


## Article

# The Diversification of Sicilian Farms: A Way to Sustainable Rural Development

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**Abstract:** Rural areas still suffer from a lack of sustainable development, and the diversification of farms may be a step in the right direction. The paper provides a detailed picture of the diversification of Sicilian farms into tourism services. Specifically, we propose a simple indicator of localization intensity of agritourism farms and explore their spatial distribution at municipality level. Our study highlights that Sicilian farms rarely diversify into tourism services, despite being situated in attractive areas. That said, some significant spatial clusters of municipalities where agritourism farms are highly concentrated do emerge from the study.

**Keywords:** diversification; sustainability; agritourism farms; Sicilian rural areas; spatial clusters



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## 1. Introduction

In the 1950s, agricultural innovation was oriented to increase production in response to global food demand. To this end, rural farms received incentives as part of the Common Agriculture Policy (CAP) to adopt innovations which favored an intensive exploitation of natural resources [1]. This strategy not only negatively influenced the conservation of bio-diversity but also placed rural farms under the control of the Large-Scale Distribution (LSD) of produce. This essentially led to lower quality food production as well as unsustainable rural development. Therefore, at the end of the last century, policy makers and scholars increasingly supported the idea that the world urgently needed a new direction towards sustainable development. As far as rural areas are concerned, this has meant promoting a development strategy that aims to: (i) preserve natural resources (environmental sustainability), (ii) preserve local traditions and limit depopulation of rural communities (social sustainability), and (iii) support rural employment and farmers' income (economic sustainability).

From this perspective, rural areas are seen as *places* with important environmental, natural, and cultural assets, where local actors play a strategic role in the preservation not only of biodiversity and soil but also of cultural roots [2].

Recently, the OECD has suggested that diversification in rural economies may also increase resilience to external shocks such as the current pandemic. In this respect, some opportunities for the rural tourism industry may come in the near future because overcrowded urban destinations have become less attractive [3].

In light of that, diversification of farms is a potential way forward in sustainable rural development [4–7] by extending the boundaries of agriculture to other related industries like tourism and cultural services, as well as transforming agricultural economies into bio-economies [1]. This view implies that, “*The agriculture of the future must necessarily be multifunctional, i.e., it must have the ability to produce other non-food goods and services, of public or collective interest, in addition to food. These include environmental services that bring us back to sustainability*” [1] (p. 247).

A prime example of such diversification is that of agritourism, i.e., farms that exploit their production and other resources for hospitality and catering services. This type of economic activity is generally considered as an example of rural tourism [6,8]. However, agritourism significantly differs from other forms of rural tourism. In Italy for example, agritourism is regulated by a specific law (n. 96/2006), according to which hospitality and catering services must only be secondary activities, with agriculture being the main purpose of the firm. This classification allows agritourism farms to benefit from the tax breaks available to the agricultural sector, even though they also operate in the tourism sector. As [6] say, the Italian legislation has favored this type of economic activity because it may pursue “ambitious goals related to (i) economic issues, by integrating farmers’ revenues and by promoting local products; (ii) socio-cultural issues, by consolidating the relations between city and the country-side, and by preserving local tradition; (iii) environmental issues, by protecting the environment and the landscape; (iv) occupational issues, by creating new job opportunities, especially in the marginal areas, with the aim of limiting the exodus in particular of young and female labour force” (p. 384).

Although agritourism may represent a valuable opportunity for sustainable development for rural economies, it is still not widespread, especially in southern Italy where there is actually a lot of potential for rural tourism. For example, [6] show that in 2011, 37% of the total number of farms were in the southern regions of Italy (Campania, Molise, Basilicata, Apulia, Calabria, Sardinia, and Sicily), but only 10% of those devoted to agritourism were situated in the South. In contrast, the regions of Tuscany and Emilia Romagna, with only 11% of the total number of farms, had about 28% of Italian agritourism enterprises.

Our study focuses on the case of Sicilian rural economies and, using *Exploratory Spatial Data Analysis* (ESDA), explores the spatial distribution of farms and agritourism farms. The spatial concentration of agritourism has been examined by performing a small-scale analysis using data at municipality level in order to indirectly assess the vocation of farms towards tourism activities. To the best of our knowledge, few studies provide quantitative analyses on this topic, despite the importance it may have for the development of tailored policies. In this respect, Sicily, with its favorable climate and attractive scenery (both coastal and mountain), is an interesting case study. There is relatively little research on Sicilian agritourism farms, and the literature is quite recent and mainly refers to the impacts of public funding [9], farmers’ strategic decision processes and the role of websites [10], environmental and social determinants of entrepreneurial success [11], regulatory aspects and sectoral development [12], and demand satisfaction and managerial implications [13].

However, past studies have not specifically focused on rural areas and applied spatial methods to explore the spatial distribution and the localization of Sicilian agritourism farms. Our study is the first empirical investigation from a spatial perspective on the Sicilian case.

Exploiting data on the population of Sicilian rural farms in 349 rural municipalities for the year 2020, we proposed a simple indicator of localization to measure the intensity of agritourism activities at municipality level and then assess the presence of significant spatial clusters. We found four potential clusters not far from the coast in the northern and eastern areas of Sicily, where most of the mountain ranges and natural parks are situated. At the same time, we observed a lack of agritourism farms in some inner areas that, notwithstanding a vocation to rural tourism, suffer from a scarce endowment of transport infrastructures. Our results may represent a useful support for regional and local policy makers by extending the information set needed to plan rural policies more effectively.

## 2. Spatial Exploratory Analysis

This paper exploits data extracted from the business registers of the Chambers of Commerce on the population of Sicilian firms operating in agriculture (code A01 of ATECO2007 classification) as the principal sector of activity (henceforth called farms) at the end of 2020. The dataset provides information on 78,076 farms distributed across 382 municipalities (the total number of municipalities is actually 390 but in line with the aims of the analysis, we

excluded the Aeolian, Pelagie and Egadi Islands, as well as Ustica and Pantelleria). From this population, we extracted those farms operating in hospitality and catering services as a secondary activity (henceforth called agritourisms). These are identified by the codes I55 and I56 of the ATECO2007 classification. See Table S1 in Supplementary Materials for a detailed description of these economic activities.

We also grouped municipalities according to their level of rurality. According to the definition adopted by the Italian Ministry of Food, Agriculture and Forestry Policies, municipalities can be grouped into four different areas: (A) urban and periurban areas (11 municipalities), (B) rural areas with high intensity agriculture (22 municipalities), (C) rural areas with medium intensity agriculture (82 municipalities), and (D) rural areas with low intensity agriculture (267 municipalities). Table S2 in the Supplementary Materials section provides the full list of municipalities by area.

As [14] say, this classification is currently used for policy targets (for example, the National Strategic Plan for Rural Development, the National Strategic Framework of the EU Cohesion Policy, the Common Agricultural Policy, and the Biodiversity Strategy for 2030) and is based on the intensity of agricultural activities. In this study, we particularly focused on areas D and C, which include all the 349 municipalities involved in the policies of the Rural Development Plan and covered by the work of Local Action Groups (LAGs). Areas classified as in group D are those with the lowest intensity of agricultural production. These places are often defined as marginal for characteristics such as depopulation and an ageing population, lack of essential services and technological infrastructures, lack of entrepreneurship, and low incomes. The authors of [14] assert that, “*The chances of survival and growth of these realities are connected to the local resources. They range from the more effective promotion of typical and quality products, to development based on diversification of local economic activities, and attraction of tourism through environmental resources and cultural landscapes, when not affected by intense abandonment and inappropriate policies.*” (p. 5).

Table 1 shows that 77% of farms are in areas C and D, with 53%, that is about 41,000 farms, in area D. This concentration is even higher when considering agritourism farms, with 63% in area D and 24% in area C. However, confirming previous evidence, the percentage of agritourisms is very limited, with only 0.66% of farms being involved in tourism services as a secondary activity. This evidence underlines the lack of diversification with consequent negative impacts on sustainable rural development.

**Table 1.** Sicilian farms by area.

Area	Farms	Agritourisms	Total
(A) urban and periurban	4979 6% (99.24%)	38 7% (0.76%)	5017 6% (100%)
(B) rural with high int. agr.	13,130 17% (99.76%)	32 6% (0.24%)	13,162 17% (100%)
(C) rural with medium int. agr.	18,675 24% (99.35%)	123 24% (0.65%)	18,798 24% (100%)
(D) rural with low int. agr.	40,779 53% (99.22%)	320 63% (0.78%)	41,099 53% (100%)
Total	77,563 100% (99.34%)	513 100% (0.66%)	78,076 100% (100%)

Note: Row percentages in parentheses.

The quartile maps make clear the spatial distribution of both farms and agritourisms. Panels (a) and (b) in Figure 1 compare the two groups, aggregating economic units by municipality. We excluded areas A and B, which essentially include the big cities of Sicily, from our analysis since they are mainly involved in urban policies. We noted a high concentration of farms in several inner areas (darker areal units), especially in the south and south-east of Sicily. Looking at panel (b), we observed a lower concentration of agritourism farms in inner areas, while a large cluster is to be found in the extreme

south-east of the region. The Moran's I global index [15] of spatial autocorrelation confirms the existence of a positive and significant spatial correlation for farms and agritourism farms, which is higher for the population of farms; viz. it is equal to 0.44 and 0.26, respectively (Table 2). Specifically, the Moran scatter plot shows a polarization of farms in the High-High (HH) and Low-Low (LL) quadrant, 84 and 181 municipalities (76% of all municipalities in areas C and D), respectively (see Figure S1 in the Supplementary Materials section). As concerns agritourism, we found 51 municipalities in the HH quadrant and 159 in the LL quadrant, which is 60.17% of the municipalities in areas C and D (Figure S2 in Supplementary Materials).

To explore the potential for diversification more fully, we considered a measure of localization of economic activities. It is reasonable to hypothesize that we will have more potential agritourisms where there is already a greater concentration of farms. To this end, we computed the following index:

$$\text{Localization} = \frac{(\text{Agritourisms} / \text{Farms})_{\text{municipality}}}{(\text{Agritourisms} / \text{Farms})_{\text{region}}} \quad (1)$$

where the numerator measures the share of agritourisms in the population of farms at municipality level and the denominator measures the same share at regional level. This index may assume values above 1 if a municipality is specialized in agritourism activities and below 1 if it is not. The Moran global correlation is significant, though lower with respect to the previous cases (Table 2).

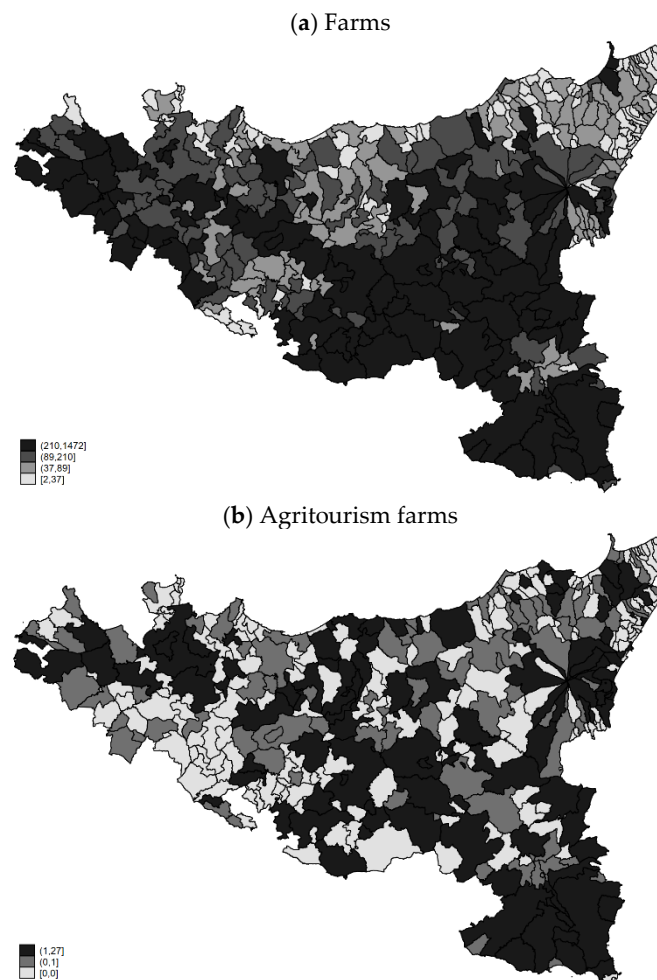
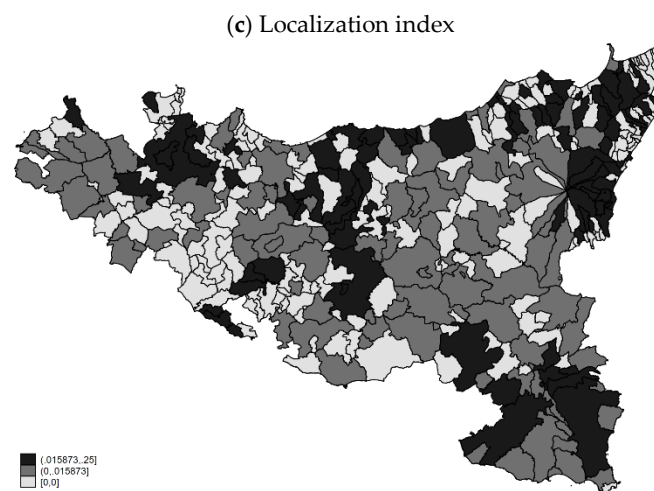


Figure 1. Cont.



**Figure 1.** Spatial distribution of Sicilian farms by municipality in rural areas. Source: Authors' elaboration on data from the Business Register by the Chamber of Commerce of Palermo.

**Table 2.** Global Spatial Autocorrelation (Moran's I).

Variables	I	E (I)	sd (I)	z	p-Value *
Farms	0.443	−0.003	0.035	12.849	0.000
Agritourisms	0.260	−0.003	0.033	8.024	0.000
Localization	0.114	−0.003	0.033	3.504	0.000

Note: \* 1-tail test.

The Localization index ranges from 0 to 33.8. From Table 3, we can see that about 46% of municipalities (179) have values equal to 0, i.e., there are no agritourism farms; 12% (i.e., 47 municipalities) have values between 0 and 1; and the remaining 42% show a relatively higher localization of agritourism farms assuming values above 1. To be more specific, 33 municipalities are in the range 1–2 of the Localization index, 26 are in the range 2–3, 15 in the range 4–5, and so on up to the highest values of about 30 in two municipalities in the Nebrodi mountains (Reitano and Frazianò). These two municipalities are very small (about 600/700 inhabitants) but show the highest vocation to agritourism activities. Obviously, this does not mean that we can find a lot of such farms in these places but that their concentration is comparatively high in comparison to the population of farms in those municipalities.

**Table 3.** Distribution of municipalities by Localization index.

Localization Index	Municipalities
0	179
0–1	47
1–2	33
2–3	26
3–4	15
4–5	14
5–6	8
6–7	5
7–8	7
8–10	5
10–13	5
13–16	3
>30	2

Note: We consider only municipalities in areas C and D (349) with the exclusion of the minor islands.



Panel (c) shows the spatial distribution of *Localization*. The darker areas include all those municipalities in the fourth quartile, i.e., areas with an index that ranges from 2.2 to 33.8. Focusing on this group of municipalities, we observed some interesting potential clusters. The first is in the north-west of Sicily, near to the city of Palermo where the Sicani mountain range begins. The second is in the central part of the region, starting from the coast (near the town of Cefalù), extending into the inner municipalities of the Madonie mountains (e.g., Collesano, Castelbuono, Pollina, Polizzi Generosa, Ganci, Petralie, etc.), and reaching up to the Erei mountains (e.g., near to the city of Enna). This area is very well known at both national and international levels for its tourist attractions, such as the medieval hamlets of Ganci and Geraci Sicula; Unesco World Heritage sites (e.g., Cefalù); and sites with a rich enogastronomic heritage, such as Collesano and Polizzi Generosa among others. The third is in the north-east of Sicily where the Nebrodi, Peloritani and Etna mountains are to be found. The last is the south-east of the region where we find the Eblei mountains and some important cultural and historical cities such as Syracuse, Noto, Ragusa, and Modica, as well as the places where the very popular TV series “Inspector Montalbano”, inspired by the books of Andrea Camilleri, was filmed. Traditionally, this regional area has been characterized by a high quality of agriculture, producing different foods having the P.G.I. (i.e., Protected Geographical Indication) and the P.O.D. brand (i.e., Protected Designation of Origin). Some examples are the Pachino tomato, the Avola almond, Cerasuolo wine, and the extra virgin olive oil of Monti Iblei, to name but a few. The area is also renowned for its Baroque architecture, with its eight gorgeous late-Baroque cities of Caltagirone, Militello Val di Catania, Catania, Modica, Noto, Palazzolo, Ragusa and Scicli, all of which are Unesco World Heritage Sites.

### 3. Detection of Spatial Clusters

The box maps presented above enable possible geographical patterns to be detected but do not individuate local clusters. To this end, we carried out an analysis of Local Indicators of Spatial Autocorrelation (LISA), computing the following measure of local spatial correlation:

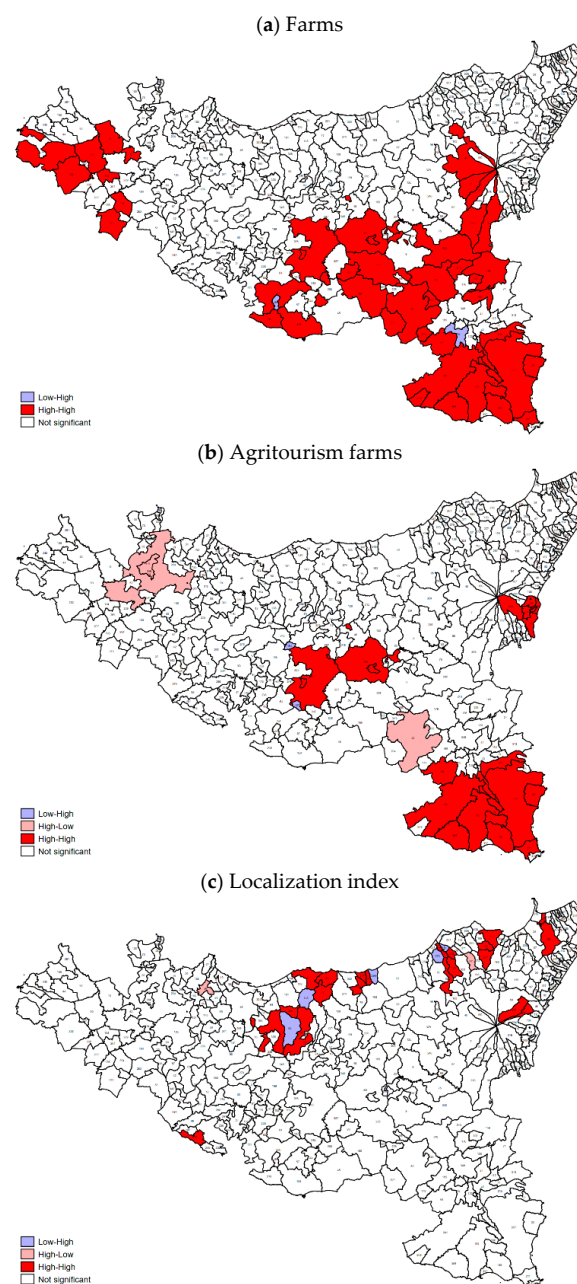
$$I_i = \sum_{j=1}^N w_{ij}^{std} \frac{(y_i - \underline{y})}{\sigma_y} \frac{(y_j - \underline{y})}{\sigma_y} \quad (2)$$

where  $y_i$  and  $y_j$  are the intensities of the variable of interest in municipalities  $i$  and  $j$  respectively,  $\underline{y}$  is the average value between spatial units,  $\sigma_y$  is the standard deviation, and  $w_{ij}^{std}$  is the element of the row-standardized contiguity matrix and defines the spatial relation between  $i$  and  $j$ . This index allows the degree of similarity in the variable of interest between a specific municipality and its neighbors to be captured [16,17]. The results are presented in LISA cluster maps, which enable the presence of hot spots to be detected. These local spatial clusters influence the values of the global spatial autocorrelation detected through Moran-I.

Specifically, positive and statistically significant values of  $I_i$  indicate the presence of spatial clusters, i.e., a grouping of similar values, while negative and statistically significant values of  $I_i$  indicate the presence of spatial outliers, i.e., a combination of dissimilar values. These results are represented in cluster maps, so that the significant locations such as High-High or Low-Low spatial clusters and High-Low or Low-High spatial outliers can be classified. The High-High (HH) cluster groups together those municipalities with high values of the variable of interest that are similar to those of neighboring locations (i.e., positive spatial autocorrelation and high index value). A cluster of low values (LL) groups together municipalities with low values of the variable of interest that are similar to those of their neighbors (i.e., positive space autocorrelation and low index value). In contrast, High-Low (HL) spatial outliers have high values of the variable of interest, but these values are dissimilar to those of their neighbors (i.e., negative spatial autocorrelation and high index values), whereas Low-High spatial outliers (LH), group together municipalities with

low values of the variable of interest that are dissimilar to those of their neighbors (i.e., negative spatial autocorrelation and low index values).

Figure 2 shows cluster maps at municipality level of farms in panel (a), agritourisms in panel (b), and the Localization index in panel (c). The red areas show clear spatial clusters for both variables: municipalities belonging to the High-High cluster are characterized by a large number of farms and agritourisms. In panel (a), we observe significant clusters in the west, the south-east, and the southern hinterland of Sicily. We find only two LH spatial outliers, i.e., Camastra and Monterosso Almo. The former is in an area that produces the Raffadali pistachio nut (P.O.D. food brand) and borders Naro and Licata, whose economies are predominantly agricultural. The second LH cluster is the municipality of Monterosso Almo, a well-known hamlet, whose agricultural production is mainly based on grain and fruit, while that of its neighbors is much more varied, including fruit, vegetables, wine, and dairy products.



**Figure 2.** Spatial clusters of Sicilian farms by municipalities in rural areas. Authors' elaboration on data from the Business Register by the Chamber of Commerce of Palermo.

As far as panel (b) is concerned, we found three evident HH clusters of municipalities with high concentrations of agritourism farms. The first is in inland municipalities near to the Erei mountains. The second is on the east coast near Mount Etna. The third and the largest is in the south-east of the region near the Iblei mountains. We found spatial outliers of both HL and LH clusters. One HL cluster in the north-west comprises the municipalities of San Giuseppe Jato, San Cipirello, and Monreale where numerous historical farmhouses have been transformed into agritourisms. Another HL outlier is Caltagirone situated in the central south-east of Sicily. It is a typical agricultural area, producing a wide variety of fruit and vegetables, which has markedly increased tourism over recent years. Marianopoli and Delia are the only two municipalities in the LH cluster, and they are to be found in the hinterland of the south, bordering Caltanissetta, which is an HH cluster.

To explore more fully the vocation of farms towards tourism activities, we performed a LISA for the Localization index. Panel (c) shows a significant HH cluster around the Madonia mountains (Petralia Sottana, Cefalù, Castelbuono, Pollina, Polizzi Generosa, Scillato, and Sclafani Bagni), a broad area that extends inland from the central northern coast. We observe some other smaller clusters near the mountain ranges of Nebrodi (Frazzanò, Patti, San Piero Patti, Longi, San Salvatore di Fitalia, Caprileone, Gioiosa Marea, Galati Mamertino, Pettineo, and Librizzi), Peloritani (Furci Siculo, San Filippo del Mela, Santa Lucia del Mela, and Merì), and Etna (Motta Camastra, Sant'Alfio, Linguaglossa, and Piedimonte Etneo). All these rural municipalities are not too far from the coast and are located in the North of Sicily. Finally, we found a very small cluster—comprising only the municipality of Sant'Angelo Muxaro—in the Sicani mountains.

#### 4. Discussion

Diversification of farms may be a potential pathway of sustainable rural development. European policies have been addressing this issue for at least two decades, and tourism seems to be the most promising sector for the diversification of rural farms. This could especially be an opportunity for rural areas in regions, like Sicily, which are lagging behind in all respects whether they be environmental, social, or economic. Notwithstanding this opportunity, Sicilian farms have a very poor record of diversification into tourism activities, as do all the other southern regions of Italy.

Using exploratory spatial data analysis, our study provides a detailed picture of the diversification into agritourism activities in rural municipalities of Sicily. To the best of our knowledge, this is the first attempt to explore the geography of the agritourism industry in Sicily by adopting a spatial analysis approach.

We observed a high concentration of farms in coastal and inner areas of the south-east of Sicily. The agritourism farms are more concentrated in the south-east and not too far from the coast. We note a localization of agritourism farms in inner areas but with a lower spatial concentration. Focusing on the concentration of agritourism farms in relation to the population of farms by municipality (as a proxy of the vocation of rural farms to tourism services), we found some potential clusters of municipalities with a higher vocation to diversification into agritourism. Although the largest number of agritourism farms are in southern rural areas, we found significant positive clusters of *Localization* only in the northern rural areas of Sicily, the largest of which is in the Madonie mountains, extending from the coast to the inner municipalities. We also found other smaller clusters in the mountain ranges of Nebrodi, Peloritani, and Etna and a very small cluster in the Sicani mountains.

Some policy implications emerge from this analysis. Firstly, diversification into tourism activities is still very limited in Sicily. In fact, in spite of the enormous potential for rural tourism in this region, only 0.66% of Sicilian farms have adopted this entrepreneurial strategy. Regional policies should be more focused on this potential, supporting a modern view of entrepreneurship and local development within rural communities by exploiting the local knowledge of LAGs (Local Action Groups). In such backward regions, policymakers often provide opportunities to finance entrepreneurial projects in rural and



marginal areas, but these are not taken up by local communities because of obstacles to divulgation and communication, usually due to a lack of digital culture and an ageing population. Overcoming these obstacles is one of the most significant challenges for sustainable development in rural areas [18].

However, the pandemic crisis may have opened up some new opportunities for rural economies. In the specific case of tourism for example, overcrowded urban destinations have become less attractive, while smaller rural destinations may now be more appealing. Moreover, consumers seem to be increasingly oriented to local products and services [3]. These opportunities will be wasted however, if a modern view of development is not accepted by local communities, and this requires serious investment in digital infrastructures accompanied by a digital and entrepreneurial culture [14,19].

This analysis indicates important directions for further research. For instance, additional information on both local environmental factors (e.g., infrastructures, quality of local institutions, local entrepreneurial culture, etc.) and the characteristics of both farms and farmers would enable us to explore differences in the spatial distribution of agritourism activities. However, the unavailability of statistics at municipality or micro level hampers further research. To this end, we underline the need to enrich the statistical information on rural areas by means of projects and surveys.

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/su13116073/s1>. Table S1: Industrial codes and definition; Table S2: Sicilian municipalities by area; Table S3: Sicilian municipalities by ID; Figure S1: Moran scatterplot on Sicilian farms; Figure S2: Moran scatterplot on Sicilian agritourisms; Figure S3: Moran scatterplot on Localization index.

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