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Sustainable development of rural areas: using urban patterns to map the agricultural systems

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Abstract

Rural territories cover 91% of EU27 area and 56% of population live in there. Common Agricultural Policy pays more and more attention to these territories, in particular to their development. In this work it is argued that a generic agricultural and/or socio-economic characterization might be not sufficient to understand these territories, to formulate appropriate policies and ultimately to evaluate the effectiveness of such policy measures. In our view, the "agricultural" character is closely related to the farmland natural attributes as well as to the specific farming activities while the "rural" character is more related to the functional relationships with the urban areas. Hence, a methodology is discussed to classify a geographical space based on a simple measure of urbanization and to provide a classification that considers multiple degrees of urbanization and/or rurality. The method is applied to municipality data for the Lombardy region to distinguish network-based urban systems from mono-centric cities and to classify "non-urban" territories accordingly, separating rural from peri-urban areas. Statistical tests are conducted to study the extent to which the different typologies of territories identified differ with respect to a set of agricultural characteristics. Substantial differences in agriculture are highlighted between urban and rural areas as well as among "non-urban" areas, suggesting that more rigorous definitions of rural can best used to program policies for sustainable local development.

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1. Introduction

The sustainable development of rural territories is challenged by the urbanization process. The identification of the areas where the phenomenon is the most relevant is necessary to assess environmental planning adequately, being the agriculture the most threatened by the urbanization pressures (Allen, 2003). For this reason it appears necessary to build a classification of territories that accounts for the geographical, economic and social relationships between the territories and the urbanization centers. Such relationships appear substantially influenced by the urban morphologies which in turn shape the urban ecological systems (MacGregor-Fors, 2010). In particular an influential role could be ascribed to the transition of medium-sized and large cities from the more traditional mono-centric model of urban development toward multi-centric models and urban networks of functionally related cities (DeGoei et al., 2010).

Building on an established literature (Baumont et al., 2004; Ramos and Silva, 2003) and on our own previous research (Guastella and Pareglio, 2013), Exploratory Spatial Data Analysis is applied to examine the spatial distribution of urbanization in contiguous territories, with an application to the case of Lombardy region in Italy. Empirical analysis is carried out at the municipality level and is based on the density of urbanization, measured by the share of municipality area defined as urbanized. This variable is expected to represent the morphology of urbanization in the region better than population density, a measure that is commonly used to characterize urbanized areas. It is also assumed that the variable alone represents a valid synthesis of the multiple characters of the geography of urbanization in the region and that, in conjunction with ESDA, can provide an effective classification of the territory. This assumption is however also tested in the empirical analysis.

The Lombardy region is among the richest regions in Italy, its economic performance being primarily related to the incidence of manufacturing and services in total production. Notwithstanding the scarce relevance of the agricultural sector, the region appears among the most competitive in this sector in Europe based on the measure of revealed competition presented in Thissen et al. (2013). Although there is general agreement that agriculture is threatened by agglomeration in cities, it is also acknowledged a great heterogeneity across municipalities. Such heterogeneity is associated to the varying urbanization morphologies that characterize the regional territory to the greatest extent. The city with the highest population density is Milan, with more than 1250000 inhabitants. Municipalities around Milan are the most urbanized in the region and characterized by specific agricultural activities. Secondary cities such as Varese, Bergamo and Brescia are still very densely populated and their activities are highly interconnected with the economy of Milan. Other cities such as Cremona, Mantova, Lodi and Pavia, located in the countryside in the southern part of the region, are less densely populated and characterized by specialized agricultures. By and large, several typologies of "urban areas", and several typologies of "rural areas" as well, are known to co-exist within the same region.

This paper is aimed at identifying and characterizing the different typologies of agriculture existing in the regional territory. For this purpose, a systematic classification of the municipalities is required, and the urban/rural dichotomy appears too restrictive to explain very heterogeneous urbanization processes (Iaquinta and Drescher, 2000). This explains, in turn, why many attempts have been made in the literature to overcome this binary approach (Hewitt, 1989; Tacoli, 1998). In Italy many studies have been conducted on the classification of territories, with particular attention to the identification of the so-called “territorial agricultural systems” (Anania and Tarsitano, 1995; Cannata, 1989, 1995; Cannata and Forleo, 1998; Favia, 1992). In the late 90’s the research has been oriented more specifically on the characterization of peri-urban agriculture (Adell, 1999; Camagni, 1999; Fleury and Donadieu, 1997; van Veenhuizen, 2006), even though clear classifications schemes have not been produced. From the methodological perspective, the traditional approach to the analysis of rural areas is based on the use of different indicators, usually at the administrative unit. This approach is fully reflected on the National and Regional Strategic Plans for agriculture (Ministero dell’Agricoltura e dell’Ambiente, 2007; Bassi and Cristea, 2009, Regione Lombardia, 2011). These classifications are deemed however inadequate to describe the heterogeneity in agriculture, especially because the urban-rural linkages are taken into account in a limited manner.

The methodological approach proposed in this paper uses urbanization density, measured by the share of urbanized to total area. Instead of producing an indicator of urbanization based on a set of variables characterizing the agriculture, a different perspective is used. A unique indicator is hence employed to classify the territory and the heterogeneity of these territories is further explored by looking at the variables which characterize the agriculture.

Urban areas developed following the standard mono-centric urban structure in some circumstances and more complex network structures in some others. The role and characters of peri-urban territories in the two cases are expected to vary accordingly. ESDA tools best account for this heterogeneity, detecting urban systems of related cities as a set of contiguous territories characterized by high urbanization density and mono-centric urban cities as municipalities in which high urbanization is opposed to low urbanization in neighbors. The identified urban system is centered on the Milan city and extends to the cities of Bergamo, Varese, Como and Brescia. Between cities, a first typology of peri-urban territories is defined. A second typology of peri-urban covers cities at the margins of urban systems. By the opposite, there is evidence of mono-centric urban structure in the cases of Pavia, Mantova, Lodi and Cremona. In such cases the opposition between urban and rural is clearer. The difference across agricultures in rural and peri-urban territories is further investigated by looking at some relevant characters related to outputs and inputs of agricultural production.

Substantial differences across rural and peri-urban territories and between different typologies of peri-urban territories are evidenced in results. In particular, agriculture is found more specialized in rural territories and more diversified in peri-urban ones, where also the value added of the sector is larger, on average. Evidence also suggests that multi-functionality invoked by policy makers to boost development of rural areas is a character of peri-urban territories more than pure rural areas. In this respect peri-urban agriculture appears very similar to the agriculture in very urbanized areas.

2. Methods and data

The methodological approach applied to study the characteristics of the agricultures in the regional territory consists of two steps. In the first step the regional territory is classified based on the typology of urbanization pattern, distinguishing urban agglomerations from peri-urban and rural areas. This step is carried out by applying ESDA tools (Anselin, 1995;1996) to analyze the spatial distribution of urbanization density, measured with the percentage of urbanized land in a municipality. In the second step the categories extrapolated from the ESDA classification are employed to examine the extent to which the agricultural systems differ across the territories in the region. For this purpose some statistical tests for the comparison of populations are conducted in relation to some variables which are deemed to represent the several aspects of the local agricultures.

2.1. Exploratory Spatial Data Analysis

ESDA tools are commonly used to explore the spatial distribution of variables. By graphical visualization it is possible, on the one hand, to represent the varying levels of local spatial associations, distinguishing the cases of contiguous areas having similar values of a variables (positive association) from cases of contiguous areas showing opposite values (negative association) and, on the other hand, to detect spatial outliers, the territories in which such an association is also significant statistically. More important, it is possible to detect *spatial clusters*, defined as geographical concentrations of neighboring units with similar high or low levels of the variables.

The Moran's Index (I) in equation 1 is considered a standard measure of *global autocorrelation*, intended as the degree of co-location of areas with similar values of the X variable. In the equation, w_{ij} is the generic element of row-standardized contiguity matrix W, a $N \times N$ matrix describing contiguity relationships through binary values, N being the number of areas under analysis. The elements of the generic i^{th} row of the matrix take values 1 for if the area representing the j^{th} column is a neighbor of the area i. By definition self-contiguity is set to zero. For the purpose of this study, contiguity is defined based and the existence of a common administrative boundary between two areas.

$$I = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij}(X_i - \bar{X})(X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2} \qquad (1)$$

The value of the indicator can be identified as the slope of a linear regression coefficient of WX on X. While the coefficient slope indicates whether the global association is positive of negative, the graphical visualization of the plot of WX on X (considering the deviations from the respective means) distinguishes four possible circumstances occurring locally, namely:

- high values of the variable in both the unit and in the neighbors (HH);
- high value of the variable in the unit and low values of the variable in the neighbors (HH);
- low value of the variable in the unit and high value of the variable in the neighbors (LH;
- low values of the variable in both the unit and the neighbors (LL).

The Local Indicator of Spatial Association (LISA) (Anselin 1995) provides a more precise statistical measure of this local association. The measure, described in the equation 2 is computed for each area i and, under the assumption that the X variable follows a normal distribution, related significance levels can be computed by using the randomization procedure described by the same Anselin (1995) and discussed by Anselin et al. (2006).

$$I_i = (X_i - \bar{X}) \sum_j w_{ij} (X_j - \bar{X}) \qquad (2)$$

Approaching the classification of the regional territory in Lombardy with ESDA, we used the Moran scatterplot to produce a classification of the 1546 municipalities based on the urbanization density and later integrated this classification considering the significance of the LISA indicator. The urbanization density is employed to proxy land use and is available in the database on land use destinations (DUSAF) of the Lombardy region. The data are obtained from the interpretation of satellite images and refer to parcels of about 100 square meters. The territory is classified according to the following typologies: urbanized land, agricultural land, forestry, other (primarily rivers and lakes). The aggregate at the municipal level is retrieved by summing up the parcel values for each administration and dividing by the total land classified, leading to the percentage of urbanized land in a municipality. Finally, the year of observation is 2007.

To define contiguity we use the common boundary approach. Hence we consider as neighbors two municipalities if they share an administrative boundary. The choice to rely on the so-called "common boundary approach" to define contiguity is completely arbitrary. Actually some other methods are available such as, for instance, the "k-nearest approach" -the *k* nearest areas are considered as neighboring- or the "great circle distance approach" –all the areas within a certain distance from the origin. Testing with a number of different contiguity matrices resulted in no significant change in both the level of global spatial association (the value of the Moran statistic) and the map of local spatial association.

The following classification of the territory has been reached, taking into account both the results of the Moran scatterplot and the significance of the LISA indicator:

- urban core: is the group of municipalities characterized by a high level of urbanization density and which neighbors are also highly urbanized; in addition the LISA indicator is significant in these municipalities;
- urban fringe: is the group of municipalities located outside the urban core, which level of urbanization is high and which neighbors are also highly urbanized but the LISA indicator is not statistically significant; together with the urban core these municipalities form an urban system representing a geographical cluster of the most urbanized territories in the region;
- peri-urban territories: are territories at the margin of the urban fringe, which level of urbanization is low and which neighbors are highly urbanized; geographically, they are located shaping a belt around the urban system defined above;
- urban areas in rural territories: these are municipalities in which the level of urbanization is high but the level of urbanization in neighbors is relatively low and include primarily isolated cities located in the less urbanized area of the region;
- rural areas: these are municipalities in which the level of urbanization is low and the level of urbanization in neighbors is also low.

Table 1 describes the typologies of territories and provides information about the number of municipalities in each typology.

Table 1: Identified typologies of urbanization pattern

Typology	Description	N of municipalities
HHsig	Urbanized core of the Lombardy region. Includes the metropolitan area of Milan and major cities such as Como, Varese, Bergamo and Brescia.	286
HH	Territories in close proximity to the urban system, characterized by high level of urbanization.	208
LH	Territories at the margin of the urbanization system, shaping a belt between the urban system and the most rural territories of the region.	75
HL	Urban centers in predominantly rural areas	75
LL	Rural territories, characterized by low urbanization density	485
LLsig	Rural systems, primarily mountain areas.	415

The spatial distribution of typologies in the regional territory is presented in figure 1. It is possible to distinguish two urban cores (*HHsig*). One is located in the western part of the region and, starting from Milan, which is the largest municipality of the region, expands north embracing other important urban centers such as Bergamo, Varese and Como. All the municipalities between these large urban agglomerations are considered part of the main urban core, which is also the most urbanized area in the region. The other one is located in the eastern part of the region and includes the city of Brescia and the contiguous municipalities gravitating around it. The municipalities between the two cores are instead characterized as urban fringe (*HH*), being located at the margins of the cores while shaping a continuum of urbanized territories between the two cores at the same time. The borders of the urban system are traced by a discontinuous belt of rural territories at the margins of urbanized area (*LH*) which we classify as peri-urban territories. Beyond these territories extend the rural areas of the country (*LL*), primarily characterized by forestry and mountain areas in the northern part of the countries and agricultural areas in the southern part. The continuum of rural areas is however interrupted by a jeopardised sample of urban areas classified as urban centers (*HL*). These are in fact single municipalities in which, opposite to their neighbors, there is a higher average rate of urbanization. We distinguish this typology of urbanization from that characterizing the urban system because, with very few exceptions, in these cases there is absence of contiguity between urbanized areas.

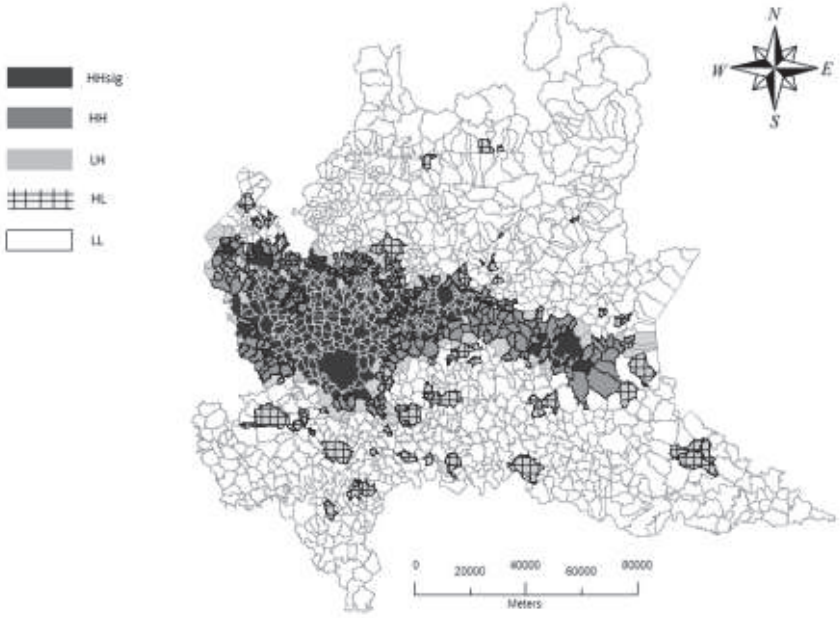

Fig 1. Typologies of urban and rural territories in Lombardy, Italy.

2.2. Statistical tests

In an attempt to compare the features of the agricultural systems in the region we proceeded with some statistical tests, which purpose is to verify the extent to which the value of some variables differ across the groups identified with the ESDA. Table 2 describes the variables used in the testing procedure and the source of data and Table 3 presents some descriptive statistics by typology. In selecting the variables which can best represent the agricultural features of the territories we focused on the features related to the nature of agricultural activities developed in the territory (Agricultural Specialization), the features related to the farm holder/manager (Characteristics of the farmer) and other features not strictly pertaining the agriculture but which are capable of influencing the environment in which farms operate (Characteristics of the socio-economic environment).

In relation to the agricultural specialization we considered the percentage of farms specialized in seeds (*SP_SEEDS*), other crops and permanent crops (*SP_CROPS*), breeding (*SP_BREEDING*) and with mixed specialization (*SP_MIXED*). Altogether these variables provide a comprehensive picture of the spatial distribution of farmers by typology in the regional territory. It becomes immediately clear for the readers that the Lombardy region shows an overall vocation for field-cropping agriculture, as the percentage of farms with a specialization in seeds (SP_SEEDS) is the largest across all the typologies. Obviously this vocation is more pronounced in predominantly agricultural areas. The second most important specialization is that in breeding activities (SP_BREEDING) which is, opposite to field-cropping, more pronounced in urbanized territories.

Table 2: Description of variables

Variable	Description and Source
Agricultural specialization	
SP_SEEDS	Percentage of farms specialized in seeds – Agricultural Census 2010
SP_CROPS	Percentage of farms specialized in cropping, including horticulture and permanent crops – Agricultural Census 2010
SP_BREEDING	Percentage of farms specialized in breeding – Agricultural Census 2010
SP_MIXED	Percentage of farms with a mixed specialization – Agricultural Census 2010
Characteristics of the farmer	
TEREDUC	Percentage of farm holders with tertiary education – Agricultural Census 2010
AGE	Percentage of farm holders which are more than 65 years old – Agricultural Census 2010
Characteristics of the socio-economic environment	
DIRSELL	Percentage of farms marketing their products directly – Agricultural Census 2010
BIOFARMS	Average number of farms in the municipality farming biological products – Lombardy Region
FARMHOLIDAYS	Average number of farm holidays structures in the municipality – Lombardy Region

In relation to the characteristics of the farmer, the share of farmers that have completed tertiary education ranges from 5.12% to 9.29%, picking the highest value in the urban centers located in rural areas. On average, the lowest level of education appears in the core. The level of education also grows moving out from the core toward the urban fringe and the peri-urban territories. Finally the highest percentage of old farmers is shown by the urban centres in rural areas whilst younger farmers concentrate in the urban fringe.

There are substantial differences across urban typologies also in relation to the agricultural characteristics of the socio-economic environment. For instance direct selling of agricultural products (*DIRSELL*) characterizes primarily the farms located in the urban fringe and in peri-urban territories, being relevant in other territories to a minor extent only. Biological farms (*BIOFARMS*) appear to be concentrated more in urban centre's in the rural area of the region, with an average of 1.5 farms per municipality. The figure decreases to about 0.8 farms per municipality in the remainder of the region with the exception of the urban fringe, where the figure almost 1.3 farms per municipality. Almost the same pattern is shown by the average number of structures for farm holydays per municipality

(*FARMHOLIDAYS*) which are primarily located in the rural area of the region and, in particular, close to urban centers.

Statistical tests are developed and implemented to see whether the differences emerging form descriptive statistics are actually significant. The aim of this analysis is twofold. On the one hand we can disentangle the extent to which the methodology used for the classification, which is based on the value of urbanization only, proves a valid tool for the classification of the regional territory. On the other hand we can use the results to discuss how the agricultural characteristics of a territory are influenced, or perhaps influence in turn, the dynamic of urbanization.

In the cases that the number of farms with a specific character is available and the total number of farms in a territory is known, we proceed using the statistic for the difference between proportions in the equation 3, which is known to follow a zero-mean unitary-variance normal distribution. In the equation, p_A and p_B are respectively the proportion of farms in groups A and B, n_A and n_B are respectively the total number of farms in the two groups and p is the joint proportion.

Table 3: Statistics by typology of urbanization pattern

	HHsig	HH	LH	HL	LL
Agricultural specialization					
SP_SEEDS	35.83%	37.49%	33.74%	39.97%	50.36%
	(2007)	(2526)	(782)	(1247)	(11209)
SP_CROPS	21.48%	20.85%	23.90%	25.48%	13.99%
	(1203)	(1405)	(554)	(795)	(3113)
SP_BREEDING	30.44%	31.05%	31.28%	24.62%	27.60%
	(1705)	(2092)	(725)	(768)	(6143)
SP_MIXED	12.25%	10.60%	11.09%	9.94%	8.06%
	(686)	(714)	(257)	(310)	(1793)
Characteristics of the farmer					
TEREDUC	6.78%	5.12%	6.30%	9.29%	6.97%
	(380)	(345)	(146)	(290)	(1551)
AGE	27.89%	30.30%	30.16%	32.02%	30.74%
	(1562)	(2041)	(699)	(999)	(6842)
Characteristics of the socio-economic environment					
DIRSELL	46.85%	31.79%	39.60%	26.54%	17.78%
	(1994)	(1711)	(687)	(692)	(3534)
BIOFARMS	1.290	0.832	0.893	1.560	0.814
FARMHOLIDAYS	0.399	0.779	1.160	1.307	1.010

In general the number of farms is known when the information comes from the agricultural census. For instance in the case of the *TEREDUC* variable we know exactly the number of farmers with at least tertiary education and the total number of farms (n) so that we can easily compute the proportion (p). On the contrary the total number of farms is unknown when the source of information is the archive of the Lombardy region. In the case of *BIOFARMS* the information is based on a certification system used by the regional authority. Farms are invited to apply for such a certification, and the majority of farms do not apply at all because either it is inconvenient, because too expensive, for them to satisfy the requirements or the probability of being certified is very low for some a priori motivation. Accordingly we should consider the sole number of applying farms in the proportion but unfortunately this information is unknown and, for this reason we consider the number of certified farms only in the statistic. A similar argument applies to the *FARMHOLIDAYS* variable, being not all the farms in the region potentially suitable to develop a farm holiday business. In these two cases we use the average number of farms per municipality and we

test the difference between the averages across municipalities. The statistic used for this purpose is presented in the equation 4. y_A and y_B are respectively the means computed across the municipalities in the two groups, s_A^2 and s_B^2 are the sample variances and n_A and n_B the number of municipalities in the two groups. The statistic is valid for $n_j > 30; j = A, B$ and follows a zero-mean unitary-variance normal distribution.

$$\frac{(p_A - p_B) - 0}{\sqrt{p(1-p)\left(\frac{1}{n_A} + \frac{1}{n_B}\right)}} \tag{3}$$

$$\frac{(y_A - y_B) - c}{\sqrt{\frac{s_A^2}{n_A} + \frac{s_B^2}{n_B}}} \tag{4}$$

In both the equations 3 and 4 c is the value to be tested under the null hypothesis and is set to 0, meaning that the difference between the proportions (in the equation **Errore. L'origine riferimento non è stata trovata.**) and between the means (in the equation **Errore. L'origine riferimento non è stata trovata.**) are zero under the null and hence that there is no difference between the two groups.

For all the variables presented in tables 2 and 3 the test is conducted considering all the typologies in pair. More specifically we compare the urban core with the urban fringe (HHsig vs HH), the urban fringe with the peri-urban area (HH vs LH), the urban core with the peri-urban area (HHsig vs LH), the peri-urna area with the rural areas (LH vs LL) and, the urban centres in rural areas with rural areas (HL-LL).

3. Results

The statistical tests results are presented in Table 4. In relation to the agricultural specialization, we find that there are not substantial differences between the urban core and the urban fringe. Both show very similar specializations in seeds crops and breeding. The only exception is the percentage of mixed farms, which is significantly higher in the urban core. There are some remarkable differences between the urban fringe and the peri-urban areas, being the percentage of farms specialized in seeds higher in the sooner case and the percentage of farms specialized in crops higher in the latter case. A similar difference shows up also comparing the urban core with the peri-urban territories, but peri-urban territories are characterized, in addition, by a higher share of mixed farms with respect to the urban core. Hence, in terms of agricultural specialization, we conclude that peri-urban territories are substantially different from urban territories. According to the results, peri-urban territories are also very different from the rural territories. Seeds activities are by far the most important in rural areas, where the share of farms specialized grows dramatically. In contrast, peri-urba territories result more specialized than rural territories in field-cropping, breeding and other farm specializations. Finally, it is important to note that there are substantial differences also between the rural areas and the urban centers located in rural areas. This result is however largely expected.

The statistical tests conducted to inspect the characteristics of the farmers suggest that both the education and age of the farmer vary across typologies of territory. The share of tertiary educated farmers is significantly higher in the urban core and the peri-urban areas, compared to the urban fringe; and it is also significantly higher in urban cities compared to rural areas. The farmers' age is also significantly lower in the urban core compared to the urban fringe and the peri-urban areas but there are no significant differences between urban fringe and peri-urban areas. There are no significant differences as well between the peri-urban territories and the rural areas while the difference between ruban cties and rural areas is only weakly significant.

Finally, considering the characteristics of the socio-economic environment, direct selling of agricultural products characterizes more the urban core and the peri-urban areas than the urban fringe. It is also worth noting that direct selling is more relevant in peri-urban areas than in rural ones. Farmers of biological products appear equally

distributed in the geographical space of the region. In contrast, the concentration of farm holidays structures in the peri-urban areas is significantly higher compared to the urban core and the urban fringe and is not significantly different from the urban cities and the rural areas.

4. Conclusion

The study intended to investigate the characteristics of urban/rural territories in the Lombardy region. Using municipality data the regional territory has been classified in five main typologies, based on the density of urbanization, distinguishing the urban core, the most densely urbanized and populated area of the region, the urban fringe, peri-urban territories, urban cities and rural areas. We focus more closely on peri-urban territories because in these areas the urbanization pressures are the most relevant due to their geographical position between urban and rural, with important consequences in terms of environmental sustainability.

Table 4: Statistical tests for the hypothesis of group-mean equality

	HHsig-HH Urban Core vs Urban Fringe	HH-LH Urban Fringe vs Peri-Urban	HHsig-LH Urban Core vs Peri-Urban	LH-LL Peri-Urban vs Rural	HL-LL Urban Cities vs Rural
Agricultural specialization					
SP_SEEDS	-1.66	3.76	2.10	-16.62	-10.39
	(0.028)	(0.001)	(0.038)	(0.000)	(0.000)
SP_CROPS	0.62	-3.04	-2.42	9.91	11.49
	(0.199)	(0.001)	(0.009)	(0.000)	(0.000)
SP_BREEDING	-0.61	-0.22	-0.84	3.68	-2.98
	(0.232)	(0.420)	(0.231)	(0.000)	(0.000)
SP_MIXED	1.65	-0.49	1.16	3.03	1.88
	(0.002)	(0.256)	(0.073)	(0.000)	(0.000)
Characteristics of the farmer					
TEREDUC	1.66	-1.18	0.49	-0.67	2.33
	(0.000)	(0.015)	(0.215)	(0.113)	(0.000)
AGE	-2.41	0.14	2.27	-0.58	1.28
	(0.002)	(0.450)	(0.021)	(0.281)	(0.074)
Characteristics of the socio-economic environment					
DIRSELL	15.07	-7.81	7.25	21.81	8.76
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BIOFARMS	0.46	-0.06	0.40	0.08	0.75
	(0.147)	(0.350)	(0.186)	(0.293)	(0.005)
FARMHOLIDAYS	-0.38	-0.38	-0.76	0.15	0.30
	(0.000)	(0.023)	(0.000)	(0.220)	(0.162)

The statistical analysis presented in the paper defines a clear picture of the characters of peri-urban areas in relation to the urbanized areas, on the one side, and to the rural part of the region on the other. We find that, in terms of agricultural specialization, peri-urban areas show very peculiar characters, based on which it is possible to distinguish them from both the urban neighbors and the rural ones. Compared to the urban territories, represented by the urban core and the urban fringe, peri-urban territories are less specialized in seeds and more specialized in field-cropping. Compared to the rural territories, peri-urban areas are also more specialized in every farming type

excluding seeds. In terms of farmers characteristics and of characteristics of the socio-economic environment, the agriculture in peri-urban territories appears more similar to the agriculture in the urban core than to the agriculture in the urban fringe.

Concluding, peri-urban agriculture differ substantially from both the urban agriculture and the rural one. Accordingly it is important to account for such a diversity in structuring the agricultural policy at the regional level. Although this empirical exercise represents a first attempt to use ESDA tools for the purpose of defining and characterizing different typologies of urban and rural territories, the results presented in this paper provide clear support to the use of this approach. In this respect the theoretical discussion on the classification of territories needs further discussion and the methodological approach requires additional refinement. By and large the paper confirms the need to extend the current classification methodologies by considering more explicitly their general geography and, more in particular, their relationships with the urban centers.

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