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# Territorialisation dynamics for Italian farms adhering to Alternative Food Networks

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**Abstract.** The demographic processes of the last decades have led to variations in urban and peri-urban territorial configurations, questioning the patterns of traditional productive localisation. They have begun to outline new perspectives related to proximity to trading and commerce sites as well as to the services offered by the city. Business strategies, such as multifunctionality and diversification, have begun to consider these new possibilities that, at a larger scale, have triggered the process of territorialisation. The study analyses the influence of proximity to the city on the strategies of farms diversifying income through short food chains, with the aim of identifying the prevailing behaviours adopted in three different concentric areas at the urban centre of gravity: peri-urban, belt and rural. The study involves a dataset constituted by 217 farms, where each farm has been associated with a set of explanatory variables that outline some structural, social and economic characteristics. The sample has been segmented through a hierarchical cluster analysis, which allowed us to identify 5 groups of farms, after having reduced the number of variables through PCA (Principal Component Analysis). The results show that short food chains and, more generally, AFNs, are based on strategies alternative to those of traditional chains, and which involve a different economic dimension of the same chains and the construction of a different place-based agro-food system, also envisaging a re-localisation of space near the final market.

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## 1. Introduction

The demographic processes of the last decades have led to variations in urban and peri-urban territorial configurations, questioning the patterns of traditional productive localisation. The analysis of the risks and costs associated with these urbanisation paths is characterised by fragmentation of boundaries and the development of new low-density settlements (Bruegmann, 2005; Salvati et al, 2012; ISPRA, 2017). Nevertheless, we can state that these new urban conformations characterised by a modified relationship between city and country, have begun to outline new perspectives related to proximity to trading and commerce sites, as well as to the services offered by the city.

Diversification strategies have begun to consider these new possibilities that, at a larger scale, have triggered a process of territorialisation (1) (Raffestin, 1984) related to proximity to the city core. The processes of urban expansion have therefore been among the most determining factors for the forms of agriculture (Heimlich, Barnard, 1992), both in terms of localisation and conformation of the agricultural landscape, and from the point of view of the economic relations activated by the agricultural entrepreneur, according to the opportunities deriving from proximity to the urban centre. The spatial context is increasingly recognised as a driver for entrepreneurial decisions and farmers' business strategies (Lange et al., 2013); Wästfelt and Zhang (2016) recognise that "proximity to the city is [...] an element decisive in deciding on farm production systems and land use", while from the point of view of the generation of profitability, Ilbery (1991) argues that localisation is a key element of diversification decisions (2). However, as noted by Lange et al. (2013) and Meraner et al. (2015), further research is needed on the influence of spatial localisation on farmers' strategic choices, and more specifically on the application of diversification activities. Meeting this need, the present study analyses the influence of proximity to the city regarding the strategies of farms diversifying income through short food chains, with the aim of identifying the prevailing behaviours adopted in three different concentric areas at the urban centre of gravity: peri-urban, belt, and rural. After analysing the literature on diversification strategies and the role of Alternative Food Networks within them, the materials and method used are presented. Results of the cluster analysis conducted on 220 farms situated around five Italian cities (Lecce, Pisa, Rome, Turin, and Trento) are presented and discussed to investigate possible spatial correlations of farm strategies. In this regard, it is specified that the study arises from the need to find correlations between spatiality and strategies at a general level, which would provide guidance on the phenomenon of urban farming at the national level. The results, therefore, reflect the processes of territorialisation of the panel as a whole, not the individual outputs of the five cities. Finally, conclusions have been drawn from the results of the study, as well as the indications that emerged in terms of spatial, landscape, and food planning policies at the most appropriate scale according to the results obtained and as to the opportunities related to the next steps of the research.

### 1.1. Alternative Food Networks as diversification and adaptation strategies for the city

In the literature related to the agricultural economy, from the 1980s onwards, various interpretations and models related to diversification have been de-

veloped (Morris et al., 2017). Indeed, in Europe, on the one hand, the traditional model of agriculture has been subject to deep criticism of the distortions deriving from European agricultural policies focusing on production incentives and price intervention (Giaccio, Mastronardi, 2009). On the other hand, diversification has been the strategy which many farms have begun to adopt in order to meet the new expectations expressed by society and to meet the decreasing profit margins in the primary sector due to agricultural overproduction. In fact, diversification involves economic sustainability through vertical and horizontal business integration, multiplying the types of economic revenue, minimising income volatility and balancing fluctuations in prices, and also contributing to multifunctionality in agriculture (Mastronardi et al., 2015a; Lupi et al., 2017). Multifunctionality contributes to the provision of tangible and intangible services that have a wider impact on the territory and the population, such as ecosystem services and, in particular, social and cultural ones (Maier, Shoboyashi, 2001; Randelli et al., 2014). The increasingly recognisable contiguity between the city and the countryside, between consumption and production sites, opens different possibilities for the future of agriculture in a multifunctional perspective (Wästfelt, Zhang, 2016), and therefore of lasting economic sustainability. Diversification is therefore of growing importance in European agriculture which is in a transitional period from the exclusively productive approach towards a multifunctional model increasingly demanded by society (European Parliament, 2016; Giaccio et al., 2018). In fact, as reported by Davoudi and Stead (2007), agriculture, due to its territorial extension, plays a key role in the management of peri-urban landscapes and the social, aesthetic, and environmental functions of urban agglomerations close to the city (Cavallo et al., 2015).

Referring to some of the most recognised positions in literature on response strategies and adaptation of farms to economic and social changes that have occurred in the last decades in Europe, we can observe different positions. Ilbery (1991) distinguishes agricultural-related crop diversification from structural diversification which includes tourist and recreational activities, food processing, direct sale, and rent of land and buildings. van der Ploeg and Roep (2003) recognise three types of diversification activities: deepening strategies, i.e. vertical integration through short food chains that reduce the number and weight of commercial intermediaries; broadening strategies, i.e. activities not directly related to agri-food production in the strict sense but still connected to agricultural resources (tourism, landscape management, recreational activities); and re-grouping strategies, i.e. business-related activities outside the farm not related to production. Meraner et al. (2015) resumes this distinction, but focuses exclusively on deepening and broadening activities. Finally, van der Schans (2010), refers to business models adapted to the classification of agricultural strategies of farms operating in the metropolitan areas of developed countries. He distinguishes between low-cost specialisation, differentiation (3), and diversification, where the first involves focusing on high added value products, the second means participation in direct marketing, and the third diversification into non-strict agricultural activities and services, such as agritourism, landscape maintenance, etc. (McNamara, Weiss, 2005).

From this brief review, we can recognise how entrepreneurial activities aimed at recovering the economic and trustful relationship with the consumer through traditionally delegated intermediary activities—differentiation and deepening—are some of the strategies put in place by that portion of farmers who occupy territories that allow an exchange with the city (Pascucci et al., 2011). In particular, we refer to those territories where relations between the urban and rural contexts are facilitated by the proximity and presence of tangible and intangible infrastructures in support of these forms of marketing. We are particularly referring to the framework of short food chains. It developed over the last few decades and has shaped a range of opportunities that, depending on the context under consideration, respond to the changing dynamics between country and city. In fact, they represent models of production and consumption based on the following relationship (Laboratory of Rural Studies Sismondi, 2012): a) territoriality, proximity of production and consumption; b) socialisation practices, safeguarding of work, and fair remuneration for those involved in the agri-food business; and c) trust between producer and consumer. The relational dynamics that are created through short food chains express feedback within the food system, induc-

ing changes—which may be reinforcing certain determinants or slowing down others—and business innovations whose result is a process of territorialisation, forming new food patterns and landscapes (Marino, 2016a). New forms of urban and peri-urban agriculture are therefore the outcome of spatial processes underpinned by innovations, whether they focus on horizontal (diversification) or vertical (differentiation) integration processes (Marino, 2016b). If, for a long time, agriculture has been absorbed in an increasingly standardised and non-spatial economic system, the new economic, social, and relational reconnection processes between cities and the countryside have allowed for a change of business perspective that builds a new relationship with the consumer and urban space, leveraging the proximity to the city.

### 1.2 Proximity and determining factors of farms' strategies

To the extent that farm survival requires innovative adaptations and investments to capture the benefits of the peri-urban environment (Akimowicz et al., 2016), the urban fringe is an area in which alternative forms of agricultural activities—from production to marketing—have the potential to develop (Beauchesne, Bryant, 1999). The demand expressed by the urban population in terms of goods and services is certainly one of the most obvious factors driving farms to adapt to the city and capitalise on the benefits of proximity (Busck et al., 2006). On the one hand, increasing interest and involvement of consumers and residents in farms' actions and practices "forces" producers to focus on environmental sustainability, the impact of their actions on soil quality, and the effects on social and territorial management (Mastronardi et al., 2015b). On the other hand, it creates business options by meeting the needs of an increasingly demanding market (Marino et al., 2013). A production fabric is therefore outlined that, through diversification, multi-activity, and direct sales (Torquati et al., 2009), tries to respond to urban demand that is no longer solely food, but looks in the direction of social and environmental needs, in a virtuous process in terms of employment, added value, and educational and environmental roles (Marino, 2016b). The rapprochement between the supply and demand system is facilitated by the emergence of new models of production and exchange of products. Thanks also to the outlined active role of consumers and their high level of involvement in the production process, this rapprochement gives rise to forms of governance of trade based on participation, cohesion, transparency, and trust, which have many positive, environmental, economic, and social effects (Marino, 2016b). In this context, the emergence of local markets represents their natural consequences. In this regard, a study conducted in France observed that consumers show increasing preferences for regional productions, particularly for high quality products (Gilg, Battershill, 1998).

Initiatives resulting from the link between urban and rural food and nutrition related to the short chains of food are various, and all are linked to types of social innovation with sustainability and food democracy (Brunori et al., 2012); these are all common strategies for farms situated in the urban sphere. Direct sale is a strategy now consolidated by farms operating near densely populated urban centres (Inwood, Sharp, 2012) and adopted by producers to retain a higher share of the sale price. At the same time, according to some studies conducted in Berlin (Doernberg et al., 2016) and Ontario (Akimowicz et al., 2016), consumers express a higher willingness to pay for locally produced food. Nevertheless, it is to be considered that short food chains, despite making better profit margins due to the reduction of transactions with commercial intermediaries (Blandon, 2009) and greater price control, require a different and larger business organisation, under the profile of production, work, and skills (Marino, 2016b). The paper notes that in particular in direct sales, the producer's choice must necessarily take into account the relationship between the most marginal cost and the most marginal benefit.

Alternative Food Networks (AFN)—including Community-Supported Agriculture (CSA)—have progressively emerged around the most densely populated areas of North America, Europe, and Australia, contributing to the emergence of a new shared economy concept within the agri-food industry thanks to their spatial scope and socialisation of the food system, from production to distribution and consumption (Jarosz, 2008). However, it is also

reported that AFNs do not necessarily benefit all farmers participating in the network, due to the fragility and the dynamism inherent in these short food chains forms (Blay-Palmer, Donald, 2006).

The results of an analysis conducted in the Ruhr area (Pölling, Mergenthaler, 2017) show greater probability of deepening and broadening activities in the event that the farm is in the proximity of the city. The study notes that the farmers' perception on their localisation compared to the urban nucleus plays a decisive role in activating short food chains and activities such as tourist and recreational services.

It is evident that agriculture, which has been subject to a de-territorialisation process over the last decade, is now renewing its relationship with the city through the keys offered by the short food chains, recapturing classic (von Thünen, Hall, [1826] 1966) and modern (Sereni, 1961) models. Therefore, the local aspects and the resulting exchanges and flows of goods and services between the city centre and the countryside are considered the main factors driving the management of the agrarian landscape and the strategic addresses of the farms. As Zasada et al. (2011) observes, proximity to the city is the main factor driving business diversification, concluding that urban and peri-urban farming are characterised by being more diverse and diversified than those with larger distance to the city. The same result emerged from an analysis of the determinants of diversification in the Marche region (Italy), which states that geographical location plays a crucial role in the strategic choices that go in this direction (Finocchio, Esposti, 2008).

## 2. Materials and research methods

The present study involves a dataset of farms already investigated in 2012 (Marino, 2016b). The original panel included 226 farms, sampled randomly and selected according to territorial distribution and the typology of short chain. These farms have been again contacted in 2017 for our purposes through interviews with the aim of tracing the evolution of business strategies; we received answers from 220 of them.

Among the different types of supply chains, the largest category is represented by Farmers' Markets (FMs) with 137 producers being surveyed, followed by Solidarity Purchasing Groups (SPGs) (37 farmers), and the category of Farms Selling Directly (FSD), meaning on-farm sale (30 farmers). A decidedly smaller number of producers were detected for the Box Schemes (BS) and Community Supported Agriculture (CSA) categories (8 and 4 units, respectively). In addition, there is a special category defined as Multi-Chain Farms (MCFs) (10 farms), which identifies producers participating indistinctly in several markets (short chains and traditional markets).

At the territorial level, most farmers have been interviewed in the markets of Rome (103 units), while in the remaining markets, significantly fewer farmers have been detected, varying between a minimum of 20 interviewed in Pisa to a maximum of 33 in Lecce.

Each farm is associated with a set of 19 explanatory variables that outline some structural, social and economic characteristics (Table 1).

The indicators used in the paper are dashboard indicators that were chosen by adopting main references in the form of the most frequently cited examples in the literature on short supply chains in terms of the environmental, social and economic impact (Marino et al., 2013; Mastronardi et al., 2015b). Additional variables characterising the market (six binary variables: Lecce, Pisa, Rome, Turin, Trento, Other Market) have been added with the respective spatial zone (three binary variables), according to the classification scheme shown in Table 2. Zoning has been carried out in accordance with the municipal classification of the Italian territory used in the National Strategy for the Internal Areas of Italy (http://www.agenziacoesione.gov.it/it/arint/).

Firstly, the variables have been reduced through the Principal Component Analysis (PCA; Hotelling, 1933, 1936) on a correlation matrix with an algorithm that maximises the variance between each short chain market as a group (*PCA between groups*); in this way, farms belonging to different markets tend to separate more than the farms belonging to the same market.

Secondly, core component coordinates (PCA 1-5) have been used as multidimensional vectors to

**Table 1.** Starting variables

| Variable | Description | Type |
|---|---|---|
| ALT | Altitude of the farm's production centre | Discrete (meters a.s.l.) |
| DIV UAA[a] | Degree of crop diversification. The index assumes unitary value in the presence of a single order and null value in the case of equi-distribution of the surfaces of the ordinances | Normalised and continuous |
| UAA ORG | Extension of the cultivated area according to organic farming criteria | Continuous (hectares) |
| UAA PA | Extension of the agricultural area subject to environmental protection constraints | Continuous (hectares) |
| GENDER | Gender of the farm leader[b] | Binary (M=1, F=0) |
| AGE | Age of the farm leader | Discrete (integer number of years) |
| WOMEN | Share of female employment | Continuous |
| YOUNG | Share of workers aged 40 or under | Continuous |
| AWU/UAA | Annual Work Unit per hectare of UAA | Continuous |
| SO | Standard Output | Discrete (euro) |
| SO/UAA | Standard Output per hectare of UAA | Discrete (euro) |
| MONO | Farm with sales in Farmers' markets equal to or greater than 75% | Binary |
| MIXED | Farm with sales in wholesale, organised large-scale distribution, cooperative or industry markets equal to or greater than 25% | Binary |
| S&R | Farm with sales in shops and restaurants equal to or more than 50% | Binary |
| TIME | Years of activity in AFN | Discrete |
| C.AT. | Number of activities related to farming, such as:<br>a) catering activities;<br>b) recreational activities and/or didactic farms;<br>c) cultural activities | Discrete (N = 0 – 3) |
| PROCES | Presence of product processing activities | Binary (Yes=1, No=0) |

*Source:* Own work based on collected materials

*Legend:*

[a] The types of cultivation have been calculated through the normalised Index S of Shannon, expressed by:

$$S = -\frac{\sum_i^R p_i \ln p_i}{\ln R}$$

Where: i = 1,…; R is the number of types of cultivation; $p_i$ is the fraction occupied by each type of cultivation.

[b] We refer to the principal operator in the farm, as farmer

**Table 2.** Spatial zoning of AFN farms

| Variable | Spatial zone | Distance from market centre (centroid) |
|---|---|---|
| PERI | Peri-urban | </= 25 km |
| BELT | Belt | 26 - 44 km |
| RUR | Rural areas | >/= 45 km |

*Source:* Marino et al. (2016b)

reclassify farms into new groups using a hierarchical clustering algorithm based on Euclidean distances and operating in a way that makes the variance of each group minimal (Ward, 1963).

Last, we carried out the distribution of farms by regular classes of distance and altimetry within a reference threshold so that each class has at least two farms and the trend of each distribution can be highlighted.

## 3. Results

Table 3 shows the descriptive statistics for the selected variables. Farms are predominantly located in hilly areas and are of diverse types. In a study on the Marche region (2008), Finocchio and Esposti show how deepening activities, to which AFN strategies belong, are less frequent among farms located in mountainous areas. Conversely, in our study, broadening and broadening-deepening strategies are more common among mountain farms. The extension of the areas cultivated using the organic production method is rather conspicuous, as confirmed by some studies showing a positive correlation between proximity to the city and the share of organic production in the United Kingdom (Ilbery et al., 1999), Denmark (Zasada et al., 2011), and Canada (Beauchesne, Bryant, 1999). However, other studies conducted in Germany (Pölling et al., 2016) do not confirm these patterns of urban/rural relationship, while Tobias et al. (2005) identify other factors—soil fertility, topography, and natural properties of the site—as the determinants of the choices to carry out organic production. However, business areas are small in protected areas. In line with an Italian survey conducted utilising the Farm Accountancy Data Network (FADN) data, farmers are predominantly male (73%) and on average 41 years old. Studies on the correlation between the farmer's age and the choices of diversification provide different results: while some studies (Ilbery, 1991; Finocchio, Esposti, 2008; Aguglia, 2009) argue that farmers with well-established experience carry out diversification activities more frequently than younger colleagues, other researchers (McNamara, Weiss, 2005) support the predominance of young farmers among the actors of diversification practices.

The sample shows a good presence of young workers and women. Annual Work Unit per hectare of Utilised Agriculture Area (UAA) is low. Total standard output and standard output per hectare of UAA are high. Although the present study focuses on strategies within the AFN network, some studies reveal conflicting results: Meraner et al. (2015) and McNally (2001) identify a significant correlation between size and diversification activities in general, due to the more efficient allocation and exploitation of corporate resources than in the case of smaller farms. A study on diversified farms in the Marche region (Finocchio, Esposti, 2008) shows that there is a negative correlation between the level of diversification and the standard gross margin, interpreted as a lesser interest in diversification by highly specialised farms. The correlation between sale on farmers' markets and the number of women employed has not yet been clarified and deserves greater depth, but US research (Paul, Fremstad, 2016) shows that farms making direct sales or adhering to CSAs have a greater number of female entrepreneurs and more women employed than farms that address conventional trading channels.

Half of the farms sell predominantly in farmers' markets. However, the mixed marketing mode (short food chain and traditional channels) is fairly commonly practiced. Shop and restaurant sales are somewhat marginal, though it has been observed that the strategy of selling to restaurants and stores—presumably linked to high quality products and a higher selling price—is probably a major factor in overcoming the distance distribution costs, or sustaining the pressure of urban settlements (Marino, 2016b). However, the participation of farms in the short food chains has only been recent. Recreational activities and product transformation within the farms are poorly developed.

Values of the variation coefficient show, however, a situation of strong variability for many variables considered, so the average probably has little interpretative capacity with reference to the investigated phenomenon.

The Principal Component Analysis (PCA) lets us summarise the set of starting variables in a small number of new components or factors which explain most of the observed variability formed by the first two components (PCA axis 1 and 2; Fig. 1). PCA allowed us to highlight the most signifi-

cant correlations between variables and components in a hierarchical order according to the eigenvalues scores. The first three components sum up to over 96% of the global variance (Table 4). The weight of each variable is higher as it is further from the origin of axis.

Figures 2, 3, and 4 show the correlations between the variables and the components for each of the three components. We decided to restrict the analysis to the variables that have coefficients of correlation greater than 0.65.

The first component explains 51% of the observed variability. Positive correlations indicate the prevalence of farms located in the urban areas of Rome and Trento, based on organic farming, most of them with farmland situated in protected area. These farms have a greater-than-average economic size and labour intensity. Transformational and recreational activities are quite developed. Sales to shops and restaurants are more frequent with respect to the other farms. Negative correlations show a smaller consistency of these farms in the belt areas, a lower presence of young occupants, and a lesser recurrence of the mixed marketing mode.

The second component explains 28% of the overall variability. The upper (positive) side of Fig. 2 shows a prevalence of farms spread over the urban area of Turin, many of them placed at quite high altitude. Positive correlations also indicate a greater involvement of young and female employees. Short-term sales are the prevailing mode. The lower (negative) side confirms the situation just described.

The third component explains 17% of total variability. We only find a positive correlation above the threshold that shows a concentration of farms in peri-urban areas. Negative correlations show instead the poorer consistency of these farms in rural areas and the marginality of transformation activities.

The sample, consisting of 217 farms, was segmented through a hierarchical cluster analysis which allowed us to identify 5 groups of farms, whose summary features are shown in Table 5.

Groups A, C, and E can be associated with some groups of variables, while group D includes 86 farms (40% of the total) and represents the reference level because most of its values are very close to the general average.

Group B, including only 3 farms, represents a residual group of the cluster analysis, which is formed by those elements that cannot be assigned to any of the features found in other groups. In particular, it consists of two subgroups—a group with a single element and a group of two elements—which are very different each other. If compared to the sample as a whole, they represent abnormal values.

Table 5 also shows the mean values within each group for each variable, in addition to the sample mean that represents the reference parameter for the detailed characterisation of the groups.

### 3.1 Group-specific strategies

Clustering has allowed us to identify the prevailing strategies of the panel farms and to outline relationships between the clusters identified and their location in the zoning of Table 2.

Cluster A: *High quality and very fresh products*. It is possible to hypothesise that for the farms of this group the priority is to provide fresh raw materials to those who are interested in a product of high quality. This explains the need to gain greater benefit from direct sales and sales to shops and restaurants that are less interested in products that have already been processed and which, as a differentiation strategy compared to the negotiating power of large retailers, must necessarily express greater availability to pay for an above-average product with better features. In fact, the group is characterised by sales channels dedicated to both shops and restaurants (21%, the highest among clusters) and to sale to wholesalers, large retailers, cooperatives; a low level of surfaces intended for organic products (less than half the average); a scarce interest in transformation activities and related activities. The fact that organic production is not widespread among these farms is another indication that the market referring to farms in Cluster A is more concerned with freshness and the ability to get the product quickly, finding a reason for quality in these characteristics rather than biological certification. The number of workers under the age of 40 is higher than average, confirming the logistical dynamics required by this type of strategy based on a continuous trading activity with intermediate buyers (wholesalers, shops, restaurants).

Cluster C: *Women-led farmers' market-orientation*. The predominant strategy of this cluster ap-

**Table 3.** Descriptive statistics of variables

| | Mean | Median | Min | Max | Range | Standard Dev. | Var. Coeff. |
|---|---|---|---|---|---|---|---|
| ALT | 333 | 250 | 0 | 1.700 | 1.700 | 324 | 0.97 |
| DIV UAA | 0.505 | 0.546 | 0 | 1 | 1 | 0.367 | 0.726 |
| UAA ORG | 18.6 | 0 | 0 | 500 | 500 | 59 | 3.17 |
| UAA PA | 6.08 | 0 | 0 | 300 | 300 | 27.7 | 4.55 |
| GENDER (M=1) | 0.77 | 1 | 0 | 1 | 1 | 0.43 | 0.56 |
| AGE | 41 | 40 | 20 | 70 | 50 | 11.2 | 0.27 |
| YOUNG | 28.1 | 20 | 0 | 100 | 100 | 32 | 1.14 |
| WOMEN | 29.4 | 25 | 0 | 100 | 100 | 28.9 | 0.98 |
| AWU/UAA | 0.67 | 0.24 | 0.01 | 40 | 39.9 | 2.85 | 4.23 |
| SO | 186.921 | 85.917 | 749 | 3.706.937 | 3.706.188 | 333.782 | 1.79 |
| SO/UAA | 8.775 | 7.333 | 503 | 12.539 | 12.489 | 12.978 | 1.48 |
| MONO | 0.48 | 0 | 0 | 1 | 1 | 0.5 | 1.04 |
| MIXED | 0.39 | 0 | 0 | 1 | 1 | 0.49 | 1.25 |
| S&R | 0.12 | 0 | 0 | 1 | 1 | 0.33 | 2.66 |
| TIME | 1.7 | 2 | 0.5 | 2 | 1.5 | 0.52 | 0.31 |
| C.AT. | 0.28 | 0 | 0 | 3 | 3 | 0.61 | 2.16 |
| PROCES | 0.37 | 0 | 0 | 1 | 1 | 0.48 | 1.31 |

*Source:* Own work based on collected materials

**Table 4.** Eigenvalues scores, explained and cumulative variance of the principal components.

| PCA | Eigenvalues | % expl. variance | % cumul. variance |
|---|---|---|---|
| 1 | 13.2275 | 50.88 | 50.88 |
| 2 | 7.3441 | 28.25 | 79.13 |
| 3 | 4.5173 | 17.37 | 96.50 |
| 4 | 0.9111 | 3.50 | .. |

*Source:* Own work based on collected materials

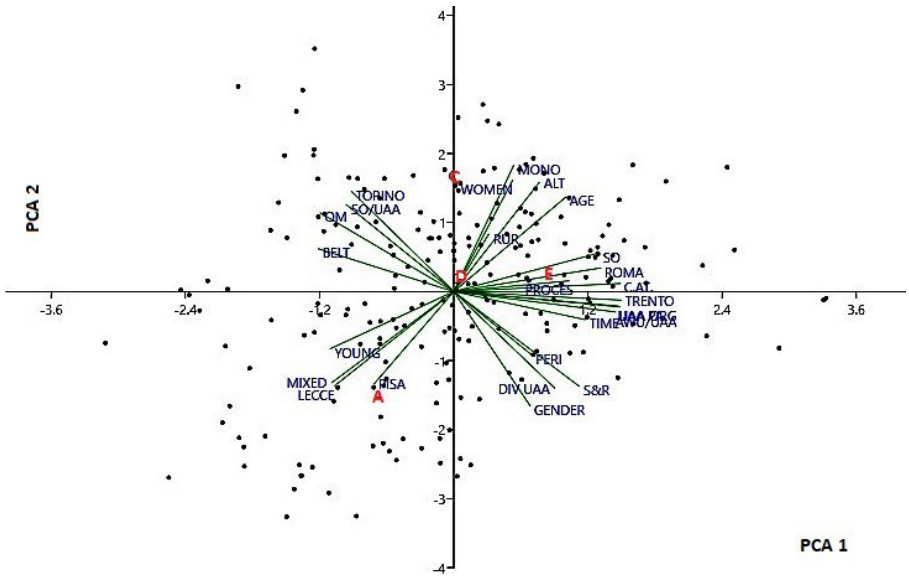


**Fig. 1.** Scatter biplot of the first two components. Groups are reported with red letters A-E, variables are pointed in blue at the end of rays

*Source:* Own work based on collected materials

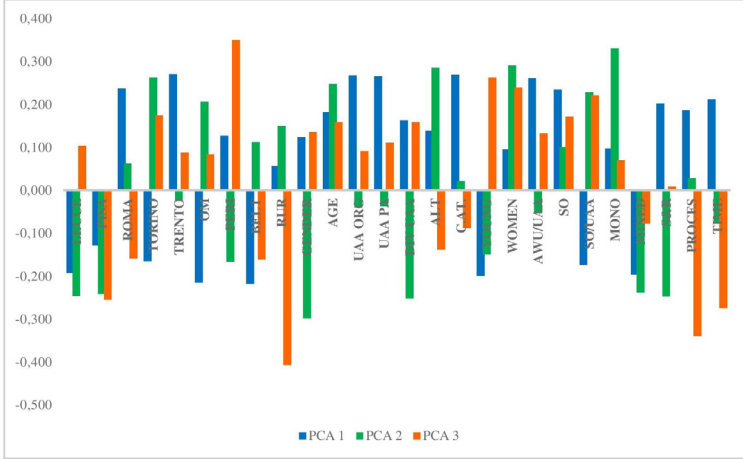


**Fig. 2.** Correlations related to the PCAs axis
*Source: Own work based on collected materials*

**Table 5.** Main associations between groups, variables, markets and zones and Means value

| Group (obs) | Variable | Mean group | Mean sample | Market | Zone |
|---|---|---|---|---|---|
| A (58) | YOUNG | 0.15 | 0.29 | LECCE<br>PISA<br>TORINO | BELT |
| | SO/UAA | 7.55 | 8.78 | | |
| | MIXED | 0.72 | 0.39 | | |
| B (3) | outlier with respect to E | | | OM<br>cfr. E | |
| | ALT | 487 | 333 | | |
| C (29) | AGE | 45.6 | 41.0 | TORINO | RUR |
| | WOMEN | 0.48 | 0.77 | | |
| D (86) | MONO | 0.83 | 0.48 | Everyone | |
| | Reference level (everyone) | | | | |
| | UAA ORG | 36.7 | 18.6 | | |
| | UAA PA | 12.0 | 6.08 | | |
| E (41) | S%R | 0.15 | 0.12 | ROMA | PERI |
| | TIME | 1.98 | 1.70 | TRENTO | RUR |
| | C.AT. | 0.59 | 0.28 | | |
| | PROCES | 0.83 | 0.37 | | |

*Source:* Own work based on collected materials

pears to be the sale of high value-added products at the farmers' market. In this group, the high recourse to sell at farmers' markets (roughly the highest in the sample) is associated with the highest ratio between SO and UAA (almost double the average), confirming the correlation highlighted between direct trading channels and higher margins in terms of added value. The group is characterised by a high presence of female operators (58%), which is twice as high as the average and nearly four times greater than Cluster A (15%).

Cluster D: *Broad distribution channels of high-value products.* The predominant strategy of the farms in the group seems to be to differentiate between marketing methods, with a focus on the sale of intensive work farming products. Unlike

Cluster C, Cluster D does not have a bias towards a single commercial channel; although farmers' markets continue to represent the preferred form of sale, these farms are also turning to large quantities of shops and restaurants and canals such as wholesale, large distribution, and cooperatives. Such farms have very few areas covered in protected areas, while the per-hectare workforce is the highest among clusters: the combination of this information, together with the strong propensity to produce vegetables and fruit, leads us to confirm the high added value propensity of this cluster of farms. Employees are mainly male and in this sense, one can notice the difference with Cluster C in which a high female presence is accompanied by a rooted presence at the farmers' market.

Cluster E: *Broadening strategies in rural context*. The prevailing strategy of the cluster appears to be a diversification in the broadening sense, i.e. integration of income through related activities and services that leverage the less urbanised environment. Cluster E farms are on average located higher than the other clusters' farms and are interested in a relationship with the consumer that goes beyond short food chains, providing related services, often for social purposes. Rural contexts lead cluster E farms to multiply their activities: in fact, besides agricultural production, farms invest in processing on the farm (it is no coincidence that the ratio between SO and UAA is the lowest among all groups). In addition, one aspect that should not be underestimated is the number of years of past activity in AFNs. In fact, sector experience appears to be a determining factor due to the greater organisational and economic complexity of the related and transformational activities. The low number of young people and the relatively high number of years of experience in AFNs confirm this hypothesis.

To identify the degree of correlation between each cluster (A, C, D, E) and each of the three zones (peri-urban, belt, and rural), a Specialisation index has been used. The Normalised Specialisation Productivity Index (NSPI) is a measure of the disparity between the share of the clusters and the total share of the sample producers, and describes the geographical Specialisation of each group compared to the sample's average situation. A higher index increases the specialisation of the group in the geographical area considered. The range of variation is always between -1 and +1. The NSPI tends to -1 in groups where no producers of the considered geographic area is present; values close to zero (0) are observed in the groups where the percentage of producers in the geographic area is similar to that observed at the sample level (absence of specialisation); it tends to +1 when all the producers of a group are concentrated in the geographical area considered and, at the same time, all the producers of the group considered are concentrated in that single geographical area (maximum specialisation).

$$NSPI\ (Normalized\ Specialization\ Productivity\ Index) = \frac{(SPI - 1)}{(SPI + 1)}$$

where:
PrCA: number of producers of a specific Cluster located in a specific Area
PrA: number of producers located in a specific Area
PrC: number producers of a specific Cluster
Pr: total number of producers

$$SPI\ (Specialization\ Productivity\ Index) = \frac{\frac{PrCA}{PrA}}{\frac{PrC}{Pr}}$$

Table 6 shows the results of the NSPI calculation between -1 and 1 for each group and zoning.

**Table 6.** Normalised Specialisation Productivity Index (NSPI) within spatial zones and groups

| | **Cluster A:** *High quality and very fresh products oriented* | **Cluster C:** *Women-lead farmers' markets oriented* | **Cluster D:** *Differentiation strategies* | **Cluster E:** *Rural adaptation* |
|---|---|---|---|---|
| Peri-urban | 0.20 | 0.02 | -0.06 | -0.36 |
| Belt | -0.18 | -0.04 | 0.11 | -0.01 |
| Rural | -0.16 | 0.01 | -0.05 | 0.23 |

*Source: Own work based on collected materials*

Figures 3 and 4, respectively, show the distribution of the farms with respect to distance and altitude; the gradient is highlighted by the linear interpolation line between the classes. With respect to distance, farms included in clusters A and C (Fig. 3) are mainly placed in the second class of distance (12.5–25 km) from the principal market place of reference; Group D shows relative distance independence, while Group E highlights a tendency for farms to concentrate in the rural area (far from the city centre). Compared to altitude (Fig.4), there is a general decrease in the number of farms rising from the plain to the hilly and mountainous plain, more marked in the first group (A).

### 3.2. Discussion

Table 6 shows the existence of a correlation between farm strategies and localisation. The results outlined below appear to be consistent with the research questions that this study seeks to answer: is there a correlation between the characteristics of farms belonging to AFN and the classification of zones according to the three areas? Despite all the farms in the sample adhering to forms of AFN, are there prevailing strategies among them depending on the proximity to the city centre? How and to what extent are the strategies affected by localisation? The hypothesis that prompted this question is that short

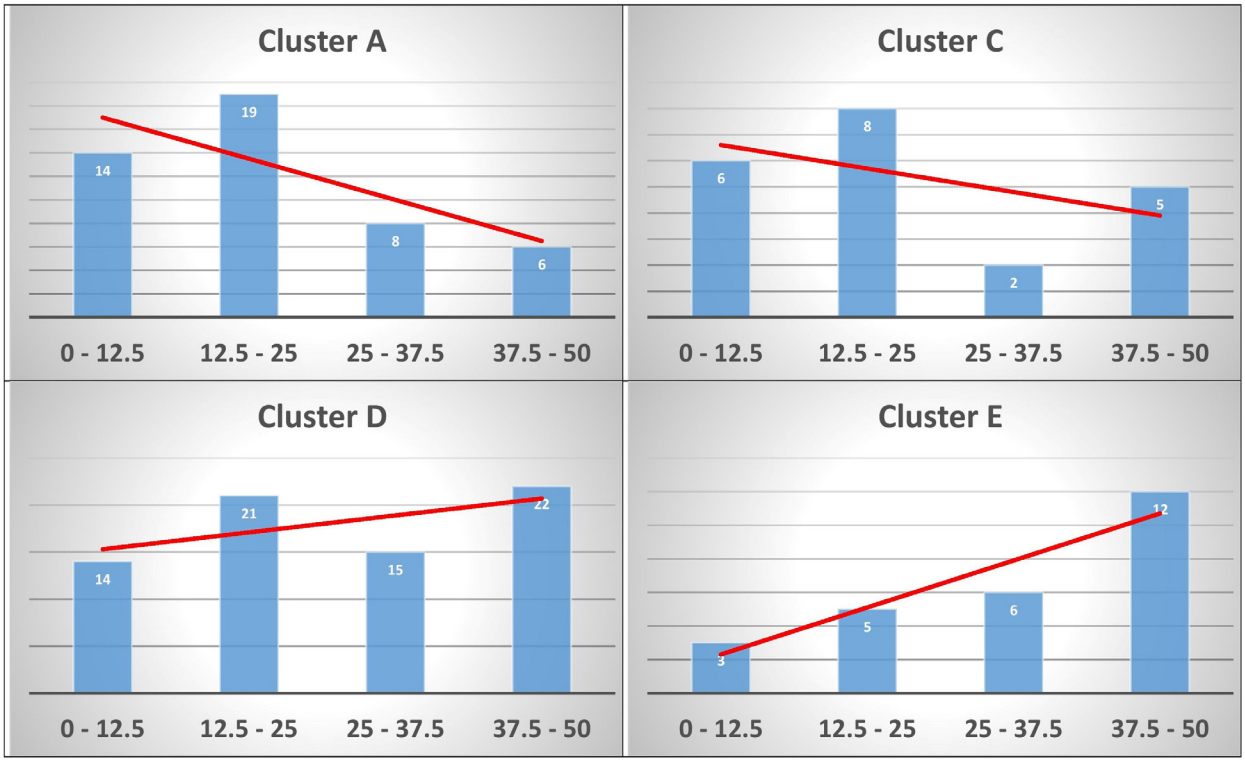


**Fig. 3.** Number of farms by class of distance up to 50 km from the centre of market
*Source:* Own work based on collected materials

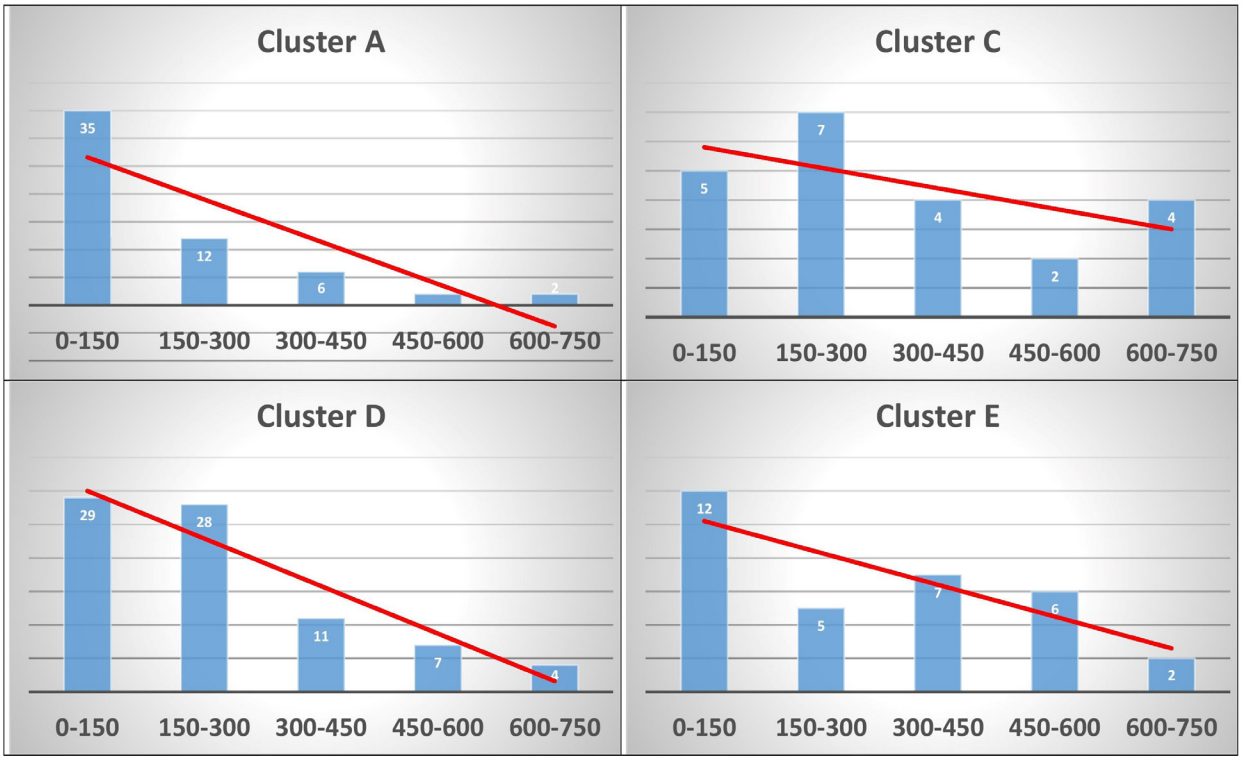


**Fig. 4.** Number of farms by class of altitude from sea level up to 750 meters a.s.l.
*Source:* Own work based on collected materials

food chains and, more generally, AFNs, are based on strategies alternative to those of traditional chains, and which involve a different economic dimension of the same chains and the construction of a different place-based agro-food system, also envisaging a re-localisation of space near the final market (Marino, 2016b). The approach we have adopted for the purpose of this article is based on the clusterisation of the sample and the following analysis of the results of the Normalised Specialisation Productivity Index. Nevertheless, other approaches have been adopted by other researchers to determine the correlation between the city and the farm strategies: Polling and Mergenthaler (2017) suggest a methodological approach based on binary logistic regressions, showing increasing odds and predicted probabilities for "deepening" and "broadening" activities when approaching the city; Finocchio and Esposti (2008) utilise FADN data to recognise the driving forces of diversification strategies and to investigate the linkage between diversification choices and CAP payments.

The most immediate feature to be noted is the high level of Specialisation of Cluster A in the peri-urban area and the Cluster E in the rural area. On the contrary, low Specialisation is found for Cluster A in the rural area and for Cluster E in the peri-urban area. This result appears to be consistent, as for Cluster A there is a decreasing frequency compared to the increasing distance from the market, while in Cluster E, poorly represented in the peri-urban area closest to the city centre, we find a growing frequency as distance from the market centre grows.

According to this approach, the results outlined in the study show certain conclusions:

In the peri-urban area, closest to the market centre, the is a clear prevalence of Cluster A producers and a low level of Specialisation of Cluster E, while Clusters C and D show no particular Specialisation (NSPI values close to 0). This evidence of spatial order allows us to observe how, in areas close to the city, producers have a close exchange relationship with restaurants and retail stores. This denotes a diversification of activities towards sales forms not exclusively directed to the final consumer, but rather to commercial establishments particularly interested in the freshness of unprocessed raw material. Probably, poor bio-certification adhesion may be justified by the need to ensure a stable production flow

subject to lesser risks as it may derive from the one resulting from organic production. The same argument applies to business areas located in protected areas, scarcely present in the peri-urban area; this indication is relevant and provides policy-based reflections that the importance of protected areas in the environmental management of peri-urban areas is increasingly acknowledged (EEA, 2017). The spatialisation that emerged from the analysis of the NSPI index is consistent with the hypotheses that very different types of strategies— Clusters A and E— have a frequency that is manifested in function of distance from the urban centre.

The rural area is characterised by the prevalence of farms with characteristics of Cluster E. Also in this case, the Spatialisation that emerged from the NSPI index is consistent with the assumptions: in fact, in the rural area, a high Specialisation index of Cluster E is accompanied by a low frequency of the Cluster A which, in the proposed clustering, represent the two most opposite strategies. The correlation between Cluster E and this area is also coherent: the rural features described in section 5.1 correspond to the spatiality of those farms, located in areas subject to lesser residential and infrastructural pressures, which can leverage the characteristics of a more favourable environment for diversifying activities not only in terms of deepening, but also related to on-site catering and recreation and cultural services (broadening). In this sense, a typical multifunctional approach emerges in the rural area as an adaptation strategy in response to the new consumer demand for goods and services towards the primary sector. This leads to a relocalisation of production factors from agricultural production in the strict sense in favour of functions—environmental, social, recreational—which allow them to generate additional income (Henke, Salvioni, 2010). The greater experience of the farmer plays an important role in these types of farms, as confirmed by the fact that only 15% of them are run by young farmers under the age of 40 and that the number of years of previous experience in the AFN is the highest among all the considered clusters. However, this aspect deserves greater insight, even in light of the commitment of many young people in Italy (Canale, Ceriani, 2013) and elsewhere (van der Ploeg, 2009) who are taking the lead in agricultural cooperatives. According to the literature, they focus their businesses on innovation, diversification, and relationship with the local community, and often accompany the management of the farm with social and environmental commitments, such as the recovery of unsold or abandoned land, returned to the benefit of the population through the activities of broadening descriptions. These activities could be favoured by the policy maker through the allocation of abandoned agricultural land to young farmers, especially those that have a high social and environmental value and are suitable to provide basic ecosystem services for the urban population (Mazzocchi, Marino, 2017).

In the belt area, between the peri-urban and the rural, Cluster D is the most represented, although only with a moderately high NSPI (0.11), while Cluster A is less specialised (-0.18). This area marks a profound inclination for sale at farmers' markets, which shows the highest value following Cluster C. This could be associated with the location of these farms along the main axes of traffic infrastructures that would allow manufacturers to gain logistically efficient access to exchange sites. The belt area is the one that is most likely to have the effects of urban sprawl along the road transport lines (Marino, 2016b), a necessity arising from the spread of settlement dwellings that are discontinuous and irregular in the areas adjacent to urban centres, often cut off from areas of public transport and requiring private means of transport. The belt thus appears to be the intermediate passage between peri-urban and rural areas where farm strategies are driven, on the one hand, by the proximity to the urban centre while undergoing residential and environmental pressures linked to urbanisation and, on the other hand, by the opportunity to capture income opportunities linked to a territory that has still natural or semi-natural landscape features and is suitable for some recreational, social, educational, and cultural activities.

## 4. Conclusions

The theme of the territorial location for AFN farms is part of a wider context of new relationships that govern the issue of food in cities. Food chains, in fact, have a twofold implication:

1) direct: on either consumers-farms relationship, affecting socio-economic aspects;

2) indirect: on the localisation of agricultural entrepreneurs who are oriented in response to outlet markets; on the governance of urban and peripheral urban areas; on public land management; and on the effectiveness of environmental and territorial policies for the role of green infrastructures that agricultural areas take towards the city (ecological network, resilience functions, recreational services). In this second sense, the question of the food chain assumes a political function. On the one hand, the issue of food systems—understood in the broad sense from producer to consumer—is closely related to the social and health aspects related to the consumption of food. On the other hand, it involves issues related to the "Food democracy" and "Food Sovereignty", i.e. the possibility of access to healthy and sustainable food from all parts of the population and the ability to make the citizen-consumer actor and maker of choices about what and how to eat (Renting et al., 2012; Windfuhr, Jonsén, 2005).

From the point of view of the economic and political planning of the territory, we can state that the agrarian landscape is the result of the demand expressed by the urban population in terms of agri-food goods and material and immaterial services, having this immediate resonance determining the farmers' choices, which, because of the rapid development of these needs, increasingly require close and constant relationships with consumers. Surely, direct selling, farmers' markets and other typologies of AFNs represent opportunities in which the entrepreneur can better interpret the needs and trends of urban demand. On the other hand, and from a policy-making point of view, the correct interpretation of the short food chain phenomena can guide food policies towards good territorial management. Hence the social and economic relationships that work within it—and the landscape—in an ecosystemic and environmental setting. In addition, in a situation, where peripheral areas undergo pressure to advance housing settlements and farmland fragmentation, short chains offer the possibility to obtain higher marginal revenues from small and very small farms which insulate the remaining land squeezed by the advancement of the city on the countryside.

As it has been said so far, it is no coincidence that, above all internationally, urban agendas are including the recognition of the importance of food systems and their planning among the most important policies (CGIAR, 2016; FAO, 2017; IPES-Food, 2017). At the most local level, there are already many planning actions that seek to solve food-related problems at the regional level, both in the north (UK and Canada) and in the south (South Africa and Argentina) (Raja et al., 2017).

Looking at the Mediterranean areas, food planning projects are increasingly applied through an approach that interprets food as an infrastructure, or as part of the cultural and natural heritage of a territory, an opportunity to redefine public, environmental, economic policies and social groups that, with a programmatic vision, aim at defining actions and projects for planning and territorial development. The central point of urban food policy is the ability to act on the food environment, or the whole of the material and immaterial factors that influence consumer choices, making it more plural than a situation where almost exclusively the strong subjects of the food supply chains operate.

In fact, cities are responsible for allocating commercial space, the relationship between agricultural areas and urban areas, health prevention, waste management, education and information. In this case, short food chains can be a strategic element. By favouring fresh production compared to the processed one and proposing personal communication between farmers and consumers, involving civil society and stimulating consumer interaction, AFNs strengthen the process of building sustainable consumer styles (Brunori, Galli, 2017). So far, cities have been able to delegate the management of food access to strong retail farms of the food supply chain and to agricultural and rural policies, in the presumption that in the near future the regulation of these aspects could be entrusted to the market or to national and local policies. Facing the augmented critical issues linked to urban development, cities will have to define food strategies that address the multidimensionality and complexity of food system, pursuing the coordination of the various administrative sectors around a unitary intervention framework (IPES-Food, 2017) (4).

## Notes

(1) Territorialisation is the relationship that a community establishes with its elective space being constituted in the possession, use, control and exploitation of local resources. Therefore, territorialisation is defined as a process in which communities, settling in a place, perceive its specific nature, attribute symbols, cognitions and values to local assets thus structuring and organising space. In this perspective, this concept emphasises forms of learning and processes of development based on local priorities and needs (Battaglini, Palazzo, 2016).

(2) In this case, Ilbery (1991) does not refer to crop diversification but to the development of direct marketing and recreational activities linked to the farming activities.

(3) Differentiation is more than direct sale, but it is about finding niches, USPs, etc., so that direct sale is one option

(4) This article is part of the 40th issue of *Bulletin of Geography. Socio-economic Series* entitled "Sustainability—differently", edited by Mirek Dymitrow and Keith Halfacree (Dymitrow, Halfacree, 2018).

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