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MAPPING CONSERVATION STATUS AND EVALUATION OF ECOSYSTEM SERVICES ON DROVE ROADS: STUDY CASES OF TRATTURO CASTEL DI SANGRO-LUCERA AND CAÑADA REAL SEGOVIANA

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PhD Candidate: Michele Minotti
ID: 149360

Tutor
Prof. Paolo Di Martino

PhD Course coordinator
Prof. Gabriella Stefania Scippa

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1 Introduction

Pastoralism has been widely practiced all over the world, starting with the Neolithic period (Bower 2011) and nowadays can be divided into three types: pastoral farming (pastoral mobility with little or no long-distance movement); nomadic pastoralism (pastoral mobility in highly irregular patters); and transhumant pastoralism (regular back-and-forth movements between relatively fixed locations) (Dong et all 2016). In the case of transhumant pastoralism, there is a broad interest in analyzing the dynamics of transhumance over time (Gómez-Ibáñez 2016, Morgado 2017), for instance in relationship to the maintenance of particular cultural landscapes (Bunce et all 2004). Moreover, we can say that the practice of transhumance consisted of a sustainable use of land, linked to the use of a wide number of 'ecosystem services' (Oteros-Rozas et all 2012, Papachristou 2016, Francioni et all 2016). In particular, transhumance roads are considered to have played an important role as 'ecological corridors', enabling the diffusion of plant and animal species along their routes (Bunce et all 2006). It was a role that today, because of the bad state of conservation associated with its non-use, can be defined as heavily altered.

In Europe, examples of organized transhumant pastoralism and the development of a network of routes can be found in Spain (*Cañadas Reales*), Italy (*Tratturi*), Portugal (*Caminhos*), France (*Draylles* in Languedoc), Greece (*Vlachostrata*), the United Kingdom (*Drove roads*), Germany, Romania (*Drumul olior*), and Bosnia and Herzegovina (Manzano-Baena et all 2010, Biber et all 2010, Luick 2008, Huband et all 2010, Matley 1968, Hadjigeorgiou et all 2011).

As has been widely reported, the seasonal movement of livestock allowed the use of complementary pastures, which could be located in the plains and mountains of the same mountain region (vertical transhumance between valley pastures and high-altitude pastures) or far apart and between different regions (horizontal transhumance between pastures close to or far from shepherds' homes) (Graziani et all 2011).

In European countries, transhumance can today be considered a relic, mostly because of the compromised conservation state of drove roads (Takola 2016). In fact, since 2005, the conservation of landscapes [1] and the recognition of transhumance immaterial heritage values attracted great interest, which was followed, in the case of Italy and Spain, by the nomination proposals on the UNESCO World Heritage List[2].

1 United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. The Causses and the Cévennes, Mediterranean Agro-Pastoral Cultural Landscape 2011. Available online: http://whc.unesco.org/en/list/1153. United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. Hallstatt-Dachstein/Salzkammergut Cultural Landscape 1997. Available online: http://whc.unesco.org/en/list/806. United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. Pyrénées -Mont Perdu 1997. Available online: http://whc.unesco.org/en/list/773.
2 United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre.

However, despite the great interest in transhumance due to the important legacy of this practice with features of intangible cultural heritages and agro-pastoral landscape[3] (Pellicano 2008, Bill 1992, Landi et all 2015, Mallorquí et all 2015, Agnoletti 2011), knowledge of the conservation status of drove roads is still scant. This paucity of information, often associated with a lack of suitable study methods, may limit the identification of proper governance and the inclusion of the network of transhumance routes in a broad international context, e.g., Pan-European Ecological Corridors.

Two examples of transhumance routes' conservation state assessment are worth mentioning: Spain and Australia. In the case of Spain, since 1995, within the extensive legal framework of the "Vias Pecuarias Act"[4], drove roads in different regions have first been mapped (125,000 linear kilometers covering 421,000 hectares) and then protected by specific laws; this framework represents the first example in the world of transhumance governance[5].

In Australia a methodological approach has been used for the development of New South Wales Travelling Stock Routes using historical documents, maps, and surveying [Cameron et all 2010, Spooner et all 2010).

For many countries, information on transhumance routes' conservation status and governance is still very poor, highlighting the importance of identifying suitable methodological approaches.

The promotion of drove roads can also occur by way of the Ecosystem Services, in particular evaluating all the benefits that drove roads, as important elements of landscape can offer to local people and to tourists. These benefits, even if they are not economically evaluated, can represent important drivers for the territorial management providing addresses of planning for the authorities concerning the valorization and the administration of drove roads. The complete restoration of drove roads (or even part of them) to its original state and an appropriate promotion could grant the use of these routes as trekking paths (the widest of world), or specific areas where it is possible perform environmental educational activities or moreover open air museums or simply grasslands dedicated to grazing.

We decided to compare two realities, Italian and Spanish ones, in which the system of Transhumance characterized by historical and organizational analogies. The comparison was based on the evaluation

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The Transhumance: The Royal Shepherd's Track-Tentative list01/06/2006. Available online: http://whc.unesco.org/en/tentativelists/5005/. United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. MestamLivestock Trails-Tentative list24/07/2007. Available online: http://whc.unesco.org/en/tentativelists/5128/

3 Ministerio de Educación, Cultura y Deporte. Real Decreto 385/2017, de 8 de Abril, por el que se Declara la Trashumanciacomo Manifestación Representativa del Patrimonio Cultural Inmaterial. Available online: https://www.boe.es/diario_boe/txt.php?id=BOE-A-2017-4009.

4 Ley 3/1995, de 23 de Marzo. Agencia Estatal Boletín Oficial del Estado n. 71 de 24 marzo de 1995. https://www.boe.es/buscar/doc.php?id=BOE-A-1995-7241.

5 Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, Información Cartográfica de las vías Pecuarias por Provincias. Available online: http://www.mapama.gob.es/es/desarrollo-rural/temas/politica-forestal/vias-pecuarias/rvp_descargas.aspx

about the conservation state of an Italian *Tratturo* (Castel di Sangro-Lucera) and a *Cañada* (Segoviana): the two drove roads have similar geographic context (presence of mountainous and flat areas).

1.1 Transhumance in the Mediterranean Basin

The climatic characteristics of the countries bordering the Mediterranean basin permitted the birth of a civilization marked by an extensive pastoralism since ancient times. After a period of nomadic pastoralism, there followed an organized transhumant pastoralism, which developed in several European countries: Spain, France, the United Kingdom, Italy, Germany, Romania, Bosnia and Herzegovina, Greece, etc.

This seasonal movement of livestock allowed use to be made of complementary pastures, which could be located in the plains and mountains of the same mountain region, vertical transhumance between valley pastures and high-altitude pastures, or far apart and between different regions, horizontal transhumance between pastures close to or far from shepherds' homes (Graziani et all 2011, Dong et all 2016).

In many European countries, there wasn't an organized and regulated transhumance with preferential paths, as there was in Spain and in Italy. In fact, in these two countries in the thirteenth century, we find the first formal references to organized transhumance, to the sheep routes (*Tratturi* in Italian, *Cañadas* in Spain) and designated organizations, to the improvement of breeding and to fiscal regulation.[6] Transhumance in medieval Europe can be subdivided into three different types, taking into account the displacement range (Juler 2014, Garcia Martí 1998). 'Local transhumance' was characterized by short transfers within the municipal limits and was practised mostly by mountain or lowland populations. 'Trespassing transhumance' was characterized by medium-range and mostly vertical transfers during which the cattle crossed different municipalities. Finally, the 'great transhumance' was characterized by long cyclical transfers, and to manage this important cultural practice it was necessary to create institutions capable of managing a million heads of cattle every year. In the fourteenth century Alfonso I of Aragon relocated the efficient model of the Spanish *Mesta*[7] in the Italian peninsula, founding the *Regia Dogana della Mena delle pecore* (the Royal

6 During the roman era, the cattle short range displacement (alternating pastures) took place predominantly on pubblicae calles, the main traffic routes with the use of public pastures associated with them and after the payment of a fee. Only in the fourth century bc it was formalized the shepherds' privilege for the use of public roads; this privilege was called tractoria, the term which will originate the name *Tratturi* (sing. *Tratturo*).

7 Honrado Concejo de la Mesta, honarable council of the Mesta, private association of shepherds keeping royal privileges, such as the right to pass sheep routes and municipalities' properties, to freely graze in royal properties.

Customhouse of transhumance), a fiscal centralized institute equipped with an efficient administrative system (Guenzi et all 2014)

The two drove roads chosen for this work are included in the system of the 'great transhumance', that in Italy and in Spain was very accurate and well organized in every aspect: the fiscal management system, the movement of herds, the verification of the conservation state, the squatting of drove roads and the control service along these paths of communication.

1.2 Ecosystem services

The word ecosystem, abbreviation of ecological system, was coined by George Tansley in 1935 (Golley 1991) and began to be used since the XX century. The central topic of the concept ecosystem is that the living organisms of a community not only interact with each other, but they also have functional relationships with their non-living environment. Through chemical, physical and biological processes, the ecosystems provide an unique support for the life quality of its inhabitants. The concept of Ecosystem Service (ES) is not so recent, in fact in 400 b.C. (Adorno 1953) Platone already sensed that the deforestastion could cause phenomena of soil erosion and the draining of springs, but only as from 1990, the ES began to be an important topic in scientific literature. An important contribution is a first valuation of ES estimated by Costanza (Costanza et all 1997) at global scale in 1997. Costanza claimed the importance of evaluation ES for both the decisions related to the management of natural resources and the territory planning.

During the last decade, the increasing consensus about the importance of ES allowed the increment of several international projects, such as Teeb[8], Diversita[9] (An international programme on biodiversity science), Rubicode (Rationalising Biodiversity Conservation in Dynamic Ecosystems)[10], e MEA[11] (Millennium Ecosystem Assessment). Each one of these projects propose different definition and classification of ES, but for this thesis we preferred to refer to MEA ones, which represent the most well-established reference at international level and which was decisive to reinforce for the valorization of services offered by ecosystems. The promoters of the project MEA are United Nations and in particular the United Nations Environmental Programme (UNEP), which sets the purpose to analyze with scientific multidisciplinary methodology the effects of human activities on planet's ecosystems and the related impacts on the human well-being and to identify the strategies' actions for a sustainable development. MEA simply describes the Ecosystem Services as

8 http://www.teebweb.org
9 http://www.futureearth.org/projects/ecoservices
10 http://www.rubicode.net/rubicode/index.html
11 Millennium Ecosystem Assessment, 2001- 2005 https://www.millenniumassessment.org/en/index.html

the benefits that people can obtain from ecosystems classifying them in *provisioning services* (which provide real necessity/resources such as food, water, wood, fibers, combustible and other raw materials, but genetic materials and ornamental species too), *regulating services* (which regulate climate, air and water quality, the soil generation, pollination, the waste absorption and services that mitigate natural risks such as erosion or invasion of alien species), *cultural services* (which include immaterial benefits such as the cultural heritage and identity, the spiritual and educational enhancement and creative and esthetic values) and *supporting services* (referring to those services which provide to the creation of habitats and to the conservation of genetic diversity). The last Millennium Assessment report highlights that the most of ES are endangered, but on the other side in last years the communal interest concerning these theme is increasing, and in particular the importance of ES for the management of natural resources and the territory planning is always more current (Santolini et all 2011). Although there is a wide awareness about the relevance of Ecosystem Services, they or some of them do not yet have a definite value, it means that they are not straight evaluated on the market, because they do not have a reference's one; this is the reason why often the Ecosystem Services are not considered in political decisions (Costanza et all 1997). The relevance/value of ecosystems and the related benefits can be evaluated through different methods, for example the ecological value can be measured with ecological indicators such as the diversity, then again the socio-cultural value, in through the importance that people give to a specific benefit (e.g. the cultural identity) related to ecosystem services. With the aim to establish the value of ES, De Groot (De Grooot 2010) suggests two types of approaches referring to the use value and the non-use value. The use value consists of the *direct use*, as the value of timber or other resources directly supplied by ecosystems, and the *value* direct *use but not consumptive*, such as those related to creative or aesthetic aspects. The *value of indirect use* refers to those services provided by nature, such as the air and water purification, the prevention of erosion and cultivations' pollination. The *non-use value* consists in the importance ascribed to a feature of the environment in supplement to its value of use or independently from it, that is its value of existence. Moreover, De Groot (De Grooot 2010) claim that to convert ES in economic value, different methods can be applied, among these the *market price* (marginal values) of some ES such as the wood supply, the *damage cost avoided*, such as the forest fires, or indirect values of other services, as the *travel costs* for some cultural services. Evaluating the ES merely through the financial value, there is the risk to consider only part of the "true" value, excluding the ecological and socio-cultural value.

In this thesis, we preferred to evaluate the ES of drove roads through a contingent evaluation (submitting questionnaires) and analyzing only the related perception of the socio-cultural features; for this aim, the manuscript "Socio-cultural valuation of ecosystem services in a transhumance social-

ecological network" (Oteros et all 2013a) drawn up by Elisa Oteros-Rozas represents a fundamental basis for the evaluation process.

2 Data and methods

This chapter summarizes the historical features of transhumance concerning Italy and Spain, as well as the regulatory framework about the protection of drove roads. The methodology for the evaluation and the comparison of the conservation state has been based on the submission of survey questionnaire to obtain information which were opportunely analyzed highlighting the knowledge of interviewees about drove roads and their perception about the benefits supplied.

2.1 The Transhumance in Italy and the "Dogana delle Pecore"

In the Italian peninsula, already among the pre-Roman peoples, it existed a migrant pastoralism, as attested by, for example, Marco Terenzio Varrone (Corbier 1983). These short-range movements were not yet regulated, but were located between the valleys and the surrounding mountain ranges and there was no stable road network (Salmon 1995). During the Roman era, the cattle short range displacement (alternating pastures) took place predominantly on *pubblicae calles*, the main traffic routes, with the use of public pastures associated with them and after the payment of a fee. Only later, the fourth century BC, was formalized the shepherds privilege to the use of public roads; This privilege was called *tractoria*, a term which will originate the name *Tratturi* (sing. *Tratturo*), the Italian drove road network of greater width. Only from the thirteenth century, in Spain and in Italy, we find the first formal references to organized transhumance, to the sheep routes and designated organisms to the improvement of breeding and fiscal regulation (Garcia Martí 1998). With the establishment of the *Dogana* (1447), in the Tavoliere pastures transhumance was made obligatory for all flocks consisting of more than 20 sheep and it was imposed even on small owners and shepherds wintering along the Abruzzi and Molise coasts or in hilly areas (Grana 1770, Russo 2016). The structure of this very complex institution considered at the head a customs officer, the *Doganiere*, who had the task to manage the entire institute, supported by different figures, by *Cavallari*[12], *Credenzieri*[13], *Giudici*[14] and *Agrimensori*[15].

Although the drove roads in Italy were partially traced in the thirteenth century, only in 1533 the *Tratturi* boundaries were defined for the first time using milestones placed along the outer limits and their center line (Pellicano 2007). The *Dogana* also defined the standard width equal to 60 Neapolitan feet (about 111 meters). In modern times these widths were defined for the whole *Tratturi* system:

12 Armed guards.
13 Officer of Dogana to check taxes.
14 Judges.
15 Operators of Dogana offices; their main role was to verify the state of drove roads network.

111 meters for the *Tratturi* (main routes), between 32 and 38 meters for the *Tratturelli* (small cattle tracks) and from 12 to 18 meters for the *Bracci* (arms).

Although, on these preferential routes for cattle, any kind of occupation was banned, the municipalities (*Universitas*), the barons or the owners of the neighboring land frequently used them for multiple purposes, for example from cultivation to building construction (Di Cicco 1987). Because of these instances of abuse, it was essential to check periodically the state of preservation and, where necessary, to undertake restoration. The instrument that the *Dogana* used to perform these checks was the *Reintegra* (Reinstatement): thanks to its agrimensori the *Dogana* carried out new measures and investigations along the *Tratturi* using both ancient documents and the milestones.

During the period of activities, the *Dogana* managed a considerable number of sheep, amounting to about 511 million (Marino 1992).

Number of sheep managed by the *Dogana* from 1447 to 1806. Following Marino (Marino 1992), the data are grouped into three periods of development (1445-1494, 1551-1612 and 1687-1805) separated by two periods of decline (1495-1550 and 1613-1686).

Period	Total	Mean	Maximum value (Year)	Minimum value (Year)
1445-1494	5.525.480	920.913	1.700.000 (1474)	424.642 (1445)
1495-1550	21.206.440	1.060.322	2.000.000 (1521)	550.000 (1532)
1551-1612	140.717.763	2.759.172	5.552.305 (1605)	969.144 (1574)
1613-1686	10.538.248	1.170.916	2.212.513 (1615)	400.000 (1638)
1687-1805	333.774.400	3.476.817	7.558.798 (1784)	1.087.344 (1727)

Table 1 Comparison the number of sheep from 1447 to 1806. Data from J.A. Marino (Marino 1992). The intervals time represent three different periods of development separated by two periods of decline.

In 1806, with the appointment of Joseph Bonaparte as King of Naples, the practice of the *Dogana delle Pecore* came to an end. In fact, on 21st May, the law on the Tavoliere of Apulia was enacted, which put an end to the establishment of the *Dogana*. The reform also affected the drove road network, which became public property with the law of 1806.

From the beginning of the twentieth century, in the *Tavoliere delle Puglie* (Apulia plains) the pastoral economy and the transhumance (already drastically reduced) were gradually replaced by cereal cultivation, which was also favored due to the sale of many state-owned and church properties (Pellicano 2007, Calinadro et all 2013). Therefore, the twentieth century is the period that marks the

transhumance as a ‘relict’, particularly in Italy, and represents the end of an economy based on the cyclical transfer of animals.

Figure 1 A photo representing the last transhumant family in Italy, Famiglia Colantuono, near the municipality of Molise.

2.1.1 Drove road network in Italy

In 1533 a first list of the seven *Tratturi* was registered; it included some of the main drove roads, but only in the twentieth century a normative and cartographic framework regarding the entire drove roads’ network was available. Information drawn up by the Commissioner for the Reintegration of *Tratturi* (established in 1908), were published in the Official Gazette no. 97 on April 23th 1912 and quoted in the cartography General Map of the *Tratturi*, *Tratturelli*, *Bracci* and *Riposi* (General Map of drove roads’ network and herd resting areas). The southern Italian drove roads’ network, as reported in the General Map of 1912, extended from the Abruzzi mountains to the *Capitanata* plains (Apulia plains), including five regions (Abruzzi, Molise, Campania, Apulia and Basilicata), for a total length of about 3100 km and a total of 83 connecting elements: 12 *Tratturi*, 60 *Tratturelli* and 11 *Bracci*.

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Figure 2 General Map of drove roads' network and herd resting areas – 1912.

In 1959 the General Chart of the *Tratturi* has been updated by including in the list 15 new drove roads mostly represented by *Tratturalli* and *Bracci*; among all the drove roads drawn up on the map, those that were fully reinstated are: *Tratturo Aquila-Foggia*; *Tratturo Lanciano-Cupello*; *Tratturo S. Andrea-Biferno*; *Tratturo Celano-Foggia*; *Tratturo Lucera-Castel di Sangro*; *Tratturo Pescasseroli-Candela*; *Braccio Cortile-Centocelle*; Tratturello *Ururi Serracarpiola*; *Braccio Nunziatella-Stignano*; *Tratturo Foggia-Campolato*; *Braccio Lenzalonga*; *Braccio Candelaro-Cervaro*; *Tratturello Canosa-Ruvo*; *Braccio Canosa-Montecarafa*; *Tratturello Alle Murge*; *Tratturello Orsanese*; *Tratturello dei Pini*.

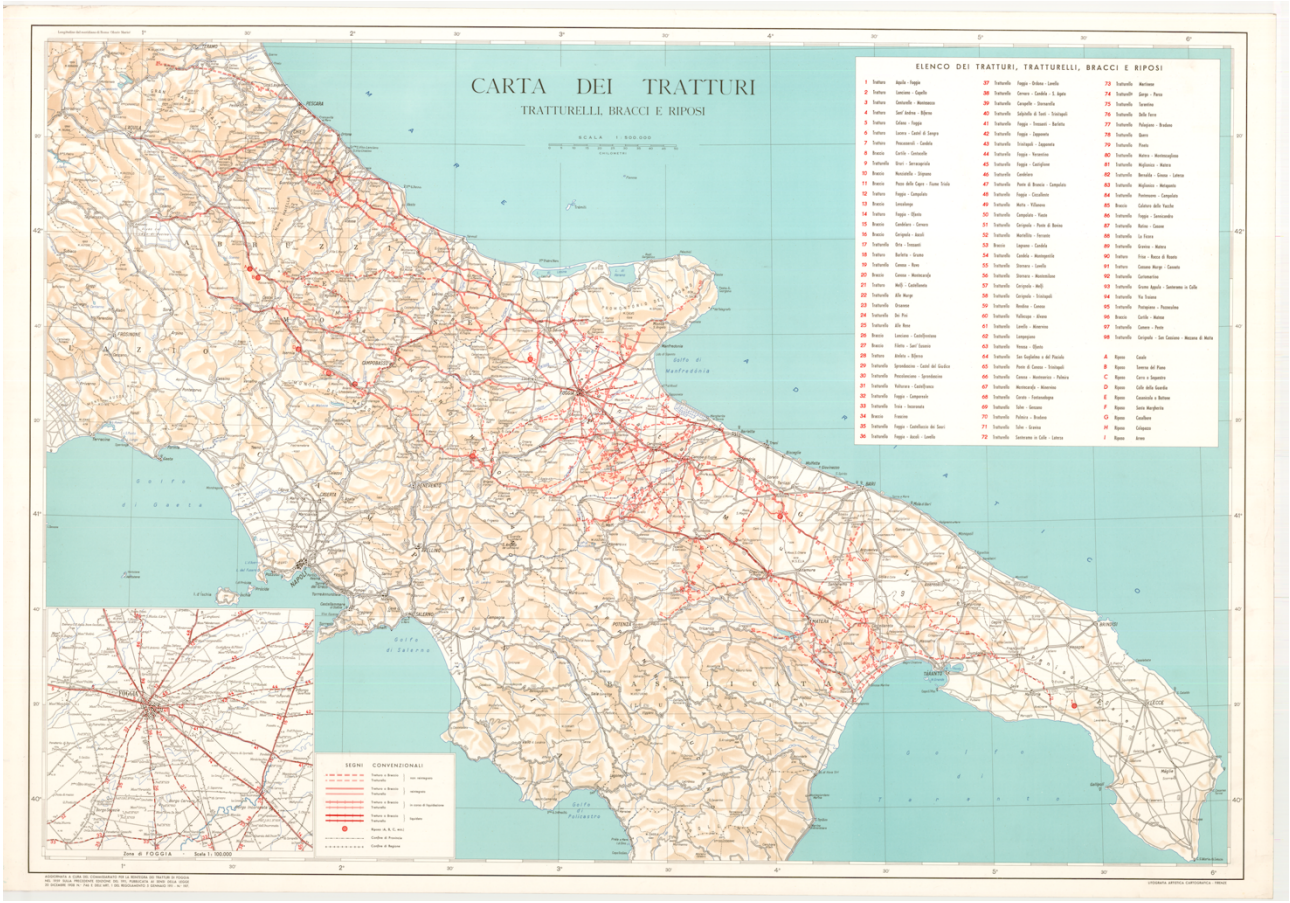


Figure 3 General Map of drove roads' network and herd resting areas – 1959.

Currently, according to the results of Circular 16339 enacted on May 17th, 1993 of the State Forestry Corps, there are 11 *Tratturi* for 1149 km, 6 *Tratturelli* for 116 km and 6 *Bracci* for 79 km (Esposito et al, 2012).

Among the several *Tratturi*, which connected the mountains of the central Apennines to the plain of *Capitanata*, the most important in terms of length and traffic density were: the Aquila-Foggia (length 243 km), the Celano-Foggia with a length of 207 km, the Pescasseroli-Candela with km 211 and the Lucera-Castel di Sangro with a length of km 129.

2.1.2 The drove roads protection laws in Italy

After the closure of the *Dogana delle Pecore*, it was necessary to regulate the safeguard of the drove roads' network, therefore during the Kingdom of Italy a series of regulations were issued, with the aim to conserve and monitor drove roads: regulation 2211/1865, regulation 2168/1865, royal decree 3244/1923, royal decree 2801/1927 (Pellicano 2007). In 1939, during the Fascist period, the Ministry of Cultural and Environmental Heritage issued the law n. 1089 of June 1th, 1939 "Tutela delle cose di interesse artistico e storico". The regulation aimed the protection of drove roads with a wider intent, such as the preservation of a cultural identity arose around the *Tratturi*'s system with the awareness that "all the elements decisive in the physiognomy of the cultural environment, such as the topography

of the settlements, the morphology of the historical centers, the aspect of the agricultural landscape, have been intensively characterized by the historical function performed by the Tratturi". With the Decree of the Republic President of July 24th, 1977 n. 616, the State analogously transferred to the Regions (double jurisdiction) many administrative tasks, as the jurisdiction about the State property of drove roads (Finocchietti 2013). The Molise Region holds the first Decree, June 15th 1976, thanks to which the land owned by the State located within the Molise Region and belonging to the network of *Tratturo* were restricted. The second Decree, dated March 20th, 1980, regulates the interventions on the *Tratturi* allowing the municipalities to present their own framework Plan of the drove roads. The third Decree, dated December 22th, 1983, extends the safeguard of drove roads to the Abruzzi, Apulia and Basilicata Regions.

Thanks to the Regional law n. 9 of April 11th, 1997, Molise rules the "tutela, valorizzazione e gestione del demanio Tratturi" (safeguard, valorization and management of regional stete properties of tratturo). Since Tratturi are considered as goods of significant historical, archaeological, naturalistic and landscape interest, as well as being useful for the practice of pastoral activity, these ancient paths are safeguarded in the regional property and constitute an organic system of the drove roads' network called "Parco dei Tratturi del Molise" (Drove Roads Regional Park of Molise). The susequent regional law n. 19 of May 5th, 2005 clarifies that the "the property of the regional drove road" consists of both the material heritage (physical, historical, archaeological) and the immaterial (ethnological, social, anthropological, productive) establishing the regional coordination as administrative organ of the *Tratturi* and of the civilization of transhumance. The Abruzzi Region through the regional law n. 35 of the July 29th, 1986[16] "Tutela ed utilizzazione dei beni costituenti il demanio armentizio" primarily establishes that the regional drove roads constitute the regional properties drove roads. Moreover, this regulation protects those *Tratturi* which are strictly considered necessary for the pastoral activity or for the promotion of sheep breeding, as well as those of historical, archaeological and naturalistic interest.

The Apulia Region includes the *Tratturi* in its own property issuing the regional law n. 67 of June 9th, 1980; afterward with the regional law n. 29 of December 23th, 2003 the Region establishes the "Parco dei Tratturi della Puglia" (Drove Roads Regional Park of Apulia), aligning itself with the law of 1997 issued by Molise Region. Moreover, the law n.29 considers the *Tratturi* as "monument of the economic and social history of the Apulian territory since it was involved by seasonal migrations of herds and because it offers archaeological testimonies of settlements dated back to various ages". An other important aspect of this law consists in the obligation to draw up the municipal plan of the *Tratturi*, *Tratturelli*, *Bracci* e *Riposi*, in order to evaluate the real consistency and to enhance them

16 Regional law n. 35 of July 29th, 1986
http://www2.consiglio.regione.abruzzo.it/leggi_tv/abruzzo_lr/1986/lr86035.htm.

for tourism and cultural purposes. In March 2013, through the regional law n. 4 of February 5th, 2013[17], the Apulia Region defines a complex procedure in order to realize the institution of the "Parco Regionale dei Tratturi di Puglia", which has not been achieved with the regional law n. 29. So with this recent regulation, the aim is to provide for the implementation and the conclusion of the municipal plans of *Tratturi* and to define the governance of the "Parco Regionale dei Tratturi di Puglia".

The Campania Region regulates pastoral property with the regional law n. 11 of May 7th, 1996[18], although regional territory is crossed by only some sections of the *Tratturo Pescasseroli-Candela* and *Tratturo Castel di Sangro-Lucera* and by some *Tratturelli*. The law refers to verification actions able to define the consistency and the assessment about the reinstatement of soils. This preparatory phase is useful to allow for subsequent proceedings as the issue of temporary concessions for land use and of authorizations for grazing other than to define action of restoration and conservation. The protection of drove roads is so extended to historical, archaeological, environmental, naturalistic, cultural and tourist purposes, in order to prevent definitive alterations of the current drove roads' state.

The overlap between the state and regional jurisdiction, regarding the administration of *Tratturi* (since 1977 to today), caused interpretative uncertainties and sometimes conflicts between State and Regions. At the same time this critical condition spurred the administrations interested by the presence of drove roads to establish inter-institutional collaboration, as the agreement of June 16th 2017 between Molise, Apulia and Abruzzi. The agreement had the purpose to adapt the *Tratturi* and the bracci to realize a new rural roads network, specifically referring to the areas of Pescasseroli-Candela, Celano-Foggia, Castel Di Sangro-Lucera, Cortile-Centocelle and Cortile-Matese. The supervision activities related to the territory crossed by drove roads, which extends from central Apennines to the *Capitanata*, are currently under the responsibility of the Superintendence through Regional Directorates for Cultural and Landscape Heritage of the involved Regions.

2.1.3 The Tratturo Castel di Sangro Lucera

The Italian study area is circumscribed within the Abruzzi, the Molise and the Apulia Region. The *Tratturo Castel di Sangro-Lucera* has a linear length of 129 km, from the locality of *Vallesalice* (Castel di Sangro, L'Aquila) at 850 m a.s.l., ending up in the locality of *Perazze* at 117 m a.s.l. (Lucera, Foggia) (Liebetanz 1999). This drove road extends for a total of of 1357 hectares, it deviates

17 Regional law n. 4 of February 5th, 2013
http://portale2015.consiglio.puglia.it/documentazione/leges/modulo.aspx?id=12484.
18 Regional law n. 11 of May 7th, 1996 http://www.agricoltura.regione.campania.it/foreste/PAF/LR_11_96.pdf

from the *Tratturo Celano-Foggia* near the locality of *Vallesalice* and it reconnects again it near the locality of *Perazze*.

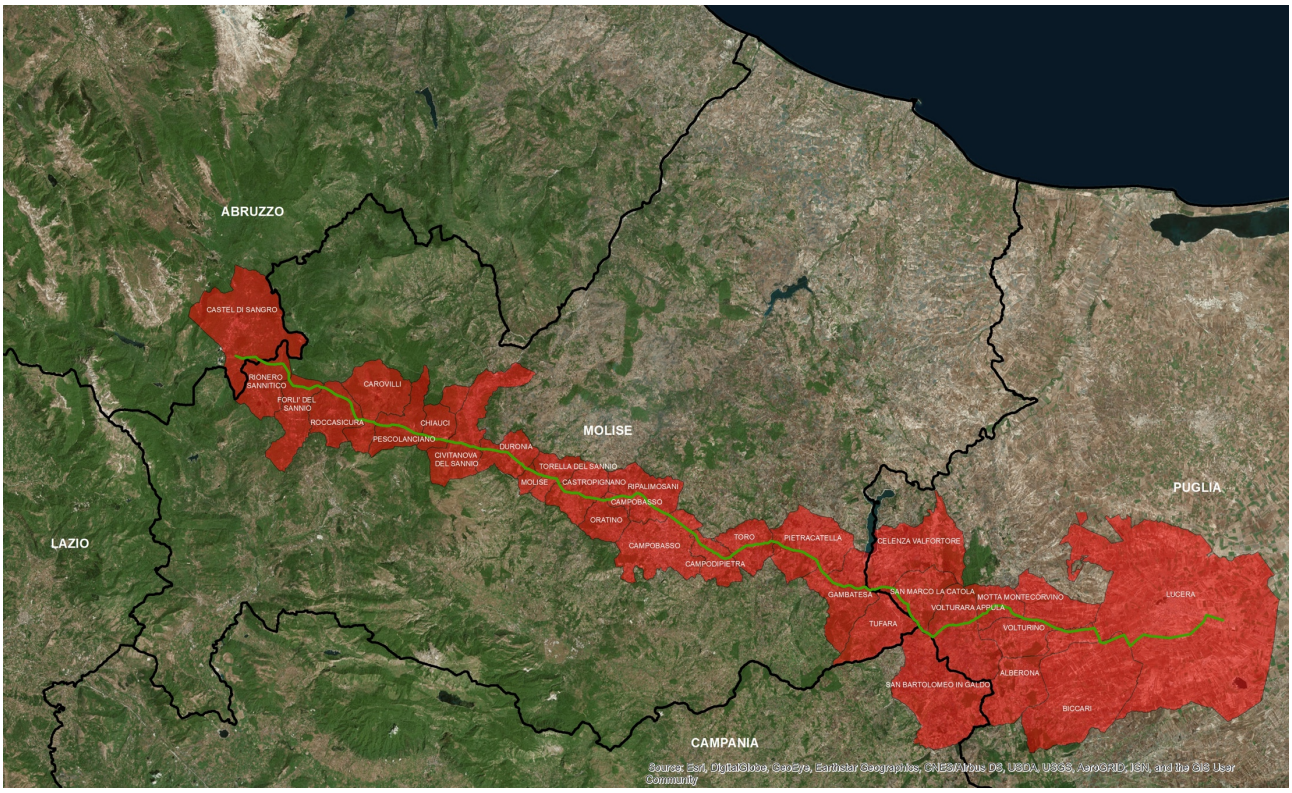


Figure 4 The Tratturo Castel di Sangro-Lucera in green and the crossed municipalities.

We decided to focuse the research on this *Tratturo* depends primarily for two factors, the first one is attributed to the its assessment as a public path[19] characterized by a long distance, the second factor concerns the good state of conservation.

MUNICIPALITY	REGION	PROVINCE	LENGH (meter)	AREA (squares meter)	AREA (hectares)
Alberona	Apulia	Foggia	5395	555162	55,5
Biccari	Apulia	Foggia	2921	321438	32,1
Campobasso	Molise	Campobasso	5873	644796	64,5
Campodipietra	Molise	Campobasso	5568	603492	60,3
Carovilli	Molise	Isernia	1646	161615	16,2
Castel di Sangro	Abruzzi	L'Aquila	2862	311329	31,1
Castropignano	Molise	Campobasso	5070	523886	52,4
Celenza Valfortore	Apulia	Foggia	2578	285401	28,5
Chiauci	Molise	Isernia	3293	369437	36,9
Civitanova del Sannio	Molise	Isernia	3656	332726	33,3
Duronia	Molise	Campobasso	5773	614617	61,5
Forli' del Sannio	Molise	Isernia	4297	405893	40,6
Gambatesa	Molise	Campobasso	6805	711230	71,1
Lucera	Apulia	Foggia	13203	1509580	151,0
Molise	Molise	Campobasso	1643	182647	18,3

19 Association "Attraverso il Molise", sui Regi Tratturi d'Italia http://www.tratturocoast2coast.org

Motta Montecorvino	Apulia	Foggia	6101	650236	65,0
Oratino	Molise	Campobasso	844	96741	9,7
Pescolanciano	Molise	Isernia	4860	533992	53,4
Pietracatella	Molise	Campobasso	6010	617437	61,7
Rionero Sannitico	Molise	Isernia	4517	470587	47,1
Ripalimosani	Molise	Campobasso	5140	566906	56,7
Roccasicura	Molise	Isernia	6405	598695	59,9
San Bartolomeo in Galdo	Campania	Benevento	1267	70138	7,0
San Marco la Catola	Apulia	Foggia	5507	508335	50,8
Torella del Sannio	Molise	Campobasso	2502	280516	28,1
Toro	Molise	Campobasso	5226	534889	53,5
Tufara	Molise	Campobasso	319	18157	1,8
Volturara Appula	Apulia	Foggia	5628	640205	64,0
Volturino	Apulia	Foggia	4241	457263	45,7
TOTAL			**129149**	**13577347**	**1357,7**

Table 2 The table shows the length in meters and the area in square meters of the municipalities crossed by the Tratturo Castel di Sangro-Lucera.

The *Tratturo* intersects 29 municipalities located in Abruzzi, Molise and Apulia, crossing only eight town: Montalto (hamlet of Rionero Sannitico), Pescolanciano, Civitanova del Sannio, Duronia, Castropignano, Santo Stefano (hamlet of Campobasso), Campodipietra, Motta Montecorvino.

Figure 5 Tratturo Castel di Sangro-Lucera near the municipality of Pescolanciano.

The *Tratturo* intersects 29 municipalities located in Abruzzi, Molise and Apulia, traversing only eight town: Montalto (hamlet of Rionero Sannitico), Pescolanciano, Civitanova del Sannio, Duronia, Castropignano, Santo Stefano (hamlet of Campobasso), Campodipietra, Motta Montecorvino.

The route of the drove road starts in Abruzzi Region close to the mountains chain Mainarde, a calcareous massive on the border between Abruzzi and Molise. It extends for the first 18 km in the mountainous area, settling on altitudes above 900 m a.s.l.., with the exception of the *Vandra* river valley. It passes through the sub-mountainous area between 900 and 600 m a.s.l. crossing the territory between Roccasicura and Carovilli, reaching then the 60 km near the municipality of Campodipietra. In this section of *Tratturo* there are the valley of *Fiumarello* and *Biferno* rivers which are at exceptions. From the municipality of Campodipietra to the locality *Toppo dei Morti* (between the territories of Tufara, Volturara Appula and San Bartolomeo in Galdo) at kilometer 90, the *Tratturo* continues to develop through a hilly area, to then returns to the sub-montainous area up to km 101, near the *Madina* plateau (between the territories of San Bartolomeo in Galdo and Volturara Appula) and *Toppo della Crocella* (between the territories of Volturara Appula and Motta Montecorvino), except for the la *Cantola* torrent valley where the territory is decisively hilly. From km 101, near the territories of Motta Montecorvino, the *Tratturo* quickly descends into the hilly area passing through the *Tavoliere delle Puglie* at km 119. Examining the altitudinal characteristics, the *Tratturo* reaches the maximum altitude of 1153 m a.s.l. near the territory of Forlì del Sannio (near *Casino Pece*), and the minimum altitude of 117 m a.s.l. near the territory of Lucera, with an average of 535 m a.s.l. along the 129 km of length..

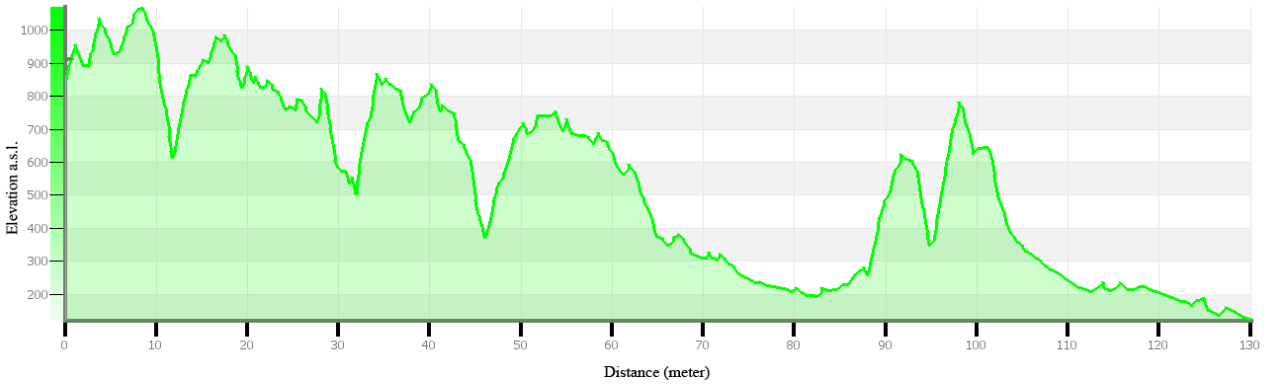


Figure 6 Elevation profile of the Tratturo Castel di Sangro-Lucera.

Figure 7 Tratturo Castel di Sangro-Lucera near the municipality of Volturara Appula.

2.2 The Transhumance in Spain and the "Honrado Concejo del la Mesta"

In the *Honrado Concejo* laws the definition of "making Mesta" expresses the action of separating the lost herd to conduct it to the assemblies in order to consent to owners to identify the missing drove (Garcia Martí 1998). Usually shepherds periodically gathered these assemblies, which represented the opportunity to ensure that ordinances would be observed by everyone in order to mitigate the continuous conflict between the pastoral and the agricultural world. These assemblies represented the model with which in 1273 Alfonso X the Wise founded the *Mesta*, a powerful corporation of shepherds. According to Pedro Garcia Martin, the *Mesta* was not simply founded as a federation of local "*mestas*", but rather as an initiative by breeders of the kingdom to find legal support and protection from sovereigns. Therefore, the confederation asked the King for a series of benefits as th transit along drove road and in municipal territories, free grazing in those lands managed by the King and in the municipal areas, the formation of an autonomous police force, the tax regulation and the improvement of selection procedure of the merino's race (Rodríguez Pascual 2001). The shepherd's requests represented the essential bases for the establishment in Spain of the great transhumance, which firstly required to be infrastructure, in order to permit the passage of millions of sheep from villages to large displacement routes (Klein 1914). The *Cañadas*, the preferential routes of transhumance in Spain, were very often influenced by factors that were not merely geographical and logistical ones, even if they were planned in a rational manner, as indeed happened in Italy too. Some of these factors were, for example, events / fairs of regional importance and local economic reasons, such as the obligatory steps for tolling. This complex system required professional figures whose purpose was to control the various aspects related to the complexity of the transhumant civilization. In 1282 the position of the *Alcalde entregador* (Barriguete 1988) was established, representing in the

organization of the *Mesta*, the main figure for the administration of justice. It represents a figure very similar to the Doganiere of the Regia *Dogana delle Pecore*. Among his competences, the *Alcade entregator* had the task to maintain the relationships' balance between the shepherds and farmers and to control the *Cañadas'* conservation state. Usually the compromise between these two contrasting classes, the agricultural and the pastoral one, consisted in respecting some essential rules. For example, shepherds had a series of prohibitions such as the passage in the vineyards, cultivated fields, vegetable gardens, pastures and lawns to be mowed. On the other side the farmers could absolutely not occupy the *Cañadas* with cultivation or with the realization of new settlements. Only in 1284 the dimensions and therefore the diversification of the several drove roads were reported in a Royal charter (Barriguete 1988), which identifying: *Cañadas*, of 90 *varas*, about 75 meters, the *Cordeles*, of 45 *varas*, about 37 meters and le *Veredas*, of 20 *varas*, about 20 meters. Other not official secondary components characterize the drove roads, whose names are local, such as, ramales, *cordones*, *cuerdas* etc, and with a smaller size to 20 *varas*.

In the efficient organization of the *Mesta*, the figure of a president was foreseen and it was usually represented by the oldest member of the royal council and it was at the head of both the internal administrative and judicial branches. In the internal administrative branch, the main figure corresponded by the attorney general, who represented the corporation at the Court and the Royal Chancelleries in those cases in which the interests of Transhumance were damaged. Other relevant figures were general tax, accountants/treasurers and secretaries. The bureaucracy, that is the judicial administration, included besides the *Alcalde entregador* and other *Alcaldes*. The *Alcaldes de la Mesta* had usually competences at the local level, dealing mostly with causes among shepherds and with disputes over the borders of the *Cañadas* and trespassing. The appeals against the decisions of the *Alcaldes de la Mesta* could be resolved through the *Alcaldes* de alzada, who on turn communicated the results to the *Alcaldes* de apelación who at the end related to the Honrado Concejo (Garcia Martí 1998). The efficient model had as its foundation a bureaucracy and therefore laws, which firstly referred to the foundation of the *Mesta* in the thirteenth century. There were several attempts to collect and redaction, including the *Real Pragmática* of 1633, which represents for the guild of shepherds the collection of more advantageous privileges in the history of the *Mesta* and the latest collection of laws and ordinances (1729-1827) created by Matías Brieva (Brieva 1828).

These collections can be divided into two wide groups: the taxation regime and all what concerns with the *Cañadas* and pasture, in particular with the size of the arterial streets, the freedom of passage, the privileges on the pastures. As well as in Italy, also in Spain the incursions in the drove roads by the farmers were frequent, in order to squat pieces of fertile land to cultivate them. These testimonies come to us through the countless Royal Coupons (report), which condemned the abuse. This information and all the collections of the laws are now archived at the Archivio Histórico Nacional

(Barriguete 1988). Unlike the reinstatement system adopted in Italy by the *Dogana delle Pecore* with the aim to supervise the abuses and the drove roads' conservation state, in Spain the supervision of *Cañadas'* network was permanently performed. There are not many general detailed maps about the location of the abuse, but at municipal level there are plans with information regarding the squatting cases. Planimetric maps drawn up with a big detail and reporting the entire drove roads network in Spain are those made in the early 1900s by the Geographical Institute Y Estadistico. The history and the vicissitudes of the *Mesta*, however so antique, are absolutely similar to those of the *Dogana delle Pecore*. This organization reached the goal to manage millions of leaders during the D'Aragona period, permitting to the *Mesta* to become one of the main sources of income of the Kingdom (Garcia Martí 1998). In effect, in the first half of the eighteenth century, during the Habsburgs' kingdom, the *Mesta* reached about 3.5 millions of sheep (Oteros et all 2013).al network in Spain are those made in the early 1900s by the Geographical Institute Y Estadistico. The history and the vicissitudes of the *Mesta*, however ancient, are absolutely similar to those of the *Dogana delle Pecore*. This organization reached the goal to manage millions of leaders during the d'Aragona era, allowing the *Mesta* to become one of the main sources of income of the Kingdom (Garcia Martí 1998) and that in the first half of the eighteenth century, during the Habsburgs, reached about 3.5 millions of sheep (Oteros et all 2013).

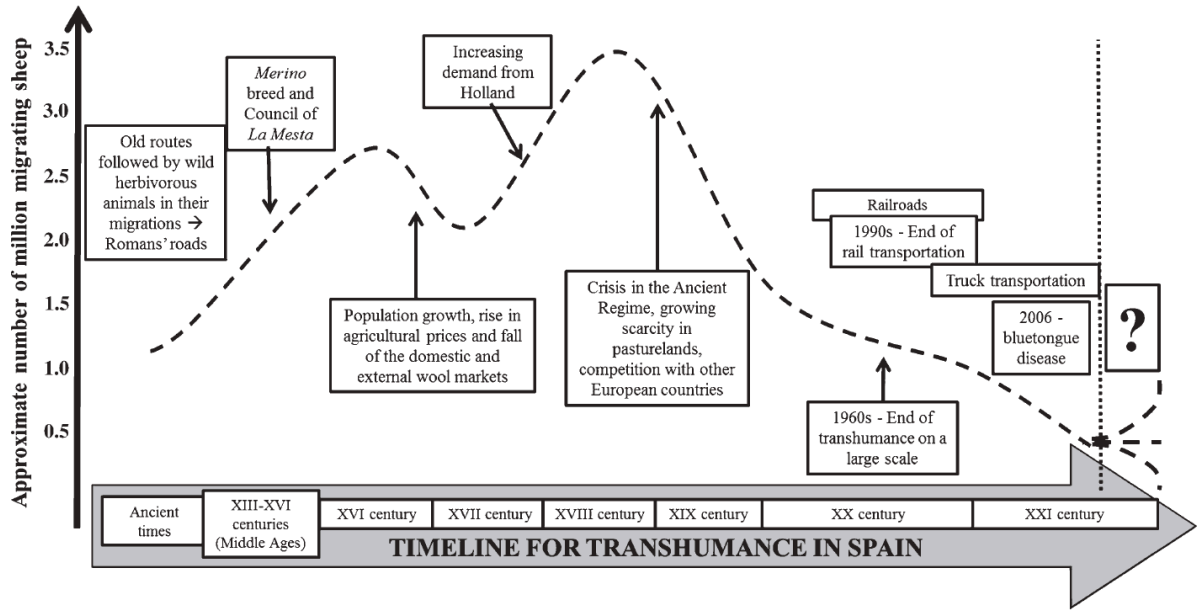


Figure 8 The figure shows the approximate number of millions of sheep from the foundation of the Mesta to the 21st century. The image derives from the work of Elisa Oteros-Rozas "Envisioning the future of transhumant pastoralism through participatory scenario planning: a case study in Spain".

The slow decline of Transhumance in Spain began during the second half of the eighteenth century, because of a series of circumstances, among which the decrease of shepards' privileges and the icrease of the forage and cereals' prices. During the independence war (Napoleonic wars) the *Mesta* suffered a serious crisis, due to both slaughter of millions of animals and to the economy change

imposed by the pro-French government. The promotion of agricultural and trading activities weakened the model of the *Mesta* (Vidal González 2010). The crisis of the *Mesta* culminated with its suppression in 1982; it was replaced by the National Association of Breeders of the Kingdom, through the Royal Order of January 31th, 1836. Although this event does not represent the end of transhumance, which is destinated to continue in an exorbitable decline until the twentieth century.

Figure 9 Sheep transhumance along the Cañada Real Conquense.

2.2.1 Drove road network in Spain

Since 1284 the transhumance in Spain was practiced along identified and delimited drove roads, even if from the pre-Roman times the non-organized transhumance was widely practiced. The drove roads'

network in Spain represents a wide network that extends from north to south through the peninsula geography.

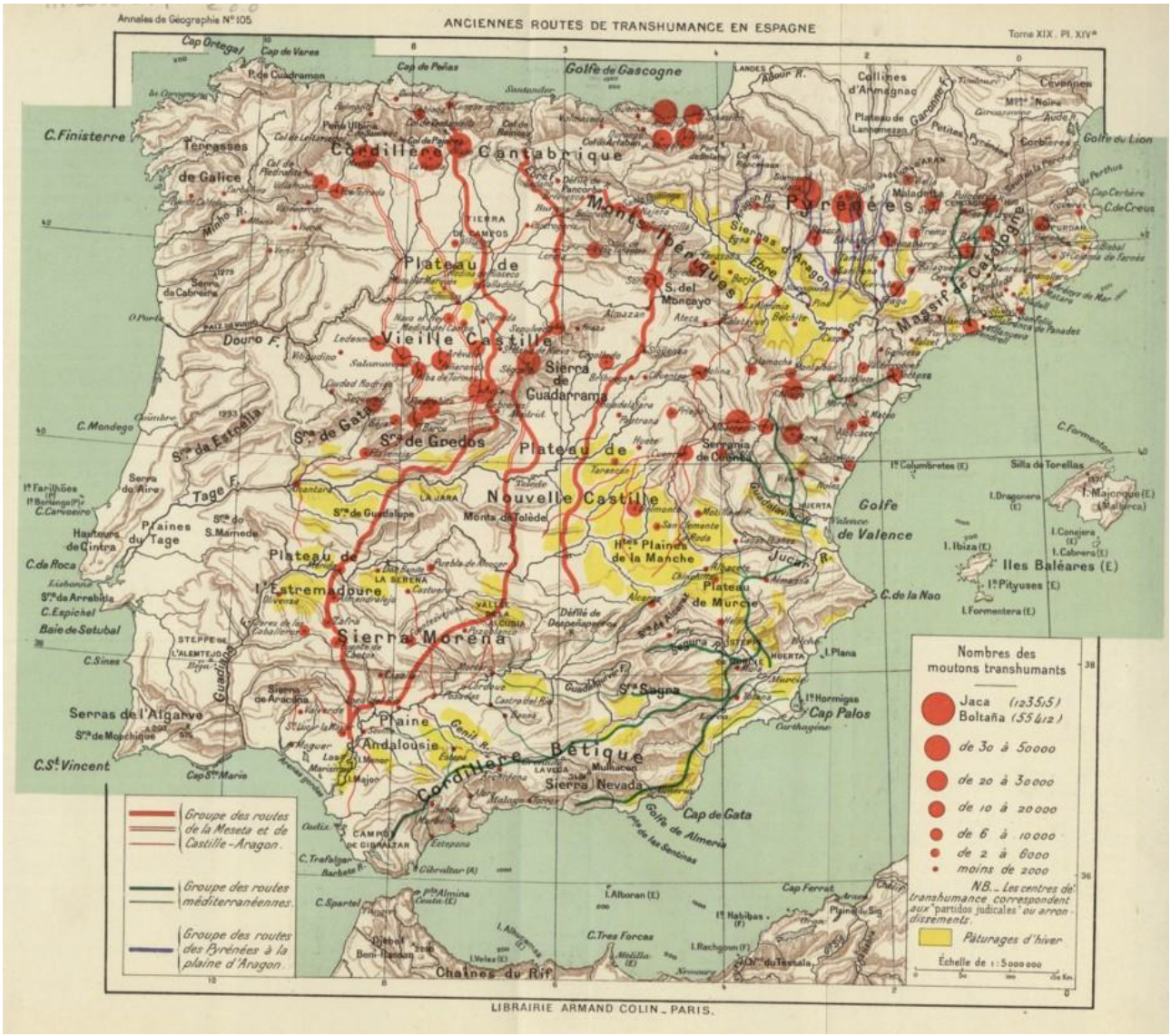


Figure 10 Map of Spanish Old Transhumance Routes by André Friborg – 1910.

This network, as reported in the 1910 map drawn up by French geographer André Friborg, does not interest all the Spanish region, but only those areas where climatic conditions prevent the exploitation of pastures throughout the year. The total length of the Spanish network is 125.000 kilometers and occupies an area of 425.000 hectares representing so the 1% of the national territory.

The main *Cañadas* in Spain are the *Cañada Real de la Plata* with a length of about 500 km, the *Cañada Real Leonesa Occidental* with a length of about 700 km, the *Cañada Real Leonesa Oriental* with a length of about 700 km, the *Cañada Real Segoviana* with an approximate length of 500 km, the *Cañada Real Soriana Oriental* with a length of about 800 km, the *Cañada Real Soriana Occidental* with a length of about 700 km, the *Cañada Real Galiana* with a length of about 400 km, the *Cañada Real Conquense* with a length of approximately 350 km and the *Cañada Real del Reino*

de Valencia with a length of about 250 km[20] This network, as reported in the 1910 map drawn up by French geographer André Friborg, does not interest all the Spanish region, but only those areas where climatic conditions prevent the exploitation of pastures throughout the year. The total length of the Spanish network is 125.000 kilometers and occupies an area of 425.000 hectares representing so the 1% of the national territory.[21].

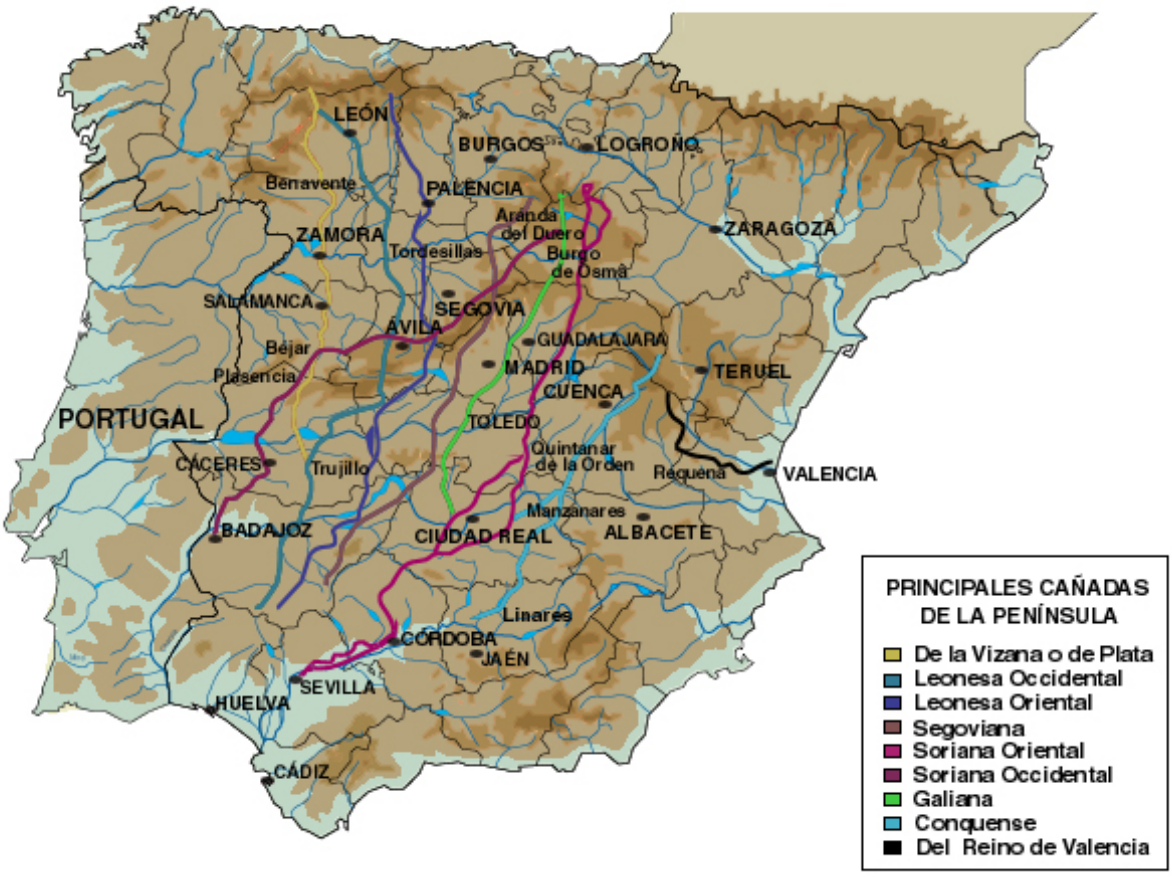


Figure 11 Map regarding an overview of Spanish Cañadas.

2.2.2 The drove roads protection laws in Spain and in the Province of Madrid.

In the nineteenth century, after the suppression of the *Mesta* and afterwards reconstituted as the National Association of Breeders of the Kingdom, through the royal order of August 12th 1892, the Vias Pecuarias had to be delimited, measured and differentiated according to their importance once again. In this royal order it is emphasized that the Vias Pecuarias are public property, where the

20 El valor histórico y cultural del trazado de las vías pecuarias https://www.ecologistasenaccion.org/IMG/pdf/valor-vias-pecuarias.pdf.
21 El valor histórico y cultural del trazado de las vías pecuarias https://www.ecologistasenaccion.org/IMG/pdf/valor-vias-pecuarias.pdf.

absolute prohibition of any form of interruption or use of the land are forbidden. Although the royal order in force, the delimitation and classification of the pecuarias vias was carried out only for a very limited number of drove roads. During the twentieth century according to political changes, there were several attempts to classify and to delimit the Vias Pecuarias that very often consisted in ministerial or royal orders never applied or partially applied (ministerial order of November 7th, 1912, ministerial order of April 8th, 1916, Royal Order of August 30th, 1917, Royal Order of June 5 th, 1924, Royal Order of December 7th, 1931, Royal Order of December 23th, 1944) (Valdelande 1995). In the mid-twentieth century, the drove roads' management was entrusted to the Vias Pecuarias Service, which had the task to draft a national classification and to proceed with the identification of the boundaries and the positioning of the milestones. Unfortunately, the esigue financial resource did not allow to reach the pre-defined goals. The law n. 22 of June 27th, 1974 defined that the management, the administration and the custody of these paths was entrusted to the Institute for Nature Conservation.

In 1978, consequently to the birth of the Autonomous Communities, some of state services, as the management of Vias Pecuniaras, were transferred to them, although the state reserved the right to have the exclusive competence regarding basic legislation on the Vias Pecuarias[22].

After about 15 years of national legislative inactivity in 1995 the law 3/1995[23], of March 23th concerning the Vias Pecuarias was issued. In the introduction of the law the economic and social importance of drove road for Spain were clearly claimed. The Vias Pecuarias are goods of public domain belonging to the Autonomous Communities and are inalienable. The delimitation and management of these drove roads are entrusted to the Autonomous Community which had to guarantee their public use, even if not necessarily linked to transhumance. Moreover, the same law of 1995 establishes the Red Nacional de Vías Pecuarias, a documentary catalogue consisting of a general archive, organized on the basis of municipal boundaries. The catalogue contains historical information and documents concerning the management and the administration of the pecuarias vias and a section dedicated to the bibliography and to the cartography of the Transhumance and the Vias Pecuarias. On the basis of the law issued in 1995, Madrid promulgated the law 8/1998[24], dated June 15th, which was characterized by an even more protectionist feature. In detail, the law of 1998 aims to ensure the correct conservation of the Vias Pecuarias and to adopt all the necessary measures for the restoration and an adequate protection. So a series of actions were defined with the purpose to

22 Vias Pecuarias
http://www.guiasjuridicas.es/Content/Documento.aspx?params=H4sIAAAAAAAEAMtMSbF1jTAAAUMTU2MjtbLUouLM_DxbIwMDCwNzAwuQQGZapUt-ckhlQaptWmJOcSoAqs4sejUAAAA=WKE
23 Ley 3/1995, de 23 de Marzo. Agencia Estatal Boletín Oficial del Estado n. 71 de 24 marzo de 1995. https://www.boe.es/buscar/doc.php?id=BOE-A-1995-7241.
24 Ley 8/1998, de 15 de junio, de Vías Pecuarias de la Comunidad de Madrid. http://www.madrid.org/wleg_pub/secure/normativas/contenidoNormativa.jsf?cdestado=P&nmnorma=198&opcion=VerHtml#no-back-button.

guarantee the biodiversity and genetic exchange of the flora and fauna through the conservation of drove roads, to contribute the preservation of native breeds and the exploitation of resources, to promote and encourage contacts between urban and rural areas. Moreover the law intend to support compatible social and cultural activities around drove roads, in order to both to implement the creation and the conservation of an environmental and social conscience and to satisfy the demand for outdoor recreational activities.

2.2.3 The Cañada Real Segoviana

The *Cañada* start in the Sierra de Neila, exactly in the province of Burgos and it crosses the territories of the province of Segovia, Madrid, Toledo, Ciudad Real, to end in the town of Granja de Torrehermosa in the province of Badajoz. It extends for a length of about 500 kilometers, with a very different conservation state among the different provinces.

The study area is circumscribed within the province of Madrid, the *Cañada Real Segoviana* has a linear length of 131 km, from the locality of *Las Culebras* (Somosierra, Madrid) at 1260 m a.s.l., ending up in the locality of *Vallecompadre* at 590 m a.s.l. (Villamanta, Madrid), occupying a surface of 937 hectares.

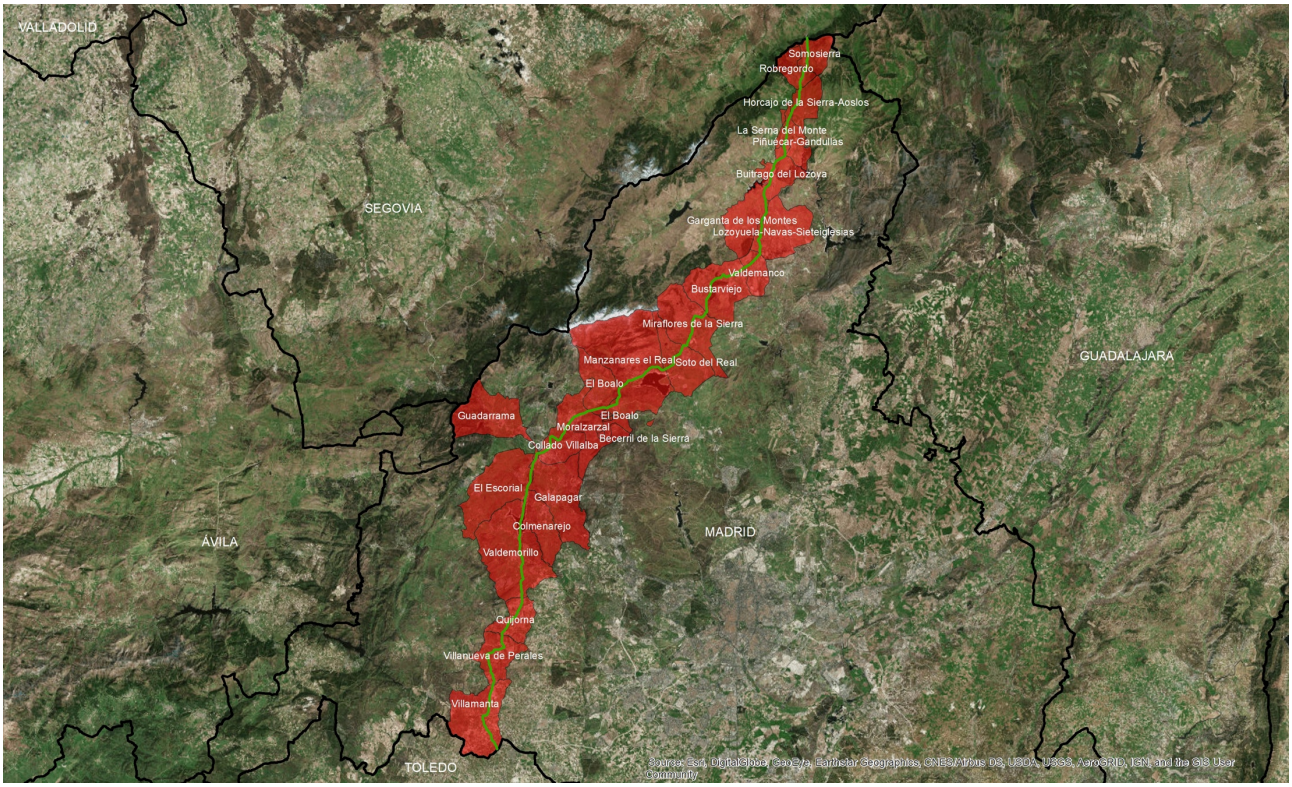


Figure 12 Extension of the Tratturo Castel di Sangro-Lucera and of the crossed municipalities.

We dicided to chose this *Cañada* for three main reasons: the linear dimensions similar to the *Tratturo Castel di Sangro-Lucera*, the presence along this drove road of a trail network and a conservation state similar to the Italian case.

MUNICIPALITY	PROVINCE	LENGH (meter)	AREA (squares meter)	AREA (hectares)
Buitrago del Lozoya	Madrid	7527	563414	56,3
Bustarviejo	Madrid	10189	821727	82,2
Collado Villalba	Madrid	7191	653473	65,3
Colmenarejo	Madrid	402	31334	3,1
El Boalo	Madrid	2594	206575	20,7
El Escorial	Madrid	4125	334658	33,5
Galapagar	Madrid	2355	120925	12,1
Garganta de los Montes	Madrid	3895	246092	24,6
Guadarrama	Madrid	55	212	0,0
Horcajo de la Sierra-Aoslos	Madrid	4177	347436	34,7
La Serna del Monte	Madrid	2235	83718	8,4
Lozoyuela-Navas-Sieteiglesias	Madrid	5020	325209	32,5
Manzanares el Real	Madrid	11610	822763	82,3
Miraflores de la Sierra	Madrid	6622	511285	51,1
Moralzarzal	Madrid	4396	227088	22,7
Piñuécar-Gandullas	Madrid	3737	191447	19,1
Quijorna	Madrid	6048	415665	41,6
Robregordo	Madrid	2523	130091	13,0
Somosierra	Madrid	4881	259049	25,9
Soto del Real	Madrid	5253	426101	42,6
Valdemanco	Madrid	2914	293225	29,3
Valdemorillo	Madrid	14348	1066680	106,7
Villamanta	Madrid	10309	844396	84,4
Villanueva de Perales	Madrid	9438	454253	45,4
TOTAL		**131844**	**9376818**	**937,7**

Table 3 The table shows the length in meters and the area in square meters of the municipalities crossed by the Cañada Real Segoviana.

The *Cañada* crosses 24 municipalities in the province of Madrid including only 11 populated area: Villamata; Villanueva; Quijorna; Collado Villalba; Moralzarzal, Manzanares el Real; Bustarviejo; Buitraigo del Lozoya; Robregordo; Somosierra. From north to south the *Cañada* runs along the *Royo*

Duratón valley near the territories of Somosierra, it is surrounded by a mountain area consisting of the *Sierra Cebollera* in the east part and the *Sierra de Guadarama* in the south-west part.

Figure 13 Cañada Real Segoviana near the municipality of Moralzarzal.

It extends through the mountain chain for over 90 km, reaching the *Rio Horcajo* and the *Rio Lozoya* valley and *Santillana* Lake. It passes through the sub-mountainous area near Collado Villalba to end at km 105, near the town of Cerro del Globo (nearby the town of Qujorna). From the inhabited area of Qujorna to the province of Madrid border, the drove road reaches the hilly area.

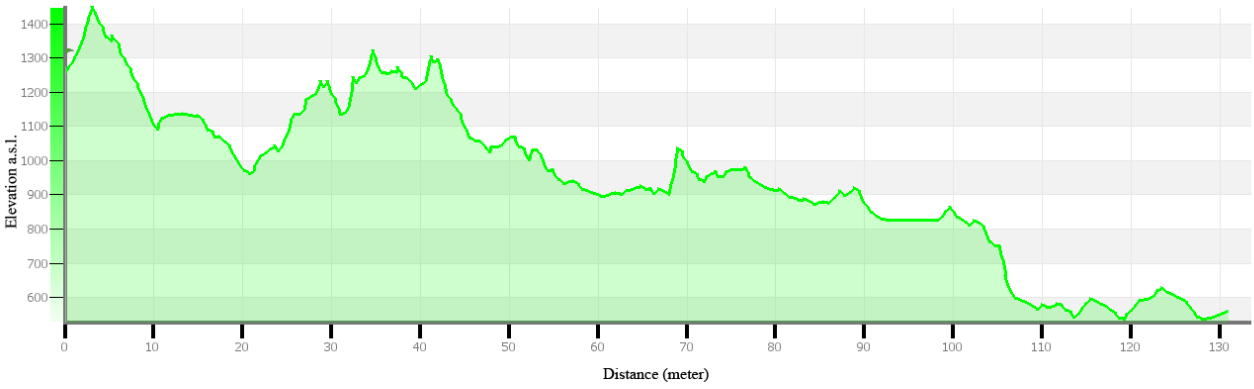


Figure 14 Elevation profile of the Cañada Real Segoviana.

Figure 15 Cañada Real Segoviana near the municipality of Quijorna.

2.3 Cartographic analysis

To compare the Italian *Tratturo* and the Spanish *Cañada*, it was necessary first to redraw the actual drove roads' boundaries on detailed maps; afterward, we proceeded examining the conservation state of each drove road. The analysis was carried out drawing detailed land use maps which were validated through survey carried out in the *Tratturo* first and in the *Cañada* after. The two maps were drawn with the same detailed scale 1:2000. The importance to have available cartographic information so exhaustive is due to the drove roads' features in the landscape context. In effect drove roads are tiny linear elements if we relate them to landscape scale, so only the availability of actual and accurate information can allow to plan actions aimed to the valorization and the conservation of drove roads. The reconstruction of boundaries and the prevention of squatting were the usual procedure since the establishment of *Dogana delle Pecore e della Mesta*. This practice could be achieved by every single municipality, as for the Spanish case, or it could be carried out along the entire drove road, as it was an ordinary procedure in Italy.

Since the period of *Dogana*'s activities and until after the unification of Italy, the agrimensori realized multiple reinstatements. The first one even if reported detailed descriptions about the drove road network's conservation state and about squatting or process of natural recolonization, any drawings or maps was included in the reinstatement. Since 1649 to 1652, another reinstatement led by the *Doganiere* Ettore Capecelatro was realized featuring a drove road representation. Other reinstatements containing maps were carried out in the following years, the last one ended in 1884 by the *Ispettorato Forestale di Foggia* (Foggia Forestry Inspectorate) was featured by very detailed planimetric representations (Di Cicco 1987).

2.3.1 The definition of the limits and the land cover maps of Tratturo Castel di Sangro-Lucera

Thanks to the availability of historic maps (1875-1957) suitably georeferred in GIS and of updated cartographic information, as the map of Land Registry, it was possible to reconstruct the actual drove roads' boundaries in a scale of 1:2000. This phase of elaboration results from the application of a methodology achieved ad hoc to reconstruct the section of *Tratturo Castel di Sangro-Lucera* crossing the Molise Region. This methodology applied to the entire *Tratturo* is well described in the paper "*Land Use Dynamics of Drove Roads: The Case of Tratturo Castel di Sangro-Lucera (Molise, Italy)*" (Minotti et al, 2018) published by Journal Land. To carry out this phase, several maps were used; in Table 4 synthesized information about it are listed.

The land use map of 2014 was produced within the drove road's boundaries previously reconstructed. We referred to CORINE land cover classification[25] to draw the land use map with a description at the third level of detail.

25 European Environment Agency. CORINE Land Cover. Available online: https://www.eea.europa.eu/publications/COR0-landcover.

Name Map	Years	Scale	Source	Format
Map of southern Italy	1875	1:50.000	ITMI	paper
Bonamici's reinstatement	1875-1884	1:1000 1:2000 1:5000	State Archive of Campobasso State Archive of Foggia	*.tif
The Map of Italy	1957	1:25.000	IGMI	*.ecw
The Land Registry	1947-2016	1:2000	Land Registry Office and Molise Regional cartographic portal	Paper and wms link

Table 4 List of maps used to define the boundaries of the Tratturo Castel di Sangro-Lucera.

2.3.1.1 The reconstruction of the Tratturo's limits

To proceed to the identification and the reconstruction of drove road's boundaries, several maps were utilized; the related main information are reported item by item, from the antique map to the recent one, moreover in the following Figure 16 the representation of the methodology applied to this research is reported.

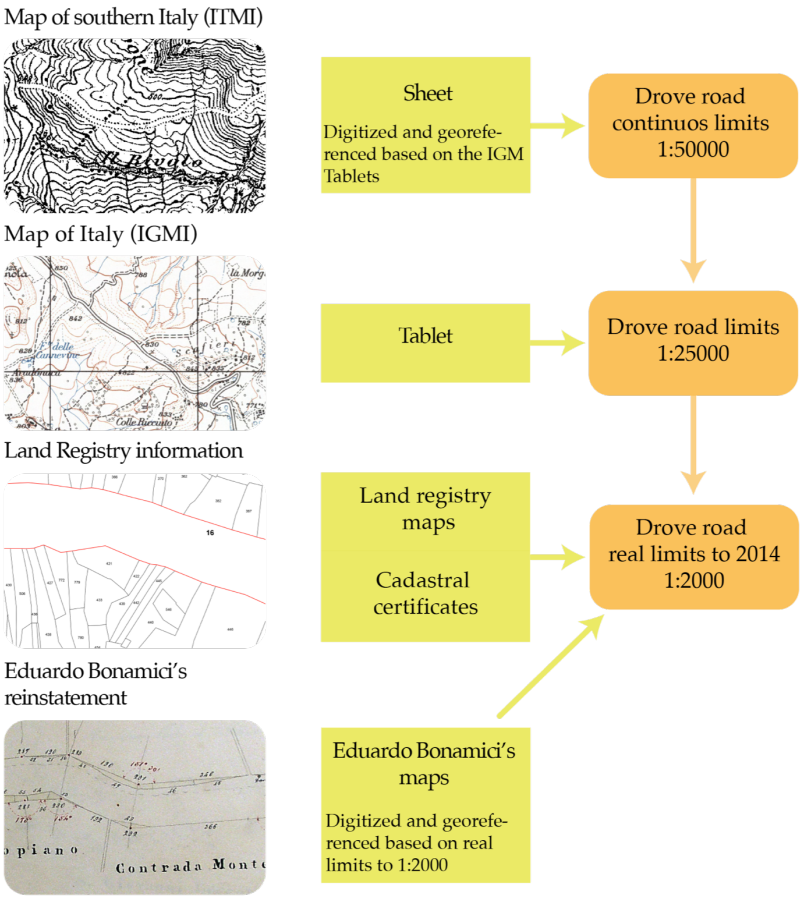


Figure 16 Schematic representation of the methodology used.

Map of Southern Italy (ITMI). After the unification of Italy, the Istituto Topografico Militare Italiano (Italian Topographic Military Institute) quickly produced (1860–1875) the Carta dell'Italia Meridionale (Official map of southern Italy) with a scale of 1:50.000 (Cantile 2013). To identify the *Tratturo Castel di Sangro-Lucera* we used five sheets (with dimensions of about 50 × 70) published in 1875. Although this is small-scale cartography, the maps are sufficiently detailed and are faithful to the reality of the land features, including the drove roads' network (Figure 17).

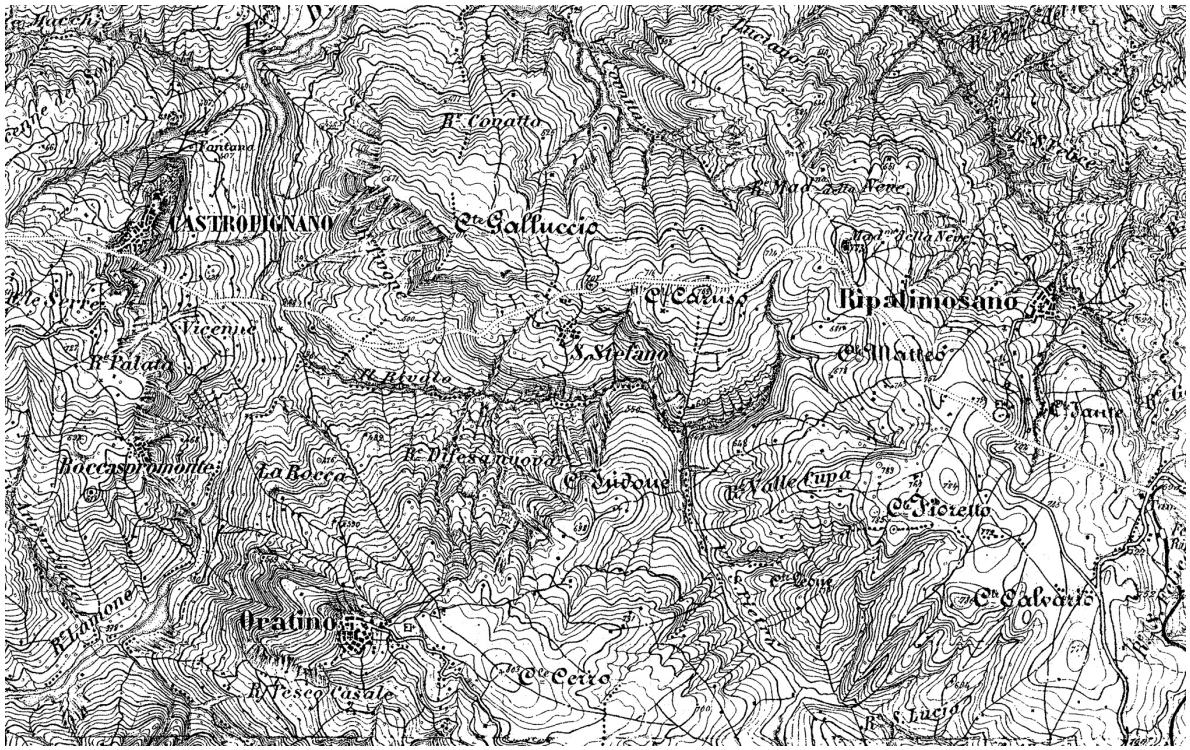


Figure 17 Details of sheet 1:50.000, it is possible to recognize the Tratturo's boundaries represented by two dotted lines. In particular, it can be noticeable above the toponym C. Caruso. The Tratturo's width is not drawn with the same scale of the map.

Eduardo Bonamici's Reinstatement (BR). Following the rules of 18th March 1881, the Ministry of Finance ordered that this reinstatement would be the last one (Di Cicco 1987). The reinstatement, which was entrusted to the Forest Inspectorate, began in 1875 and ended in 1884. The documentation of this reinstatement provides very detailed and precise information about the status of the *Tratturo*. The reinstatement of the *Tratturo Castel di Sangro-Lucera* was achieved by Eduardo Bonamici and the surveyor Carlo Ciampi between 1881 and 1883. It contains a short introduction, a concise history of the *Tratturo*, summary tables of distances and angles between the milestones, planimetries, and information about occupations. The tables are about 38 × 47 cm in size and are collected on single manuscript, produced with paper obtained from mechanical pulping and with the use of India ink. Each map reports on the *Tratturo* divided according to administrative boundaries, reporting the towns, the houses, the rivers, the bridges, the presence of vegetation, roads and the milestones, with the distance between them and the equivalent angles also being reported. Unlike in the reinstatement of the Capecelatro, the maps are characterized by a modern territorial representation, although they do not represent any detail of the landscape outside the Tratturo and report a lack of toponymy. This reinstatement was acquired in digital format from the State Archives of Campobasso and Foggia and the geographical references were created in the GIS environment.

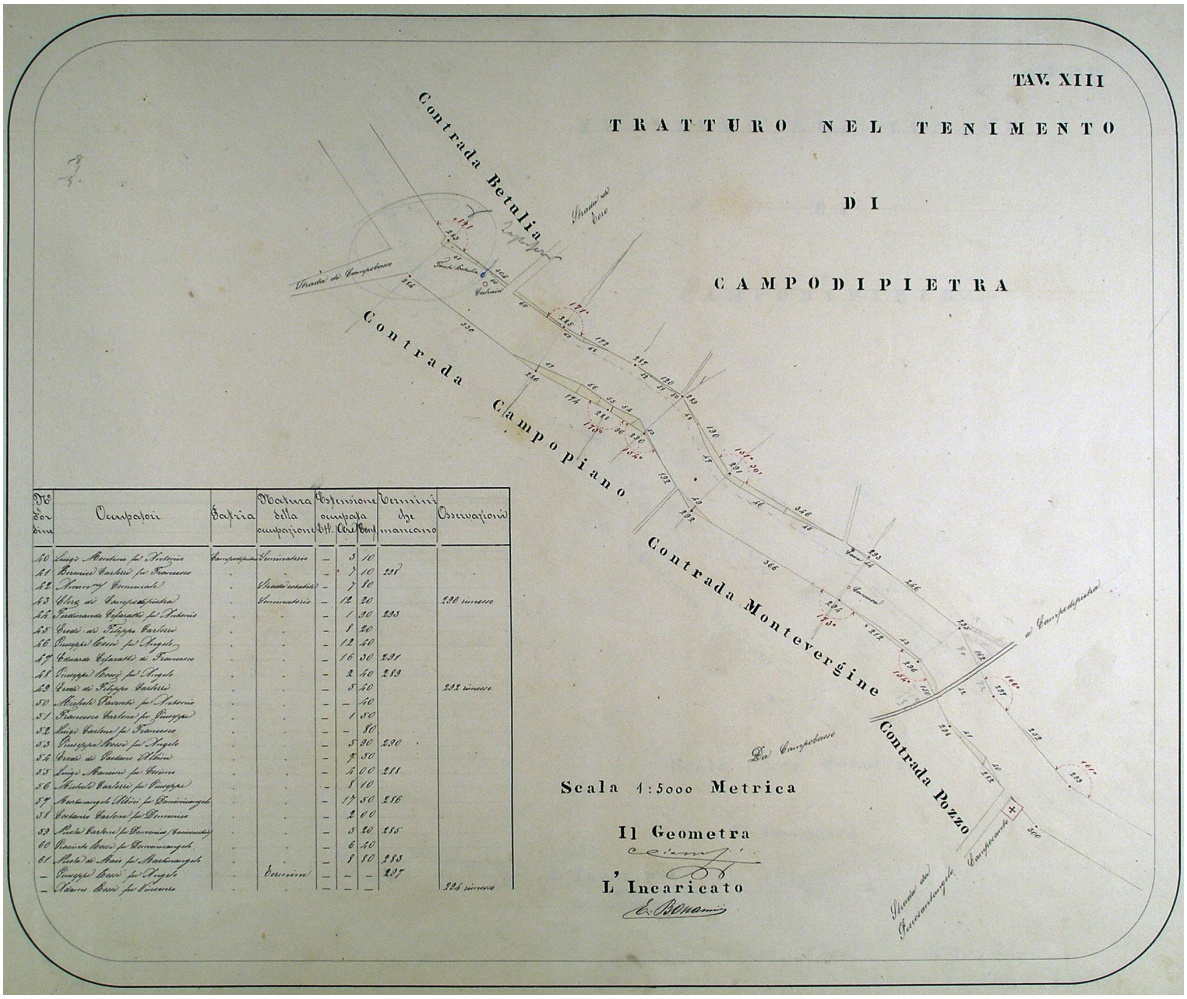


Figure 18 Details of Bonamici's reinstatement, table XIII. The map reports the Tratturo's boundaries, the distances in meters among milestones, the angles included between two milestones (red ink) and the presence of squatting (yellow ink). The details of squatting are listed in the table.

The Map of Italy (IGMI). The origins of this cartography, drawn by the *Istituto Geografico Militare Italiano* (Italian Geography Military Institute, the name of *Istituto Topografico Militare* after the 1882), are closely connected to the Great Map of Italy (1878—1903) and, in particular, to topographical surveys with a scale of 1:25.000, which allowed the production of maps typified by an extraordinary richness of topographical elements. These maps are called Tavolette (Tablets) and they are 45 × 50 cm in size. This cartography was officially adopted as the Italian basic map in 1878. It is characterized by an extreme attention to topography and toponymy, in addition to the usual information such as roads and orography, and there is important information related to the type of vegetation, the presence of drystone walls, ruins, and last but not least the location of drove roads (Figure 19). To identify the *Tratturo Castel di Sangro-Lucera*, we used nine tablets drawn in 1957.

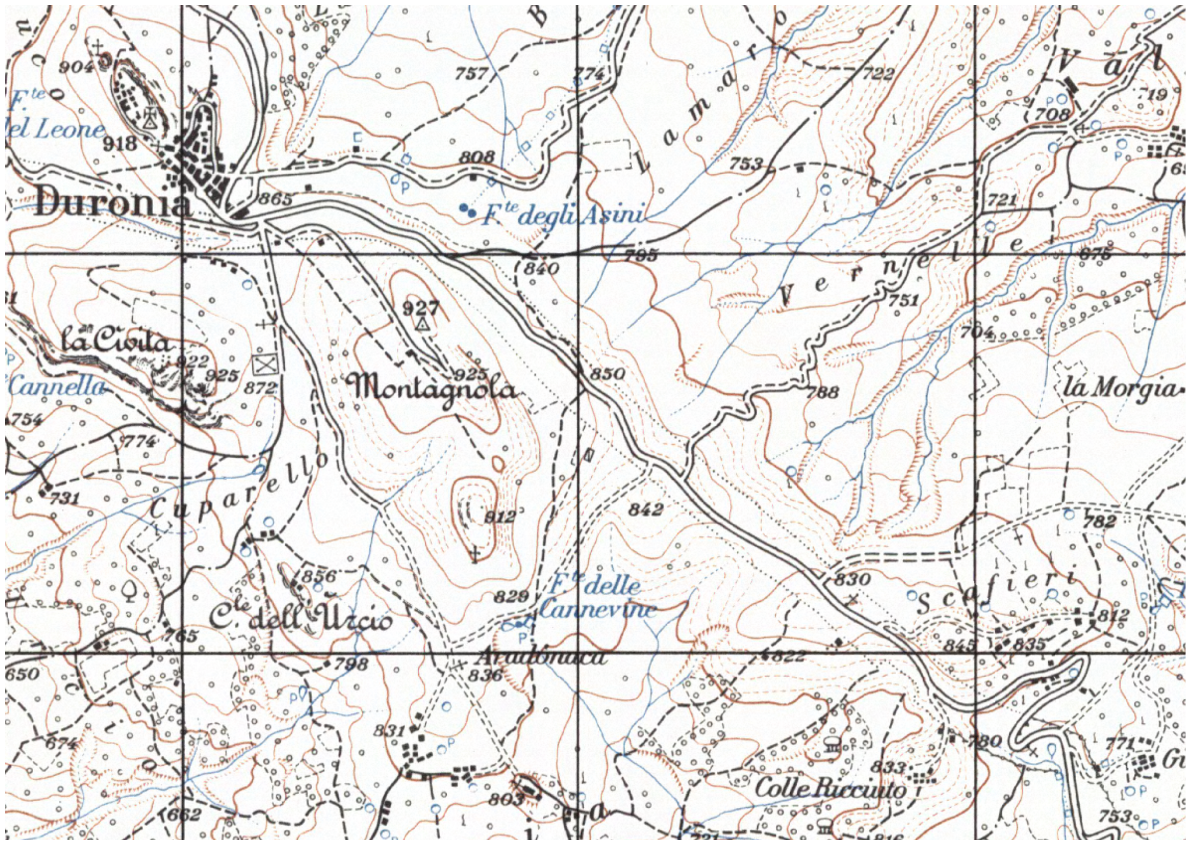


Figure 19 Details of IGM tablets, the Tratturo Castel di Sangro-Lucera is represented with two dotted lines. It is possible to notice its narrowing nearby the residential area of Duronia and the presence of an ordinary road, nowadays named Provincial Street 46.

The Land Registry (1947–2016). This is a geometrical parcel cadastre, but is not probative since it does not certify real rights on real estate. In our case the consistency of the *Tratturo* was verified, as a state property, through the Land Registry information, by consulting hundreds of cadastral certificates. The cadastre of land conducts a census of land parcels (minimum unit), which are drawn on the Land Registry maps, otherwise a complete mapping of the area is drawn on a scale 1:2000, in which the toponymy is not detailed.

Figure 20 Details of land registry maps. The Tratturo is represented with a red line and usually it is identified as a unique linear parcel with variable size; in the figure the Tratturo is the parcel number 396 in sheet number 16.

The identification of boundaries was first performed referring to the quadrants drawn in 1875 in scale of 1:50.000, thanks to the ARCMAP 10.1 - ESRI program we digitized and georeferenced quadrants. To georeference the quadrants, IGM tablets with a scale of 1:25.000 were used, since they were already georeferenced (Datum WGS 84 - 33 Nord). Although the quadrants were produced in a scale with less detail than the tablets, it was possible to retrace the boundaries of the *Tratturo Castel di Sangro-Lucera* with constant continuity. Even though the tablets report a detailed toponymy, they do not often draw the *Tratturo*. The reason why there is a lack of tracing of the *Tratturo* is the use of aerial photography: it was not always possible to individuate the *Tratturo*, because of its conservation state damaged by woodland, forestry recolonization or squatting, or because it was difficult to individuate it, for example, near rivers or towns.

After the preliminary recognition of the limits on a scale of 1:50.000, using the sheets, we outlined again the *Tratturo Castel di Sangro-Lucera'*s boundaries on a scale of 1:25.000; but to trace the real boundaries of the *Tratturo*, we used the information collected in the Land Registry, referring to maps (updated to 2005) reporting all the land parcels, and to cadastral certificates (updated to 2016), which report details about the property of land parcels. The land parcels were examined using the WMS service of Molise Region[26] and displayed through ARCGIS software, instead for the Apulia Region

26 Regional cartographic portal http://servizi.geo.regione.molise.it/arcgis/services/Catasto/MapServer/WMSServer

we proceeded to georeference a synthesis of Land Registry Map in A3 size and then we and displayed them through ARCGIS software. This allowed us to retrace the *Tratturo*'s boundaries on a scale of 1:2000, since in a lot of sections there was a positive comparison with the limits drawn in the tablets; moreover, to validate this elaboration phase and to retrace the limits of those portions of the *Tratturo* that did not coincide with what was reported in the tablets, we used the information from cadastral certificates. We acquired this documentation from the Agenzia del Territorio (Territory Agency), which provided us with the information of public property related to the *Tratturo* and information about land parcels near the *Tratturo*, whose annexation was not definite. Even in this case, the only exceptions, during the redrawing of the *Tratturo*, concerned those situations where the *Tratturo* crosses towns or is near rivers.

Through the georeferentiation in the GIS setting, the maps of Bonamici's reinstatement were overlaid to the limits of the *Tratturo* traced using the cadastre information (Figure 20).

This elaboration phase was carried out with particular attention, in order that the measurements between milestones and the width of the *Tratturo Castel di Sangro-Lucera* identified on the map would reflect the real ones; therefore, it was possible to obtain accurate measurements with a medium error of 8 m.

Surveys along the *Tratturo* were carried out to geolocalize the tangible traces; the geolocalization of all the tangible elements were performed using a professional GPS. During these surveys 22 milestones were individuated and the information about the geolocalization were used to validate the maps georeferentiation.

Figure 21 Milestones near the Municipality of Pescolanciano and of Chiauci.

2.3.1.2 Land cover maps of 2014

The land cover maps related to 2014 were produced within the limits of the Drove road previously reconstructed with a new methodology able to compare several cartographic and historic documents. We considered the CORINE land cover classification at a description of third level detail. To draw the map, we utilized the 'Basemap' service of ARCGIS, which is a color aerial images from DigitalGlobe. These images have a resolution of 60 cm for pixel. Accuracy assessment was carried out on the land-use map of 2014, with a number of validation points of 274, to have an accuracy of 85%. Validation points were randomly distributed within the drove road's boundaries in ARCMAP 10.1 using Arc Toolbox "Create Random Points"; then they were checked in field with a professional GPS. Overall accuracy and kappa coefficient were used for assessing the performance. All the validation points were checked during the field surveys with the aim to validate the map 1:2000 of drove road.

2.3.2 The definition of the limits and the land cover maps of Cañada Real Segoviana

Through the portal of Spanish National Geographic Information Center, it is possible to download several maps, which report the drove roads' boundaries and frequently land use features; moreover, it is possible to download aerial photograms and orthophotos realized between 1970 and 2014.

As the relevant importance of *Cañadas* in Spain, cartographers always reported drove roads on maps with accurate details, but only maps produced since 1900 can be utilized in GIS.

The land cover map of 2014 was produced within the *Cañada's* boundaries previously reconstructed and we considered CORINE land cover[27] classification with a description at the third detail level.

Name Map	Time frame	Scale	Source	Format
Topographic tablet - ancient geographical documentation	1900-1910	1:25.000	IGYE	*.ecw
Topographic map of Spain	1985-2014	1:25.000	IGN	*.ecw
Topographic tablet - Topographic map of Spain	1920-2014	1:50.000	IGN	*.ecw
Harmonized topographic map	2014	1:5000	IGN	Paper
Orthophotos	1973-2014	various	IGN	*.ecw

27 European Environment Agency. CORINE Land Cover. Available online: https://www.eea.europa.eu/publications/COR0-landcover.

Table 5 List of maps used to define the boundaries of the Cañada Real Segoviana.

2.3.2.1 The reconstruction of the Cañada limits

Once identified the municipalities crossed by *Cañada Real*, we elaborated the reconstruction of boundaries using software "GIS". This phase was quite simple, since all the maps report the drove road's boundaries even if they are drawn with different scale. The Spanish portal consent to download all the maps in ECW format and in addition useful information about every single map.

In the following figure the representation of the methodology used is reported.

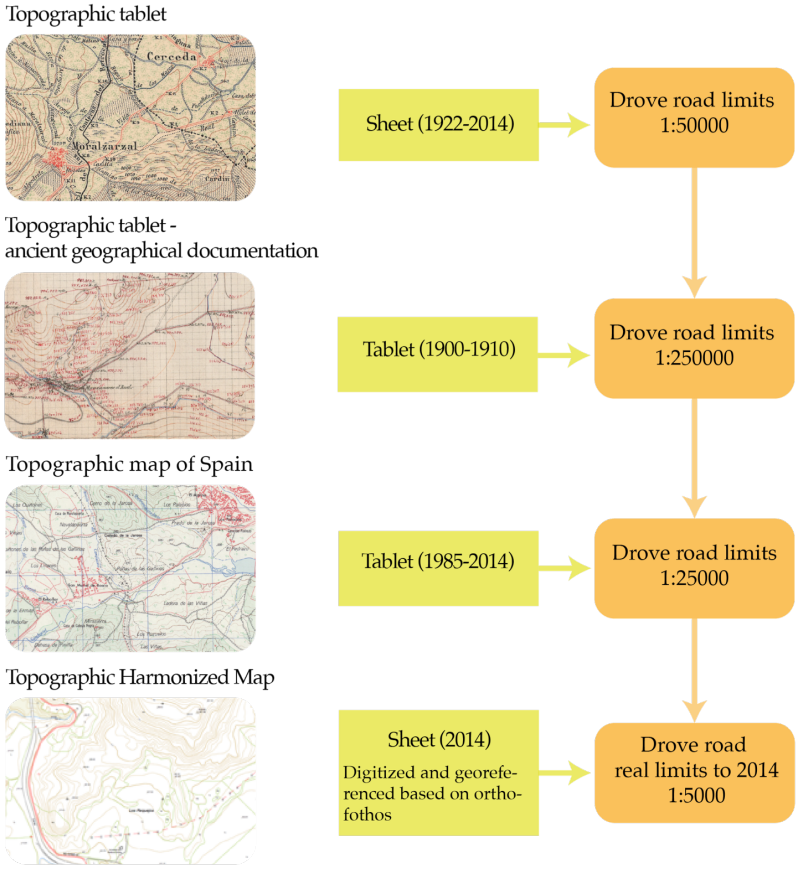


Figure 22 Schematic representation of the methodology used.

The reconstruction of drove road's boundaries was carried out using different maps, beginning to analyse the antique and less detailed maps to the recent and more detailed ones. In particular, using the maps with a scale detail of 1:5000 (Harmonized Topographic Map), it was possible to quickly draw down the limits of the *Cañada* with a very detailed level. During the phase of boundaries reconstruction, we also used orthophotos of 1975 to validate the limits created with GIS. Afterward, we started with the field activities, checking the entire length of the *Cañada Real Segoviana*; the aim was to evaluate the boundaries in the field, using the "Mojones" - boundary marker, which are equally positioned along the drove road. Through the elaborations carried out in GIS and the georeference of

Mojones, it was possible to draw accurate drove road's boundaries with a medium error of 5 m at a scale detail of 1:5000.

(a) (b) (c)

Figure 23 Milestones near the Municipality of Moralzarzal (a), Miraflores de la Sierra (b) and Soto el Real (c).

2.3.2.2 Land cover maps of 2014

The land cover map related to 2014 was produced within the drove road's boundaries previously reconstructed. We considered the CORINE land cover classification with a description at the third detailed level and we utilized color aerial images named 'Basemap' service of ARCGIS. Accuracy assessment was carried out on the land-use map of 2014, with a number of validation points of 248, to have an accuracy of 85%. Validation points were randomly distributed within the drove road's boundaries; then they were checked in field with a professional GPS. Overall accuracy and kappa coefficient were used for assessing the performance. All the validation points were checked during the field surveys with the aim to validate the map 1:5000 of drove road.

2.4 Evaluation of ecosystem services and knowledge of Drove Road.

Regarding the researches about ES, most of them primarily focused on monetary and biophysical features, and only very few studies investigated the socio-cultural preferences and/or the perception concerning ecosystem services (Vihervaara et al. 2010). In general, non-economic evaluations are mostly interesting, because they propose the possibility to analyze the motives for conserving ecosystem services, which are often imperceptible in monetary evaluations. Socio-cultural valuation approaches emerge to be worth in understanding the diversity of values provided from the different ecosystem services and in analyzing how human well-being may be affected by ecological changes. In the PhD thesis, we exclusively aim to evaluate the socio-cultural value of ecosystem services through valuation approaches which specifically investigate human attitudes and perceptions

concerning ecosystem services; thus, they may be a particularly relevant tool for valuating ecosystem services on drove road landscapes.

Following the research of Oteros carried out on the *Cañada Real Conquense*, we proposed part of this research to two new case studies: *Tratturo Castel di Sangro-Lucera* and the *Cañada Real Segoviana*.

The questionnaire is organized in open and closed questions concerning the Ecosystem Services and the state of conservation of drove road: there are three section regarding the following topics:

- the socio-economic variable of the interviewees;
- the knowledge about the presence of the drove road and the relative use;
- the Ecosystem Services related to the drove road.

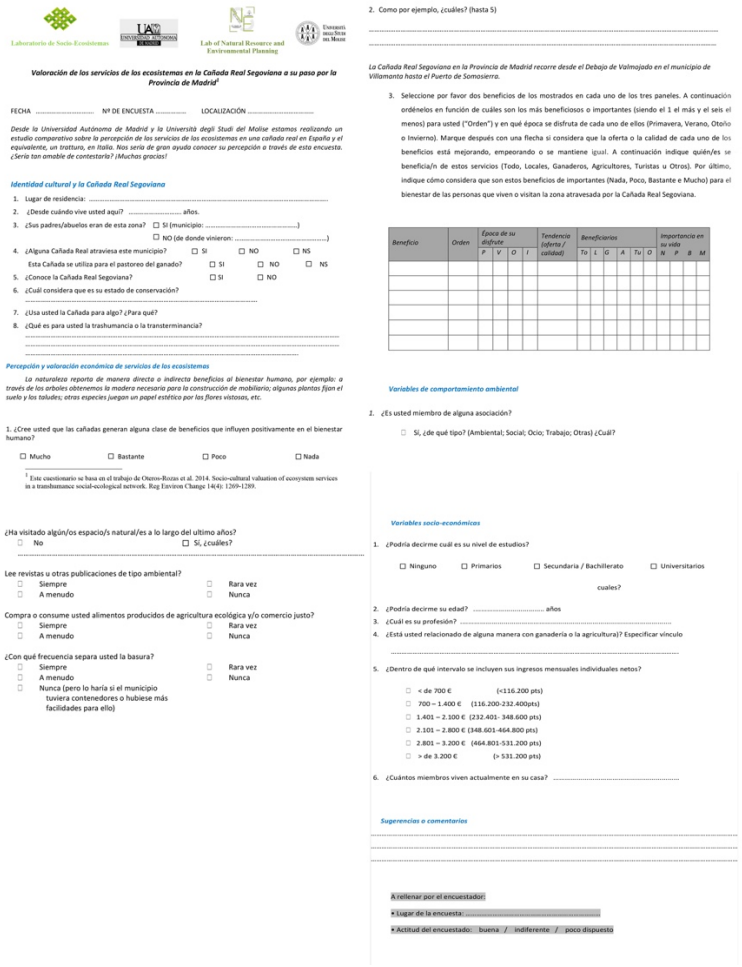


Figure 24 Questionnaire submitted during interviews.

The questionnaire is structured ad hoc for following services: Provisioning, are the products obtained from ecosystems such as food, wood, fiber, genetic resources. Regulating, are defined as the benefits obtained from the regulation of ecosystem processes such as microclimate regulation, hydrological

regulation, pollination or tree regeneration. Cultural, include non material benefits that people obtain from ecosystems such as spiritual value, recreation and aesthetic values.

According to the research carried out by Oteros and to the classification of Millenium Ecosystem Assessment, a total of 34 ES were proposed: 10 provisioning, 12 regulating and 12 cultural.

Type of Ecosystem Services	Ecosystem Service
Provisioning	Manure
	Food from agriculture
	Food from hunting
	Livestock
	Feed for animals
	Products from apiculture
	Wood and timber
	Gathering
	Fibre
	Genetic pool
Cultural	Recreational hunting
	Scientific knowledge
	Local ecological knowledge
	Environmental education
	Bullfighting events
	Cultural identity
	Aesthetic value
	Tranquillity/relaxation
	Nature recreation activities
	Rural tourism
	Spiritual value
	Way of cultural exchange
Regulating	Ditch maintenance
	Air purification
	Biological control
	Soil erosion control
	Connectivity and seed dispersal
	Maintenance of soil fertility
	Habitat for species
	Pollination
	Fire prevention (natural hazard)
	Tree regeneration
	Microclimate regulation
	Hydrological regulation

Table 6 Classification of the Ecosystem Services used for this work, in according to the research carried out by Oteros and to the classification of Millenium Ecosystem Assessment.

To determine the necessary number of interviews we calculated the simple size to get results that precisely reflect the target population of continuous and discontinues urban fabric on drove roads. For this phase we took into account: the total residents number, a confidence level of 95% and a confidence interval equal to 6%. The total number of the interviews was then distributed for each municipality crossed by the drove roads.

Figure 25 A moment of an interview administered along the Cañada Real Segoviana.

To evaluate the ES, it was necessary to give a brief explanation about both the study area and the ecosystem services concept to interviewees.

Afterwards, we asked interviewees to what extent they considered the ecosystems of the study area as providers of services to society (nothing, little, some or much), and we asked them to list the ecosystem services they perceived. Then we presented them three visual panels listing, describing and presenting examples and pictures of the 34 ecosystem services. Subsequently we enquired interviewees to select, from the 34 ecosystem services listed in the panels, the six ecosystem services they considered to be the most important for social well-being and to order them in terms of their importance.

Beneficios que el ser humano obtiene de la naturaleza de manera intangible relacionados con aspectos CULTURALES		
Beneficio	*Ejemplo*	*Foto*
Tranquilidad, relajación	Paseos a la sombra	
Turismo activo en la naturaleza	Senderismo, equitación, ciclismo	
Identidad cultural	Cultura pastoril, mezcla de culturas	
Caza recreativa	Caza menor (perdiz, liebre, conejo), caza mayor (gamos, corzo, jabalí)	
Conocimiento científico	Investigaciones en ecología, etnografía, historia	
Educación ambiental	Educación ambiental, libros sobre trashumancia	
Espectáculos taurinos	Encierros, corridas, novilladas...	
Paisajes	VP: elemento diversificador, escenas bonitas→ fotografía, documentales	
Vía de comunicación	Cañada →Entre fincas/pueblos, para personas y animales	
Valores espirituales	Satisfacción de que exista la ganadería trashumante	
Conocimiento tradicional	Manejo de los animales, salir a ver el paso del ganado por el municipio	
Turismo rural	Cortijos, gastronomía, agroturismo	

Beneficios que el ser humano obtiene de la naturaleza de manera indirecta a través de la REGULACIÓN de procesos		
Beneficio	*Ejemplo*	*Foto*
Regeneración de especies vegetales	Rebrote de encinas y pinos, hongos, calidad del pasto	
Control de especies	Eliminación de malas hierbas	
Aire limpio	"corredor verde"	
Hábitat para especies	Refugio y guardería de especies, conectividad ecológica	
Prevención de incendios	Por el desbroce de los animales	
Control de la erosión	Cobertura de vegetación que retiene suelo en las raíces	
Conservación de especies	Razas autóctonas, aves esteparias	
Dispersión de semillas	Animales que ayudan a dispersar frutos, semillas y esporas	
Fertilización del suelo	Fertilización del suelo con los desechos animales	
Polinización	Insectos polinizadores	
Regulación del microclima	Papel de la vegetación en el secuestro de CO_2 y en la lluvia	
Regulación hídrica	Evapotranspiración de la vegetación	

Beneficios que el ser humano obtiene de la naturaleza de manera directa a través del ABASTECIMIENTO de productos		
Beneficio	*Ejemplo*	*Foto*
Recolección	Setas, espárragos, collejas, caracoles, bellotas, cardillos, cascarrias, etc.	
Abono	Restos fecales de animales para abonar cultivos	
Alimento para animales	Pastos y forraje	
Apicultura	Miel	
Alimento de caza	Perdices, liebres, conejos, jabalíes, etc.	
Alimento de ganadería	Carne y lácteos de alta calidad	
Tejidos	Lana y cuero	
Combustible	Madera	
Ganado	Venta de ovejas, cabras, vacas y novillos a otro ganaderos	
Mantenimiento de cunetas	En caminos y carreteras	
Alimento de agricultura	Vino, aceite, cereales, ajos, etc.	

Figure 26 Panels submitted during interviews.

Thereafter, we asked when (summer, autumn, winter and/or spring) interviewees perceived those ecosystem services were mainly provided. Moreover, we asked them which trend (increasing, decreasing or stable) the chosen ecosystem services seemed to be following. At last, interviewees scored each of the six selected ecosystem services according to their importance for their own personal well-being.

All the data recorded during the interviews were organized and analyzed to extrapolate the perception of the social and personal importance of ecosystem services. To calculate the importance for social well-being it was considered the mean of the ranking (1st = 6; 2nd = 5 and 3rd = 4 etc), meanwhile the importance for personal well-being was calculated as the mean score (no importance = 1; little importance = 2; some importance = 3; very important = 4) that interviewees gave to the selected ecosystem services to satisfy their personal well-being.

We proceed with the assessment of ecosystem services' trend and the relative importance for social well-being considering the frequencies for the perception of the trends followed by ecosystem services depicted in histograms. Moreover, we developed an index representing the overall perceived trend shown below $= \frac{I-D}{I+D+M}$ where I = frequency of increases; D = frequency of decreases; M = frequency of stable.

We performed Chi square test to analyze the associations between the supply of ES and seasons, that allowed us to investigate the perception of the temporal location of ecosystem services delivery.

A redundancy analysis (RDA) was carried out to identify the relationship between socio-demographic characteristics of interviewees and their perceptions of significant ecosystem services. The scatterplot consented to highlight socio-demographic factors underlying the importance of particular ecosystem

services for social well-being. To find out the significance of independent variables in influencing perception of the importance of ecosystem services for social well-being, a Monte Carlo permutation test (500 permutations) was performed. The inertia of the factors was used to identify the most important variables, according to socio-cultural perceptions.

3 Results and discussions

In this chapter results about the land use cover of drove roads, the evaluation of ecosystem services and the knowledge about *Tratturo* and *Cañada* are discussed. A comparison between the two realities, Italian and Spanish ones, is carried out.

3.1 Land use map of Tratturo Castel di Sangro-Lucrea

Even if the *Tratturo Castel di Sangro – Lucera* is one of the best drove road preserved in Molise Region (32% of 871 hectares are occupied by natural grasslands), the elaboration of the land use data concerning the whole drove road (Abruzzi-Molise-Apulia) highlighted that the conservations status is not optimal. In fact, only the 24% of the whole surface (1,357 hectares) is interested by natural grasslands, the land use class that is typical of drove roads. Instead, the non-irrigated arable lands occupy 36% of the *Tratturo* area, even if this land use class mostly interests the municipalities of Molise (Toro, Pietracatella, Gambatesa) neighbouring Apulia, where the drove road is quite completely disappeared. In fact, examining merely the municipalities of Apulia acrossed by drove roads, out of 492 ha of *Tratturo* only the 12% is characterized by Natural grasslands, meanwhile non-irrigated arable land category represents the 65% more or less.

CORINE land cover classes	CORINE land cover	Area (square meters)	Area (hectares)	Percentage
111	Continuous urban fabric	124117	12,4	0,91
112	Discontinuous urban fabric	45852	4,6	0,34
121	Industrial or commercial units	30554	3,1	0,23
122	Road and rail networks and associated land	947775	94,8	6,98
131	Mineral extraction sites	1000	0,1	0,01
132	Dump sites	25360	2,5	0,19
141	Green urban areas	2935	0,3	0,02
142	Sport and leisure facilities	44705	4,5	0,33
211	Non-irrigated arable land	4912334	491,2	36,18
212	Permanently irrigated land	175679	17,6	1,29
221	Vineyards	22961	2,3	0,17
222	Fruit trees and berry plantations	3429	0,3	0,03
223	Olive groves	125111	12,5	0,92
231	Pastures	168189	16,8	1,24
311	Broad-leaved forest	2761007	276,1	20,34
312	Coniferous forest	35215	3,5	0,26
321	Natural grasslands	3305114	330,5	24,34
322	Moors and heathland	623069	62,3	4,59
331	Beaches, dunes, sands	38150	3,8	0,28
332	Bare rocks	916	0,1	0,01
333	Sparsely vegetated areas	51712	5,2	0,38
511	Water course	131295	13,1	0,97
512	Water bodies	867	0,1	0,01
Total		**13577348**	**1357,7**	**100**

Table 7 Classes of land use of the Tratturo Castel di Sangro-Lucera.

The municipalities where the drove road is best preserved, hot spot areas, (more than the 50% of the total area) are Carovilli, Oratino, Molise and Torella del Sannio, rural villages placed in the northern and central part of Molise. In these areas the *Tratturo* is conserved in his original land use class, natural grasslands, thanks to herds (sheep and horses) which still regularly graze. On the contrary in the municipalities of Alberona, Volturino, Lucera, Forlì del Sannio, and Chiauci the drove road goes through an awful conservation state, (only 10% is represented by its original land use). In this last case the municipalities of Molise are characterized by natural recolonization of forests, meanwhile in the municipalities of Apulia the drove road is quite completely used as non-irrigated arable land.

MUNICIPALITY	Natural grasslands surface	Drove road surface (square meters)	Percentage of Natural grasslands on Municipality surface
Alberona	18226	555162	3,3
Volturino	21683	457263	4,7
Lucera	85782	1509580	5,7
Forli' del Sannio	25473	405893	6,3
Chiauci	33148	369437	9,0
Celenza Valfortore	28979	285401	10,2
Ripalimosani	95399	566906	16,8
San marco la Catola	100137	508335	19,7
Volturara Appula	128707	640205	20,1
Castropignano	117510	523886	22,4
Pietracatella	142740	617437	23,1
Toro	128706	534889	24,1
Biccari	78363	321438	24,4
Rionero Sannitico	117480	470587	25,0
Civitanova del Sannio	83361	332726	25,1
Motta Montecorvino	173098	650236	26,6
San Bartolomeo in Galdo	18788	70138	26,8
Tufara	5176	18157	28,5
Campodipietra	175422	603492	29,1
Campobasso	200141	644796	31,0
Gambatesa	233969	711230	32,9
Castel di Sangro	126143	311329	40,5
Pescolanciano	222122	533992	41,6
Duronia	279792	614617	45,5
Roccasicura	278307	598695	46,5
Torella del Sannio	141623	280516	50,5
Molise	93083	182647	51,0
Oratino	52731	96741	54,5
Carovilli	99024	161615	61,3
TOTAL	**3305114**	**13577348**	

Table 8 The table shows the coverage in Natural grasslands, in hectares and percentage, for every single Municipality.

Instead, regulations concerning the protection of drove roads (regional law of Abruzzi, Molise and Apulia) positively affected the preservation of *Tratturo* from paved roads: Castel di Sangro-Lucera is barely interested by 7% of road and rail networks and associated land, about an half compared to the Spanish *Cañada*.

Figure 27 Tratturo Castel di Sangro-Lucera near the Municipality of Duronia.

3.2 Land use map of Cañada Real Segoviana

Despite the transhumance on the *Cañada Rela Segoviana* is no more practiced since 1980, this drove road is characterized by natural grasslands, which indicate a fair conservation status.

The section of the *Cañada* investigated consists of 937 hectares. The predominant class of Corine Land Cover is the natural grasslands, which is represented by the 50% by (see Table 9), but at the same time, the class of Road and rail network and associated land characterize the *Cañada* with about 13%. The data highlights how the necessity to realize a road network negatively affected on the conservation state of drove rods.

CORINE land cover classes	CORINE land cover	Area (square meters)	Area (hectares)	Percentage
111	Continuous urban fabric	225467	22,5	2,40
112	Discontinuous urban fabric	24775	2,5	0,26
121	Industrial or commercial units	34302	3,4	0,37
122	Road and rail networks and associated land	1264167	126,4	13,48
124	Airports	1873	0,2	0,02
141	Green urban areas	96160	9,6	1,03
142	Sport and leisure facilities	83652	8,4	0,89
211	Non-irrigated arable land	54375	5,4	0,58
212	Permanently irrigated land	1055	0,1	0,01
221	Vineyards	12435	1,2	0,13
222	Fruit trees and berry plantations	5416	0,5	0,06
223	Olive groves	5481	0,5	0,06
231	Pastures	138653	13,9	1,48
241	Annual crops associated with permanent crops	22207	2,2	0,24
242	Complex cultivation patterns	4021	0,4	0,04
243	Land principally occupied by agriculture, with significant areas of natural vegetation	1217	0,1	0,01
311	Broad-leaved forest	749319	74,9	7,99
312	Coniferous forest	3113	0,3	0,03
313	Mixed forest	85317	8,5	0,91
321	Natural grasslands	4952250	495,2	52,80
322	Moors and heathland	814135	81,4	8,68
324	Beaches, dunes, sands	56517	5,7	0,60
331	Bare rocks	10882	1,1	0,12
332	Sparsely vegetated areas	131834	13,2	1,41
333	Water course	72788	7,3	0,78
512	Water bodies	527221	52,7	5,62
Total		**9378631**	**937,9**	**100**

Table 9 Classes of land use of the Cañada Real Segoviana**.**

Fortunately, there are various municipalities where the drove road is best preserved (hot spot areas) and where the natural grasslands represent more than the 50% of the drove road's surface at municipality level (see Table 10). These municipalities are the little rural town o town distributed along the *Cañada* but in a landscape matrix characterized by agricultural areas where the ancient path is used as element of connection among several crops parcels.

Except for the municipalities of Guadarrama and Colmenarejo, intersected by *Cañada* just for a small portion of the territory, there are not any municipalities characterized by a bad conservation state. The conservation state of *Cañada* is primarily influenced by the presence of areas recolonized by forests, especially in the northern part neighbouring the province of Segovia and at the same time in the central part of the *Cañada* the road network and presence of water bodies negatively affect the conservation state.

MUNICIPALITY	Natural grasslands surface	Drove road surface (square meters)	Percentage of Natural grasslands on Municipality surface
Guadarrama	0	212	0
Colmenarejo	1994	31343	6
Somosierra	79136	259233	31
El Escorial	123474	334680	37
Valdemorillo	401651	1066692	38
Manzanares el Real	320691	822853	39
Piñuécar-Gandullas	78399	191503	41
Collado Villalba	272270	653506	42
Galapagar	51498	121003	43
Bustarviejo	363851	821765	44
Moralzarzal	103549	227112	46
Robregordo	65232	130138	50
Lozoyuela-Navas-Sieteiglesias	163327	325338	50
Horcajo de la Sierra-Aoslos	190158	347476	55
Villamanta	508236	844871	60
Soto del Real	272227	426173	64
Miraflores de la Sierra	346455	511338	68
Garganta de los Montes	166873	246112	68
La Serna del Monte	57484	83749	69
Buitrago del Lozoya	388843	563503	69
Quijorna	287158	415717	69
Villanueva de Perales	320129	454373	70
Valdemanco	216345	293296	74
El Boalo	173272	206646	84
Total	**4952250**	**9378631**	

Table 10 The table shows the coverage in Natural grasslands, in hectares and percentage, per single municipality.

Figure 28 Cañada Real Segoviana near the municipality of Buitrago de Lozoya.

3.3 Result about the evaluation of ecosystem services and knowledge on Tratturo Castel di Sangro-Lucera

Regarding the *Tratturo*, the necessary total number of interviews is equal to 303. In the Table 11 reports in a synthetic structure the socio-economic variables characterizing the interviewees.

Residence	Frequency	%
Local	232	76,6
Not local	71	23,4
Age	Frequency	%
≤20	13	4,3
21-30	66	21,8
31-40	53	17,5
41-50	46	15,2
51-60	64	21,1
61-70	37	12,2
>70	24	7,9
Protected areas	fre Frequency	%
Visitor	59	19,5

Family	Frequency	%
Local	214	70,6
Not local	89	29,4
Educational level	Frequency	%
None	3	1,0
Primary school	29	9,6
Secondary school	196	64,7
University	75	24,8
Monthly net income (Euros)	Frequency	%
≤700	162	53,5

Not visitor	244	80,5	701-1,400	116	38,3
			1,401-2,100	22	7,3
			2,101-2,800	2	0,7
			2,801-3,200	0	0,0
			>3,200	1	0,3
Organic food	Frequency	%	***Recycling***	Frequency	%
Always	56	18,48	Always	172	56,8
Frequently	86	28,38	Frequently	46	15,2
Rarely	88	29,04	Rarely	24	7,9
Never	73	24,09	Never but	25	8,3
			Never	36	11,9
Location	Frequency	%	***Years_area***	Frequency	%
Castel di Sangro (Valsalice)	1	0,3	≤10	15	5,0
Rionero Sannitico (Montalto)	9	3,0	11-20	35	11,6
Roccasicura	3	1,0	21-30	75	24,8
Pescolanciano	37	12,2	31-40	55	18,2
Civitanova del Sannio	41	13,5	41-50	38	12,5
Duronia	17	5,6	51-60	41	13,5
Torella del Sannio	6	2,0	61-70	24	7,9
Castropignano	41	13,5	>70	20	6,6
Campobasso (Santo Stefano)	10	3,3			
Campodipietra	100	33,0			
Toro	3	1,0			
Motta Montecorvino	32	10,6			
Biccari (Mezzana grande)	1	0,3			
Lucera (M. Figliola)	2	0,7			
Gender	Frequency	%			
Men	217	71,6	***Association***	Frequency	%
Women	86	28,4	A: environmental	6	2,0
			O: leisure	28	9,1
			S: social	53	17,3
			T: work	5	1,6
Professional background	Frequency	%	X: other	30	9,8
Student	41	13,5	None	185	60,3
Primary sector	17	5,6			
Secondary sector	5	1,7	***Reading environmental publications***	Frequency	%
Tertiary sector	145	47,9	Always	8	2,6
Education/research	7	2,3	Frequently	40	13,2
Retired	45	14,9	Rarely	57	18,8
Unemployed	43	14,2	Never	198	65,3

Table 11 Characteristics of the sample.

The 76% interviewees are local people, meanwhile the rest are mainly tourists or people coming from neighbouring municipalities; analyzing the data concerning the professional background, secondary sector was the least interviewed category. Even in this case, the result is probably due to the fact that

the interviews were conducted during the early morning and the late afternoon, a time period when employees work.

Some drove road crosses this municipality?	Frequency	%
Si	279	92,08
No	2	0,66
Do not know	22	7,26
Total	**303**	**100**
This drove road is used for grazing?	Frequency	%
Si	77	27,60
No	89	31,90
Does not know	113	40,50
Total	**279**	**100**
Do you know the Tratturo Castel di Sangro-Lucera?	Frequency	%
Si	213	76,34
No	66	23,66
Do not know	0	0,00
Total	**279**	**100**
Do you know the state of conservation?	Frequency	%
Preserved	94	33,69
Partly preserved	31	11,11
Not preserved	82	29,39
Do not know	72	25,81
Total	**279**	**100**

Table 12 State of knowledge on drove road.

About the knowledge on the presence of the drove road by interviewees, most of them (279) know that there's a drove road in the municipality where the interview was administered, out of 279 only 213 know the correct name of the *Tratturo*. In particular, 94 out of 279 (92%) have the perception that the drove road is characterized by a good state of conservation, 31 out of 279 (11%) have the perception that the drove road is partly preserved, 88 out of 279 (25%) have the perception that the drove road is not preserved and 72 out of 279 (25%) do not know about the status conservation.

Examining the conservation state of each municipality, Campodipietra is characterized by the highest perception of conservation.

Conservation state	Preserved	Partly preserved	Not preserved	Does not know
Biccari (Mezzana grande)			1	
Campodipietra	46	15	6	22
Castel di Sangro (Valsalice)			1	
Castropignano	10	3	15	11
Civitanova del Sannio	4	1	24	10
Duronia	1	3	9	4
Lucera (M. Figliola)			2	
Montalto			7	2
Motta Montecorvino	5	4	8	12
Pescolanciano	18		5	10
Roccasicura		3		
Santo Stefano	5		2	1
Torella	5	1		
Toro		1	2	

Table 13 Perception on the state of conservation for each municipality.

Out of 279 interviewees who are aware of the *Tratturo*, only 113 do not know if the *Tratturo* is grazed.

Concerning the use of drove road, 122 (43,7%) interviewees out of 279 use the *Tratturo* performing activities related to the landscape.

Figure 29 Trekkers along the Tratturo Castel di Sangro-Lucera near the municipality of Pescolanciano.

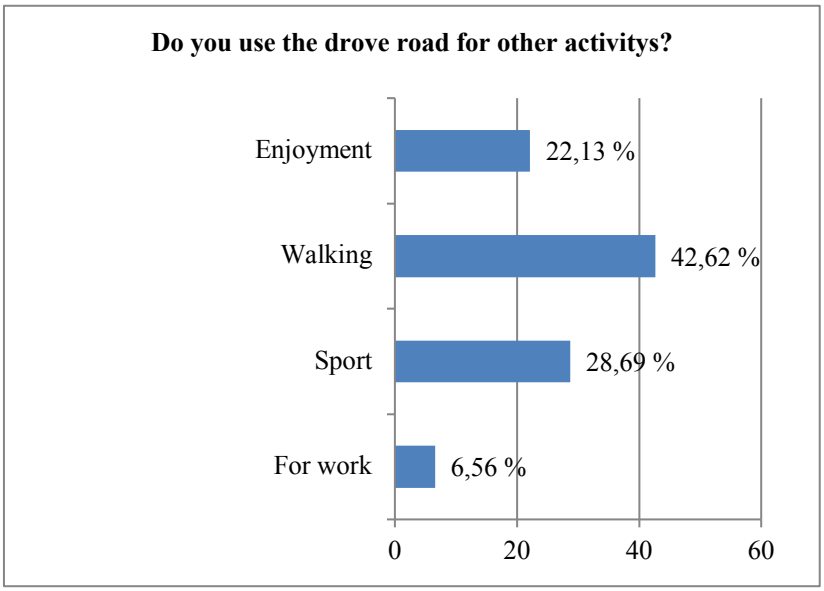


Figure 30 The histogram shows the type of use of the drove roads resulted by answers of 122 interviewes.

Regarding the last question of the survey, that is the perception about the supply of benefits for well-being provided by drove roads, the 71% (303) of all interviewees consider that the drove road are not suited to provide benefits or that they can provide few of them.

The Table 14 refers to the *Perception of the social and personal importance of ecosystem services*. It is evident that some benefits are very important both for the social well-being and for the personal well-being, such as the case of Spiritual value. Other services are significant only for social well-being, as well the Soil erosion control, or barely for the personal well-being, as the Pollination. Among the several services delivered by the *Tratturo* the Air purification is perceived as a stable service through the time, at the same time the Nature recreation activities is experienced with a high increase. The benefit of Feed for animals is instead perceived with high decreased, this aspect reflects the state of abandonment of the *Tratturo* because of its non-use for the Transhumance or grazing.

Figure 31 Flock of sheeps near the Tratturo Castel di Sangro-Lucera in the municipality of Castropignano.

To analyze the *Perception of ecosystem services' trends and their importance for social well-being*, we used the index of overall. The index which perceived trends showed that the delivery of most ecosystem services was perceived as either decreasing or stable, with the exception of Nature recreation activities, Environmental education and Tree regeneration, meanwhile the fiber providing are heavily perceived in decreasing.

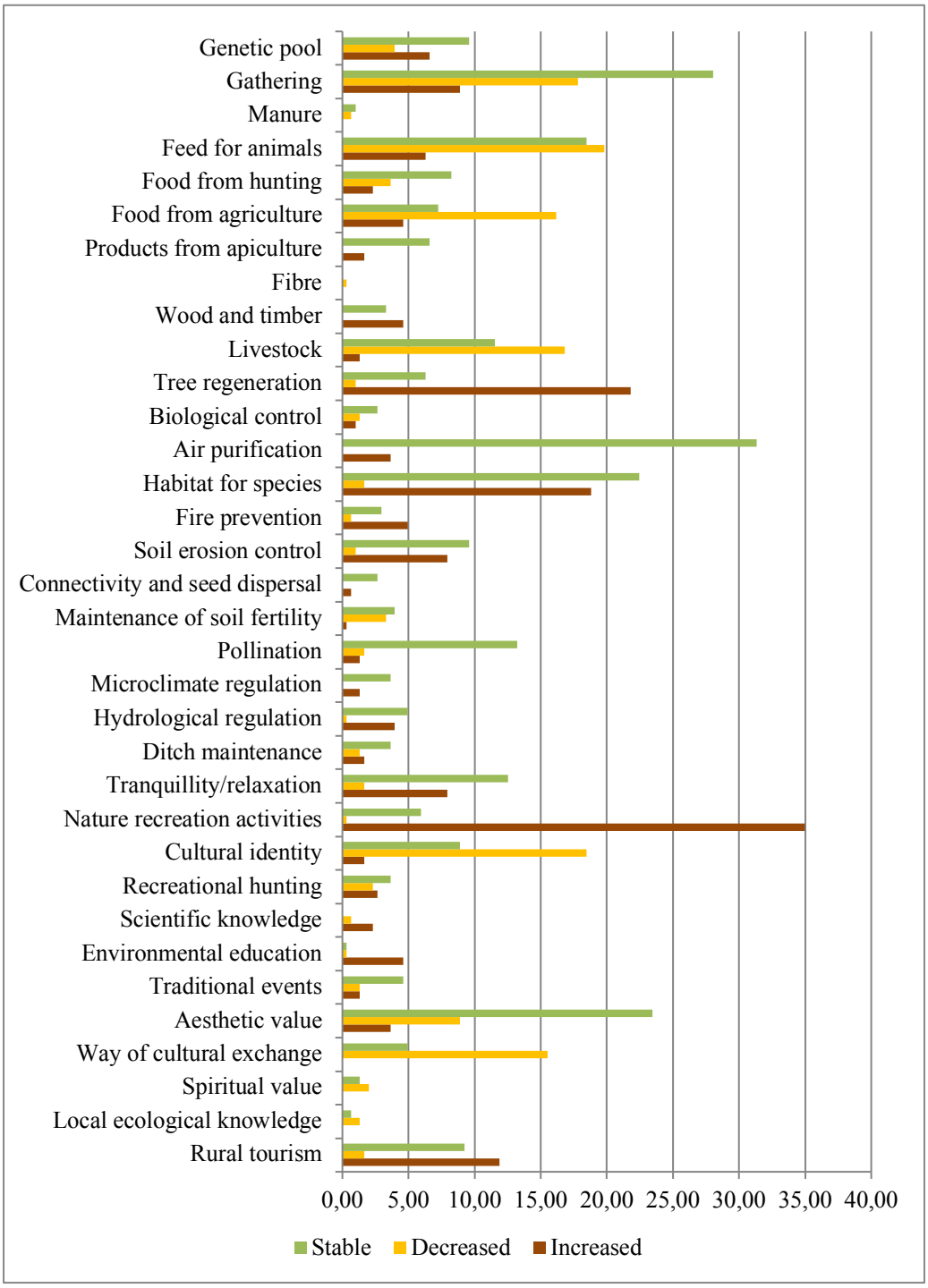


Figure 32 Trend histogram of frequencis for social well-bing. For: Increased represents the percentage of respondents selecting an ecosystem service that they considered to be increasing; Decreased represents the percentage of respondents that consider an ecosystem service to be decreasing; and Stable represents the percentage of respondents who believed that an ecosystem service is not changing.

	Ecosystem Services	Increased	Decreased	Stable	Index of overall	Social well-being	Personal well-being
Cultural	Rural tourism	11,88	1,65	9,24	0,449	3,97	2,94
	Local ecological knowledge	0	1,32	0,66	-0,667	4,67	3,83
	Spiritual value	0	1,98	1,32	-0,6	5,4	3,8
	Way of cultural exchange	0	15,51	4,95	-0,758	4,71	3,26
	Aesthetic value	3,63	8,91	23,43	-0,147	4,32	3,08
	Traditional events	1,32	1,32	4,62	0	4,86	3,59
	Environmental education	4,62	0,33	0,33	0,813	4,06	3
	Scientific knowledge	2,31	0,66	0	0,556	4	3
	Recreational hunting	2,64	2,31	3,63	0,038	3,81	2,96
	Cultural identity	1,65	18,48	8,91	-0,58	4,81	3,64
	Nature recreation activities	34,98	0,33	5,94	0,84	4,73	3,13
	Tranquillity/relaxation	7,92	1,65	12,54	0,284	4,42	3,18
Regulating	Ditch maintenance	1,65	1,32	3,63	0,05	2,55	2,5
	Hydrological regulation	3,96	0,33	4,95	0,393	2,21	2,89
	Microclimate regulation	1,32	0	3,63	0,267	1,8	2,93
	Pollination	1,32	1,65	13,2	-0,02	3,1	3,1
	Maintenance of soil fertility	0,33	3,3	3,96	-0,391	2,48	2,52
	Connectivity and seed dispersal	0,66	0	2,64	0,2	1,9	2,7
	Soil erosion control	7,92	0,99	9,57	0,375	3,54	3,2
	Fire prevention	4,95	0,66	2,97	0,5	2,42	2,58
	Habitat for species	18,81	1,65	22,44	0,4	2,18	2,56
	Air purification	3,63	0	31,35	0,104	2,83	3,03
	Biological control	0,99	1,32	2,64	-0,067	1,4	2,2
	Tree regeneration	21,78	0,99	6,27	0,716	2,28	2,35
Provisioning	Livestock	1,32	16,83	11,55	-0,522	3,1	2,8
	Wood and timber	4,62	0	3,3	0,583	2,96	2,38
	Fibre	0	0,33	0	-1	1	4
	Products from apiculture	1,65	0	6,6	0,2	2,56	3,04
	Food from agriculture	4,62	16,17	7,26	-0,412	3,44	2,96
	Food from hunting	2,31	3,63	8,25	-0,093	3,79	3,07
	Feed for animals	6,27	19,8	18,48	-0,304	3,28	2,55
	Manure	0	0,66	0,99	-0,4	1,2	1,8
	Gathering	8,91	17,82	28,05	-0,163	4,39	3,05
	Genetic pool	6,6	3,96	9,57	0,131	2,25	2,62

↑↑ (0,60-1)	≤3,5	≤3
↑ (0,20-0,59)	>3,5	>3
– (-0,19-0,19)		
↓ (-0,59--0,20)		
↓↓ (-0,60--1)		

Table 14 Perceived trends in ecosystem services and their importance for social and personal well-being.

To analyze *Perception of temporal locations of ecosystem services*, participants in the study perceived a differentiated delivery of Ecosystem Services at each time of year. We carried out the chi-squared

test (p value\0.05) to verify the significant correlation between the seasonal variable and the use of Ecosystem Services. In the Figure 33, the results of the chi-squared test are reported. The Ecosystem Services significantly and positively correlated to one of the four seasons, as well the genetic pool in the Spring or the grazing during summer time.

Figure 33 Significant associations between seasons of the year and ecosystem services delivery perceived by respondents and determined by chi-squared test.

The *RDA analysis* allowed us to relate socio-demographic characteristics of respondents to their perceptions of important ecosystem services, indicates a statistically significant relationship between the ecosystem services perceived as being important for social well-being and the socio-demographic characteristics of respondents (p value\0.0001, from 500 permutations). The three principal axes of the RDA accounted for 59 % of the total variance. The first axis was positively related to Nature recreation activities, Pollination, Feed for animals, Products from apiculture, which were primarily selected by, high Income, a good Schooling and works in the sector of Education/research. The negative values on this axis were related to Aesthetic value, Way of cultural exchange, Fire prevention, Gathering, Food from hunting, Wood and timber, preferentially selected by a higt Age, Local Residence and Retired. The negative values of second axis, Tranquillity/relaxation and Air purification was related to Recycling, Retired and Men. The third axis was positively related to Traditional events preferentially selected by the high Age, Environmental reader, who works in the Primary sector and Retired. The negative values of third axis, Aesthetic value, Rural tourism and Soil erosion control was related to who works in the Secondary sector and Tertiary sector.

Scores for the redundancy analysis variables and statistics	Axis 1	Axis 2	Axis 3		Axis 1	Axis 2	Axis 3
Dependent variables (ecosystem services)				*Explanatory variables*			
Nature recreation activities	0,556	0,039	0,025	Age	-0,201	-0,065	0,101
Cultural identity	0,104	0,000	0,090	Income	0,114	0,144	-0,078
Recreational hunting	-0,129	0,064	-0,028	Schooling	0,341	0,068	0,070
Scientific knowledge	0,058	0,004	0,015	Local Residence	-0,110	-0,048	-0,055
Environmental education	0,064	-0,006	0,023	No local Residence	0,110	0,048	0,055
Traditional events	0,021	-0,029	0,134	No Association	-0,302	-0,124	-0,084
Aesthetic value	-0,267	0,086	-0,256	Association	0,302	0,124	0,084
Way of cultural exchange	-0,376	0,276	0,149	No natural parks visitor	-0,168	-0,113	-0,022
Spiritual value	0,037	0,030	-0,018	Natural parks visitor	0,168	0,113	0,022
Local ecological knowledge	0,033	0,041	-0,004	No Environmental reader	-0,326	-0,092	-0,150
Rura ltourism	0,005	-0,113	-0,167	Environmental reader	0,326	0,092	0,150
Tree regeneration	-0,131	0,162	0,122	No Consume organic products	-0,207	-0,079	0,048
Biological control	-0,003	0,022	-0,036	Consume organic products	0,207	0,079	-0,048
Air purification	-0,171	-0,375	0,059	No Recycling	-0,282	0,120	0,046
Habitat fors pecies	0,079	-0,040	-0,010	Recycling	0,282	-0,120	-0,046
Fire prevention	-0,121	0,072	0,015	Profession-Education/research	0,132	0,006	-0,014
Soil erosion control	-0,028	0,069	-0,246	Profession-Primary sector	-0,061	0,174	0,134
Connectivity and seed dispersal	0,021	0,023	-0,053	Profession-Retired	-0,179	-0,141	0,185
Maintenance of soil fertility	-0,025	0,071	0,056	Profession-Secondary sector	0,084	0,043	-0,141
Pollination	0,195	-0,091	-0,078	Profession-Student	0,063	-0,051	0,073
Microclimate regulation	-0,061	-0,044	0,048	Profession-Tertiary sector	0,024	0,099	-0,139
Hydrological regulation	0,077	0,114	0,068	Profession-Unemployed	0,041	-0,076	-0,094
Ditch maintenance	-0,029	0,015	0,009	No agriculture constraint	0,091	-0,169	-0,064
Genetic pool	0,158	0,015	0,055	Agriculture constraint	-0,091	0,169	0,064
Gathering	-0,235	-0,036	0,000	Women	-0,269	0,236	0,006
Manure	0,055	0,003	0,003	Men	0,269	-0,236	-0,006
Feed for animals	0,235	0,104	-0,094				
Food from hunting	-0,148	-0,010	-0,015				
Food from agriculture	-0,027	-0,077	0,154				
Products from apiculture	0,159	0,008	0,074				
Fibre	0,003	-0,018	-0,010				
Wood and timber	-0,115	-0,021	-0,068				
Livestock	0,117	-0,009	-0,044				

Highlighted values represent those ecosystem services (dependent variables) with a squared cosine > 0.3 and those explanatory variables with scores > 0.1

Table 15 Scores for the redundancy analysis variables and statistics.

Axis 1			
(+)	**Nature recreation activities**	**(-)**	**Aesthetic value**
	Pollination		**Way of cultural exchange**
	Feed for animals		**Fire prevention**
	Products from apiculture		**Gathering**
	Income		**Food from hunting**
	Schooling		**Wood and timber**
	Profession-Education/research		Age
			Local Residence
			Retired
Axis 2			
(+)		**(-)**	**Tranquillity/relaxation**
			Air purification
			Recycling
			Retired
			Men
Axis 3			
(+)	**Traditional events**	**(-)**	**Aesthetic value**
	Age		**Rural tourism**
	Environmental reader		**Soil erosion control**
	Profession-Primary sector		Profession-Secondary sector
	Retired		Profession-Tertiary sector

Table 16 The table shows the ecosystem services perceived as important for social well-being and with a statistically significant relationship with the socio-demographic characteristics of the respondents.

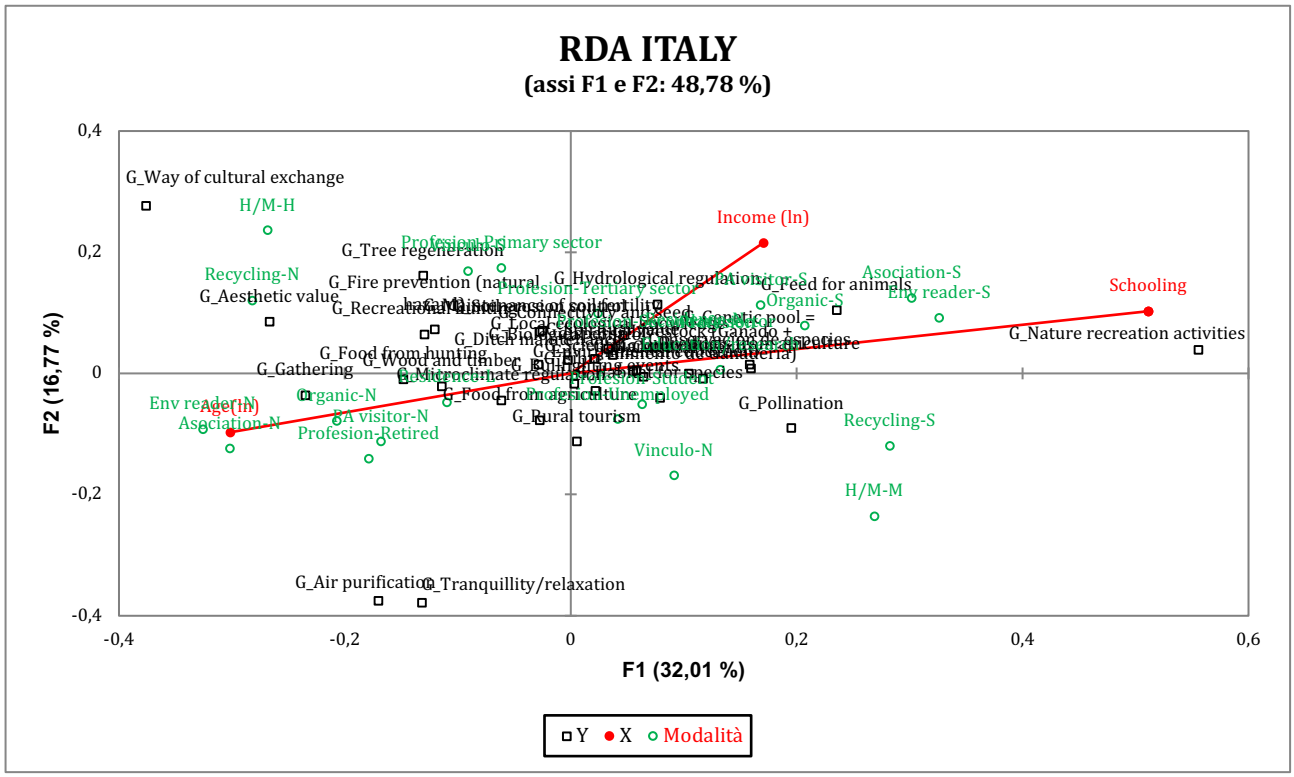


Figure 34 - Scatter plot showing the first two axes of the Redundancy Analysis (RDA). The tags shown correspond to active variables (ecosystem services) with a squared cosin >0.3 in either axis 1 or axis 2 of the RDA and to explanatory variables (socio-demographic)

3.4 Result about the evaluation of ecosystem services and knowledge on Cañada Real Segoviana

For the Spanish study area the necessary total number of interviews is equal to 316. In the Table 17 reports in a synthetic structure the socio-economic variables characterizing the interviewees.

Residence	Frequency	%
Local	214	67,72
Not local	102	32,28
Age	Frequency	%
≤20	22	6,96
21-30	51	16,14
31-40	78	24,68
41-50	68	21,52
51-60	53	16,77
61-70	20	6,33
>70	24	7,59
Protected areas	Frequency	%
Visitor	189	59,81012658
Not visitor	127	40,18987342

Family	Frequency	%
Local	129	40,82278481
Not local	187	59,17721519
Educational level	Frequency	%
None	4	1,265822785
Primary school	50	15,82278481
Secondary school	154	48,73417722
University	108	34,17721519
Monthly net income (Euros)	Frequency	%
≤700	126	39,87341772
701-1,400	119	37,65822785

				1,401-2,100	51	16,13924051
				2,101-2,800	13	4,113924051
				2,801-3,200	7	2,215189873
				>3,200	0	0,00
Organic food	Frequency	%		***Recycling***	Frequency	%
Always	29	9,18		Always	200	63,29
Frequently	86	27,22		Frequently	64	20,25
Rarely	92	29,11		Rarely	21	6,65
Never	109	34,49		Never but	4	1,27
				Never	27	8,54
Location	Frequency	%		***Years_area***	Frequency	%
Villamanta	15	4,75		≤10	52	16,46
Villanueva de Perales	11	3,48		11-20	68	21,52
Quijorna	19	6,01		21-30	74	23,42
Valdemorillo	22	6,96		31-40	45	14,24
Collado Villalba	73	23,10		41-50	33	10,44
Moralzarzal	56	17,72		51-60	24	7,59
Manzanares el Real	38	12,03		61-70	9	2,85
Soto el Real	21	6,65		>70	11	3,481012658
Miraflores de la Sierra	15	4,75				
Bustarviejo	31	9,81				
Buitrago de Lozoya	12	3,80				
Robregordo	2	0,63				
Somosierra	1	0,32				
Gender	Frequency	%				
Men	189	59,81		***Association***	Frequency	%
Women	127	40,19		A: environmental	9	2,83
				O: leisure	32	10,06
				S: social	15	4,72
				T: work	6	1,89
Professional background	Frequency	%		X: other	15	4,72
Student	35	11,08		None	241	75,79
Primary sector	14	4,43				
Secondary sector	4	1,27		***Reading environmental publications***	Frequency	%
Tertiary sector	208	65,82		Always	6	1,90
Education/research	7	2,22		Frequently	61	19,30
Retired	19	6,01		Rarely	77	24,37
Unemployed	29	9,18		Never	172	54,43

Table 17 Characteristics of the sample.

As for Italian case even for Spanish one most of the interviewees exactly the 67% are local people. Although comparing this pertange with the Italian one, the datum is lower, because the *Cañada* is more frequented by travelers thanks to the presence of more facilities and benefits related to tourist towns, as Buitrago de Lozoya e Manzanares el Real. Analyzing the data regarding the professional

background, the least category interviewed is represented by the secondary sector. Moreover, comparing to Italian data, the most of Spanish interviewees spend more time in protected areas.

Some drove road crosses this municipality?	Frequency	%
Si	264	83,54
No	13	4,11
Do not know	39	12,34
Total	**316**	**100**
This drove road is used for grazing?	Frequency.	%
Si	80	30,30
No	92	34,85
Do not know	92	34,85
Total	**264**	**100**
Do you know the Cañada Real Segoviana?	Frequency	%
Si	204	77,27
No	59	22,35
Do not know	1	0,38
Total	**264**	**100**
Do you know the state of conservation?	Frequency	%
Preserved	101	38,26
Partly preserved	16	6,06
Not preserved	91	34,47
Do not know	56	21,21
Total	**264**	**100**

Table 18 State of knowledge about drove road.

Regarding the knowledge by interviewees about the presence of the drove road, most of them (264) know that there's a drove road in the different municipalities e 204 interviewees out of 264 know correctly the name of the drove road; this datum is similar to that one recorded in Italian case. In particular, 101 out of 264 (38%) have the perception that the drove road is characterized by a good state of conservation, 16 out of 264 (6%) have the perception that the drove road is partly preserved, 91 out of 264 (34%) have the perception that the drove road is not preserved and at least 56 out of 264 (21%) do not know about the status conservation. In this case the differences between the two study areas are scarce too. Interviewees had the perception that Bustarviejo is the municipality where the drove road is best preserved.

Conservation state	Preserved	Partly preserved	Not preserved	Does not know
Buitrago	5		2	1
Bustarviejo	21		3	5
El Paraiso	1		1	
Manzanares	13	9	7	7
Miraflores de la Sierra	8		4	2
Moralzarzal	8	2	20	18
Quijorna	2		9	5
Robregordo			1	
Somosierra	1			
Soto el Real	13	1	3	
Valdemorillo	6		8	3
Collado Villalba	12	4	24	11
Villamanta	6		6	2
Villanueva de Perales	5		3	2

Table 19 Perception on the state of conservation for each municipality.

Among the 264 interviewees who know the drove road, only 80 (30%) are aware of the *Tratturo* as grazing area and another 92 (34%) believe that on the drove road there is not any activity related to herding. In relation to the use of drove road, 188 (67,4%) interviewees out of 264 use the drove road primarily for walking activities; this datum is similar to the one recorded in Italy.

Figure 35 Flock of sheep grazing in the Cañada Real Segoviana near the municipality of Soto el Real.

Figure 36 Cyclist (MTB) along the Cañada Real Segoviana near the municipality of Somosierra.

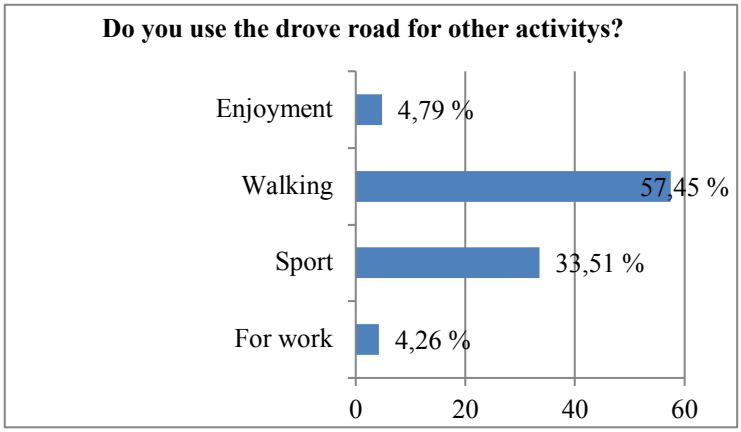


Figure 37 The histogram shows the type of use of the drove roads resulted by answers of 188 interviewes.

Concerning the question about the capacity of drove road to provide some benefits which positively affect well-being, the 52% of Spanish interviewees believe that the *Cañada* can supply some or more ecosystem services. This notably positive aspect contrast with data emerged from Italian interviews. For example in the province of Madrid, the *Cañada Real Segoviana* was given value through the realization and the management of a path for trekkers and athletes. But at the same time the path is enjoyed by everyone who wants to walk in a green area well managed and easily reachable from the town. These are all benefits which highly influence interviewees' perception. Moreover concerning the *Perception of the social and personal importance of ecosystem services*, the Table 20 highlights

that several benefits are perceived to be very important both the social well-being and personal well-being, as well for example the Microclimate regulation. Contrary to what emerged from Italian interviews, Spanish interviewees indicated more benefits perceived as important for both social well-being and personal well-being. The benefit of Biological control is the only one indicated to be significant for social well-being, meanwhile the benefit of Genetic pool is the unique perceived as main for the personal well-being. Among all the benefits provided by drove roads, it is clear that Air purification is indicated as a stable benefits, meanwhile Nature recreation activities is perceived with a high increasing as it was perceived by Italian interviewees too. The Livestock is recognized as a benefit characterized with a high decrease; this datum is comparable with what indicated by Italian interviewees regarding the benefit Feed for animal. These responses emphasize the interviewees' perception about the actual abandonment of drove roads generated by the end of transhumance.

Regarding the *Perception of ecosystem services' trends and their importance for social well-being*, the index of overall perceived trends showed that merely 3 benefits are perceived in increasing, these are Rural tourism, Nature recreation activities and Fiber. The Spiritual value is recognized with decisive decreasing, that reflect how this service/benefit is strictly linked to the tranhumance which by now is completely relic. Although the benefit Fiber is considered in increasing, this perception is expressed only by few interviewees as reported in the Table 20.

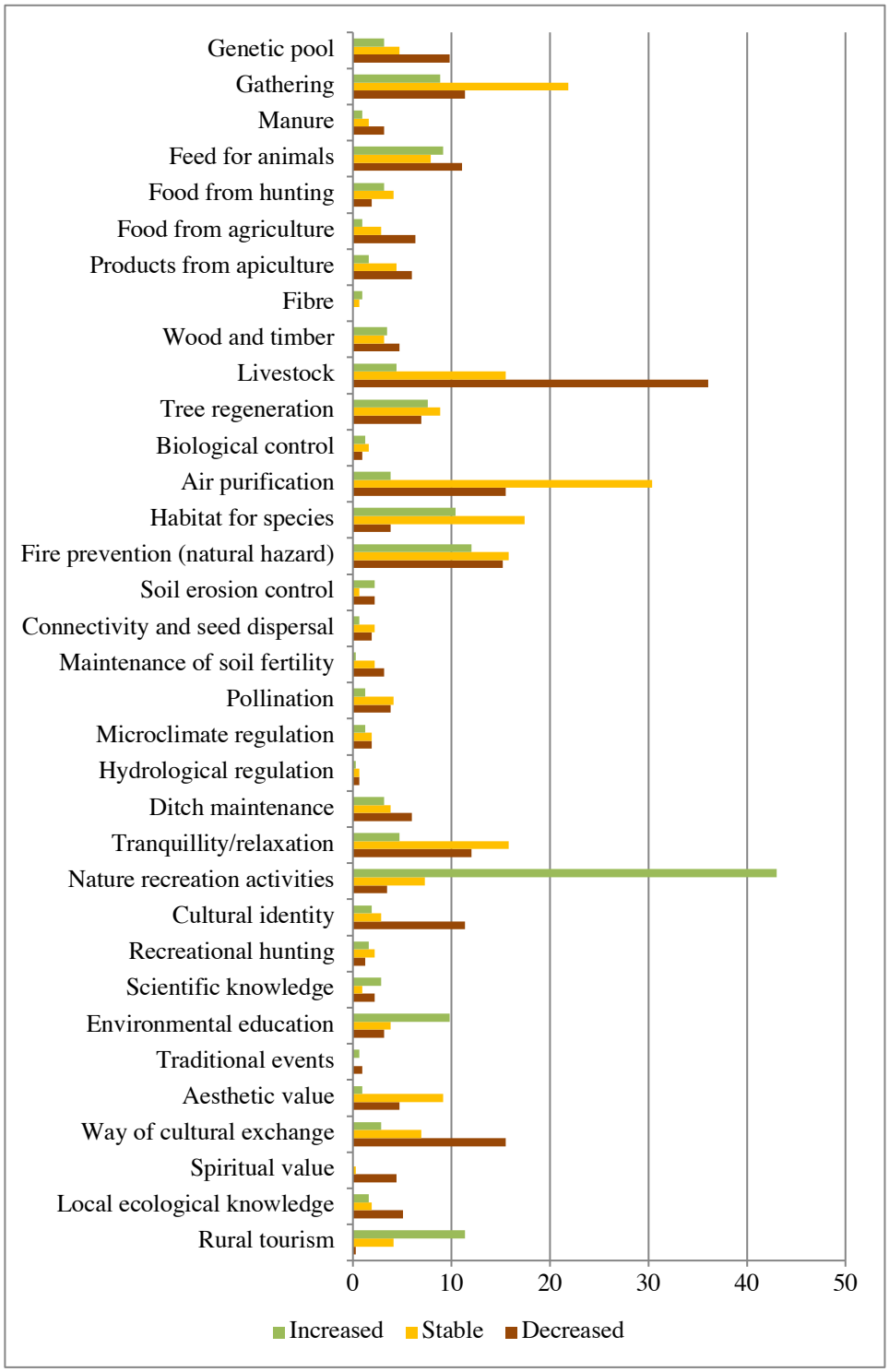


Figure 38 Trend histogram of frequencis for social well-bing. For: Increased represents the percentage of respondents selecting an ecosystem service that they considered to be increasing; Decreased represents the percentage of respondents that consider an ecosystem service to be decreasing; and Stable represents the percentage of respondents who believed that an ecosystem service is not changing.

	Ecosystem Services	Increased	Decreased	Stable	Index of overall	Social well-being	Personal well-being
Cultural	Rural tourism	11,39	0,32	4,11	0,70	3,82	3,12
	Local ecological knowledge	1,58	5,06	1,90	-0,41	3,70	3,04
	Spiritual value	0,00	4,43	0,32	-0,93	4,13	3,67
	Way of cultural exchange	2,85	15,51	6,96	-0,50	4,34	3,20
	Aesthetic value	0,95	4,75	9,18	-0,26	3,96	3,38
	Traditional events	0,63	0,95	0,00	-0,20	1,80	3,40
	Environmental education	9,81	3,16	3,80	0,40	3,91	3,36
	Scientific knowledge	2,85	2,22	0,95	0,11	3,74	3,32
	Recreational hunting	1,58	1,27	2,22	0,06	2,13	2,31
	Cultural identity	1,90	11,39	2,85	-0,59	4,47	3,67
	Nature recreation activities	43,04	3,48	7,28	0,74	4,49	3,08
	Tranquillity/relaxation	4,75	12,03	15,82	-0,22	4,49	3,57
Regulating	Ditch maintenance	3,16	6,01	3,80	-0,22	2,32	2,49
	Hydrological regulation	0,32	0,63	0,63	-0,20	2,40	3,40
	Microclimate regulation	1,27	1,90	1,90	-0,13	4,63	3,75
	Pollination	1,27	3,80	4,11	-0,28	3,79	3,31
	Maintenance of soil fertility	0,32	3,16	2,22	-0,50	3,00	3,00
	Connectivity and seed dispersal	0,63	1,90	2,22	-0,27	3,27	3,20
	Soil erosion control	2,22	2,22	0,63	0,00	3,44	3,25
	Fire prevention	12,03	15,19	15,82	-0,07	4,27	3,67
	Habitat for species	10,44	3,80	17,41	0,21	2,99	2,83
	Air purification	3,80	15,51	30,38	-0,24	4,12	3,70
	Biological control	1,27	0,95	1,58	0,08	3,75	2,92
	Tree regeneration	7,59	6,96	8,86	0,03	3,07	3,11
Provisioning	Livestock	4,43	36,08	15,51	-0,56	3,45	2,91
	Wood and timber	3,48	4,75	3,16	-0,11	2,03	2,33
	Fibre	0,95	0,00	0,63	0,60	2,60	3,20
	Products from apiculture	1,58	6,01	4,43	-0,37	2,50	3,39
	Food from agriculture	0,95	6,33	2,85	-0,53	2,63	2,78
	Food from hunting	3,16	1,90	4,11	0,14	1,59	2,07
	Feed for animals	9,18	11,08	7,91	-0,07	2,54	2,38
	Manure	0,95	3,16	1,58	-0,39	2,94	2,83
	Gathering	8,86	11,39	21,84	-0,06	2,30	2,43
	Genetic pool	3,16	9,81	4,75	-0,38	3,45	3,13

↑↑ (0,60-1)	≤3,5	≤3
↑ (0,20-0,59)	>3,5	>3
– (-0,19-0,19)		
↓ (-0,59--0,20)		
↓↓ (-0,60--1)		

Table 20 Perceived trends in ecosystem services and their importance for social and personal well-being.

To analyze *Perception of temporal locations of ecosystem services*, we carried out the chi-squared test (p value\0.05) to verify the significant correlation between the seasonal variable and the use of Ecosystem Services. In the Figure 39, the results of the chi-squared test are reported. One or more Ecosystem Services are significantly and positively correlated to one of the four seasons, as well the Food from hunting to Autumn or Products from apiculture to the spring time.

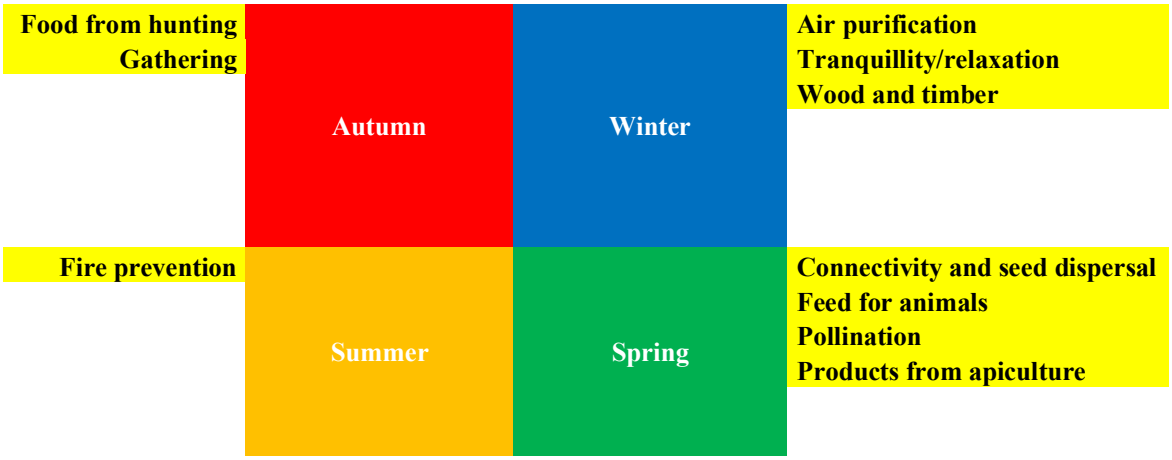


Figure 39 Significant associations between seasons of the year and ecosystem services delivery perceived by respondents and determined by chi-squared test.

The *RDA analysis*. The three principal axes of the RDA accounted for 54 % of the total variance. The first axis was positively related to Nature recreation activities and Habitat for species, which were primarily selected by, high Income, a good Schooling, member of association, visitors to protected areas and more. The negative values on this axis were related to Tranquillity/relaxation, Way of cultural exchange and Fire prevention, preferentially selected by a high Age, Local Residence, works in the Primary sector, Retired and Unemployed. The positive values of second axis, Cultural identity and Livestock was related to high Age, high Income and who works in the Primary and Tertiary sector. The negative values of second axis, Environmental education, Pollination, Products from apiculture was related to Local residence, Environmental reader, Consume organic products, Student, Unemployed and Men. The third axis was positively related to Gathering preferentially selected by a good Schooling, who Recycles and Retired. The negative values of third axis, Wood and timber, was related to who works in the sector of Education/research and Primary sector.

Axis 1			
(+)	**Nature recreation activities**	**(-)**	**Tranquillity/relaxation**
	Habitat for species		**Way of cultural exchange**
	Income		**Fire prevention**
	Schooling		Age
	Association		Local Residence
	Natural parks visitor		Profession-Primary sector
	Environmental reader		Retired
	Consume organic products		Unemployed
	Recycling		
	Profession-Education/research		
	Profession-Student		
	Profession-Tertiary sector		
Axis 2			
(+)	**Cultural identity**	**(-)**	**Environmental education**
	Livestock		**Pollination**
	Age		**Products from apiculture**
	Income		Local residence
	Association		Environmental reader
	Profession-Secondary sector		Consume organic products
	Profession-Tertiary sector		Student
			Unemployed
			Men
Axis 3			
(+)	**Gathering**	**(-)**	**Wood and timber**
	Schooling		Profession-Education/research
	Recycling		Profsesion-Primary sector
	Retired		

Table 21 The table shows the ecosystem services perceived as important for social well-being and with a statistically significant relationship with the socio-demographic characteristics of the respondents.

Scores for the redundancy analysis variables and statistics	Axis 1	Axis 2	Axis 3		Axis 1	Axis 2	Axis 3
Dependent variables (ecosystem services)				*Explanatory variables*			
Tranquillity/relaxation	-0,238	-0,103	0,102	Age	-0,238	0,164	0,086
Nature recreation activities	0,511	0,261	0,082	Income	0,130	0,275	0,087
Cultural identity	-0,112	0,185	0,098	Schooling	0,248	-0,060	0,114
Recreational hunting	-0,064	-0,016	-0,077	No Asociation	-0,146	-0,126	0,037
Scientific knowledge	0,072	-0,100	0,009	Asociation	0,146	0,126	-0,037
Environmental education	0,155	-0,207	0,049	No natural parks visitor	-0,312	0,046	-0,067
Traditional events	0,003	-0,031	-0,015	Natural parks visitor	0,312	-0,046	0,067
Aesthetic value	-0,057	-0,023	-0,048	No Environmental reader	-0,180	0,108	-0,001
Way of cultural exchange	-0,310	0,105	-0,246	Environmental reader	0,180	-0,108	0,001
Spiritual value	-0,033	-0,012	0,019	No Consume organic products	-0,156	0,124	-0,064
Local ecological knowledge	0,032	-0,030	0,052	Consume organic products	0,156	-0,124	0,064
Rural tourism	0,020	-0,029	0,004	No Recycling	-0,148	-0,049	-0,219
Tree regeneration	0,160	-0,023	-0,014	Recycling	0,148	0,049	0,219
Biological control	-0,011	-0,045	-0,076	Profesion-Education/research	0,130	-0,025	-0,110
Air purification	-0,063	0,083	-0,152	Profession-Primarysector	-0,225	0,052	-0,187
Habitat for species	0,267	-0,010	-0,029	Profession-Retired	-0,258	0,070	0,108
Fire prevention	-0,295	0,254	0,249	Profession-Secondary sector	0,070	0,105	0,058
Soil erosion control	-0,019	-0,007	0,057	Profession-Student	0,195	-0,166	-0,090
Connectivity and seed dispersal	0,011	-0,040	0,024	Profession-Tertiary sector	0,102	0,110	0,074
Maintenance of soil fertility	-0,050	-0,069	-0,048	Profession-Unemployed	-0,105	-0,122	0,059
Pollination	-0,005	-0,173	0,057	No agriculture constraint	0,078	-0,041	0,081
Microclimate regulation	0,001	0,017	-0,013	Agriculture constraint	-0,078	0,041	-0,081
Hydrological regulation	-0,003	-0,012	-0,002	Women	-0,021	0,336	-0,081
Ditch maintenance	-0,031	-0,039	-0,023	Man	0,021	-0,336	0,081
Geneticpool	0,004	0,011	-0,119	Local residence	-0,204	-0,118	0,072
Gathering	-0,052	0,045	0,157	No local residence	0,204	0,118	-0,072
Manure	0,023	-0,065	0,059				
Feed for animals	-0,029	-0,033	0,160				
Food from hunting	-0,041	-0,008	-0,084				
Food from agriculture	0,069	-0,033	-0,106				
Products from apiculture	0,029	-0,181	0,067				
Fibre	0,025	-0,025	-0,001				
Wood and timber	0,025	-0,113	-0,122				
Livestock	0,087	0,321	-0,134				
Highlighted values represent those ecosystem services (dependent variables) with a squared cosine > 0.3 and those explanatory variables with scores > 0.1							

Table 22 Scores for the redundancy analysis variables and statistics.

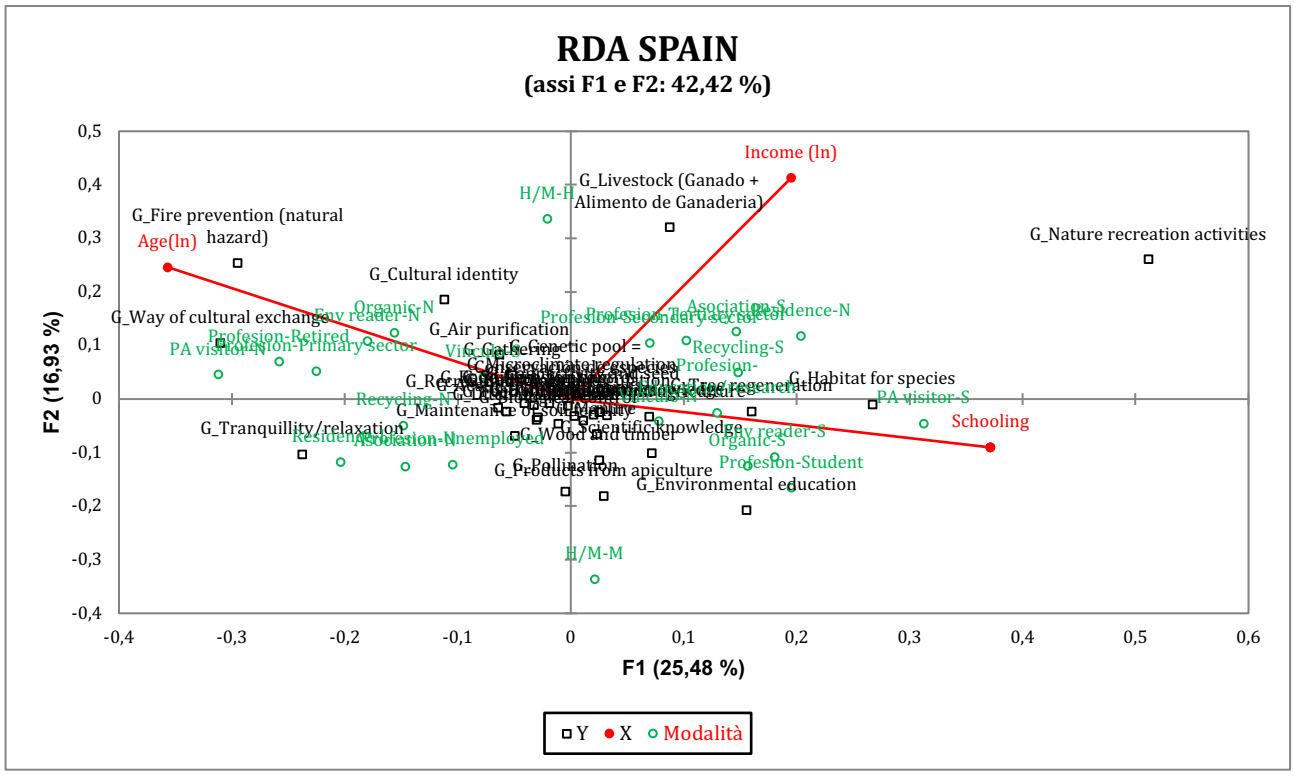


Figure 40 Scatter plot showing the first two axes of the Redundancy Analysis (RDA). The tags shown correspond to active variables (ecosystem services) with a squared cosin >0.3 in either axis 1 or axis 2 of the RDA and to explanatory variables (socio-demographic)

3.5 Discussion

Comparing the Spanish and Italian study cases, it is clearly that *Tratturo Castel di Sangro-Lucera* is the drove road less preserved. This is probably due to the abandonment of the Transhumance in Italy about thirty years early than in Spain and to the absence of a concrete policy of valorisation. Otherwise, legislation concerning the protection of drove roads (regional law of Abruzzi, Molise and Apulia) positively affected the preservation of *Tratturo* from paved roads: Castel di Sangro-Lucera is interested by 7% of road and rail networks and associated land, about a half compared to the Spanish *Cañada* (13%).

Italian regulations have had the same positive effect for the protection of the Continuous urban fabric and Discontinuous urban fabric too. In fact the percentage is 1,2% in Italian case and 2,6 in Spanish case. Analyzing the effect of the forest recolonization along the drove roads, it emerges that the natural vegetation dynamics interest the 20% of drove road especially in mountainous area. In Spain this phenomenon typify the *Cañada* only for the 9%, although there is a substantial necessity to reforestation in the autonomous community of Madrid to arrange urban green area and suitable habitats for little mammals.

The class of moors and heathland is mainly distributed along the Italian drove road in the mountainous and sub-mountainous belt, meanwhile the Spanish *Cañada* is interested by shrublands between the sub-mountainous and hilly belt for 9%. This difference in coverage of shrublands probably is influenced by climatic conditions which favor this type of land use.

Analyzing the data related to the conservation state of Italian and Spanish drove roads for each municipality, a very good conservation state emerges for some of them. Although the overall framework about the conservation state is endangered by forest recolonization, presence of network road and squatting (chiefly of arable land), an effort could be addressed to those well preserved areas. In fact, these sections of drove roads characterized by a good state of conservation can be represent open air museums as they are a symbol of an important landscape element at risk of disappearance. Examining the socio/economic data, it is relevant the difference between the two study cases about the residence of interviewees: for Italian case the 76% of interviewees were resident, meanwhile for Spanish case only the 67%. This difference is due to the significant tourist flow that characterizes the *Cañada*. Moreover, there is a clearly difference between the two case studies regarding the visits to protected areas: 59% for Spanish case and only 19% for Italian one. This aspect is obviously influenced by the noteworthy presence of tourists in the Spanish area. Regarding the ecological behavior, Spanish interviewees demonstrated to have a conduct more sustainable for recycling than Italian interviewees, meanwhile the Italian interviewees demonstrate to consume more Organic food. This datum reflects the residents' behavior related to the rural context in which they live; most of them have the possibility to cultivate an own vegetable garden for their own family's necessities.

On the basis of the knowledge about the two drove roads emerged by interviews, responses are quite comparable. Actually it was expected that in Spain the knowledge related to drove roads would be greater than in Italy because of the recent abandonment of transhumance.

It is interesting to compare the conservation state of drove roads from data carried out by the interviewees' perception and from the data extrapolated from the land use map. In general, the interviewees perceived that the drove road does not experience a good state of conservation (about 55% both in Italian case and Spanish one), this datum matches with the data represented in land use map. Although the response Preserved referring to the conservation state has a high frequency, 33,69% (94 interviewees) for Italian drove road and 38,6% (101 interviewees) for Spanish one respectively. Comparing these last data with the overall conservation state of drove roads extrapolated from land use map it seems there is not a real correspondence between the perception/actual knowledge of interviews and the cartographic data. But examining the percentages referring to preserved conservation state for every single municipality there is a significant coherence. For example, in Italy the response Preserved was indicated by 41 respondents out of 94 interviewed in Campodipietra, where the drove road is characterized by a very good conservation state equal to 29%

of the entire municipality territory. Even for Spanish study case, 21 interviewees out of 101 indicated the response Preserved referring to those municipalities where the *Cañada* is well conserved for example Bustarviejo and Soto El Real. The 67% of Spanish interviewees evidence that they enjoy drove roads principally for walking, meanwhile in Italy only the 42% of interviewees benefit from *Tratturo* practicing non-sporting activities.

Figure 41 Signage of the hiking network along the Cañada Real Segoviana

Moreover, differently to Italy, Spanish respondents appreciate the *Cañada* to practice Sport or other activities related to Enjoyment thanks to the presence of a public network paths which is constantly well maintained.

Analyzing the part of this research dedicated to the *Perception of the social and personal importance of ecosystem services* of the two drove roads, there are some important analogies which reflect common feelings and there are some differences related instead to the different necessities of Italian and Spanish respondents. Even if Italian interviewees (11) indicated less benefits than Spanish ones (14), the most of ecosystem services which were indicated by both of interviewees sample are recognized to be important both for well-being and personal well-being. A good number of this benefits are included in Cultural services (8 for Italian interviewees and 9 for Spanish ones), which are perceived from all interviewees as to be the most important provided by drove roads. Cultural services, as well as the Spiritual services, represent immaterial benefits for populations; the fact that interviewees perceived this type of service as significant one for both social well-being and personal well-being reflect the nostalgic feeling of respondents towards passed transhumance. There are some differences between Italian and Spanish answers regarding the benefits considered as important for personal well-being. In effect for Italian respondents the services of Provisioning (e.g. food from hunting) are considered to be more important for personal well-being, meanwhile Spanish respondents indicated as to be important the services of Regulation (e.g. Fire prevention). This difference reflect the dissimilar interviewees' necessities, that for Spanish case consists in providing of Air purification and Fire prevention (Regulation services) and for Italian ones they consist in Products from Agriculture (Provisioning services). Regarding the *Perception of ecosystem services' trends and their importance for social well-being* both Italian and Spanish interviewees the trend perceived is the same for both populations. Referring to the Table 14 and 20,

it is quite clear that the perception between Italian and Spanish respondents, but only for two benefits the perception is identical. For example, among benefits perceived in decreasing both Italy and in Spain, Spiritual value was indicated. One more time this result reflects the emotion evocated by the passed transhumance, which strongly affected Italian and Spanish territories. On the other hand, among services perceived in increasing there is the Nature recreation activities, which reflects different perception of Italian interviewees and Spanish ones. In Italy, the drove roads are deprived of their original use and so natural processes of reforestation are diffusely characterizing these ancient paths. Meanwhile in Spain the perception of increasing of the service is related to the presence of well maintained paths enjoyed by beneficiaries. These aspects are very important to individuate appropriate strategies aimed to the valorization and the restoration of these drove roads, of which the traditional use is not practiced any more. Another remarkable divergence that underlying the differences between Italian and Spanish behavior and or necessities is reflected by the answer indicated for Gathering service. Italian respondents indicated Gathering service as important both for social well-being and personal well-being, instead for Spanish respondents this service does not any weight. This dissimilarity is probably due to the different climatic conditions which influence on the supply of nature product.

Analyzing the *Perception of temporal locations of ecosystem services*, the results are quite different except for the Air purification service, which is perceived in the same season that is winter time. It was supposed that this service could be mostly perceived in spring or summer time, but probably the response related to winter reflects the state of towns during this season. Because of the turning on of heating during the winter season, respondents perceive that as a factor of pollution, so they believe that drove road can provide Air purification service.

Comparing the scatterplots depicted by the RDA analysis, it emerged that Nature recreation activities is positioned in the first positively axis for both study areas. This benefit was primarily indicated by interviewees with a satisfying salary and with a job in research or educational sector. They are people with the economic possibility to dedicate their own spare time to recreation activities and with a high educational level so they know drove roads and relative activities that can be performed on. On first negative axis Way of cultural exchange and Fire prevention are positioned. These two services were indicated by interviewees whose past experiences was strictly related to Transhumance. So they are elderly, local and retired respondents, who had the possibility to experience transhumance when it was still practice even if it was relic. The other axes do not show any correlation between the two study areas.

Considering the responses indicated by Italian interviewees, Tranquility/relaxation and Air purification services are correlated to those respondents with an environmental attitude (Recycling) and which are retired men. For Spanish study case, the data carried out from interviewees highlight

that Cultural identity and Livestock are strictly connected to transhumance activities or even to a scarce use of the *Cañada* by local breeders. These services are perceived by elder interviewees, who work in the secondary and tertiary sector with a satisfying salary and who participate to associative activities.

From an overall analysis the perception of Italian and Spanish interviewees who work in the primary sector reflects probably the actual situation of drove roads and the passed transhumance. This type of respondents indicated as benefits those services that are indirectly provided by drove roads as Traditional events for Italian ones and Fire prevention and Wood and Timber for Spanish ones.

4 Conclusion

The results carried out from this research provide a new methodological approach that can be applied to transhumance heritage analysis in countries where ancient maps are available.

In particular, for Italian drove roads' network the methodology can be applied to redraw with a high detailed the original boundaries of *Tratturo*. Redrawing the boundaries on map with a greater detail is important because even if these paths have a notable length their width is not so distinguishable. In particular, the data carried out for Italian case allowed us to realize a virtual reinstatement of *Tratturo* Castel di Sangro-Lucera updated to 2014, in which boundaries and land use map in scale 1:2000 are reported. The elaborated data can represent the basis for the actual identification of Drove Road Park in Molise Region as declared in the regional law n. 19 of May 5, 2005.

The data concerning the Spanish study case permitted us to draw a land use map updated to 2014 and in scale 1:2000 too. In both cases it was possible to update the cartographic information thanks to the surveys carried out on the territory, and in particular it was possible to redraw the drove roads' boundaries checking the current position of milestones.

All the recorded and elaborated information about land use allowed us to individuate particular areas defined as conservation hot spot, as they represent important section of drove roads well conserved. Thanks to their characteristics we indicate these hot spot areas as model to preserve, because they reflect a portion of the past landscape when Transhumance was still practiced.

Relating to drove road management issues, our data can suggest some indications on the restoration, valorization and conservation of these routes. In areas where it is difficult to identify the boundaries of drove road because of the presence of a homogeneous landscape matrix (e.g., pasture areas), the plantations of autochthonous shrubs and trees might be useful to realize and so to make perceivable the linear features of a drove road. Moreover it would be helpful to order along the boundaries thematic informational signs with ancient maps and historical features. To offer an adequate information service the thematic informational signs could be equipped with information and communication technology (ICT) applications, as they represent a useful tool for self-guided tours in increasingly use.

The analysis about the perception of Ecosystem Services related to drove roads allowed us to confirm that although the transhumance is no more practiced drove roads have alternative functions and different services/benefits. It is clear that the functionality of the services/benefits is primarily related to the conservation status recognized during the investigation carried out on the Italian and Spanish territory. At the same time the Spanish case demonstrate that people's attitude and the territorial policies are fundamental driving forces to determine the functionality of benefits.

All the data gathered from analysis of the data concerning the Ecosystem Services are useful tools which can be employed by the administrations designated for the conservation and valorization of drove roads. In Molise although the law establishing the Drove Road Regional Park, actually not only the Park does not exists but there are even not the adequate tools for the its definition, as well it could be a current reinstatement.

Because of their importance as landscape elements and provider of Ecosystem Services, drove roads need to be preserved. It could be adequate to conserve the hot spot areas and improve some of the benefits perceived by people. Maintaining at least one suitable path along the drove road it allows to guarantee that beneficiaries can use it for sport activities but also for gathering or simply for walking

At present, especially in Italy, there is the risk that without any conservation actions drove roads could disappear because of secondary succession of shrub and forest trees or by squatting.

5 Bibliography

Agnoletti, M. *Paesaggi Rurali Storici*: *Per un Catalogo Nazionale*; Laterza: Bari, Italy, 2011; pp. 420–422.

Barriguete, F.M. Archivo de la Mesta: Tipologías documentales y posibilidades de investigación (XVI-XVIII). *Cuadernos de Historia Moderna* **1996**, *17*, 193–216.

Biber, J.P. Transhumance in France. *Pastoralism* **2010**, *1*, 91–98, doi:10.3362/2041-7136.2010.006.

Bil, A. Transhumance place-names in Perthshire. *Soc. Antiq. Scotl.* **1992**, *122*, 383–402.

Bower, J. The Pastoral Neolithic of East Africa. *J. World Prehist.* **1991**, *5*, 49–82, doi:10.1007/BF00974732.

Brieva, M. *Colección de leyes, reales decretos y órdenes, acuerdos y circulares pertenecientes al ramo de Mesta, desde el año de 1729 al de 1827*. Concejo [de la Mesta], 1828 (Madrid: Imprenta de Repullés) Available online: https://bibliotecadigital.jcyl.es/es/consulta/registro.cmd?id=2040 (accessed on July 2017).

Bunce, R.G.H.; De Aranzabal, I.; Schmitz, M.F.; Pineda, F.D. *A Review of the Role of Drove Roads (Cañadas) as Ecological Corridors*; Alterra-Rapport 1428. Alterra: Wageningen, The Netherlands, 2006.

Bunce, R.G.H.; Pérez-Soba, M.; Jongman, R.H.G.; Gómez Sal, A.; Herzog, F.; Austad, I. *Transhumance and Biodiversity in European Mountains*. *Report of the EU-FP5 Project TRANSHUMOUNT (EVK2-CT-2002-80017)*; IALE Publication Series; Wageningen, The Netherlands, 2004.

Caliandro, L.P.; Loisi, R.V.; Dal Sasso, P. Historical road system and farmhouses in Apulia. *J. Agric. Eng.* **2013**, *44*, 441–447, doi:10.4081/jae.2013.s2.e89.

Cameron, J.M.R.; Spooner, P.G. Origins of Travelling Stock Routes. Early development, management, and the growing embrace of the law (1830–70s). *Rangel. J.* **2010**, *32*, 341–351.

Cantile, A. *Lineamenti di Storia Della Cartografia Italiana. Volume Secondo: Dal Seicento al Novecento*; GEOWEB: Rome, Italy, 2013.

Clementi A., 1987. *La transumanza nella sua Storia*. Ass. Culturale per la Storia della Civiltà della transumanza, L'Aquila-Foggia.

Cohen, J. A coefficient of agreement for nominal scales. *Educ. Psychol. Meas*. **1960**, *20*, 37–46.

Corbier, M. Fiscus and Patrimonium: The Saepinum Inscription and Transhumance in the Abruzzi. *The Journal of Roman Studies* **1983**, *73*: 126–131.

Costanza, R.; D'Arge, R.; De Groot, R.; Farber, S.; Grasso, M.; Hannon, B.; Naeem, S.; Limburg, K.; Paruelo, J.; O'Neill, R.V.; Raskin, R.; Sutton, P.; Van den Belt, M., The value of the world's ecosystem services and natural capital. *Nature* **1997**, *387*(6630): 253–260.

De Groot, R.S.; Alkemade, R.; Braat, L.; Hein, L.; Willemen L. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological Complexity* **2010**, 7: 260–272.

De Martino, D. *Lavoro Istorico Positivo sul Tavoliere di Puglia*; Tipografia Simoniana: Napoli, Italy, 1857.

Di Cicco, P. La Cartografia Tratturale. In *La Capitanata Rassegna di Vita e di Studi della Provincia di Foggia*; Anno XIV, Luglio-Dicembre 1987; Archivio di Stato di Foggia: Foggia, Italy, 1987; p. II. Available online: http://www.bibliotecaprovinciale.foggia.it/capitanata/1987/1987pdf_parte2/1987_pII_51-57_diCicco.pdf (accessed on 9 September 2016).

Dong, S.; Kassam, K.-A.S.; Tourrand, J.F.; Boone, R.B. (Eds.) *Building Resilience of Human-Natural Systems of Pastoralism in the Developing World: Interdisciplinary Perspectives*; Springer International Publishing: Cham, Switzerland, 2016; doi:10.1007/978-3-319-30732-9.

Esposito, L.; Lupo, M.; Pandiscia. G.V. Cartografia dei tratturi e della civiltà della transumanza in Basilicata: l'antico tratturo Matera-Montescaglioso. *Bollettino A.I.C.* **2012**, *144-145-146*, 141–152. Available online: https://www.openstarts.units.it/bitstream/10077/11694/1/Esposito%20et%20al..pdf (accessed on September 2017).

Finocchietti, C. *La tutela e la valorizzazione dei tratturi: La normativa di tutela* 2013 Available online: http://www.camminarenellastoria.it/index/trat_approf_tutela_files/Tratturi%20-%20normativa.pdf (accessed on April 2015).

Francioni, M.; Toderi, M.; Lai, R.; Trozzo, L.; Foresi, L.; Sciarra, F.; Avanzolini, P.; Sedić, E., Budimir, K.; Santilocchi, R.; D'Ottavio, P. Does transhumant sheep system provide ecosystem services for climate change adaptation in Mediterranean environment? In *Ecosystem Services and Socio-economic Benefits of Mediterranean Grasslands, Option Méditerranéennes*; Kyriazopoulos, A., López-Francos, A., Porqueddu, C., Sklavou, P., Eds.; CHIEAM: Zaragoza, Spain, 2016, 114, pp. 103–106.

Garcia Martí, P. *La Mesta: Transumanza e Istituzioni in Castiglia dal XIII al XIX Secolo*;

Mediterranea Collana di Studi Storici 12; Edipuglia: Bari, Italy, 1998.

Golley, F.B. The ecosystem concept: A search for order. *Ecol. Res.* **1991**, *6*(2): 129. Available online: https://doi.org/10.1007/BF02347157 (accessed on 2 October 2017).

Grana, S. *Istituzioni Delle Leggi Della Regia Dohana di Foggia*; Stamperia Raimondi: Napoli, Italy, 1770.

Graziani, M.; Avram, M. Il "genius loci" del "tratturo". Recupero del retaggio della transumanza nel Parco Nazionale d'Abruzzo, Lazio e Molise (Italia). *ETNICEX Revista de Estudios Etnograficos* **2011**, *2*, 77–92.

Guenzi, A.; Rossi, R. Institutions, natural resources and economic growth in the modern age: The case of Dogana delle Pecore in the Kingdom of Naples (XV-XVIII Centuries). *Rev. Econ. Inst.* **2014**, *5*, doi:10.5202/rei.v5i2.115.

Gómez-Ibáñez, D.A. Energy, economics, and the decline of transhumance. *Geogr. Rev.* **1977**, *67*, 284–298. Available online: http://www.jstor.org/stable/213723 (accessed on 11 November 2016).

Hadjigeorgiou, I. Past, present and future of pastoralism in Greece. *Pastor. Res. Policy Pract.* **2011**, *1*, doi:10.1186/2041-7136-1-24.

Huband, S.; McCracken, D.I.; Mertens, A. Long and short-distance transhumant pastoralism in Romania: Past and present drivers of change. *Pastoralism* **2010**, *1*, 55–71, doi:10.3362/2041-7136.2010.004.

Jamalio, A. *Tratturi e trazzere*. Annali d'Italia, Roma, Italy, 1937.

Klein, J. Los privilegios de la Mesta de 1273 y 1276. *Boletín de la Real Academia de la Historia* **1914**, *LXIV*, 202–219. Available online: https://www.google.it/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwisub-W1bbZAhUjIcAKHcecBE4QFggwMAE&url=http%3A%2F%2Fwww.cervantesvirtual.com%2FdescargaPdf%2Flos-privilegios-de-la-mesta-de-1273-y-1276-0%2F&usg=AOvVaw2ZtQCgNZyvWvrU9IzTZahO (accessed on October 2016).

Landi, F.; Calzolai, L. Transhumance routes in Tuscany: Cartography, place names, virtual landscaping. *Rev. Hist. Geogr. Toponomast.***2015**, *10*, 99–124.

Lentini, P.E.; Fischer, J.; Gibbons, P.; Lindenmayer, D.B.; Martin, T.G. Australia's Stock Route Network: 1. A review of its values and implications for future management. *Ecol. Manag. Restor.* **2011**, *12*, 119–127.

Liebetanz, G. *Camminandosi, Tratturo Tratturo: Indagine Topografica Comparata sul Territorio*

del Tratturo Lucera-Casteldisangro al Seguito di un Gregge Virtuale Seguendo il filo d'Arianna dell'Atlante Capecelatro; IRESMO: Campobasso, Italy, 1999.

Luick, R. *Transhumance in Germany.Report to European Forum on Nature Conservation and Pastoralism*; European Forum on Nature Conservation and Pastoralism (EFNCP) and University of Applied Sciences Rottenburg/Fachhochschule Rottengurg, Schadenweilerhof: Rottenburg, Germany, 2008. Available online: http://www.efncp.org/download/Swabian_Alb_F_F_Download.pdf (accessed on 15 November 2016).

Mallorquí, E.; Amigó, R.; Rabella, J.A.; Tort, J.; Roma, F. *Toponímia, Paisatge i Cultura: Els Noms de lloc de la Lingüística, la Geografia y la Història*; Documenta Universitaria Biblioteca D'història Rural: Girona, Spain, 2015.

Mangas Navas, J.M. Determinación y Recuperación de la red Nacional de vías Pecuarias. In Proceedings of the I Congreso Nacional de Vías Pecuarias, Madrid, Spain, 4–7 May 2005; pp. 169–174.

Manzano-Baena, P.; Casas, R. Past, present and future of transhumance in Spain: Nomadism in a developed country. *Pastoralism* **2010**, *1*, 172–190, doi:10.3362/2041-7136.2010.005.

Marín Barriguete, F. Fiscalidad y Mesta: las repercusiones del "Servicio de los ocho millones de ducados". In Congreso Internacional "Felipe II (1598-1998), Europa dividida, la monarquía católica de Felipe II (Universidad Autónoma de Madrid, 20-23 abril 1998). Parteluz, Madrid, 1998; pp. 553–570. Available online: https://repositorio.uam.es/bitstream/handle/10486/1435/16042_V_Fiscalidad.pdf?sequence=1 (accessed on May 2017).

Marino, J.A. *Le Economie Pastorali nel Regno di Napoli*; Guida Editori: Napoli, Italy, 1992.

Matley, I.M. Transhumance in Bosnia and Herzegovina. *Geogr. Rev.* **1968**, *58*, 231–261.

Meini, M.; Adducchio, D.; Ciliberti, D.; Di Felice, G. Landscape conservation and valorization by satellite imagery and historic maps: The case of Italian transhumance routes. *Eur. J. Remote Sens.* **2014**, *47*, 375–387, doi:10.5721/EuJRS20144722.

Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, Información Cartográfica de las vías Pecuarias por Provincias. Available online: http://www.mapama.gob.es/es/desarrollo-rural/temas/politica-forestal/vias-pecuarias/rvp_descargas.aspx (accessed on 22 December 2017).

Ministerio de Agricultura, Alimentación y Medio Ambiente, Cuadernos de la Trashumancia, Vías Pecuarias, Available online: http://www.mapama.gob.es/es/desarrollo-rural/temas/politica-

forestal/vias-pecuarias/rvp_cuadernos_trashumancia.aspx (accessed on 22 december 2017).

Ministerio de Educación, Cultura y Deporte, Real Decreto 385/2017, de 8 de Abril, por el que se Declara la Trashumanciacomo Manifestación Representativa del Patrimonio Cultural Inmaterial. Available online: https://www.boe.es/diario_boe/txt.php?id=BOE-A-2017-4009 (accessed on 2 October 2017).

Minotti, M; Giancola, G; Di Marzio P.; Di Martino, P. Land Use Dynamics of Drove Roads: The Case of Tratturo Castel di Sangro-Lucera (Molise, Italy): Land **2018**, 7, 3, doi:10.3390/land7010003.

Molise Regional Committee Resolution No. 633 of 29 November 2013. Available online: http://www2.regione.molise.it/web/grm/deliberegiuntaanni2010.nsf/0/0E92C364704D9EDEC1257C45003E30EF?OpenDocument (accessed on 15 September 2016).

Molise Regional Law n. 9 of 11 April 1997 "Tutela, Valorizzazione e Gestione del Demanio Tratturi". Bollettino Ufficiale n° 08 del 16/04/97; Regione Molise: Campobasso, Italy, 1997.

Morgado, P.; Rocha, L. Caminhos antigos do Concelho de Monforte. *Sci. Antiquitatis* **2017**, *1*, 287–308, Available online: http://www.scientiaantiquitatis.uevora.pt/index.php/SA/article/view/93 (accessed on 15 December 2017).

National Library of Australia, Map of New South Wales Showing Stock Routes, Tanks, Wells, and Trucking Stations, 1888. Available online: https://nla.gov.au/nla.obj-232204514/view (accessed on 20 December 2017).

Ntassiou, K.; Doukas, I.D.; Papadopoulos, I. On the study, modernisation, support and promotion of transhumance, through a dedicated web-GIS. *IJSAMI* **2016**, *2*, 193–205.

Ortega Cruz, D.J.C. Deslinde de la Vía Pecuaria "Cañada Real Galiana o Cordel Segoviano" en el Tramo Comprendido Dentro del Término Municipal de Pulgar Incluida la Parte Caballera con Cuerva, en la Provincia de TOLEDO. Master's thesis, Universidad de Valladolid, Spain, 2014

Ortiz Borrego, I. Directrices, objetivos, instrumentalización y datos generales del plan de recuperación y ordenación de las vías pecuarias de la Comunidad autónoma de Andalucía. In Proceedings of the I Congreso Nacional de Vías Pecuarias, Madrid, Spain, 4–7 May 2005; pp. 237–244.

Oteros-Rozas, E; Martín-López, B; López, C.A.; Palomo, I; González J.A. Envisioning the future of transhumant pastoralism through participatory scenario planning: a case study in Spain. *The Rangeland Journal* **2013**, *35*, 251–272.

Oteros-Rozas, E.; Gonzalez, J.A.; Martìn-Lòpez, B.; Lòpez, C.A.; Zorrilla-Miras, P.; Montes, C. Evaluating ecosystem services in transhumance cultural landscapes: An interdisciplinary and

participatory framework. *GAIA Ecol. Perspect. Sci. Soc.* **2012**, *21*, 185–193.

Oteros-Rozas, E.; Martín-López, B.; González, J.; Plieninger, T.; López, C.; et al. Socio-cultural valuation of ecosystem services in a transhumance social-ecological network. *Reg. Environ. Change* **2013**: 1–21. (a)

Papachristou, T.G. Greece's grazing/forage resources for livestock production. In *Ecosystem Services and Socio-Economic Benefits of Mediterranean Grasslands, Option Méditerranéennes*; Kyriazopoulos, A., López-Francos, A., Porqueddu, C., Sklavou, P., Eds.; CHIEAM, Zaragoza, Spain, 2016, 114, pp. 29–42.

Peattie, R. M. *Mountain Geography—A Critique and Field Study*; Harvard University Press: Cambridge, MA, USA, 1936.

Pellicano, A. *Geografia e Storia dei Tratturi del Mezzogiorno: Ipotesi di Recupero Funzionale di una Risorsa Antica*; Aracne: Roma, Italy, 2007.

Pellicano, A.; Zarrilli, L. I toponimi della transumanza nell'Abruzzo aquilano tra retaggio storico e persistenze socio-culturali. In *Toponomastica Italiana. L'eredità Storica e le Nuove Tendenze*; Società Geografica Italiana: Rome, Italy, 2008; pp. 213–231.

Petrocelli, E. *Itinerari Sulle vie Della Transumanza*; Touring Editore: Milano, Italy, 2011; pp. 149–153.

Plan of Stock Route Hughenden to Cloncurry, Queensland, 1899. Available online: https://nla.gov.au/nla.obj-231770786/view (accessed on 20 December 2017).

Platone, *Crizia*. In F. Adorno (a cura di) Dialoghi politici e lettere. Utet, Torino, 1953.

Rodríguez Pascual, M. *La trashumancia. Cultura, cañadas y viajes*. Edilesa, León, 2001.

Ruiz, J.P.; Ruiz M. Ecological history of transhumance in Spain. *Biological Conservation* **1986**, *37*, 73–86.

Russo, S. Il conflitto tra agricoltura e pastorizia transumante nella Dogana di Foggia in età moderna. *Mélanges de l'École Française de Rome-Antiquité* **2016**, 128–132. Available online: http://mefra.revues.org/3451 (accessed on 7 October 2017).

Salmon, E.T. *Il Sannio e i Sanniti*. Einaudi, Torino, 1995.

Santolini, R.; Morri, E.; Scolozzi, R. Mettere in gioco i servizi ecosistemici: limiti e opportunità di nuovi scenari sociali ed economici. *Ri-Vista ricerche per la progettazione del paesaggio* **2011**, *4*(15-16): 41–55.

Snedecor, G.W.; Cochran, W.G. *Statistical Methods*, 7th ed.; Iowa State Univ. Press.: Ames, IA, USA, 1980.

Spooner, P.G.; Firman, M.; Yalmambirra Origins of Travelling Stock Routes. 1. Connections to Indigenous traditional pathways. *Rangel. J.* **2010**, *32*, 329–339.

Sprengel U. *La pastorizia transumante nell'ambiente dell'Italia centro-meridionale*. Marburg/Lahn, Geographischen Institutes der Universitat Marburg, 1971.

Takola, E.; Sidiropoulou, A.; Karatassiou, M. The impact of transhumance abandonment on land use changes in Mount Pindos (Greece). In *Ecosystem Services and Socio-Economic Benefits of Mediterranean Grasslands, Option Méditerranéennes*; Kyriazopoulos, A., López-Francos, A., Porqueddu, C., Sklavou, P., Eds.; CHIEAM: Zaragoza, Spain, 2016, 114, pp. 143–146.

United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. The Causses and the Cévennes, Mediterranean Agro-Pastoral Cultural Landscape 2011. Available online: http://whc.unesco.org/en/list/1153 (accessed on 2 October 2017).

United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. Hallstatt-Dachstein/Salzkammergut Cultural Landscape 1997. Available online: http://whc.unesco.org/
en/list/806 (accessed on 2 October 2017).

United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. Pyrénées—Mont Perdu 1997. Available online: http://whc.unesco.org/en/list/773 (accessed on 2 October 2017).

United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. The Transhumance: The Royal Shepherd's Track-Tentative list01/06/2006. Available online: http://whc.unesco.org/en/tentativelists/5005/ (accessed on 5 August 2016).

United Nations Educational, Scientific and Cultural Organization (UNESCO); World Heritage Centre. Mesta Livestock Trails-Tentative list24/07/2007. Available online: http://whc.unesco.org/en/tentativelists/5128/ (accessed on 6 October 2017).

Valdelande, V.M. Las vías pecuárias: evolución y normativa actual. *Agricultura y Sociedad* **1995**, *76*, 153–186.

Vidal Gonzalez, P.; Castán Esteban, J.L. (eds.) *Trashumancia en el Mediterráneo*, CEDDAR Book series, Zaragoza, 2010, pp. 165–177. Available online: https://www.researchgate.net/profile/Pablo_Vidal-Gonzalez/publication/312371411_Trashumancia_en_el_Mediterraneo_Editor_junto_con_Pablo_Vidal_Gonzalez_Centro_de_Estudios_sobre_la_Despoblacion_y_Desarrollo_de_Areas_Rurales_Universidad_Catolica_de_Valencia_Instituto_de_Estudios_Turo/links/587bb1ab08aed3826ae8d85b/Trashumancia-en-el-Mediterraneo-Editor-junto-con-Pablo-Vidal-Gonzalez-Centro-de-

Estudios-sobre-la-Despoblacion-y-Desarrollo-de-Areas-Rurales-Universidad-Catolica-de-Valencia-Instituto-de-Estudios.pdf (accessed on August 2015).

Vihervaara, P. Rönkä, M.; Walls, M. Trends in ecosystem service research: early steps and current drivers. *Ambio* **2010**, *39*: 314–324

6 Annex

Annex 1. Model questionnaire used for the interviews.

Lab of Natural Resource and Environmental Planning

Laboratorio de Socio-Ecosistemas

Valoración de los servicios de los ecosistemas en el Tratturo Castel di Sangro-Lucera[1]

FECHA …… Nº DE ENCUESTA …… LOCALIZACIÓN ……

Desde la Università degli Studi del Molise y la Universidad Autónoma de Madrid estamos realizando un estudio comparativo sobre la percepción de los servicios de los ecosistemas en un tratturo, en Italia y una cañada real en España. Nos sería de gran ayuda conocer su percepción a través de esta encuesta. ¿Sería tan amable de contestarla? ¡Muchas gracias!

Identidad cultural y la Cañada Real Segoviana

1. Lugar de residencia: ……..
2. ¿Desde cuándo vive usted aquí? ……. años.
3. ¿Sus padres/abuelos eran de esta zona? ☐ SI (municipio: ……)
   ☐ NO (de donde vinieron: ……)
4. ¿Algunos Tratturo atraviesa este municipio? SI ☐ NO ☐ NS ☐
   Esto Tratturo se utiliza para el pastoreo del ganado? SI ☐ NO ☐ NS ☐
5. ¿Conoce el Tratturo Castel di Sangro Lucera? ☐ SI ☐ NO
6. ¿Cuál considera que es su estado de conservación?
   ……..
7. ¿Usa usted el Tratturo para algo? ¿Para qué?
8. ¿Qué es para usted la trashumancia?
   ……
   ……
   ……..

Percepción y valoración económica de servicios de los ecosistemas

La naturaleza reporta de manera directa o indirecta beneficios al bienestar humano, por ejemplo: a través de los arboles obtenemos la madera necesaria para la construcción de mobiliario; algunas plantas fijan el suelo y los taludes; otras especies juegan un papel estético por las flores vistosas, etc.

1. ¿Cree usted que las cañadas generan alguna clase de beneficios que influyen positivamente en el bienestar humano?

☐ Mucho ☐ Bastante ☐ Poco ☐ Nada

[1] Este cuestionario se basa en el trabajo de Oteros-Rozas et al. 2014. Socio-cultural valuation of ecosystem services in a transhumance social-ecological network. Reg Environ Change 14(4): 1269-1289.

2. Como por ejemplo, ¿cuáles? (hasta 5)

……

……

El Tratturo Castel di Sangro Lucera recorre desde el Pantano della Zittola en el municipio di Castel di Sangro hasta el pueblo de Lucera.

3. Seleccione por favor dos beneficios de los mostrados en cada uno de los tres paneles. A continuación ordénelos en función de cuáles son los más beneficiosos o importantes (siendo el 1 el más y el seis el menos) para usted ("Orden") y en qué época se disfruta de cada uno de ellos (Primavera, Verano, Otoño o Invierno). Marque después con una flecha si considera que la oferta o la calidad de cada uno de los beneficios está mejorando, empeorando o se mantiene igual. A continuación indique quién/es se beneficia/n de estos servicios (Todo, Locales, Ganaderos, Agricultores, Turistas u Otros). Por último, indique cómo considera que son estos beneficios de importantes (Nada, Poco, Bastante e Mucho) para el bienestar de las personas que viven o visitan la zona atravesada por el Tratturo.

Beneficio	*Orden*	*Época de su disfrute*				*Tendencia (oferta / calidad)*	*Beneficiarios*						*Importancia en su vida*			
		P	*V*	*O*	*I*		*To*	*L*	*G*	*A*	*Tu*	*O*	*N*	*P*	*B*	*M*

Variables de comportamiento ambiental

1. ¿Es usted miembro de alguna asociación?

☐ Sí, ¿de qué tipo? (Ambiental; Social; Ocio; Trabajo; Otras) ¿Cuál?

2. ¿Ha visitado algún/os espacio/s natural/es a lo largo del ultimo años?

☐ No ☐ Sí, ¿cuáles?

……

3. Lee revistas u otras publicaciones de tipo ambiental?
   - ☐ Siempre
   - ☐ A menudo
   - ☐ Rara vez
   - ☐ Nunca

4. Compra o consume usted alimentos producidos de agricultura ecológica y/o comercio justo?
   - ☐ Siempre
   - ☐ A menudo
   - ☐ Rara vez
   - ☐ Nunca

5. ¿Con qué frecuencia separa usted la basura?
   - ☐ Siempre
   - ☐ A menudo
   - ☐ Nunca (pero lo haría si el municipio tuviera contenedores o hubiese más facilidades para ello)
   - ☐ Rara vez
   - ☐ Nunca

Variables socio-económicas

1. ¿Podría decirme cuál es su nivel de estudios?

   ☐ Ninguno ☐ Primarios ☐ Secundaria / Bachillerato ☐ Universitarios

   cuales?

2. ¿Podría decirme su edad? ..... años
3. ¿Cuál es su profesión? .....
4. ¿Está usted relacionado de alguna manera con ganadería o la agricultura)? Especificar vínculo

   .....

5. ¿Dentro de qué intervalo se incluyen sus ingresos mensuales individuales netos?

   - ☐ < de 700 € (<116.200 pts)
   - ☐ 700 – 1.400 € (116.200-232.400pts)
   - ☐ 1.401 – 2.100 € (232.401- 348.600 pts)
   - ☐ 2.101 – 2.800 € (348.601-464.800 pts)
   - ☐ 2.801 – 3.200 € (464.801-531.200 pts)
   - ☐ > de 3.200 € (> 531.200 pts)

6. ¿Cuántos miembros viven actualmente en su casa? .....

Sugerencias o comentarios

.....

.....

.....

A rellenar por el encuestador:

• Lugar de la encuesta: .....

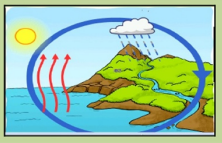
• Actitud del encuestado: buena / indiferente / poco dispuesto

• Entendimiento del cuestionario: alto / medio / bajo

• Sexo del encuestado: hombre / mujer

Annex 2. Panels used in the interviews for the identification of ecosystem services.

Vantaggi che gli esseri umani ottengono dalla natura in maniera intangibile e collegati agli Aspetti Culturali		
Beneficio	***Esemplo***	***Foto***
Tranquillità, relax	Passeggiate all'ombra	
Turismo attivo a contatto con la natura	Escursionismo, MTB, equitazione	
Identità culturale	Cultura del mondo della pastorizia , cultura del popolo della Transumanza	
Caccia ricreativa	Selvaggina di piccole e grandi dimensioni (pernice, lepre, coniglio, cervi, caprioli, cinghiali)	
Conoscimento scientifico	Attività di ricerca in ecologia, etnografia, storia	
Educazione ambientale	Educazione ambientale, libri sulla transumanza	
Rappresentazioni delle tradizioni legate alla pastorizia/agricoltura	Rievocazioni transumanza, Tresca	
Paesaggio	Diversificazione del territorio, begli scenari → fotografia, documentari	
Via di comunicazione	Passaggio per raggiungere fattorie, villaggi per le persone e gli animali	
Valore spirituale	Il compiacimento/piacere che esista ancora la Transumanza	
Conoscenze tradizionali	Conduzione degli animali, andare a vedere il bestiame che attraversa il centro abitato	
Turismo rurale	Agriturismo, gastronomia	

Vantaggi che gli esseri umani ottengono dalla natura indirettamente, attraverso i Processi di Regolazione		
Beneficio	***Esemplo***	***Foto***
Rigenerazione di specie vegetali	Ricrescita di querce e pini, funghi, qualità pascolo	
Controllo delle specie	Diserbo, eliminazione di erbe cattive	
Aria fresca	“corridoio verde”	
Habitat per specie	Rifugio e habitat per specie, corridoio ecologico	
Prevenzioni per gli incendi	Per il pascolo degli animali	
Controllo dell’erosione	Copertura vegetale che mantiene terreno grazie alle radici	
Conservazione di specie	Razze autoctone, specie che vivono a contatto con la prateria/bosco	
Dispersione dei semi	Animali che aiutano a disperdere i semi e spore	
Fertilizzazione del suolo	Fertilizzazione del suolo con rifiuti di origine animale	
Impollinazione	Insetti impollinatori	
Regolazione del microclima	Ruolo della vegetazione nel sequestro di CO2 e pioggia	
Regolazione idrica	Evapotraspirazione della vegetazione	

Vantaggi che gli esseri umani ottengono direttamente dalla natura attraverso l'Approvvigionamento / fornitura di prodotti		
Beneficio	***Esemplo***	***Foto***
Raccolta	Funghi, asparagi, tartufi, lumache, ghiande, piante commestibili, ecc.	
Concime	Resti fecali di animali per fertilizzare le colture	
Alimento per animali	Pascolo e foraggio	
Apicultura	Miele	
Alimenti dalle attività di caccia	Fagiani, lepri, conigli, cinghiali, ecc	
Alimenti dalle attività di allevamento bovini e ovini	Carne e latte di qualità	
Tessuti	Lana e cuoio	
Combustibile	Legno	
Bestiame	Vendita di pecore, capre, mucche ecc	
Mantenimento delle cunette e del bordo strada	Strade principali e secondarie	
Alimenti dalle attività agricole	Vino, olio, cereali, aglio, ecc