcome sustainability challenges, the use of multi-actor governance and knowledge integration are two key elements [109,110]. This type of governance has become essential in the transformation of the agri-food sector, where the involvement of local actors and communities is considered a necessary tool for achieving sustainability [111,112]. A multi-stakeholder network enables the co-creation of a society that is capable of achieving sustainable development [113].

The last scenario refers to the ability to activate a circular business model in the Bio-District.

The interviews provided an understanding of the types of waste generated, their quantities, and, in particular, their management. They revealed the demands of companies for more environmentally and economically sustainable waste management. It emerged that the various activities of the Bio-District produce waste that is recovered at a low value (e.g., unsold on the field). The reuse of waste from agriculture (waste, leaves, slices), livestock (wastewater, bones), or the wine sector (rasps, pomace) requires complex and systemic intervention. Resource recovery can be achieved systematically through exchanges between companies with different activities (e.g., agriculture and animal husbandry) [42] or with the same activities (e.g., agriculture), and it can allow for increased productivity and reduced waste [114]. The use of waste from agricultural activities can lead to the creation of an independent, local, and sustainable energy supply chain [115].

From the interviews, it was possible to identify energy and water consumption, as well as the practices and technologies adopted. The companies demand an improved management of resources (water, energy, soil) with the aim of sustainability and innovation.

The driver towards the CE in these areas is the development of an integrated supply chain with sustainable management of resources.

This model is based on the inter-organisational exchange of resources. The concept of inter-organisational exchanges is used in the literature [116–118] to indicate forms of cooperation between different enterprises. Companies cooperate in the exchange of resources, implementing a series of initiatives aimed at activating a variety of circular processes.

In this case, inter-organisational exchanges are represented by exchanges of natural resources (energy, water, and soil) and the waste system. These exchanges aim to establish a symbiotic relationship between businesses. This will allow the creation of integrated supply chains of primary and secondary products. The resources on which it is desirable to intervene are those that are undervalued, such as unsold products or those that remain in the field. Interaction between the agriculture and livestock sectors can certainly activate virtuous behaviours or interchanges between operators. The definition of CE policies that have a positive impact on all participating companies is one of the most significant aspects, particularly where a system of CE policies is linked to tradition and territory for the valorisation of products with high added value.

The use of industrial symbiosis in agri-food districts can allow the economic and sustainable development of the area in which the districts operate. In a study carried out in the agri-food district of the Abruzzo Region, through the implementation of the principles of Industrial Ecology (IE), it was observed that the development of industrial symbiosis is one of the most appropriate solutions for the sustainable development of this area [119].

As reported in the literature, governance is a key element for the proper functioning of a Bio-District [67]. This becomes even more evident with respect to the activation of a circular model, where governance and leadership are crucial to stimulating operators to engage in virtuous practices.

## 5. Conclusions

This exploratory analysis aimed at highlighting the potential of the Etruscan Roman Bio-District for activating the principles of the CE. The analysed context highlighted the district's development potential through a short supply chain within three scenarios. This model showed the ability to overcome the problems linked to LSSs in the agri-food sector and to develop inter-organisational exchanges of resources with the aims at productivity and sustainability of production through strong and innovative governance.

These analyses are part of a broader study that will be conducted in the Bio-District to analyse the research and policy implications arising from regulatory aspects, resource recovery, waste management, and sustainable use of energy and soil.

Through a qualitative and quantitative analysis, the study contributes to a better understanding of this governance tool in the agri-food sector. There are no studies in the literature that have analysed the sustainability of this model in depth. The use of life-cycle thinking (LCT) tools (e.g., LCA, S-LCA, LCC) would allow a better understanding of the advantages that can be had in terms of impacts (environmental, social, economic). The work can be used as a reference point to develop policies aimed at the recognition and valorisation of territories and typical production. At a managerial level, it can be used for the creation and transformation of organic companies and business networks aimed at overcoming some critical issues (e.g., sale of products).

A future direction for research is the quantitative understanding of the impacts that such production and such a model have on the environment, the economy, and society.

**Author Contributions:** The authors contributed equally to this work and to its development. S.P. and F.P. developed the research design, analysed the sources and literature and conducted the case study analyses. E.M.M. coordinated the study. G.A., G.C.E., and O.M. supervised the research project and carried out a detailed revision. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by Anna Maria Catalano Foundation.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to confidentiality requirements of the donor for the project.

**Acknowledgments:** The authors are thankful for the contribution of the Anna Maria Catalano Foundation.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- Ruggieri, A.; Poponi, S.; Cerica, R. Parte quarta: Imprese distrettuali e contesto di riferimento-IX. Qualità e innovazione: Fattori di competizione per i distretti industriali. Il caso del distretto della ceramica di Civita Castellana. In *Capitalismo Distrettuale, Localismi D'impresa, Globalizzazione*; University Press: Firenze, Italy, 2007.
- Beccatini, G. Dal settore industriale al distretto industriale. Alcune considerazioni sull'unità di indagine dell'economia industriale. *Riv. Econ. Polit. Ind.* **1979**, *1*, 7–21.
- Beccatini, G. *Distretti industriali e made in Italy. Le Basi Socioculturali del Nostro Sviluppo Economico*; Bollati Boringhieri: Torino, Italy, 1998.
- Beccatini, G. *Dal Distretto Industriale Allo Sviluppo Locale*; Bollati Boringhieri: Torino, Italy, 2000.
- Pyke, F.; Beccatini, G.; Sengeberger, W. *Industrial District and Inter-Firm Co-Operation in Italy*; International Institute for Labour Studies: Geneva, Switzerland, 1990; ISBN 929014467X.
- Fortis, M. *Crescita Economica e Specializzazioni Produttive; Sistemi locali e imprese del made in Italy*; Il Mulino: Bologna, Italy, 1996.
- Fortis, M.; Quadrio Curzio, A. *Industria e Distretti. Un Paradigma di Perdurante Competitività Italiana*; Il Mulino: Bologna, Italy, 2007.
- Fortis, M.; Carminati, M. I distretti industriali nella realtà economica e normativa dell'Italia. *Econ. Ital* **2007**, *1*, 97–115.
- Florida, R. Agglomeration and Industrial Location: An Econometric Analysis of Japanese-Affiliated Manufacturing Establishments in Automotive-Related Industries. *J. Urban. Econ.* **1994**, *36*, 23–41. [[CrossRef](#)]
- Audretsch, B. Agglomeration and the location of innovative activity. *Oxf. Rev. Econ. Policy* **1998**, *14*, 18–29. [[CrossRef](#)]
- Ottati, G.D. Cooperation and competition in the industrial district as an organization model. *Eur. Plan. Stud.* **1994**, *2*, 463–483. [[CrossRef](#)]
- Beccatini, G. Distrettualità fra industria e agricoltura. *Quest. Agrar.* **2000**, *2*, 11–24.
- Viganò, L.; Sturla, A. *La Sostenibilità Delle Filiere Biologiche: Il Caso di Varese Ligure*; INEA: Rome, Italy, 2013; pp. 317–341.
- Iacoponi, L. Distretto Industriale Marshalliano e forme di organizzazione delle imprese in agricoltura. *Riv. Econ. Agrar.* **1990**, *45*, 711–743.
- Tocaceli, D. Agricultural districts in the Italian regions: Looking toward 2020. *Agric. Food Econ.* **2015**, *3*, 111. [[CrossRef](#)]
- Cecchini, M.; Zambon, I.; Pontrandolfi, A.; Turco, R.; Colantoni, A.; Mavrakis, A.; Salvati, L. Urban sprawl and the 'olive' landscape: Sustainable land management for 'crisis' cities. *GeoJournal* **2019**, *84*, 237–255. [[CrossRef](#)]
- Colantoni, A.; Pili, S.; Mosconi, E.M.; Poponi, S.; Cecchini, M.; Doria, P. Metropolitan Agriculture, socio-demographic dynamics and the Food-City relationship in southern Europe. *Curr. Polit. Econ. Eur.* **2017**, *28*, 301–324.
- Tocaceli, D. I distretti del cibo: Novità e aspettative. *Georg. INFO* **2018**, *3*. Available online: <http://www.georgofili.info/contenuti/i-distretti-del-cibo-novita-e-aspettative/901> (accessed on 7 April 2021).
- Eco-RegionEco-Region's Portal. Available online: <https://www.ecoregion.info/> (accessed on 7 April 2021).
- European Parliament; European Council Regulation (EU) 2018/848. *On Organic Production and Labelling of Organic Product*; Official Journal of the European Union: Brussels, Belgium, 2018.
- CREA. L'agricoltura Biologica per lo Sviluppo Territoriale: L'esperienza dei Distretti Biologici. 2019. Available online: <https://www.reterurale.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/19806> (accessed on 7 April 2021).
- Assiri, M.; Barone, V.; Silvestri, F.; Tassinari, M. Planning sustainable development of local productive systems: A methodological approach for the analytical identification of Ecoregions. *J. Clean. Prod.* **2020**, *287*, 125006. [[CrossRef](#)]
- European Committee of the Regions. *The Role of Local and Regional Authorities in Making Food Systems More Sustainable*; European Commission: Brussels, Belgium, 2020.
- European Commission Circular Economy Action Plan. *For a Cleaner and More Competitive Europe*; European Commission: Brussels, Belgium, 2020.
- European Commission. *The European Green Deal COM/2019/640 2019*; European Commission: Brussels, Belgium, 2019.
- FAO. *Transforming Food and Agriculture to Achieve*; FAO: Rome, Italy, 2018.
- Ingrao, C.; Faccilongo, N.; Valenti, F.; De Pascale, G.; Di Gioia, L.; Messineo, A.; Arcidiacono, C. Tomato puree in the Mediterranean region: An environmental Life Cycle Assessment, based upon data surveyed at the supply chain level. *J. Clean. Prod.* **2019**, *233*, 292–313. [[CrossRef](#)]
- Tasca, A.L.; Nessi, S.; Rigamonti, L. Environmental sustainability of agri-food supply chains: An LCA comparison between two alternative forms of production and distribution of endive in northern Italy. *J. Clean. Prod.* **2017**, *140*, 725–741. [[CrossRef](#)]

29. Tassielli, G.; Notarnicola, B.; Renzulli, P.; Arcese, G. Environmental life cycle assessment of fresh and processed sweet cherries in southern Italy. *J. Clean. Prod.* **2018**, *171*, 184–197. [[CrossRef](#)]
30. Moschetti, R.; Raponi, F.; Ferri, S.; Colantoni, A.; Monarca, D.; Massantini, R. Real-time monitoring of organic apple (var. Gala) during hot-air drying using near-infrared spectroscopy. *J. Food Eng.* **2018**, *222*, 139–150. [[CrossRef](#)]
31. Marucci, A.; Monarca, D.; Cecchini, M.; Colantoni, A.; Cappuccini, A. The heat stress for workers employed in laying hens houses. *J. Food Agric. Environ.* **2013**, *11*, 20–24.
32. Di Giacinto, S.; Colantoni, A.; Cecchini, M.; Moschetti, R.; Massantini, R. Dairy production in restricted environment and safety for the workers. *Ind. Aliment.* **2012**, *51*, 5–12.
33. Cecchini, M.; Colantoni, A.; Massantini, R.; Monarca, D. The risk of musculoskeletal disorders for workers due to repetitive movements during tomato harvesting. *J. Agric. Saf. Health* **2010**, *16*, 87–98. [[CrossRef](#)]
34. Marucci, A.; Pagnello, B.; Monarca, D.; Colantoni, A.; Biondi, P. Heat stress suffered by workers employed in vegetable grafting in greenhouses. *J. Food Agric. Environ.* **2012**, *10*, 1117–1121.
35. Cecchini, M.; Colantoni, A.; Massantini, R.; Monarca, D. Estimation of the risks of thermal stress due to the microclimate for manual fruit and vegetable harvesters in central Italy. *J. Agric. Saf. Health* **2010**, *16*, 141–159. [[CrossRef](#)]
36. Salomone, R.; Rupo, D.; Saija, G. *Innovative Environmental Management Tools for the Agri-Food Chain BT-Product-Oriented Environmental Management Systems (POEMS): Improving Sustainability and Competitiveness in the Agri-Food Chain with Innovative Environmental Management Tools*; Springer: Dordrecht, The Netherlands, 2013; pp. 3–25, ISBN 978-94-007-6116-2.
37. Gravagnuolo, A.; Angrisano, M.; Girard, L.F. Circular Economy Strategies in Eight Historic Port Cities: Criteria and Indicators Towards a Circular City Assessment Framework. *Sustainability* **2019**, *11*, 3512. [[CrossRef](#)]
38. Paiho, S.; Mäki, E.; Wessberg, N.; Paavola, M.; Tuominen, P.; Antikainen, M.; Heikkilä, J.; Rozado, C.A.; Jung, N. Towards circular cities—Conceptualizing core aspects. *Sustain. Cities Soc.* **2020**, *59*, 102143. [[CrossRef](#)]
39. Caputo, P.; Ferrari, S.; Zagarella, F. *Urban Renovation: An Opportunity for Economic Development, Environmental Improvement, and Social Redemption BT-Regeneration of the Built Environment from a Circular Economy Perspective*; Springer International Publishing: Cham, Switzerland, 2020; pp. 125–135, ISBN 978-3-030-33256-3.
40. Kirchherr, J.; Reike, D.; Hekkert, M. Conceptualizing the circular economy: An analysis of 114 definitions. *Resour. Conserv. Recycl.* **2017**, *127*, 221–232. [[CrossRef](#)]
41. Dsouza, A.; Price, G.; Dixon, M.; Graham, T. A Conceptual Framework for Incorporation of Composting in Closed-Loop Urban Controlled Environment Agriculture. *Sustainability* **2021**, *13*, 2471. [[CrossRef](#)]
42. Jouan, J.; Ridier, A.; Carof, M. SYNERGY: A regional bio-economic model analyzing farm-to-farm exchanges and legume production to enhance agricultural sustainability. *Ecol. Econ.* **2020**, *175*, 106688. [[CrossRef](#)]
43. Özyurt, D.B.; Realf, M.J. Combining a Geographical Information System and Process Engineering to Design an Agricultural-Industrial Ecosystem. *J. Ind. Ecol.* **2001**, *5*, 13–31. [[CrossRef](#)]
44. Poponi, S.; Colantoni, A.; Cividino, S.R.; Mosconi, E.M. The Stakeholders’ Perspective within the B Corp Certification for a Circular Approach. *Sustainability* **2019**, *11*, 1584. [[CrossRef](#)]
45. BSI BS 8001:2017. *Framework for Implementing the Principles of the Circular Economy in Organizations*; The British Standards Institution: London, UK, 2017.
46. AFNOR. Circular Economy Project Management System—Requirements and Guidelines (XP X30-901). 2018. Available online: <https://www.afnor.org/en/news/practical-guide-circular-economy/> (accessed on 7 April 2021).
47. European Commission Farm to Fork Strategy. 2020. Available online: [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en) (accessed on 7 April 2021).
48. Willer, H.; Lernoud, J. The World of Organic Agriculture: Statistic & Emerging Trends. 2020. Available online: <http://www.organic-world.net/yearbook/yearbook-2020.html> (accessed on 7 April 2021).
49. SINAB Bio in Cifre 2020. 2020. Available online: <http://www.sinab.it/bionovita/bio-cifre-2020-i-dati-nazionali-sul-biologico> (accessed on 7 April 2021).
50. Regione Lazio Smart Specialisation Strategy (S3)—Regione Lazio; Bollettino Ufficiale Della Regione Lazio-N. 48-Supplemento n. 1. 2016. Available online: [http://www.regione.lazio.it/binary/rl\\_main/tbl\\_documenti/SVI\\_DGR\\_281\\_31\\_05\\_2016\\_Allegato1.pdf](http://www.regione.lazio.it/binary/rl_main/tbl_documenti/SVI_DGR_281_31_05_2016_Allegato1.pdf) (accessed on 7 April 2021).
51. Willer, H.; Kilcher, L. The World of Organic Agriculture: Statistic & Emerging Trends 2010. Available online: <https://www.organic-world.net/fileadmin/documents/yearbook/2010/world-of-organic-agriculture-2010.pdf> (accessed on 7 April 2021).
52. SINAB Bio in Cifre 2009. Available online: [https://www.politicheagricole.it/flex/files/6/9/2/D.a87184718a16df37ead4/SINAB\\_bio\\_in\\_cifre\\_2009.pdf](https://www.politicheagricole.it/flex/files/6/9/2/D.a87184718a16df37ead4/SINAB_bio_in_cifre_2009.pdf) (accessed on 7 April 2021).
53. Ministry of Agricultural Food and Forestry Policies. *National Action Plan for Organic Farming and Organic Products*; Ministry of Agricultural Food and Forestry: Rome, Italy, 2005.
54. Ministry of Agricultural Food and Forestry Policies. *Basic Text of the Bill “Organic Farming”*; Ministry of Agricultural Food and Forestry: Rome, Italy, 2007.
55. Franco, S.; Pancino, B. *Il Distretto Biologico*; Franco Angeli: Milan, Italy, 2015.



56. Fiorio, Cenni. *Bill No. 302 "Provisions for the Development and Competitiveness of Agricultural, Agri-Food and Aquaculture Production by Organic Method"*; 17th Legislature; Chamber of Deputies, Italian Republic: Rome, Italy, 2013. Available online: [https://www.camera.it/leg17/995?sezione=documenti&tipoDoc=lavori\\_testo\\_pdl&idLegislatura=17&codice=17PDL0003430&back\\_to=https://www.camera.it/leg17/126?tab=2-e-leg=17-e-idDocumento=302-e-sede=-e-tipo=](https://www.camera.it/leg17/995?sezione=documenti&tipoDoc=lavori_testo_pdl&idLegislatura=17&codice=17PDL0003430&back_to=https://www.camera.it/leg17/126?tab=2-e-leg=17-e-idDocumento=302-e-sede=-e-tipo=) (accessed on 7 April 2021).
57. Gadda, M.; Di Maio, V.; Pezzopane, R.N.; Morani, D.A.; La Marca, C.; Cantini, G. *Bill No. 290 "Provisions for the Development and Competitiveness of Agricultural, Agri-Food and Aquaculture Production by Organic Method"*; 18th Legislature; Chamber of Deputies: Rome, Italy, 2018. Available online: [https://www.camera.it/leg18/995sezione=documenti&tipoDoc=lavori\\_testo\\_pdl&idLegislatura=18&codice=leg.18.pdl.camera.290.18PDL0004280&back\\_to=https://www.camera.it/leg18/126?tab=2-e-leg=18-e-idDocumento=290-e-sede=-e-tipo=](https://www.camera.it/leg18/995sezione=documenti&tipoDoc=lavori_testo_pdl&idLegislatura=18&codice=leg.18.pdl.camera.290.18PDL0004280&back_to=https://www.camera.it/leg18/126?tab=2-e-leg=18-e-idDocumento=290-e-sede=-e-tipo=) (accessed on 7 April 2021).
58. *Ministry of Agricultural Food and Forestry Policies Ministerial Decree n. 1192 of 08.01.2016*; Ministry of Agricultural Food and Forestry: Rome, Italy, 2016.
59. Clemente, G.F.; Pugliese, L.; Valentini, S. Il distretto biologico: Uno strumento innovativo per una governance territoriale sostenibile. *Energia Ambient. Innov.* **2013**, *5*. [CrossRef]
60. Lazio Region, R.L. Of 12 July 2019 Provisions for the Discipline and Promotion of Bio-Districts, n. 11. 2019. Available online: <https://www.consiglio.regione.lazio.it/consiglio-regionale/?vw=leggiregionalidettaglio&id=9361&sv=vigente> (accessed on 7 April 2021).
61. Pugliese, P.; Antonelli, A. *L'agricoltura Biologica in Chiave Territoriale: L'esperienza dei Bio-Distretti in Italia*; CIHEAM: Bari, Italy, 2016.
62. Toccaceli, D. *Dai Distretti Alle Reti? I Distretti in Agricoltura Nell'interpretazione Delle Regioni e le Prospettive Verso il 2020*; Rete Rurale Nazionale: Rome, Italy, 2012.
63. Monarca, D. Progetto Biodistrict: Valorizzazione delle Produzioni da Agricoltura Biologica: Progetto Pilota per lo Sviluppo di Distretti Biologici ed Ecocompatibili. 2009. Available online: <http://www.sinab.it/ricerca/biodistrict-valorizzazione-delle-produzioni-da-agricoltura-biologica-progetto-pilota-lo> (accessed on 7 April 2021).
64. Favilli, E.; Hycent, T.; Barabanova, Y. Multi-actor interaction and coordination in the development of a territorial innovation project: Some insights from the Cilento Bio- district in Italy. In Proceedings of the 13th European IFSA Symposium 2018, Chania, Greece, 1–5 July 2018.
65. Basile, S.; Cuoco, E. Territorial Bio-Districts: To Boost Organic Production. 2012. Available online: <https://orgprints.org/id/eprint/23977/> (accessed on 7 April 2021).
66. Pugliese, P.; Antonelli, A.; Basile, S. *BioDistretto Cilento-Italy*; CIHEAM: Bari, Italy, 2015; pp. 1–26.
67. Truant, E.; Broccardo, L.; Zicari, A. Organic companies' business models: Emerging profiles in Italian bio-districts. *Br. Food J.* **2019**, *121*, 2067–2085. [CrossRef]
68. Guareschi, M.; Maccari, M.; Sciurano, J.P.; Arfini, F.; Pronti, A. A Methodological Approach to Upscale toward an Agroecology System in EU-LAFSs: The Case of the Parma Bio-District. *Sustainability* **2020**, *12*, 5398. [CrossRef]
69. Assaël, K.; Orefice, G. I Bio-Distretti: Costruire Territori Attraenti. *Univ. Forum* **2016**, *5*, 1–14.
70. Franco, S.; Pancino, B. *Agriregionieuropa*. 2008. Available online: <https://agriregionieuropa.univpm.it/it> (accessed on 7 April 2021).
71. Yin, R.K. *Case Study Research: Design and Methods*; Conneley, S., Ed.; Sage Publications: Thousand Oaks, CA, USA, 2009.
72. Corbetta, P. *Metodologia e Tecniche Della Ricerca Sociale*; Il Mulino: Bologna, Italy, 1999.
73. European Commission COM/2003/361/CE. *Concerning the Definition of Micro, Small and Medium-Sized Enterprises*; Official Journal of the European Union: Brussels, Belgium, 2003.
74. Ministry of Economic Development, D.M. 18/04/2005. *Adeguamento alla Disciplina Comunitaria dei Criteri di Individuazione di Piccole e Medie Imprese*; Ministry of Economic Development: Rome, Italy, 2005.
75. Lazio Region Proposal. *Recognition of Rural, Agri-Food and Bio-Districts in the Lazio Region and Their Identification as Food Districts Pursuant to Letters a), b) and h) of Article 13 of Legislative Decree 228/2001 and Subsequent Amendments*; FAO Fisheries Division: Rome, Italy, 2020.
76. Ismea Opportunità e Minacce per la Filiera Corta e la Vendita Diretta in Italia. 2017. Available online: [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjzz\\_S4oYrwAhWhs4sKHbVBD\\_0QFjAAegQIBBAD&url=http%3A%2F%2Fwww.ismea.it%2Fflex%2Fcm%2Fpages%2FServeAttachment.php%2FL%2FIT%2FD%2F2%25252Fa%25252F5%25252FD.0b6a26f9772a3cac7a13%2FP%2FBLOB%253AID%253D10153%2FE%2Fpdf&usq=AOvVaw1b4\\_VFi8ubv1k8gHD3GaVV](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjzz_S4oYrwAhWhs4sKHbVBD_0QFjAAegQIBBAD&url=http%3A%2F%2Fwww.ismea.it%2Fflex%2Fcm%2Fpages%2FServeAttachment.php%2FL%2FIT%2FD%2F2%25252Fa%25252F5%25252FD.0b6a26f9772a3cac7a13%2FP%2FBLOB%253AID%253D10153%2FE%2Fpdf&usq=AOvVaw1b4_VFi8ubv1k8gHD3GaVV) (accessed on 7 April 2021).
77. Alberdi, G.; Begiristain-Zubillaga, M. Identifying a Sustainable Food Procurement Strategy in Healthcare Systems: A Scoping Review. *Sustainability* **2021**, *13*, 2398. [CrossRef]
78. Jongeneel, R.; Hoes, A.; Berkhout, P. Climate-Smart Policy Climate-Smart Policy. Available online: <https://edepot.wur.nl/533846> (accessed on 7 April 2021).
79. Mowlds, S. The EU's farm to fork strategy: Missing links for transformation. *ACTA Innov.* **2020**, 17–30. [CrossRef]
80. Knickel, K.; Renting, H. Methodological and Conceptual Issues in the Study of Multifunctionality and Rural Development. *Sociol. Rural* **2000**, *40*, 512–528. [CrossRef]
81. Seyfang, G. Avoiding Asda? Exploring consumer motivations in local organic food networks. *Local Environ.* **2008**, *13*, 187–201. [CrossRef]

82. Brown, A. Farmers' market research 1940–2000: An inventory and review. *Am. J. Altern. Agric.* **2002**, *17*, 167–176. [CrossRef]
83. Wolf, M.M.; Spittler, A.; Ahern, J. A Profile of Farmers' Market Consumers and the Perceived Advantages of Produce Sold at Farmers' Markets. *J. Food Distrib. Res.* **2005**, *36*, 192–201.
84. Parker, G. Sustainable food? Teikei, co-operatives and food citizenship in Japan and the UK. Work. Pap. *Real Estate Plan.* **2005**, *11*, 1–29.
85. Venn, L.; Kneafsey, M.; Holloway, L.; Cox, R.; Dowler, E.; Tuomainen, H. Researching European 'alternative' food networks: Some methodological considerations. *Area* **2006**, *38*, 248–258. [CrossRef]
86. Jarosz, L. The city in the country: Growing alternative food networks in Metropolitan areas. *J. Rural. Stud.* **2008**, *24*, 231–244. [CrossRef]
87. Priefer, C.; Jörissen, J.; Bräutigam, K.-R. Food waste prevention in Europe—A cause-driven approach to identify the most relevant leverage points for action. *Resour. Conserv. Recycl.* **2016**, *109*, 155–165. [CrossRef]
88. Hinrichs, C. Embeddedness and local food systems: Notes on two types of direct agricultural market. *J. Rural. Stud.* **2000**, *16*, 295–303. [CrossRef]
89. Feenstra, G.; Lewis, C.; Hinrichs, C.C.; Jt., G.G.; Hilchey, D. Entrepreneurial outcomes and enterprise size in US retail farmers' markets. *Am. J. Altern. Agric.* **2003**, *18*, 46–55. [CrossRef]
90. Cicatiello, C.; Franco, S. La vendita diretta: Produttori, consumatori e collettività. *Agriregionieuropa* **2008**, *4*, 44–46.
91. Feenstra, G.W. Local food systems and sustainable communities. *Am. J. Altern. Agric.* **1997**, *12*, 28–36. [CrossRef]
92. Bullock, S. *The Economic Benefits of Farmers' Market*; Friends of the Earth Trust: London, UK, 2000.
93. Hilchey, D.; Lyson, T.; Gillespie, G. Farmers' Markets and Rural Economic Development: Entrepreneurship, Small Business, Incubation and Job Creation in the Rural Northeast. Publ. Farming Altern. Program. *Dep. Rural Sociol.* **1995**. Available online: <https://agris.fao.org/agris-search/search.do?recordID=US9604702> (accessed on 7 April 2021).
94. Raffaelli, R.; Coser, L.; Gios, G. Esperienze di filiera corta nell'agro-alimentare: Un'indagine esplorativa in provincia di Trento. *Econ. Agro-Aliment.* **2009**. [CrossRef]
95. Battershill, M.R.; Gilg, A.W. Traditional low intensity farming: Evidence of the role of vente directe in supporting such farms in Northwest France, and some implications for conservation policy. *J. Rural Stud.* **1998**, *14*, 475–486. [CrossRef]
96. Goodman, D. The quality turn and alternative food practices: Reflections and agenda. *J. Rural Stud.* **2003**, *1*, 1–7. [CrossRef]
97. Rivera, M.B.; Håkansson, C.; Svenfelt, A.; Finnveden, G. Including second order effects in environmental assessments of ICT. *Environ. Model. Softw.* **2014**, *56*, 105–115. [CrossRef]
98. Sui, D.Z.; Rejeski, D.W. Environmental Impacts of the Emerging Digital Economy: The E-for-Environment E-Commerce? *Environ. Manag.* **2002**, *29*, 155–163. [CrossRef] [PubMed]
99. Montanari, A.; Staniscia, B. Culinary Tourism as a Tool for Regional Re-equilibrium. *Eur. Plan. Stud.* **2009**, *17*, 1463–1483. [CrossRef]
100. Owen, L.; Udall, D.; Franklin, A.; Kneafsey, M. Place-Based Pathways to Sustainability: Exploring Alignment between Geographical Indications and the Concept of Agroecology Territories in Wales. *Sustainability* **2020**, *12*, 4890. [CrossRef]
101. De Salvo, P.; Mogollón, J.M.H.; Di Clemente, E.; Calzati, V. Territory, tourism and local products. The extra virgin oil's enhancement and promotion: A benchmarking Italy-Spain. *Tour. Hosp. Manag.* **2013**, *19*, 23–34.
102. Du Rand, G.E.; Heath, E. Towards a Framework for Food Tourism as an Element of Destination Marketing. *Curr. Issues Tour.* **2006**, *9*, 206–234. [CrossRef]
103. Sims, R. Food, place and authenticity: Local food and the sustainable tourism experience. *J. Sustain. Tour.* **2009**, *17*, 321–336. [CrossRef]
104. Freeman, R.E. The Politics of Stakeholder Theory: Some Future Directions. *Bus. Ethic Q.* **1994**, *4*, 409–421. [CrossRef]
105. Freeman, R.E. *Stakeholder Theory*; Wiley: Hoboken, NJ, USA, 2015; pp. 1–6.
106. Donaldson, T.; Preston, L.E. The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *Acad. Manag. Rev.* **1995**, *20*, 65–91. [CrossRef]
107. Shnayder, L.; Van Rijnsoever, F.J.; Hekkert, M.P. Motivations for Corporate Social Responsibility in the packaged food industry: An institutional and stakeholder management perspective. *J. Clean. Prod.* **2016**, *122*, 212–227. [CrossRef]
108. Ville, A.S.S.; Hickey, G.M.; Phillip, L.E. How do stakeholder interactions influence national food security policy in the Caribbean? The case of Saint Lucia. *Food Policy* **2017**, *68*, 53–64. [CrossRef]
109. Miller, T.R.; Wiek, A.; Sarewitz, D.; Robinson, J.; Olsson, L.; Kriebel, D.; Loorbach, D. The future of sustainability science: A solutions-oriented research agenda. *Sustain. Sci.* **2014**, *9*, 239–246. [CrossRef]
110. Shiroyama, H.; Yarime, M.; Matsuo, M.; Schroeder, H.; Scholz, R.; Ulrich, A.E. Governance for sustainability: Knowledge integration and multi-actor dimensions in risk management. *Sustain. Sci.* **2012**, *7*, 45–55. [CrossRef]
111. Bloemmen, M.; Bobulescu, R.; Le, N.T.; Vitari, C. Microeconomic degrowth: The case of Community Supported Agriculture. *Ecol. Econ.* **2015**, *112*, 110–115. [CrossRef]
112. Nost, E. Scaling-up local foods: Commodity practice in community supported agriculture (CSA). *J. Rural Stud.* **2014**, *34*, 152–160. [CrossRef]
113. Trencher, G.P.; Yarime, M.; Kharrazi, A. Co-creating sustainability: Cross-sector university collaborations for driving sustainable urban transformations. *J. Clean. Prod.* **2013**, *50*, 40–55. [CrossRef]
114. Alfaro, J.; Miller, S. Applying Industrial Symbiosis to Smallholder Farms. *J. Ind. Ecol.* **2013**, *18*, 145–154. [CrossRef]



- 
115. Bonazzi, F.A.; Cividino, S.R.; Zambon, I.; Mosconi, E.M.; Poponi, S. Building Energy Opportunity with a Supply Chain Based on the Local Fuel-Producing Capacity. *Sustainability* **2018**, *10*, 2140. [[CrossRef](#)]
  116. Chertow, M.R. Industrial Symbiosis: Literature and Taxonomy. *Annu. Rev. Energy Environ.* **2000**, *25*, 313–337. [[CrossRef](#)]
  117. Chertow, M.R. Uncovering Industrial Symbiosis. *J. Ind. Ecol.* **2007**, *11*, 11–30. [[CrossRef](#)]
  118. Ruggieri, A.; Braccini, A.M.; Poponi, S.; Mosconi, E.M. A Meta-Model of Inter-Organisational Cooperation for the Transition to a Circular Economy. *Sustainability* **2016**, *8*, 1153. [[CrossRef](#)]
  119. Simboli, A.; Taddeo, R.; Morgante, A. The potential of Industrial Ecology in agri-food clusters (AFCs): A case study based on valorisation of auxiliary materials. *Ecol. Econ.* **2015**, *111*, 65–75. [[CrossRef](#)]