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Commoning of territorial heritage and tools of participated sustainability for the production and enhancement of agro-environmental public goods

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Abstract

The purpose of this paper is to analyze how the commoning heritage processes find application for the production of agro-environmental public goods in contexts of high socio-economic marginality and environmental vulnerability, characterized by abandonment and from the consumption of agricultural land for food use. The purpose is to understand how these processes are able to influence, at local level, the governance processes for the implementation of environmental protection strategies. The survey made it possible to verify how the commoning processes aimed at the production of agro-environmental goods generate territorial resilience, understood as a community competence able to structure specific forms of social learning based on priorities identified and defined by the communities. The followed theoretical framework and the methodological approach have allowed on the one hand to draw up a taxonomy of the different territorial dynamics and on the other to identify a mixed indicator system, applicable and replicable also in other contexts, able to describe its dimensions analytically. The assessment of the cognitive elements related to the territorial fabric carried out through the proposed approach has allowed to demonstrate how the knowledge of the territorial capital contributes to the activation of forms of collective intelligence necessary for decision-making processes.

Keywords: Agro-environmental public goods, Collective actions, Inner areas, Rural areas, Vulnerability, Marginality, Territorial capital

Introduction

Over the last decade, at the national level, there has been a proliferation of multiple experiences of commoning, that is, forms of self-government (Magnaghi 2007, 2012) of the territorial heritage as a common good, a strategic result of the reconstruction of local development projects, through initiatives capable to activate governance processes for the implementation of participatory sustainability tools in favor of the environment and the protection of natural resources and of mitigation and adaptation to climate change.

These experiences have unfolded in the form of practices, behaviors, and initiatives both on the part of the productive structure and on the part of groups of citizens, who often do not know each other (Huron 2015), and are united by a narrative of renewed link between community and territory from the strongly spatial character, since the action of putting in common manifests itself in precise and concrete spaces. To reflect on the spatiality of these practices is particularly relevant in the Italian context, characterized by the emergence of numerous initiatives that have adopted the language of the commons just after the outbreak of the economic crisis, and the adoption of strict austerity policies combined the intensification of processes of neoliberalization of public policies.

In this context, a set of policy actions operate at the European level in the direction of consolidating environmental and climate performance. These include the Rural Development Policy, which offers a diversified range of incentives to encourage investment in rural areas, capable of favoring the supply of *common goods* (Hardin 2009), that are the class of goods used by several individuals, with respect to which there are difficulty of exclusion and whose “consumption” by an actor reduces the possibility of use by others (Ostrom et al. 2002); they are characterized by the absence of property rights in private terms and can give rise, under certain conditions, to phenomena of exhaustion of availability (Tietenberg et al. 2006).

The interdisciplinary debate, especially of Anglo-Saxon origin, refers to the relational nature of resources, so as not to “fix” these assets to specific entities. And thus, we witness the passage from the noun (common) to the verb (commoning) which calls in itself the dimension not of existing things, but of processes, of actions. Attention is therefore shifted from ontology, which defines what common goods are “in themselves,” in their essence, or in their perimeter, to the relative “performativity,” thus indicating the consistency in the practices that make them exist (Caleo 2016, 13-14).

The theme of common goods is closely linked to that of the multi-functionality of agriculture—related to the problems of market failure—and of the instruments of public intervention in support of the social functions recognized to the primary sector.

According to the definition given by the OECD, multifunctionality is often used to describe how agriculture can produce several non-commodity outputs in addition to agrifood products, associating it with the specificity of the agricultural production process (OECD 2001).

In fact, it is able to produce a complex set of goods, some of which (*non-commodity outputs*) are able to determine social benefits (maintaining the landscape, safeguarding biodiversity, preventing environmental risks, preserving cultural heritage, rural development, food safety, and animal welfare) being characterized by an obvious positive anthropic value. On the other hand, *commodity outputs* refer to the satisfaction of material needs and determine negative externalities (in the case of forms, for example, of pollution and depletion of natural resources); this one is a strong motivation that pushes the EU to continue to advocate, both internally and in international relations, the choice of financial support for primary activities.

The purpose of this paper is to analyze how the commoning processes of the local heritage find application for the production of agro-environmental public goods in contexts of high socio-economic marginality (Gurung and Kollmair 2005; Déry et al. 2012) and environmental vulnerability, characterized by abandonment and from the

consumption of agricultural land for food use (Benayas et al. 2007; Renwick et al. 2013). The purpose is to understand how these processes are able to influence, at local level, the governance processes for the implementation of environmental protection strategies.

Theoretical framework

The institutional approach to the production of public goods (Hagedorn 2008) theorizes that collective goods and services are produced or managed through specific organizational methods. These modalities are determined by the local governance system and by the relational dynamics among the different subjects that act within a territorial system, since public intervention must take into account, in addition to accounting for externalities in the absence of a market price, also the social and cultural dimension of public goods associated with productive activities through innovative forms of intervention. The latter must be addressed not to individual economic actors, but to a network of subjects, so as to make the intervention more effective, more aimed at the needs of local communities, and above all, lasting over time.

According to these studies, the role of agriculture and rural activities is analyzed in relation not only to the choice of policy instruments and forms of regulation adequate to guarantee a certain level of disbursement, but rather to the different organizational and coordination solutions of the institutional and social context of the structure of a territory capable of influencing the functioning of a policy action, explaining its efficiency and, above all, its effectiveness in achieving the pre-established objectives.

In this context, a crucial role is played by *collective actions* (Ostrom 2000) that are “the actions that a group of people (directly or through an organization) undertake to achieve common perceived interests” (Scott and Marshall 2009), or “a set of action taken by group of farmers, often in conjunction with other people or organizations, acting together in order to tackle local agro-environmental issues” (OECD 2013).

Their determinants rely on the characteristics (a) of the local system (Agrawal 2001; Pretty 2003; Vanni 2014), (b) of the group of actors involved (Ostrom 2006; Mantino 2010), and (c) of the institutional organization and the external environment (Mills et al. 2011) and find fulfillment on the model of agro-ecological production, on the territorial heritage, and on the paths of innovation that can contribute to rebuilding the socio-ecological systems, through the attribution of an ecological value to small-scale forms of agriculture.

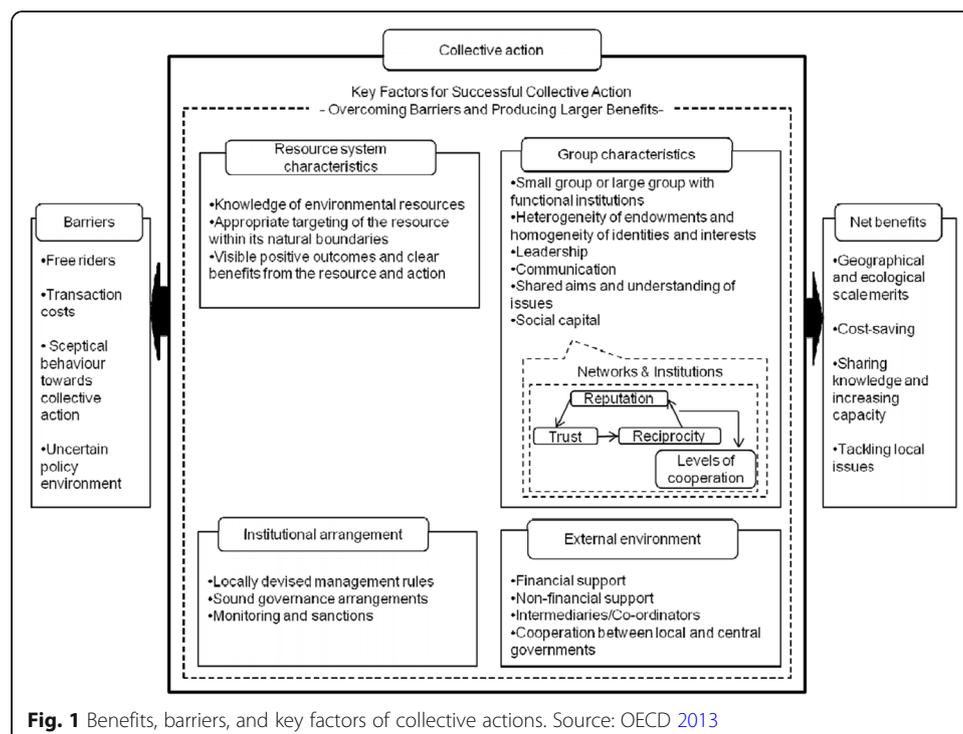
Several studies have shown that collective actions can be characterized by (a) higher productivity in the medium to long term (Badgley et al. 2007); (b) greater efficiency in the use of resources, including environmental resources (Reganold and Wachter 2016; Frison 2016, IPES-Food 2016; Rodale Institute 2015); (c) lower levels of final consumption (Rudel et al. 2009; Lambin and Meyfroidt 2011) and waste (Kneafsey et al. 2013; Forssell and Lankoski 2015) compared to those of agro-industrial production models; (d) greater temporal stability of production (Herrero et al. 2017), providing high and diversified quantities and qualities of nutrients for food (EPRS 2016); and (e) better planning and greater coordination between production and consumption and greater control of technical and commercial constraints and fair and shared determination of the final price of food (Forsell and Lankoski 2015; Nevens et al. 2017; Opitz et al., 2017).

The framework for the analysis of collective actions in the supply of agro-environmental public goods recently proposed by the Organization for Economic Co-operation and Development (OECD) (OECD 2013; Jones et al. 2015) allows to explore the key factors of success, as well as the barriers to overcome to produce goods and services of common interest through shared strategies at territorial level (Fig. 1).

In order to verify the research hypothesis, we used a two-phase research methodology—based on the analysis of certain dimensions of the *territorial capital* (Camagni 2010; Capello et al. 2011; Fratesi and Perucca 2018; Fratesi and Perucca 2019)—applied to a rural and inner area of central Sicily.

In literature, territorial capital is understood as: “the system of territorial assets of an economic, cultural, social and environmental nature that guarantees the potential for developing places” (Perucca 2014: 537); “(The stock of) specific territorial aspects” (Ventura et al., 2008); “(a set of) localized resources” (Zonneveld and Waterhout 2010); “geographically and locally limited services and conditions” (Capello et al., 2011); “attraction factors” (ESPON 2012) and “local structural elements” (Martinoia 2014).

All previous interpretations draw attention to the fact that territorial assets should be exploited and actively used in order to promote territorial development and guarantee territorial competitiveness. According to Camagni, the territorial capital includes the differentiated set of territorial resources, localized natural and artificial factors and assets, of a public, private, or “common” nature, tangible or intangible, productive or human, cognitive, relational and social that contribute to the creation of the distinctive and unique elements on which the competitive potential of a territory depends. Such a “capital” is present with differentiated quality in all places where there is a human community (Camagni 2009, 2016, 2018). According to Zonneveld and Waterhout (2010), it is a portfolio of territorial resources to be actively used to improve the added value of



economic units and strengthen territorial competitiveness that depends on the characteristics and models of the economy and society that insists on the territory, as well as on the quality of natural and man-made environment. It refers to the unity of local resources (endogenous), which differ in their extent, composition, and convenience among territorial units.

The concept of territorial capital was used to verify development problems through various case studies that attempt to measure the allocation of territorial capital at different scales, covering a varied range of objectives.

The first empirical investigations, both qualitative and quantitative, were conducted mainly by Italian scholars (Barzotto et al. 2016; Perucca 2014; Pompili and Martinoia 2015) and focus on the following:

- The explanation of the differentiated growth rates of the Italian provinces with respect to their regions and, in a comparative perspective between regions, to temporarily compare the endowment and to measure the impact of the economic crisis on the structural components of the socio-economic reality (Brasili 2012, 2014; Brasili et al. 2012; Perucca 2014);
- The analysis of the specificities and the differentiation of the conditions of particular territorial divisions, in Northern Italy (Camagni and Dotti 2010) or in the provinces of central and southern Italy (Mazzola et al. 2014, 2018) or at the level of European (Fratesi and Perucca 2018), or between the regions of the Latin arch (Affuso and Camagni 2010);
- The analysis of the relationship between territorial capital, cohesion, and economic growth policies at macro-regional level, concerning the countries of Central and Eastern Europe (Fratesi and Perucca 2014) or the NUTS 2 (Nomenclature des unités territoriales statistiques) regions of the European Union (Camagni and Capello 2013; Capello et al. 2011); the analysis of the role of territorial capital, and in particular of intangible assets such as natural and cultural capital, in regional growth processes and in local response processes to exogenous crises (Pompili and Martinoia 2011).

The study area

In order to analyze how the commoning heritage processes find application for the production of agro-environmental public goods, we have decided to investigate a rural and internal area of central Sicily, falling within the territory of the province of Caltanissetta. The area under investigation is characterized by a context of high socio-economic marginality (Gurung and Kollmair 2005; Déry et al. 2012) and environmental vulnerability, and moreover by abandonment and consumption of agricultural land. This area is characterized by structural disadvantages mainly due to peripherality, low accessibility indices, depopulation, and rarefaction of essential services for the person. Furthermore, the area must be considered as having a high environmental vulnerability (ISPRA 2017), which determines the exposure to risks for people and for the assets due to the inadequate insertion of the population in a delicate biophysical environment (Cullen and Pretes 2000; Gurung and Kollmair 2005).

Analyzing the territorial issues related to the environment and landscape aspects, it is necessary to highlight the obvious transformations of the landscape, caused by rural depopulation (Table 1) and abandonment of agricultural practice.

From the analysis of Table 2, we can observe how the variation of the agricultural surface is substantial, touching, in the period from 1982 to 2010, peaks of -67% while the decrease in the number of employees in the sector is really alarming, with the exception of the paradisiacal situation which is found in the municipality of Riesi ($+800\%$), linked to the development of the wine sector.

In particular, in central Sicily, rural and inner areas have been victims of a long and progressive process of marginalization and abandonment in favor of urban areas and a process of weakening personal services since the second half of the last century. Inexorably struck by “territorial drifts,” the main effects of which were depopulation, emigration, social and productive rarefaction, land abandonment, and landscape changes; internal Sicily was the sacrificial victim of economic development and suffered negative effects also on the environmental level: from hydrogeological vulnerability to landscape transformations, from uncontrolled re-naturalization to the loss of anthropic values.

However, the territory under study summarizes in itself a wide range of characteristics of historical and cultural specificity that make it a laboratory of extraordinary interest. It is endowed with a substantial historical-monumental cultural heritage composed

Table 1 Trend of the population residing in the territory under investigation (1971–2016, absolute values and percentage increase rate)

Municipality	1971	1981	1991	2001	2011	2016	2016/2011 (%)	2016/1971 (%)
Acquaviva Platani	1.730	1.560	1.570	1.231	1.041	948	- 8.9	- 45.2
Bompensiere	780	742	722	677	610	556	- 8.9	- 28.7
Butera	7.130	6.238	5.673	5.376	4.937	4.754	- 3.7	- 33.3
Caltanissetta	60.051	61.146	61.319	61.438	61.711	63.360	2.7	5.5
Campofranco	4.830	4.582	4.150	3.632	3.218	3.100	- 3.7	- 35.8
Delia	5.120	4.855	4.537	4.350	4.325	4.277	- 1.1	- 16.5
Gela	67.050	74.806	72.535	72.774	75.668	75.827	0.2	13.1
Marianopoli	3.360	3.013	2.675	2.362	2.006	1.906	- 5.0	- 43.3
Mazzerino	15.150	15.076	13.373	12.627	12.333	12.145	- 1.5	- 19.8
Milena	3.800	3.795	3.644	3.446	3.178	3.018	- 5.0	- 20.6
Montedoro	2.610	2.021	2.010	1.780	1.643	1.631	- 0.7	- 37.5
Mussomeli	11.762	11.342	11.537	11.547	11.010	10.780	- 2.1	- 8.3
Niscemi	24.053	26.089	26.998	27.641	27.975	27.558	- 1.5	14.6
Resuttano	4.151	3.219	2.752	2.467	2.139	2.038	- 4.7	- 50.9
Riesi	15.989	15.085	12.506	11.746	11.814	11.586	- 1.9	- 27.5
San Cataldo	20.578	21.058	22.507	23.154	23.424	23.253	- 0.7	13.0
Santa Caterina	8.583	8.071	6.541	6.087	5.727	5.388	- 5.9	- 37.2
Serradifalco	6.850	6.400	6.441	6.423	6.265	6.091	- 2.8	- 11.1
Sommatino	8.917	7.692	8.226	7.875	7.267	7.038	- 3.2	- 21.1
Sutera	2.680	2.136	2.010	1.641	1.436	1.410	- 1.8	- 47.4
Vallelunga	4.940	4.596	4.397	3.845	3.641	3.461	- 4.9	- 29.9
Villalba	2.400	2.307	2.152	1.916	1.731	1.633	- 5.7	- 32.0
Totale	282.514	285.829	278.275	274.035	273.099	271.758	- 0.5	- 3.8

Source: our processing on ISTAT and Ancitel data

Table 2 Percentage variations of the used agricultural surface (UAA) and of the number of employees in agriculture, forestry, and fishing (1971–2011, percentage variations)

Municipality	Variation % UAA		Variation employees in agriculture %				
	1982–2010	2000–2010	1971–1981	1981–1991	1991–2001	1971–2001	2001–2011
Acquaviva Platani	– 33.2	14.4	– 47.0	– 42.9	– 50.0	– 84.9	0.0
Bompensiere	– 22.1	43.1	– 53.5	0.0	– 75.0	– 88.4	0.0
Butera	– 19.8	– 2.9	– 49.3	– 35.8	– 45.3	– 82.2	– 50.0
Caltanissetta	19.9	32.6	– 46.5	47.9	– 58.3	– 67.0	– 71.0
Campofranco	– 51.2	– 37.4	– 59.5	15.0	– 56.5	– 79.7	0.0
Delia	– 29.5	21.7	– 19.2	– 4.6	– 41.3	– 54.8	– 86.0
Gela	7.8	75.1	– 43.0	– 23.3	– 7.0	– 59.4	– 52.0
Marianopoli	– 67.1	– 51.2	– 22.8	– 1.6	– 42.0	– 56.0	– 100.0
Mazzarino	– 38.7	15.3	– 33.4	– 26.5	– 34.9	– 68.2	– 50.0
Milena	– 38.1	– 33.1	– 11.2	– 6.3	– 54.0	– 61.8	0.0
Montedoro	– 43.7	– 43.0	– 50.6	– 23.5	– 52.3	– 82.0	0.0
Mussomeli	– 0.4	12.2	– 51.5	– 12.6	– 47.5	– 77.7	– 91.0
Niscemi	– 60.8	– 45.8	– 16.9	– 2.2	– 6.4	– 23.9	0.0
Resuttano	14.4	– 23.9	– 24.7	– 1.4	– 46.4	– 60.2	0.0
Riesi	– 46.4	– 5.2	– 48.8	– 5.9	– 31.9	– 67.2	800.0
San Cataldo	– 3.3	– 8.5	– 33.4	– 35.9	– 2.7	– 58.5	– 25.0
Santa Caterina	– 19.6	75.6	– 59.5	– 32.7	– 50.6	– 86.5	– 67.0
Serradifalco	– 22.8	– 4.5	– 65.7	– 0.9	– 21.8	– 73.5	– 20.0
Sommatino	– 48.3	– 42.6	– 41.2	– 12.7	– 33.8	– 66.0	– 30.0
Sutera	– 42.2	– 21.7	– 55.8	– 47.8	– 51.7	– 88.8	0.0
Vallelunga	– 28.8	– 14.0	– 29.3	– 38.1	– 42.5	– 74.8	– 86.0
Villalba	– 16.0	1.5	– 40.7	– 21.9	– 51.0	– 77.3	– 100.0

Source: our processing on ISTAT data—Census of Agriculture and Census of Population and Housing

of medieval and baroque historical villages and a relevant system of fortified architecture and archeological areas, an ecclesiastical and artistic heritage, valuable naturalistic environmental heritage as well as being strongly characterized by the presence of a historical memory, not always shared, based on the peasant tradition and that of the sulfur.

Methodology

Sampling

We proceeded to the identification of the municipalities, within which to administer the questionnaire, and to the number of the respective survey units, through a *stratified inversely proportional fixed sampling plan*, applying, therefore, in all the layers the same sampling fraction (Table 3). This technique, in literature, is used to deepen the knowledge of small segments of the population, as in the case of rural residents in the territory covered by this study.

The sampling unit of the first stage is given by the municipality. Considering that all municipalities located in the area are classified as *rural area with overall development problems*, to sample among these municipalities with rural predominate characteristics,

Table 3 Allocation of the sample units in the layers. Inverse-proportional stratified sampling

Strata	Municipalities	Resident population	W_h	n_h	N/N_h	w_h	n_{h1}
0–5	12	28.356	0.17	46	5.89	0.29	77
5–10	3	18.360	0.11	30	9.09	0.44	119
10–30	4	57.106	0.34	92	2.92	0.14	38
30–100	1	63.153	0.38	102	2.64	0.13	35
	20	166.975			20.55		269

Data on the total resident population refer to January 01, 2017; extrapolation data of June 15, 2017 by Istat —municipal resident population by sex year of birth and marital status. Source: our processing on Istat data

W_h weight of the population residing in the center amplitude class with respect to the provincial population, n_h number of interviews to be performed in the center amplitude class, N resident provincial population, N_h total resident population in the center amplitude class, w_h weight of the units to be sampled in the center amplitude class with respect to the total sample, n_{h1} number of interviews to be performed in the center amplitude class

the list was previously divided into layers according to the variables: demographic size, urbanization index, and rurality index.¹

Subsequently, the interviews were distributed according to the municipalities, basing the proportional attribution of the interviews on the adult resident population (Table 4).

The sampling unit of second stage is given by polling section; from these, the names to be interviewed are subsequently extracted, the number of which, respectively, was calculated in proportion to the population distribution.

According to this methodology, the territorial representativeness of the rural population, included in the extracted sections (towards the entire population of the municipality), is ensured, without any risk of accidental error, only if the numbering of the sections follows a strict conformity to a homogeneous and continuous logic of territorial succession (for example, the order spiral, starting from the center, or other like order) (Table 3). If the numbering of the sections does not follow such a criterion, the method described still ensures randomness of choice, even if it does not guarantee absolute protection against accidental errors of sampling.

Moreover, with the same methodology and along with the preceding, further names have been extracted as reserves in case of unavailability of the interview or untraceability of the first extracts. In this regard, it should be noted that we define rural residents as all those that are residing and living² in the territory under study, regardless of the typology of sub-regional area of origin (urban, peri-urban or peripheral area, rural area properly said, or countryside). The residence area typology is an important element in the result interpretation (Fig. 2). Analyzing the sociodemographic characteristic sample (Fig. 3), it is noted that 30% is represented by young people *under 34 years*, while 21.9% of individuals result *over 65 years*, proportion in line with the aging index that characterizes the rural areas at national level.

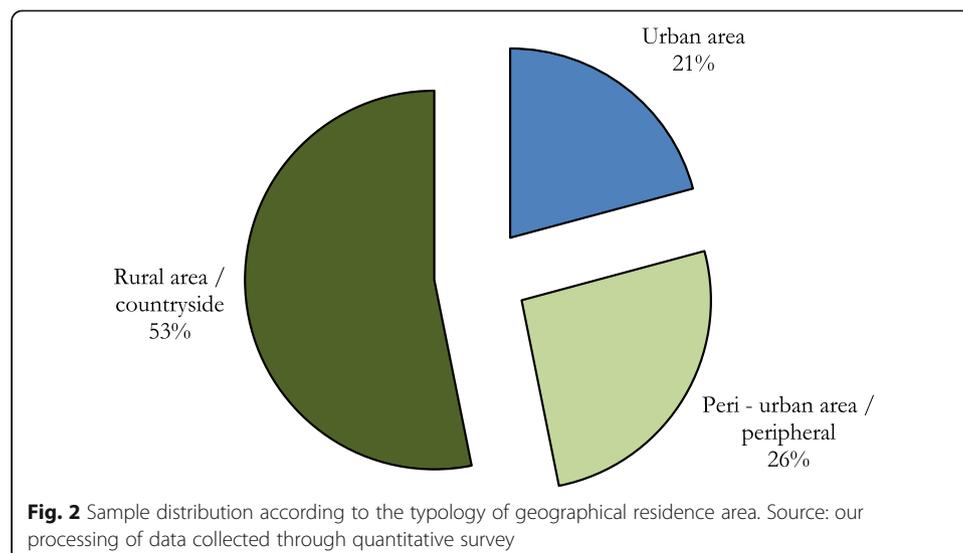
¹The *urbanization index* is calculated by the ratio between the urban surface and the total land area, per 100. The *index of rurality* is calculated using the ratio between the surface intended to agricultural land and the total land area, per 100.

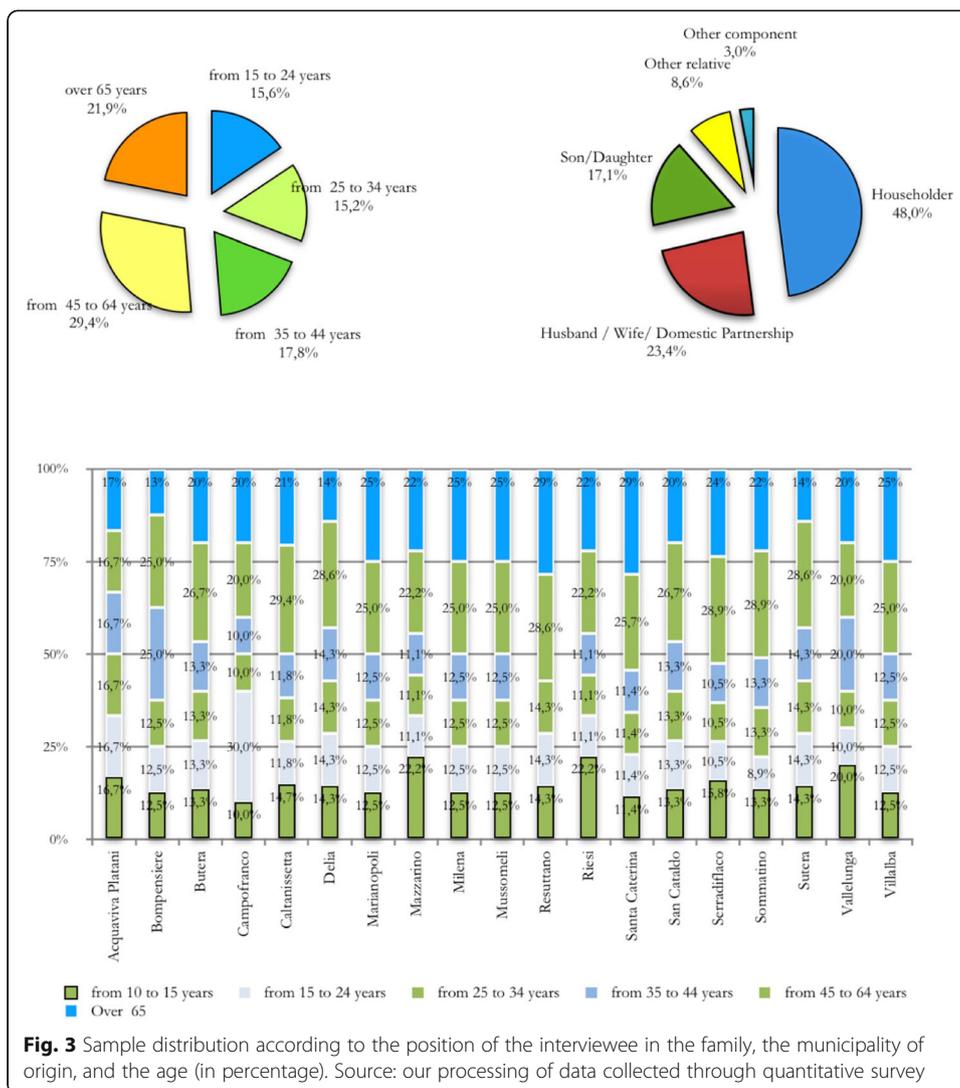
²In fact, we excluded from the survey all those cases in which, in the lists of names drawn from the electoral rolls, we found cases of “dummy” residence (second homes or other situations), not compatible with the habitual residence of the individual to be interviewed.

Table 4 First stage sampling. Attribution of the number of interviews for each municipality

Size of the class of population	Municipality	Resident population	N_h	N
0–5000	Acquaviva Platani	932	0.03	3
0–5000	Bompensiere	558	0.02	2
0–5000	Butera	4.691	0.17	13
0–5000	Campofranco	3.052	0.11	8
0–5000	Delia	4.228	0.15	11
0–5000	Marianopoli	1.858	0.07	5
0–5000	Milena	2.994	0.11	8
0–5000	Montedoro	1.613	0.06	4
0–5000	Resuttano	1.994	0.07	5
0–5000	Sutera	1.389	0.05	4
0–5000	Valllunga Pratameno	3.429	0.12	9
0–5000	Villalba	1.618	0.06	4
		28.356		77
5000–10,000	Santa Caterina V.	5.342	0.29	35
5000–10,000	Serradifalco	6.043	0.33	39
5000–10,000	Sommatino	6.975	0.38	45
		18.360		119
10,000–30,000	Mazzarino	12.046	0.21	8
10,000–30,000	Mussomeli	10.711	0.19	7
10,000–30,000	Riesi	11.484	0.20	8
10,000–30,000	San Cataldo	22.865	0.40	15
		57.106		38
3000–100,000	Caltanissetta	63.153	1	35
	TOTAL	166.975		269

Source: our processing on Istat data





Quantitative survey

All the interviews were carried out face-to-face during the second quarter of 2017, at the interviewee’s home, by a specially trained team of interviewers who administered a structured questionnaire, implemented on a platform *QuestBase*³, with well-defined execution methods.

The questionnaire consists of two sections. The objective of first section is to determine the relative importance of each dimension within which the natural capital can be broken down.

The questionnaire was focused, following the capability approach developed by Sen (1985), to assess the level of accessibility to resources.

In this literature, the key issue is given by the awareness of local actors about the allocation of territorial resources. The attention is placed, on the one hand, on the

³It is a multi-platform on web that offers the functionality to create and manage questionnaires, allowing his creation with the possibility to define rules and constraints for its completion and delivering.

production and distribution of knowledge and, on the other, on the relationships, in terms of *networks*, which determine the real access to the available resources.

The questionnaire was therefore structured to detect the level of satisfaction of rural residents regarding the knowledge, accessibility, and usability of the resources taken into consideration which were assessed in terms of *functioning* and *capabilities*. The functioning are the ways of usefully using the goods of which there is availability, usable in the context in which the individual lives.

Capabilities, on the other hand, represent the measure of being able to choose between different functioning and depend on individual characteristics and resources.

This approach allows you to collect the amplitude of possible satisfactory functioning for the individual and the characteristics of the individual himself, obtaining a different assessment from that offered by traditional indicators. By applying the Sen capability approach to the evaluation of the territorial heritage by rural residents, we will in fact have that the elements of value will consist of all the functioning that can potentially be carried out through the theoretically usable infrastructure. The set of capabilities thus outlined therefore represents the individual's freedom to benefit from infrastructural, recreational, cultural, and environmental functioning.

To measure the possibility of using the functioning themselves, determined both by the relative availability (and accessibility) and by the personal abilities to use them and proceed to the definition of an evaluation space with the consequent attribution of a relative value, the questionnaire provided for the administration of items based on 5-point Likert scales, traditionally used in studies of this type.

This technique consists mainly of developing a certain number of statements (technically defined items) which express a positive or negative attitude towards a specific object. The sum of these judgments will tend to delineate the subject's attitude towards the object in a reasonably precise way. For each item, there is an agreement/disagreement scale, generally in 5 or 7 ways. Respondents are asked to indicate their degree of agreement or disagreement with what is stated in the statement.

The underlying logic of the survey model provides that the satisfaction level is considered as an intangible construct, observable by two different perspectives:

1. The first type is *not attribute based*, in virtue of which it recognizes to the respondent, by means of his cognitive processing, the ability to formulate an overall evaluation;
2. The second type is *multi-attribute based*; it considers, instead, the satisfaction as a multidimensional variable and consists of several identified elements by the different aspects of natural capital, which, in the questionnaire, are translated into many items to be evaluated.

The socio-demographic data section closes the questionnaire.

Qualitative survey

These results are integrated by a qualitative survey detected both through desk analysis and in field observation, both through in-depth interviews with stakeholders and focus groups with local actors, called to evaluate in a participated form.

In particular, the local actors to be involved in the survey were selected on the basis of their knowledge of the territory and the local reality, where knowledge of the territory does not refer to a superficial knowledge of the places, but to the “Local Mind” (La Cecla 1993) or, in other words, something much more intimate and profound, a sort of renewed recognition of fatherhood and filiation, for the rediscovery of a forgotten as well as remote and ancestral symbiotic relationship (Bevilacqua 2008).

To this end, the investigation method based on focus groups seems particularly appropriate, thanks to the interaction between the participants on which it is based (Bertin 1994: 64). In fact, the interaction helps to deeply analyze the topics covered and allows the reproduction of the process of forming opinions. This is achieved to a greater extent the more the interaction processes are personal and less structured, as occurs precisely in focus groups, especially if conducted with participatory methods able to emphasize the role of stakeholders in helping to delineate the cognitive frame.

Respondents belong to the following categories: (1) agro-food firms (25%); (2) associations and producer organizations, linked to the primary sector (15%); (3) the professionals who carry out their activity within the area and who have relationships with agricultural companies, such as agronomists and accountants (20%); (4) representatives of government agencies, local communities, and other associations (20%); (5) rural residents (20%).

Firstly, since the territorial context is characterized by great uncertainty and a particular lack of information, we wanted to verify and integrate the indications derived from the quantitative analysis. Although, in fact, the analysis of the territorial capital is based on an articulated battery of indicators, it is affected by the typical limits of the statistical analyses, when from these we must draw operational conclusions. With reference to these problems, the qualitative analysis allows instead to highlight particular aspects that do not emerge from the quantitative analysis, aspects that are, even more so, fundamental if we want to analyze and understand the different dimensions related to rural territoriality.

Secondly, we wanted to explore the territorial dynamics put in place by local rural actors in order, on the one hand, to understand their processes, and on the other, to (a) identify the specific practices, motivations, values, objectives, actions, and adopted strategies by individual and collective actors and analyze them; (b) to understand how the subjective reflexive processes, the innovative and transformative capacities, and energies of local actors affect local practices; (c) to analyze the contents of their requests to the institutional system and the proposals for changes in policy actions.

The cognitive objective of the research, in this perspective, has been of a representative nature that is intended to trace a typology of the different social interactions between individuals and territory.

Results

During the second half of the last century, in fact, also in central Sicily, the process of radical transformation of the economies that reduced the agricultural population and restricted the cultivated areas took place. This occurred especially in the hilly areas where the grasslands and arable land have left the field to the spread of uncultivated land, while in the plains there has been the abandonment of traditional agricultural

settlements in favor of higher levels of mechanization that have reduced the reserve of biodiversity, the articulation of the landscape, and the ability of overgrown for water, increasing the flow to the main water system and consequently destroying the garrison function that traditional farms and their economies had carried out on the territory.

The changes brought about by not always adequate agro-pastoral practices, by the abandonment of the works of hydraulic-forestry arrangement, by frequent forest fires, have increased the territorial fragility and the geological-hydraulic danger; therefore, the probability of landslides and floods has greatly increased.

The cognitive analysis of the dangerous conditions caused by the geological-hydraulic instability is therefore crucial for a better territorial management, which must be supported by a joint forecasting and prevention policy. From the analysis of the data, the local people appears to be certainly worrying about the bad water regulation and the consequential risk of landslide processes of various nature, due to the geological-ographic context, the climatic characteristics, and the bad urban planning.

All this, in addition to causing a clear environmental impact, also generates a significant socio-economic fallout, due to the damage to the agricultural sector (such as the increase of unemployment in the primary sector of areas no longer suitable for cultivation, the damage to the biodiversity, the higher costs for businesses in case of interruption or significant diversions of transport infrastructure), and to the loss of land and services that are no longer able to correctly explicit their ecological, economic, and social functions.

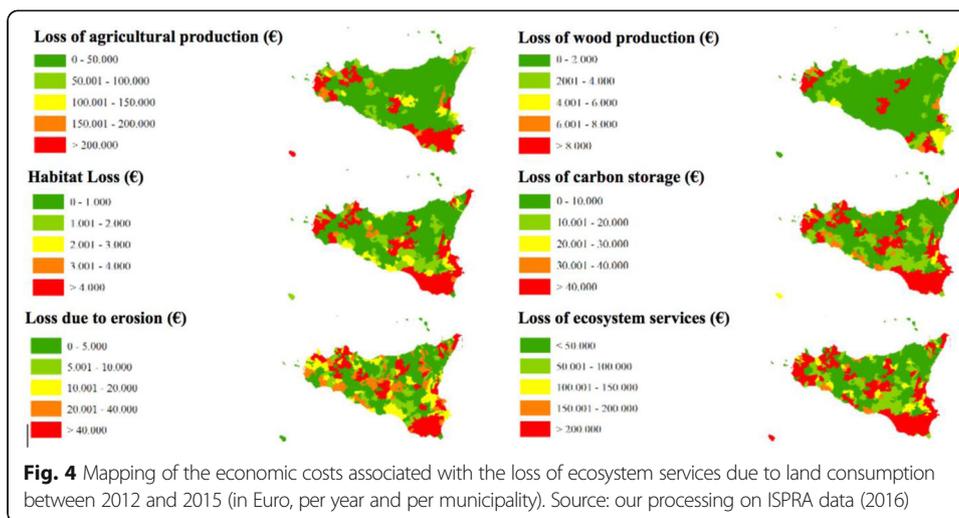
From the (ISPRA 2016) evaluation of the economic effects (Fig. 4) that the consumption of land determines on the loss of ecosystem services, it is evident how, at the local level, the impact, in terms of costs incurred, is very high, making it therefore necessary for a greater sensitivity and attention from local governance.

However, according to the interviewed sample, the environmental heritage (Fig. 4), in the overall analysis of the territorial heritage taken into consideration, appears to be one of the main strengths of the area. The results that emerged from the quantitative phase of the survey, whose data are shown in Table 5 and Fig. 5, also confirm that environmental and landscape issues play a strategic role thanks to the remarkable variety and wealth of natural and environmental resources that, to date, still appear to be insufficiently valued, used, or protected.

Preventive activities, even if held in high regard by local governance, are failing to assert themselves, while decision makers continue to operate in a perennial state of emergency in order to remedy the damage produced from time to time.

The level of satisfaction of the rural residents interviewed (Table 5 and Fig. 5) about the presence and quality of flora, fauna, and biodiversity is not high (satisfaction indicator = 2.4, average score on a scale of 1 to 5), as well as for the natural landscape, assessed by the residents through a judgment on satisfaction with the presence of lakes, rivers, woods, and parks (average score 1.7); excellent evaluation on the environmental quality, through a judgment on the presence of a healthy environment (average score 4.8) and on the low pollution levels (average score 4.7).

The results show a not too positive assessment for the aspects related to the settlement development, assessed through a judgment on the pressure of urban buildings on the agricultural and rural environment (average score 2.8). This is also confirmed



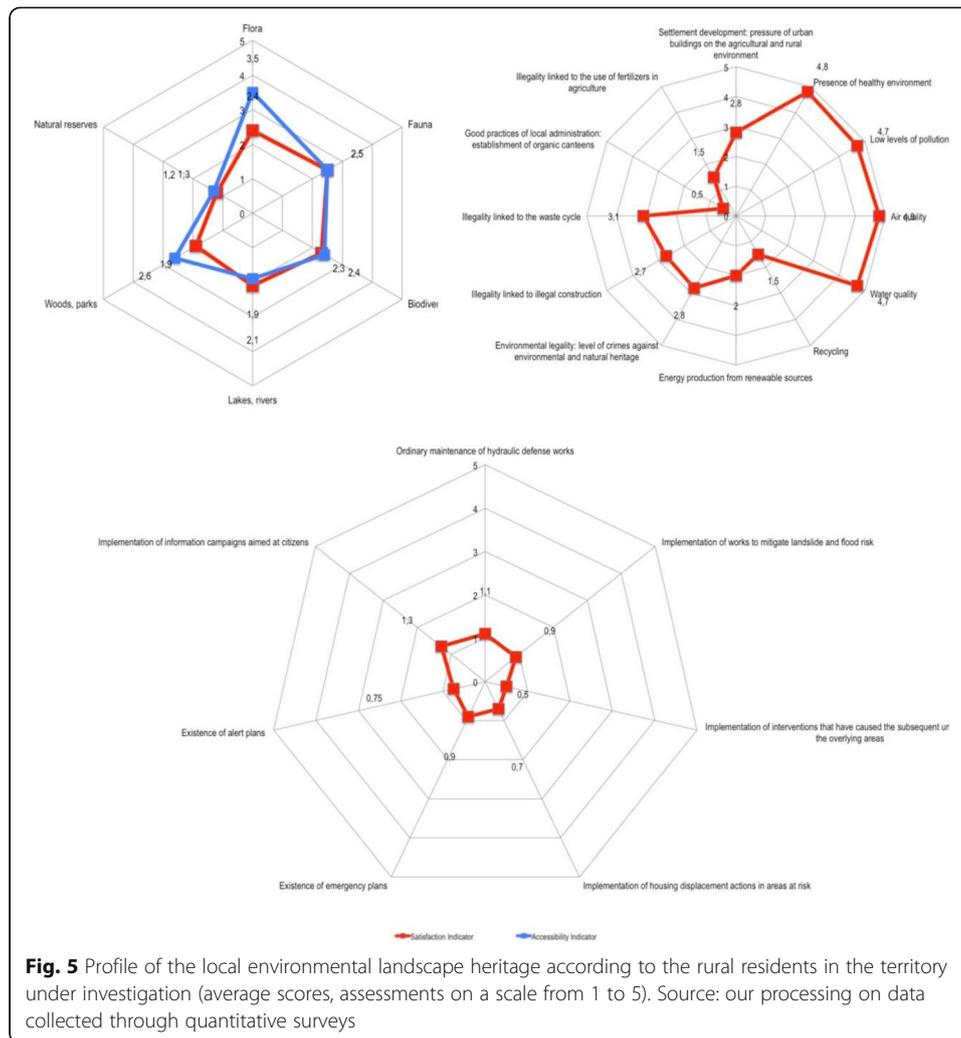
during the qualitative survey, from which critical aspects and issues deemed urgent by local actors emerge.

In particular, reference is made to the hydrogeological instability of some areas of the territory, to the incomplete implementation of integrated water and waste management, to the absence and/or partial implementation of adequate planning tools (landscape plans, forest management plans, plans in protected areas, etc.), to the high risk of

Table 5 Satisfaction indicators and accessibility indicators on the environmental landscape heritage detected by means of a quantitative survey (average scores, score expressed on a scale from 1 to 5)

Dimensions of the environmental landscape heritage	Accessibility indicator	Satisfaction indicator
Presence of environmental resources: flora	3.5	2.4
Presence of environmental resources: fauna	2.5	2.5
Presence of environmental resources: biodiversity	2.4	2.3
Natural landscape: presence of lakes, rivers	1.9	2.1
Natural landscape: presence of woods, parks	2.6	1.9
Presence of nature reserves	1.3	1.2
Settlement development: i.e., pressure of urban buildings on the agricultural and rural environment	-	2.8
Presence of healthy environment	-	4.8
Pollution levels	-	4.7
Air quality	-	4.8
Water quality	-	4.7
Separate collection	-	1.5
Energy production from renewable sources	-	2
Environmental illegality: level of crimes against environmental and natural heritage	-	2.8
Illegality related to illegal construction	-	2.7
Illegality linked to the waste cycle	-	3.1
Good practices of the local administration: establishment of biological canteens	-	0.5
Illegality linked to the use of fertilizers in agriculture	-	1.5

Source: our processing on data collected through quantitative surveys



desertification, and to the persistence of the problem of fires in protected areas and not protected.

In this context, agricultural entrepreneurs find it difficult to activate mechanisms of shared and cooperative management of agro-environmental problems, even if induced by other companies, because the family business, at the local level, does not possess in itself those necessary mechanisms of change, but only endogenous mechanisms of resistance or even opposition, not able to stimulate the indispensable technical, organizational, and social innovations that allow the construction of new networks of knowledge.

However, the overall inability attributed to the local governance to design actions that favor the conservation and environmental protection of the territory penalizes, according to the interviewed farmers, the geographically more peripheral areas that would be more damaged than other areas along which intensifies the concentration of population, economic activities, and settlements (Prescott et al. 2020).

Despite the fact that the destiny of marginalization, abandonment, and failure is almost accepted with passivity and resignation by the local population, it is as well possible to observe that the high quality of the geomorphological structure, of the

historical settlements, and of the naturalistic heritage are recognized to be part of the local identity.

The identified solution, which emerges from the results of the focus groups and qualitative interviews according to the agricultural entrepreneurs, the stakeholders, and the rural residents, should be sought in the reconstruction of a network of farmers' alliances with the subjects most interested in playing a positive role in defense of health and food (consumers) and of land and environment (ecological movements).

The integrated strategies that aim to activate these processes are therefore an obligatory path and are lived with great favor.

Furthermore, the assessment of the cognitive elements related to the territorial fabric carried out through the proposed approach has allowed to point out how the knowledge of the local capital contributes to the activation of forms of *territorial resilience* (Sheffi 2005; Walker et al. 2004; Martin 2011; Folke 2016). We intend to refer to that community competence (Battaglini and Masiero 2015) able to structure specific forms of social learning and collective intelligence, based on priorities identified and defined by local communities, through their model of territorialization (Raffestin 1984, 2012), necessary for decision-making processes capable of translating themselves into regulatory policies.

The survey methodology, in its participatory dimension, turned out to be, for the actors involved, an instrument of knowledge that allowed everyone to learn through group experience. The active involvement of agricultural entrepreneurs, residents, and stakeholders has allowed the activation of democratic processes of partnership and learning, contributing to the construction of new forms of civic responsibility until then unknown.

In fact, participatory valuation has encouraged and facilitated the definition of a model of organization of decision-making and management of policy actions coherent with the model of environmental protection based on the idea of territorial governance, definable as what makes possible, to the rural territory, to behave and act as a collective actor and through which to re-generate a shared vision of local constraints and opportunities.

In fact, one of the weaknesses frequently found in literature concerns precisely the lack of specificity of the diagnoses and strategies, linked to the absence of awareness of the importance of the dynamics of participation and sharing. In fact, in the operational reality, it often happens that the participatory dimension is often trivialized and isolated in the context of local consultation, which in itself is not able to produce adequate results either in terms of sharing knowledge, or in terms of development of processes of collective intelligence, or, in other words, cannot lead to changes in the relational structure of the system itself.

If the possibility of generating territorial resilience derives essentially from the ability to mobilize local actors in the activities of planning, organization, and exchange of information flows, often the dynamics of rural marginalization are instead able to distort the policy processes. In this case, the activity involvement of local communities are limited to simple consultation rather than to an effective *empowerment* (or participation as a direct influence in the elaboration of policy actions themselves).

Following this perspective, the methodology adopted allowed us to carry out the path that leads from a first alignment of the visions to a true participatory planning of the

strategies of sharing knowledge first and then intervening. It has permitted the reestablishment of the principles and forms of community management of the territory as a common good, and, on the other, of developing those forms of collective re-identification with the identity of the place itself capable of promoting that change towards a growth of the conscience of place and of active citizenship.

Conclusions

Our goal was to understand how the commoning heritage processes find application for the production of agro-environmental public goods.

For this purpose, we built a model useful to the understanding of the unfolding of such complexity.

Operationally, the methodology was realized by an empirical analysis of a rural area of central Sicily carried out through the observation of the lived experience by rural residents.

The first evidence has confirmed the starting information on marginalization and the strong complexity of the area examined. It is because this area has a low demographic density with no little problems of employment and income distribution. The territory is characterized by a significant infrastructure deficit and by a rural context indicating a strong presence of agriculture, in which the historical and artistic heritage is little known, whose cultural activities are aimed at enhancement of traditions, of history, and local identity.

About the questions posed, the results of the study showed, finally, at the local level, the concept of territory, as perceived in its procedural dimension of long duration takes absolute centrality.

It is a result of the meeting between the tangible and intangible elements of the territorial capital as a whole, in which, we noted, the aspects of environmental endowment play a crucial role.

Moving from the methodological to the theoretical level, if to regulate a local system, it is necessary to understand the mechanisms that govern the self-eco-organization processes; the results showed that a decisive role is played by the learning of decision-making and the relative ability to think (intelligence) and to formulate policy actions.

In this sense, such forms of collective learning in rural areas require the public decision-maker to re-elaborate strategic choices to take into account the outcomes of the strategies implemented by individual actors at the local level.

Although we have adopted a complex sampling design that has allowed to effectively reach the target of rural residents, the comparison between the different points of view of the local actors involved in the survey has allowed a more articulated reading of the frame of reference, more dense with meaning and more coherent. The context revealed itself more complex, since it has revealed that the existing obstacles to the production of agro-environmental public goods, and the influence that these exert at local level on governance processes, concern categories of residents (for example young people aged 15 to 18), whose opinion is not usually taken into consideration; it has been highlighted, also, the existence of important human resources and innovative ideas. On the other side, the context revealed also richer because, recognizing the existence of different opinions, it was possible to get out of the box, reflecting the ancestral prudence of the rural world, driven by the need to guarantee its survival. A more coherent

reading of the frame of reference comes out from the study, since expressing differences, or even divergences, has proved that the participative process is indispensable for understanding common identity elements.

The process of social participation in decision-making leads to a better understanding of the role that the territorial organization and the system of actors play in pursuing the well-being of the local community.

In a process of participated territorial development, the multilevel governance practices aimed to answer the needs of the local community should change the perception of environmental competences, related to the use of resources, from a constraint into a specific opportunity.

Abbreviations

EU: European Union; OECD: Organization for Economic Co-operation and Development; NUTS: Nomenclature des unités territoriales statistiques

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Authors' contributions

All authors read and approved the final manuscript.

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Availability of data and materials

- The datasets generated during and/or analyzed during the current study are available in the ISTAT repository <https://www.istat.it/it/popolazione-e-famiglie>.
- The datasets generated during and/or analyzed during the current study are available in the ISTAT repository <https://www.istat.it/it/censimenti-permanenti/agricoltura>
- The datasets generated during and/or analyzed during the current study are available in the ISPRA repository <http://www.isprambiente.gov.it/it/banche-dati>
- The datasets generated during and/or analyzed during the current study are available in the ANCITEL DATA repository <http://portale.ancitel.it/open-data-online-lelenco-delle-basi-dati-previste-dal-piano-triennale/>

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