Summary information

Name of the Agricultural Heritage System:
Original name in Italian: Fascia pedemontana olivata Assisi-Spoleto
Translation into English: Olive groves of the slopes between Assisi and Spoleto

Requesting Agency/Organization:
Comune di Trevi

Responsible Ministry (for the Government):
Ministry of Agriculture, Food and Forestry Policies - Italy

Location of the Site:
The proposed area is located in the province of Perugia, in Umbria, a region in Central Italy. This area extends through the territories of six municipalities: Assisi, Spello, Foligno, Trevi, Campello sul Clitunno, Spoleto.

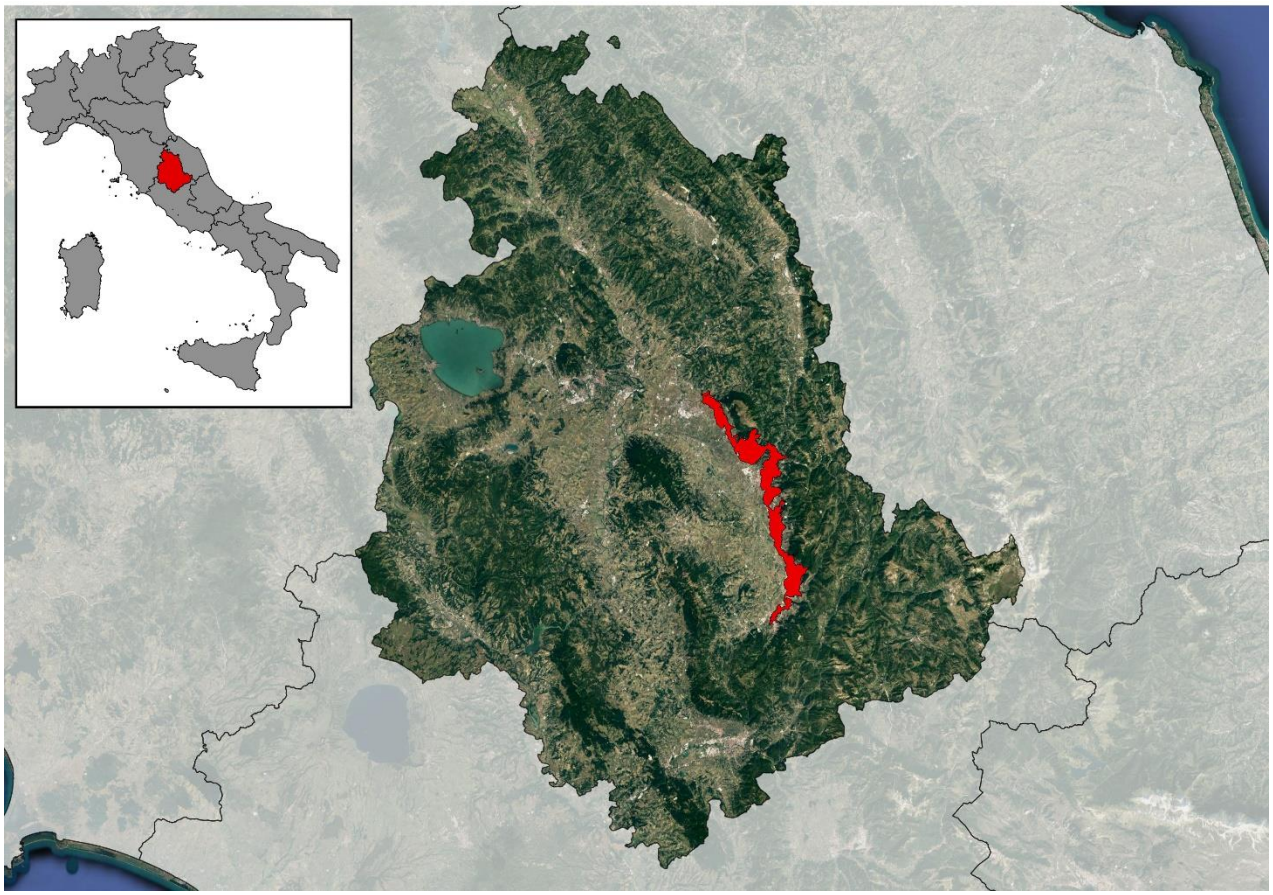


Figure 1: the proposed are is located in Umbria, in the center of Italy.

Accessibility of the Site to Capital City or Major Cities:
The area is crossed from north to south by the roads SS75 and SS3, along the base of the Assisi-Spoleto hills. From these roads many branches run towards the olive-covered hills. The journey from Rome by car takes about 2-2.5 hours.

Area of Coverage:
The proposed area occupies a total of 9,213 hectares. The olive-growing surface is equal to about 4,570 hectares.

Agro-Ecological Zones (for Agriculture, Forestry and Fisheries):
About the 70% of the area is used for agricultural activities, while the 18% is classified as woodlands or scrublands. Only 11% of the total surface is classified as urban area or built up

area. The cultivation of olive trees accounts for about half of the surface, mainly located on the west-facing slopes. Detailed land use maps can be found in the Annexes.

Topographic Features:

The proposed area is located along the Umbrian Valley, between 200 and 600 meters a.s.l., along the western Apennine ridge that runs from Assisi to Spoleto (the geomorphologic map, the map of the slopes, and the map of the slope exposure can be found in the Annexes).

The soil, mainly deriving from the mechanical disintegration of limestone, is characterized by good structure and fertility. There are also slopes exposed to the south, with rocky outcrops.

The constant remodeling of the slopes through the realization of extensive hydraulic systems not only allows to cultivate slopes that would be otherwise too steep, but constitutes a defense against hydrogeological risk and an efficient system for the preservation of water and soil.

Climate Type:

The climate is classified as temperate Mediterranean, heavily influenced by the Apennines, both for the protection that the mountains offer against the masses of air coming from the Adriatic Sea and for the characteristics of the orography. The temperature range shows that the periods in which the lowest values occur are in January and the highest in July.

The seasonal distribution of precipitation is that typical of Mediterranean areas, with minimum values in the summer and maximum values during winter. A rainfall between 800-1100 mm/year allows for good agricultural production without irrigation.

According to the Phytoclimatic Classification of the Italian Ministry of the Environment, the proposed site is mainly situated in the humid variant of low-hill climate.

Approximate Population (Beneficiary):

The total population of the five municipalities included in the proposed site is of 143,635, as per the 2011 census.

Ethnicity/Indigenous population:

Italian

Main Source of Livelihoods:

The main sources of livelihoods for the local population are agriculture and activities and services related to tourism and to rural tourism.

Executive Summary:

The olive grove slopes that stretch from Assisi to Spoleto are one of the main olive-growing areas of the Umbria region and one of the most important of Italy. Olives are, together with wheat and vines, the three main crops representing the cultural identity of the Mediterranean area. Olive oil is also a fundamental element of the Mediterranean diet, known worldwide for its benefits for human health. The culture of olive oil has shaped the history of the area and affected the environment, the economy and the society, while the traditional knowledge concerning the production system, such as dry-stone terraces, genetic variety, pruning and planting techniques, has been preserved.

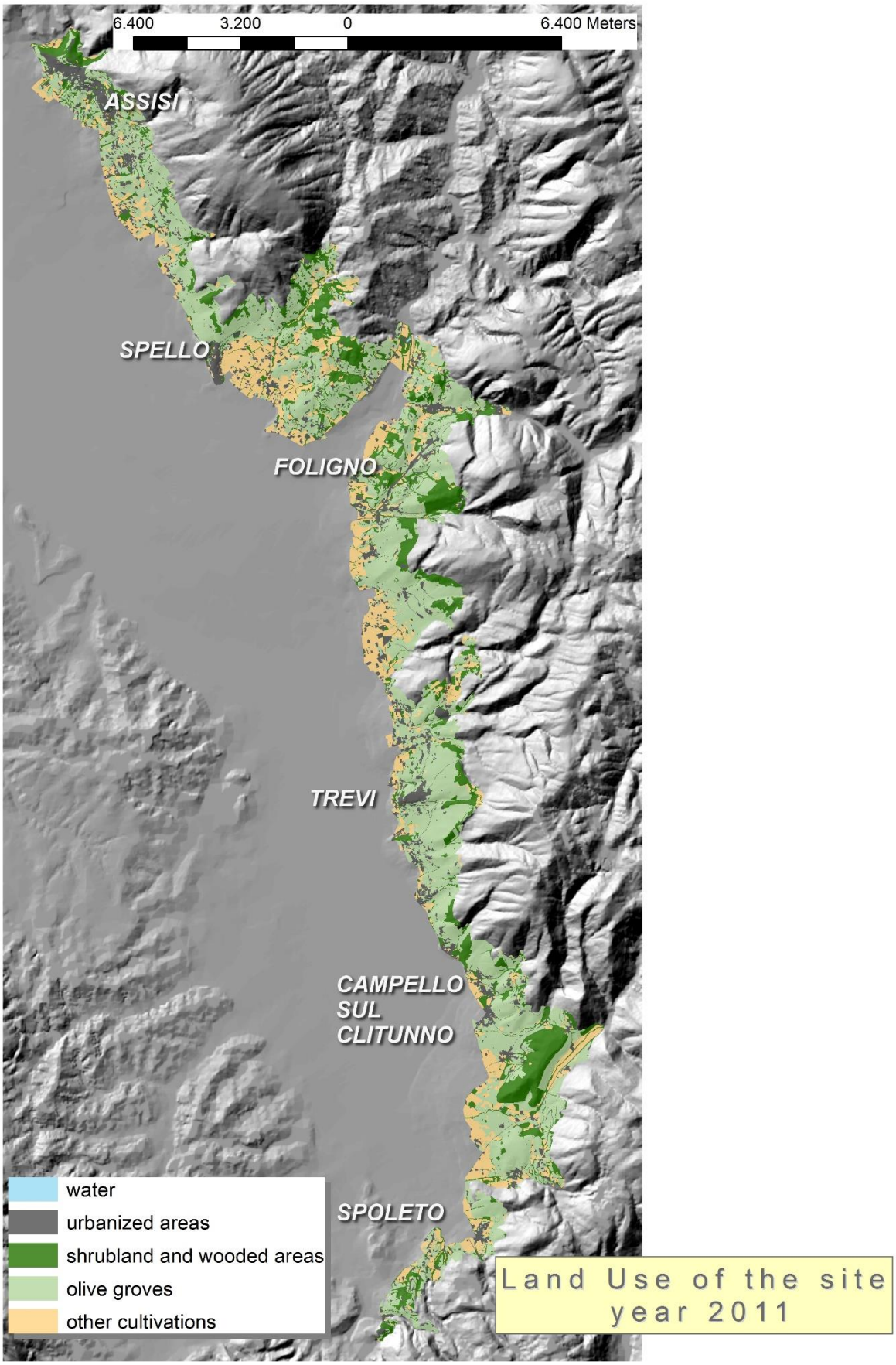
The west-facing slopes between Assisi and Spoleto, are characterized by an agricultural system of ancient origin, that still preserve traditional agricultural practices. Olive groves are still cultivated on dry-stone terraces, whose role is fundamental in preserving natural resources such as soil and water and in reducing hydrogeological risk. The local agricultural system is mainly based on family farming, and the social role of agriculture is still very important for the local communities.

Also the unique combination of little historic towns and agricultural settlements, which preserve impressive architectural treasures, represent a uniqueness of the area. The development of these towns and of religious communities in ancient times, is in fact strictly connected to the agricultural activities and to the trade of agricultural products. Moreover, local traditions, especially the religious ones, are strictly related to olive cultivation and to the use of olive oil.

Today, the high quality of the olive oil produced in the proposed area is guaranteed by the label Protected Designation of Origin (in Italy DOP), ensuring the oil is produced only in this area. The olive trees belongs to local traditional cultivars (*Moraiolo*, *Frantoio*, *Leccino*), and the olive oil is still produced by pressing the olives as they were pressed centuries ago, generating extra virgin olive oil and ensuring the highest possible quality.

The agrobiodiversity of the agricultural system is related to the high amount of vegetal and animal species that can be found in the area, but also to the variety of local agricultural cultivations, such as: wine, onions, saffron, truffles, legumes, celery.

The global value of the proposed area is supported not only by a unique beautiful landscape, but also by the conservation of traditional agricultural practices, by the social role of agriculture for the local communities and by the high levels of agrobiodiversity. The local agricultural system represent an important example of resilience and adaptation to steep slopes and the solutions developed by local communities centuries ago are today effective towards contemporary challenges, such as reducing hydrogeological risk, preserving high quality food production and agrobiodiversity, improving quality of life in rural areas, and offer sustainable solutions for climate change.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water
urbanized areas
shrubland and wooded areas
olive groves
other cultivations
Land Use of the site
year 2011

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I. Significance of the Proposed GIAHS Site

1. Global significance of the proposed GIAHS site

The edible olive culture dates back to the early Bronze Age (3150 to 1200 BC), its origin can be traced to areas along the eastern Mediterranean Coast in what are now southern Turkey, Syria, Lebanon, Palestine, and Israel (Vossen 2007). Historically, the area proposed is one of the most important areas in Italy for olive growing. Olive pits were found in Etruscan graves 2700 years ago, the Etruscans residing on the right bank of the Tiber river were the first to cultivate the olive tree and use its fruit for direct consumption. Archaeological sites of Roman olive mills, 2100 years old, can also be found in the area. Near Trevi there is one of the oldest olive trees in Italy, Saint Emiliano's (or, rather, Saint Miliano's) olive tree. In an ancient 9th century codex that narrates the martyrdom of Saint Emiliano, first bishop of Trevi, we read that "they tied him to a young olive plant" where he was beheaded. It was the year 303 or 304 AD. It is a majestic plant, with a 9-meter trunk circumference at the base and an 8-meter crown circumference, recent studies carried out with radiocarbon have confirmed that it is an ultra-millenary tree (1830 +/- 260 years old).

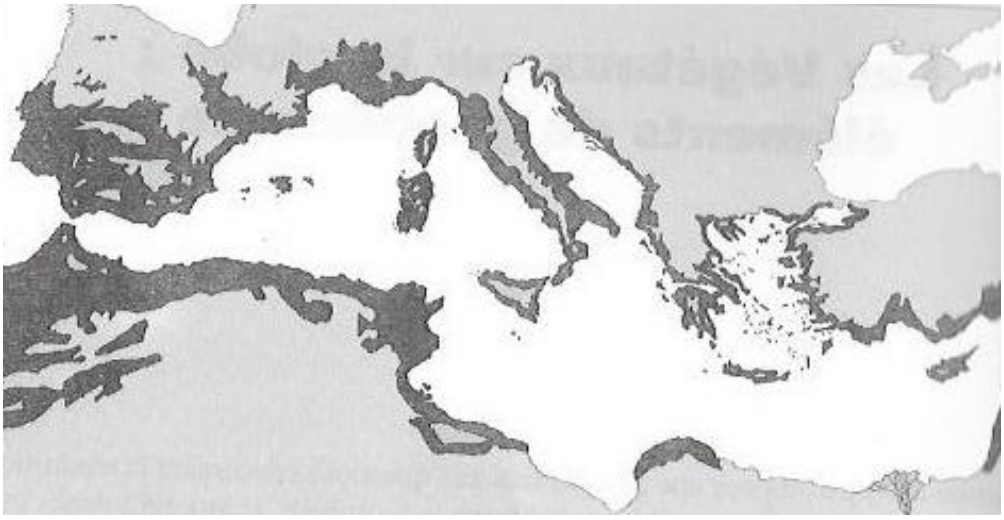


Figure 1: Olive biogeographic area.

The area is the homeland of Saint Francis of Assisi (1181-1126) whose thinking, based on poverty and a close relationship with nature, has largely influenced the entire Christian culture. The town of Assisi and its magnificent Basilica dedicated to the Saint, are still a fundamental center of the Catholic religion and are included in the proposed site. The woods of Saint Francis, with their famous olive groves, are the symbol of the association between the Franciscan order of monks

and agriculture and the role of Monasteries in the conservation of agricultural knowledge in Europe.

Figure 2: Saint Emiliano's olive tree near Trevi (left) and The sermon to the birds by Saint Francis of Assisi, attributed to Giotto (1290-1295), in the Upper Basilica of Assisi (right).

The fall of the Roman Empire and the invasions of the so-called barbarians led to a lull in the cultivation of the olive tree. In the 16th and 17th centuries interest was rekindled toward this cultivation and the olive tree spread uphill substituting the woods and reaching as high as 500-600 meters a.s.l. Emphyteusis, rental, and colony agreements often included mandatory planting of olive trees. Often in late Medieval or Renaissance paintings, you can see stretches of landscape in which the human intervention on the natural environment is evident, a redesigning for specific purposes: tilled fields appear, with planted trees, divided and fenced in. Because of the market value of oil and how much the higher classes enjoyed it, between the 17th and the 18th centuries olive cultivation tended to conquer ever vaster stretches of land, and oil from the Umbria region seems to have been appreciated, especially in the Roman and Florentine markets, as far as the oil production in Spoleto is concerned. Though we must remember that in sharecropping[1] areas, such as Umbria, the specialization in the production of olive oil for trade was quite limited if not non-

[1] Sharecropping is the historical system regulating the relationships between owners and farmer in central Italy. It dates back to the 13th center and lasted until 1964. According to this system the farmer shares the crops with the owner (50/50), it includes also the use of a farmhouse for the family of the farmer for which no rent is due.

existent in some areas. A large number of the olive groves present today are the result of planting carried out by the Papal States beginning in the second half of the 18th century until the Italian unification, which led to the end of the Papal States in 1870. Thus, preexisting olive trees in convent orchards near towns or inside the latter became part of the slopes in accordance with an overall project of crop reassessment, which was carried out alongside the recovery of the valley floor, where intensive cereal crops were concentrated, interspersed with vines and trees.

Since roman times, the olive tree was considered a transcendent symbol of spirituality and holiness. Synonym of fertility and rebirth, of resistance to the hardships of time and war, symbol of peace and valor, the olive tree represented, in mythology as in religion, a natural element of strength and purification. Olive oil is a fundamental element of the Mediterranean diet, that was recognized by UNESCO as part of the immaterial heritage of the humanity, and even now olive cultivation has a multifaceted importance for Mediterranean countries (Cicia et al. 2011). Olive oil in the area is still produced by pressing the olives as they were pressed twenty-seven centuries ago, producing extra virgin olive oil and ensuring the highest possible quality. This quality is guaranteed by the national labeling Protected Designation of Origin (in Italy DOP), ensuring the oil is produced only in this area according to a strict genetic olive variety control. This system of quality control of is a unique feature in terms of global food market. Concerning traditional farming practices, Italy has one of the highest density of dry stone walls together with other Mediterranean countries and the proposed area has the highest density of dry stone terraces among those of the national register of historic landscapes, as also among the existing GIAHS sites. The area presents also all the different typologies of terraces cultivated with olive trees, including dry stone terraces, earth terraces, dry stone lunette; these types are organized in regular linear shaped terraces, or in non-linear terraces. This combination cannot be found in other areas. The agrobiodiversity of the area is also strictly connected to the agricultural practices, as animal and plant species depend on the preservation of agricultural systems, the area also present a variety of traditional cultivars of olives.

Considering the ecosystem management values, terraces represent a complex system for managing slope dynamics, from the conservation of the soil to the triple function of runoff, drainage and the collection of rainwater, etc. The deterioration of a hillside, artificially in equilibrium, leads to the reactivation of erosion phenomena, the loss of fertile soil and the increase or disordered evolution of runoff. With the abandonment of the terraces and the cessation of maintenance works on the drainage systems, the soils begin to be saturated and the hydrogeological processes previously controlled by human intervention tend to restore the original profiles of the slopes. The dry stone walls are important to reduce slope length, trap erosion sediments and reduce soil erosion.

Olive orchards play also an important role for the mitigation of climate change. Olive production systems can sequester atmospheric carbon through photosynthesis both of the herbaceous component (grass) and the arboreal (leaves). The carbon sequestered by balancing the photosynthesis process and respiration process is thus stockpiled both in the earth and in the woody parts of plants (for example the trunk and branches). Recent studies developed in Umbria

have shown that the capacity for carbon sequestration on the part of olive groves can in average be compared with that of Mediterranean forests. The capacity for carbon sequestration of olive plantings varies not only in relation to climate conditions, but also depending on the type of agronomic management (implant density, plant size, grassing, etc.). The traditional cultivation practices employed in the proposed area (pruning, grassing, and green manure) have a fundamental role in transforming a significant part of atmospheric CO^2 into biomass and humus, increasing the flow of carbon from the atmosphere to the biosphere and the pedosphere.

The landscape of the proposed area is characterized by a series of terraces, developed on mountain slopes between 200 and 600 m a.s.l., with a highly fragmented landscape mosaic that has preserved most of its integrity in the last seventy years. In no other GIAHS sites the integrity of the landscape has been measured according to a scientific methodology as in this area. The area comprises historic settlements (towns, rural houses, religious buildings, castles) placed along the mountain slopes, where terraced olive groves dominate the landscape. The combination of geographical features, the terraced olive groves and the settlements create a beautiful unique landscapes, certified by the inclusion in the Italian National Register of Historical Rural Landscapes. According to the UNESCO-CBD Florence declaration of 2014 and to the GIAHS criteria, the area can be considered an important example of biocultural landscape, providing a crucial and effective space for integration of biological and cultural diversity. The culture of olive oil has shaped the history of the proposed site and affected the environment, the economy and the society, while the traditional knowledge concerning the production system, such as dry-stone terraces, genetic variety, pruning and planting techniques, has been preserved.

Figure 3: View of the holm oak grove and of the olive groves on the Trevi foothills

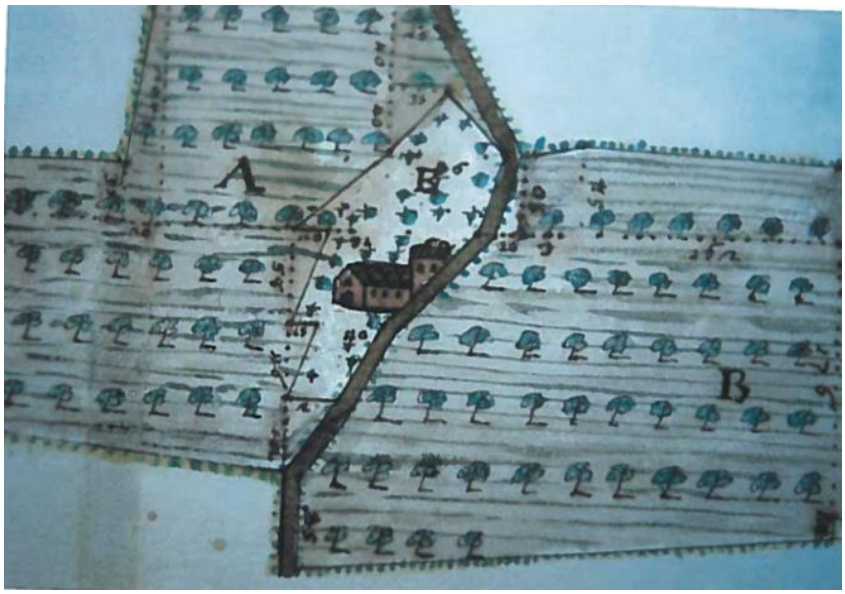


Figure 4: Cabreo (inventory of properties) of Sant'Angelo Monastery (1729), with the villa in the center surrounded by olive groves

A unique feature of the area compared to other GIAHS sites, is the presence of a high quality architectural heritage. All of the historical constructions in the area are present either as scattered buildings or centralized settlements and have all been developed in connection with the agricultural economy. Throughout the countryside we find a high density of farmhouses and tofts, as well as manor houses, villas, and in general buildings for residential and agricultural use with their annexes, but also a fair number of religious buildings or complexes (churches, convents,

abbeys, sanctuaries, hermitages, aedicules, and votive chapels), military structures (towers, citadels, and castles) and civilian buildings with specific non-residential uses (old mills, trading posts, remains of bridges and old roads, funerary constructions, etc.). Between Assisi and Spoleto we can still find today historically intact landscapes, with Medieval olive groves, such as the one inside the walls of Assisi, under the Basilica of Saint Francis, and the ones around the historical city center in Spello, in the Collepino-Chiona area. Considering the set of values represented by the area, we can conclude that the global importance of the proposed sites is mostly due to the unique combination of a wide set of high quality features, resulting from the co-adaptation of a rural community with its environment. The persistence of all these elements over a long period of time and their quality made them a part of the cultural heritage of human kind.

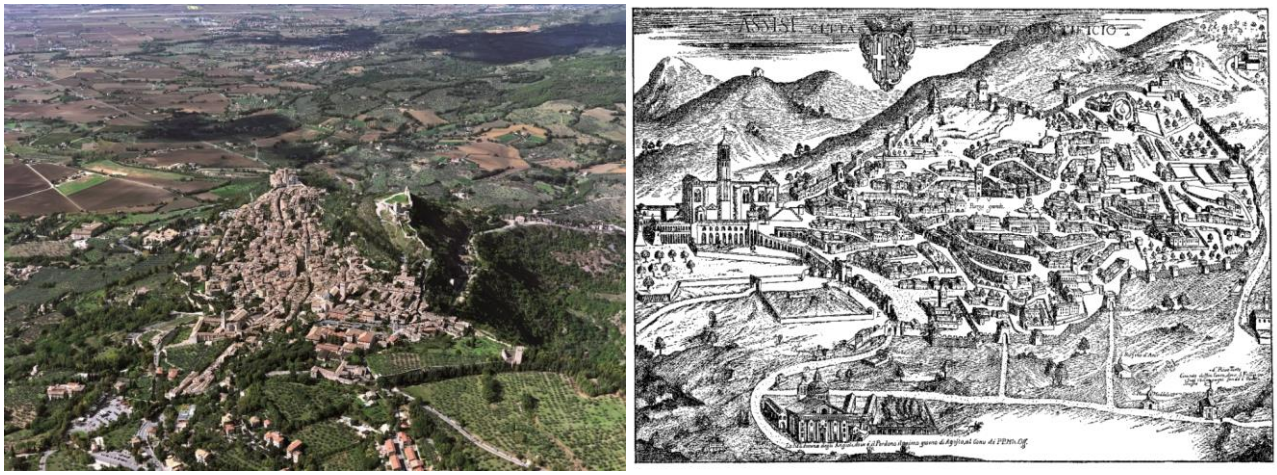


Figure 5: Assisi, on the left a vista of the olive-covered planes and hills; on the right a historical view of Assisi and its monuments with the title "Assisi, City of the Papal States," 18th century etching

Figure 6: Left, 15th century painting of the valley of Spoleto; right, the arable land spotted with oak trees is historically typical of the valley floor of the olive-grove area of Assisi-Spoleto

II. Characteristics of the Proposed GIAHS Site

1. Food and livelihood security

1.1 Socioeconomic relevance of the local agricultural production system

The local agricultural production system in particularly relevant for the economy of the local communities. Its socioeconomic role is not only limited to the sole production of food, but also to the attractiveness of the local landscape for tourist and for the social role of family farming.

Oil production in Umbria is quite relevant economically, being in fact 5% of the gross marketable agricultural production, and involves about 27,000 farms. In 2012 total olive oil production in Umbria was about 5,130 tons, 67% of which in the Province of Perugia and 70% was extra virgin olive oil (EVOO), the highest grade of olive oil quality (ISTAT, 2013). Furthermore, Umbria is characterized by a high degree of fragmentation of production on the agricultural level and a widespread use of cooperatives for the management of production, with about 257 mills throughout the region (Peluso, 2013).

According to 2017 data regarding the certified DOP olive oil production (see Chapter 1.3) in the proposed area, can be found:

- Olive farms: 285
- Oil mills: 34
- Surface: 1,911 ha
- Olive trees: 464,445
- Olive oil production: 1,000,000 liters
- Business: € 5,000,000

These data show the economic relevance of the olive oil production, but also the relevance for the local community, since the production is not based on few big producers, but on 285 family farms. Moreover, it has to be considered that this data refers to the DOP certified olive oil, without taking into account the oil produced for self-consumption. In fact, the DOP certified olive groves extend on about 2,000 ha, while the total olive groves of the proposed area are found on about 5,000 ha. The overall olive oil production of the proposed area is about 2.5 millions of liters.

The local social structure is composed by local communities, where the farms are mainly family farms, where the role of women is particularly important, especially during the olive harvest, and where all the activities related to olive cultivation and oil production strengthen family ties and those of the local communities.

For what concern the employment sectors of the population of the municipalities interested by the proposed area, the 4% of the population works in agriculture, the 27% in industries and the

21% in activities related to tourism. Even if the percentage of employed in agricultural activities seems to be low, it has to be considered that these data refers to the total surface of the municipalities, and not to the proposed area. Moreover, many olive groves are cultivated by family farming, and quite often, agricultural activities are not the main occupational activities of the components of the family cultivating the land.

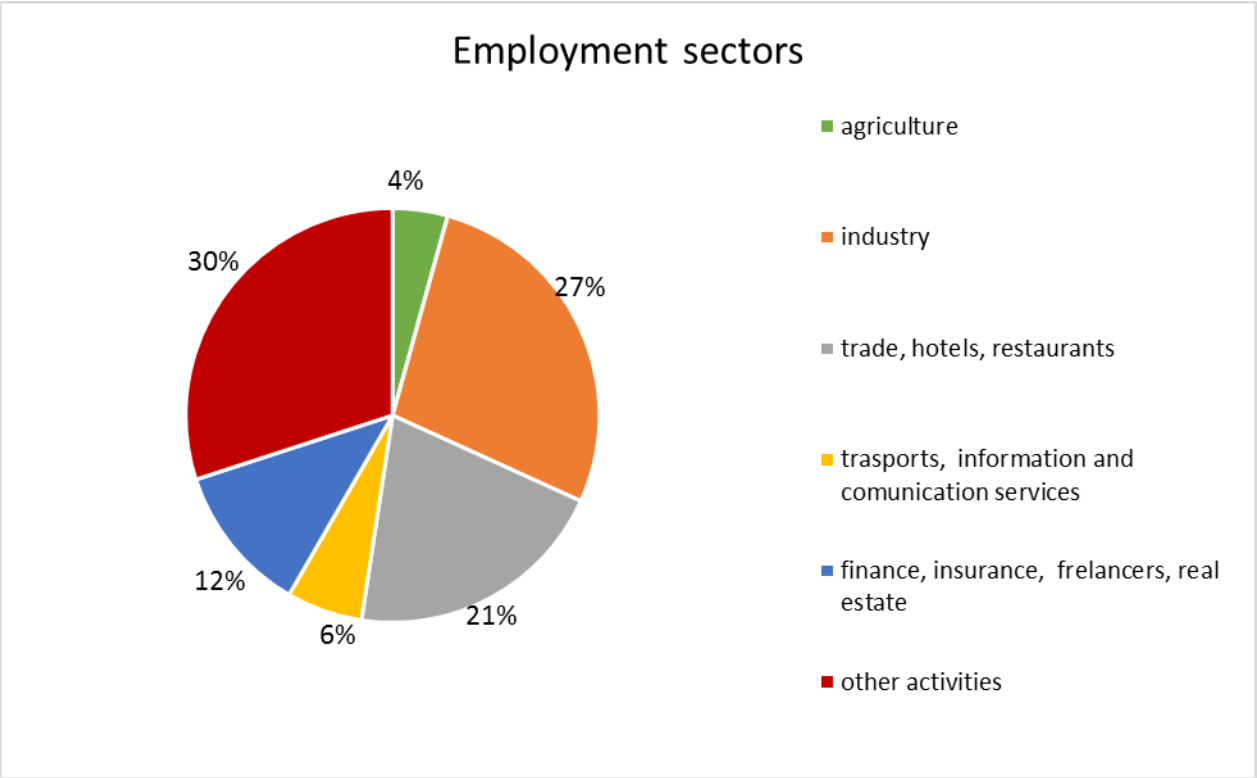


Figure 7: Employments sectors of the population of the municipalities.

Regarding the economic relevance (calculated as the monetary value of gross agricultural production) of the farms in the area, most of the farms (86%) have an economic value lower than 15.000 euros. On one side, this can show a weakness of the farms from the economic point of view, but on the other side, it is evident that the local farms are still mainly family activities, instead of big companies.

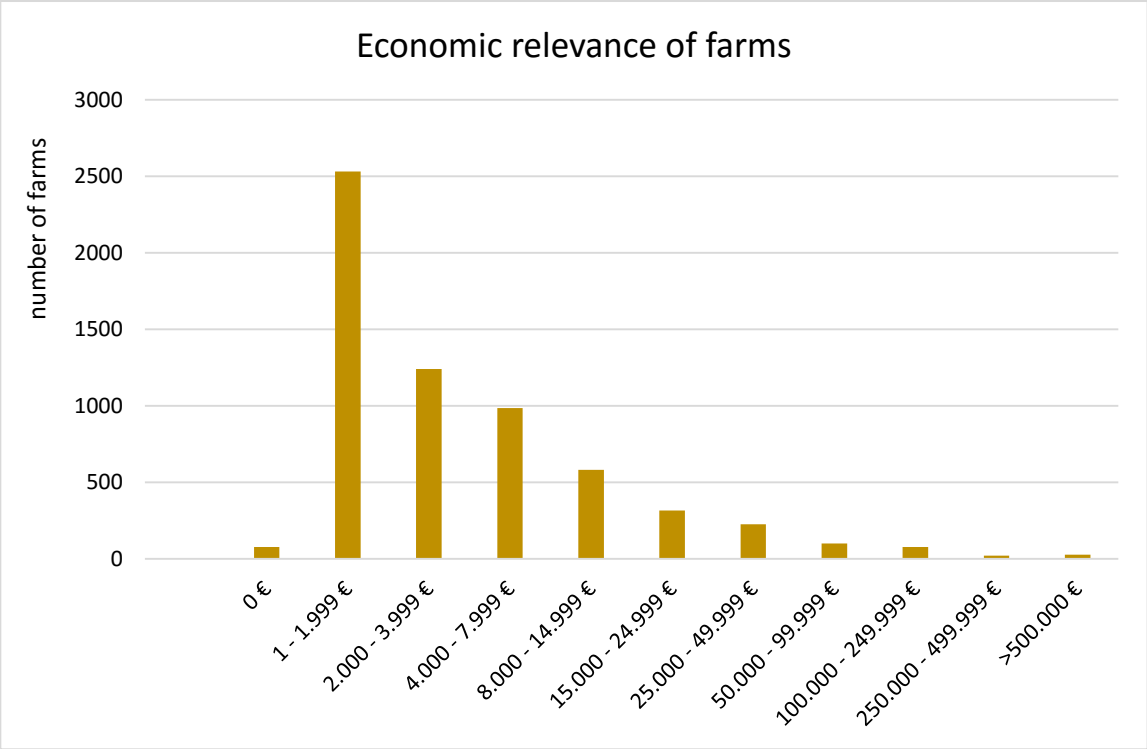


Figure 8: Economic relevance of farms

Tourism, today, is a major economic resource for farmers. On one side, tourists represent an important market for the typical local products, on the other side, many farms offer accommodation to tourists (*agriturismi*). In the proposed area there are 131 farmhouses, 51 in Assisi, 4 in Spello, 31 in Foligno, 10 in Trevi, 16 in Campello sul Clitunno and 19 in Spoleto.

Mediterranean basin produces 99% and consumes 87% of the world's olive oil. Today, olive oil has a mere 4% share in the world vegetable oil production, which is dominated by soybean and palm oil (Luchetti 1993). But despite the growth of a number of substitutes, olive oil remains an element of cultural significance for the Mediterranean, and it is tightly connected with the taste of the inhabitants of this part of the planet.

Regarding high quality olive oils recognized by the European Union, about 40% are represented by Italian labels, i.e. 42 different products recognized by the label PDO Protected Designation of Origin (in Italy it is called Denominazione di Origine Protetta, DOP). Italy is the second world producer of olive oil after Spain, and the second exporter, covering about 15% of world production. Still on an international level, Italian extra virgin olive oil manages to reach, in average, higher prices than other countries, which is indicative of the better quality of oil produced in Italy.

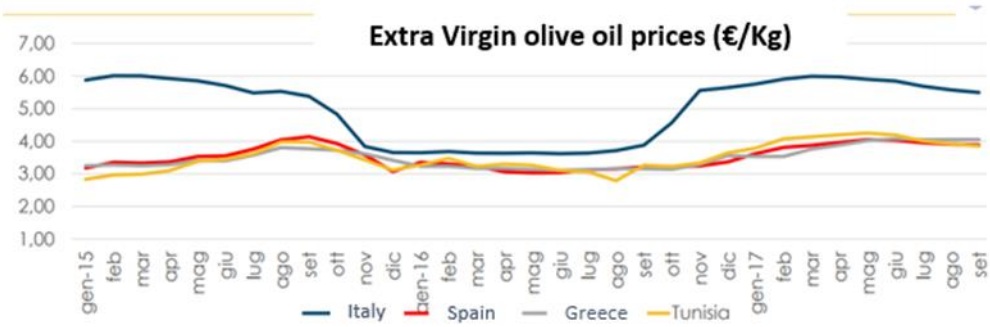


Figure 9: international Extra Virgin olive oil prices from 2015 to 2017 (ISMEA 2017)

The importance of organic olive groves has increased over the last few years, and according to 2017 data, they account for 12.4% of the total national organic surface, and organic olive groves are 21% of the total national olive grove surface.

Figure 10: Main DOP source and retail price trend from 2010 to 2015 (ISMEA, 2016)

As far as the distribution of value along the production chain is concerned, in the case of Umbria the value tied to the origin is high in average, while value lost in distribution in no more than 25%.

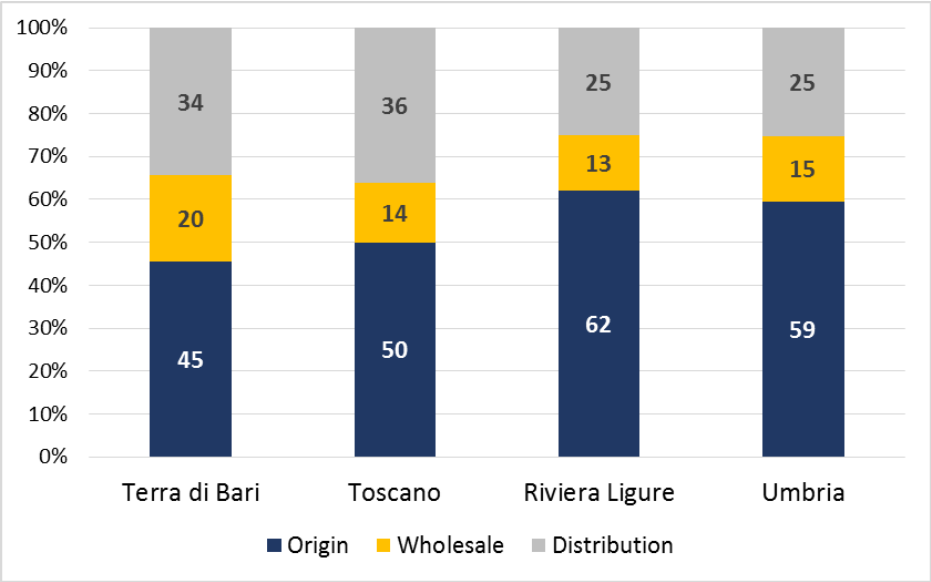


Figure 11: Production chain distribution of value of some DOPs (ISMEA 2016)

As for production costs, these vary quite a bit from one area to the next, but usually labor is the cost element that weighs most on the total cost for farms, with average production costs that go from 3 to 8 euro/kg depending on the area. A demonstration of the importance – not only economic – of the local production of oil is the fact that just in the province of Perugia there are 116 active olive oil mills (Agea data, 2014-2015 campaign), and 34 of them are located in the proposed area. Moreover, in the last few years, there has been a significant increase in the average price of DOP Umbria oil, which is caused by various factors and shows its importance for the local economy.

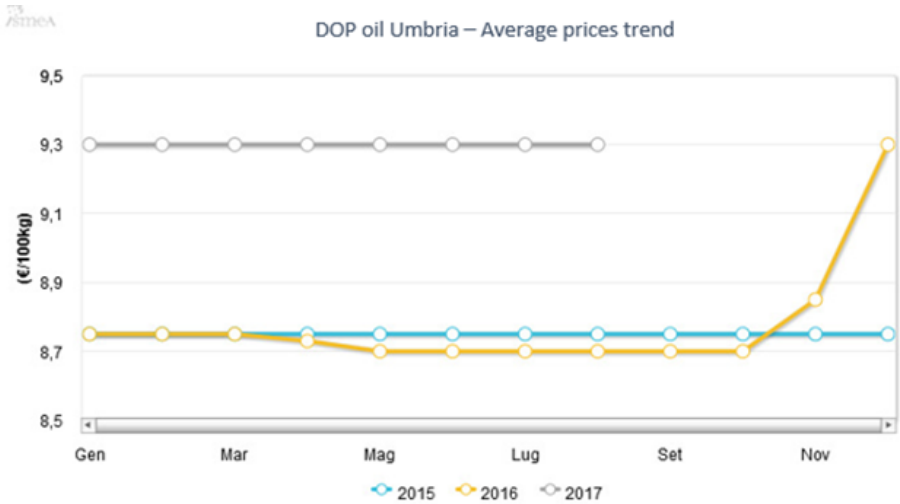


Figure 12: Average price trend of DOP Umbria oil for the years 2015-2017 (ISMEA; 2017)

1.2 Evolution of the local agricultural production system

The analysis of trends in the primary sector through official statistics allows us to understand the importance and the evolution of the agricultural industry, in particular olive farming. Below is a synthesis of the transformation of the primary sector inferred through the comparison of the data of the Agrarian Registry of 1929 with the data of the Agriculture Censuses periodically carried out by ISTAT in the municipal territories object of this proposal.

The number of farms in the census shows a constant contraction in nearly all the interested municipalities. The greatest loss was registered by the Municipality of Spoleto with a 64% contraction, while in the municipality of Campello sul Clitunno there was a 24% increase in the number of farms. The smallest contraction was registered in Assisi (-5%). Despite the decrease in the number of farms, the data shows that the overall number is high, since there are over 6,000 active farms in the municipal territories of the proposed area.

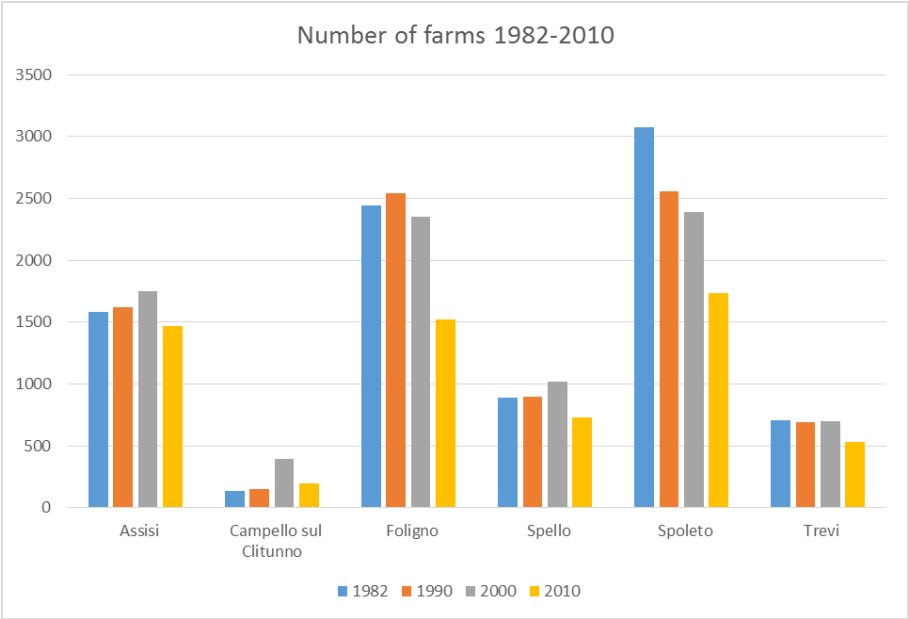


Figure 13: Number of farms per Municipality

Today 28% of the companies in which the manager is also the owner are in the Municipality of Spoleto, 25% in the Municipality of Assisi, 24% in Foligno; and only 8% in Trevi. Since 1982, direct management companies have increased only in the Municipality of Campello del Clitunno (nearly 50% more); in all other Municipalities the number basically did not vary, as in the Municipality of Assisi, or was reduced: Spoleto -43%, Foligno -36%, Trevi -26%, and Spello -15%. 60% of farms managed by salaried managers are in two Municipalities: Assisi and Spoleto; in the Municipalities

Spello and Trevi 10-11% of companies are managed by salaried managers, while in Campello sul Clitunno they are only 3%.

A relevant problem for local agriculture is the aging of the work force. According to the data of the last Agricultural Census 2010 (ISTAT), in the farms of the Municipalities of the olive grove belt, 60% of farm owners are over 60; in particular, 13% are between 60 and 64, 12% between 65 and 69, 13% between 70 and 74, and 22% are over 75. The Municipalities of Assisi, Foligno, and Spoleto have the highest number of farm workers (both owners and employees) over 75.

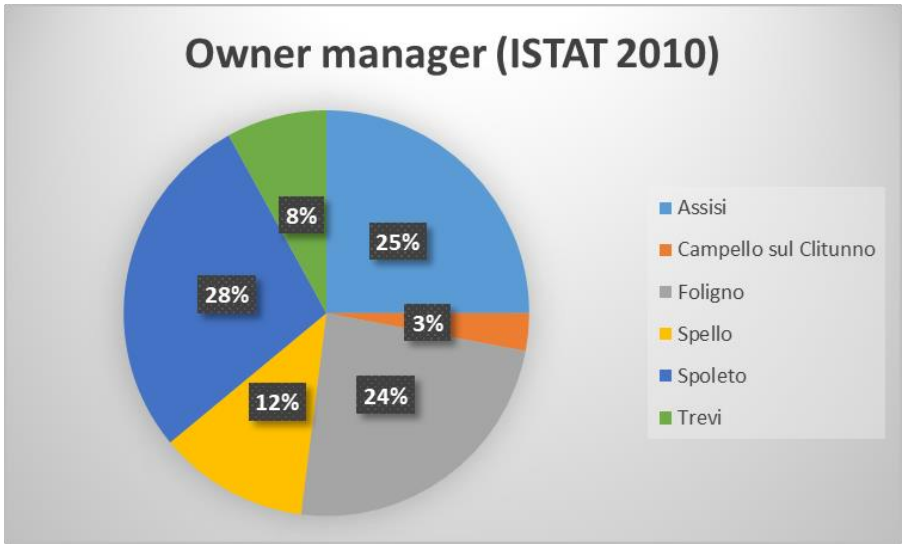


Figure 14: ISTAT 2010 data on owner manager percentage distribution.

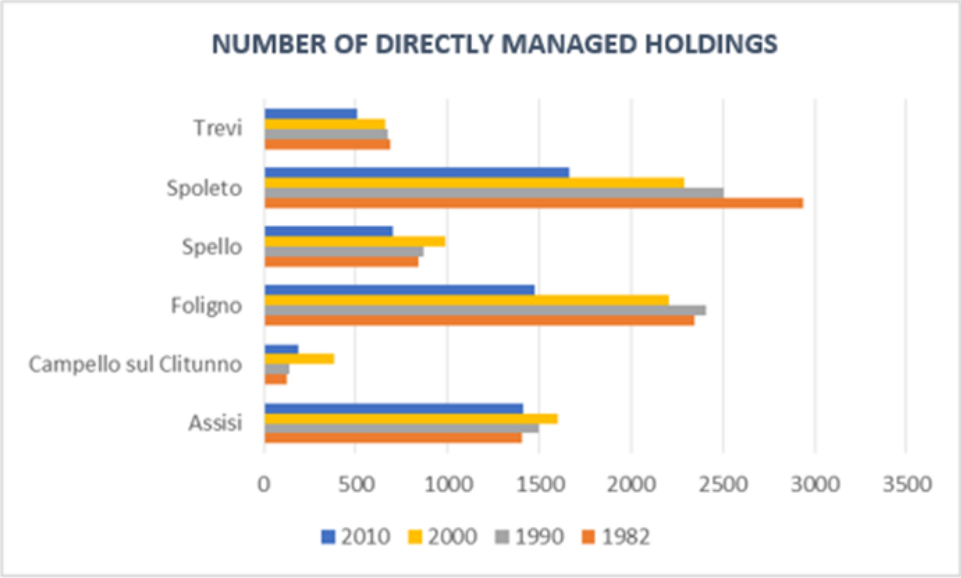


Figure 15: Number of directly managed holdings by municipality.

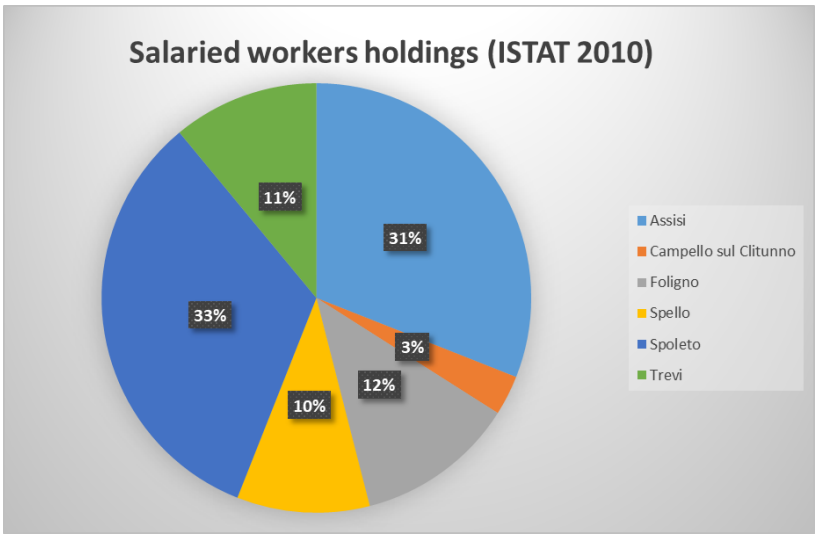


Figure 16: ISTAT 2010 data on distribution percentage of salaried workers holdings.

As for the trends of the main types of cultivation, specialized olive groves have gone from 5,382 ha in 1982, to a little more than 6,142 in 2010, proving that the local olive farming industry is alive and well, and that it is only marginally touched by abandonment, to the point that there was a slight increase in surface.

Other specialized cultivation has, instead, decreased between 1982 and 2010. This is the case with vineyards – from 2,469 ha to 777 ha (-69%) – and ordinary arable land – from 27,702 ha to 23,893 ha (-14%). Specialized orchards remain stable at 330 ha circa.

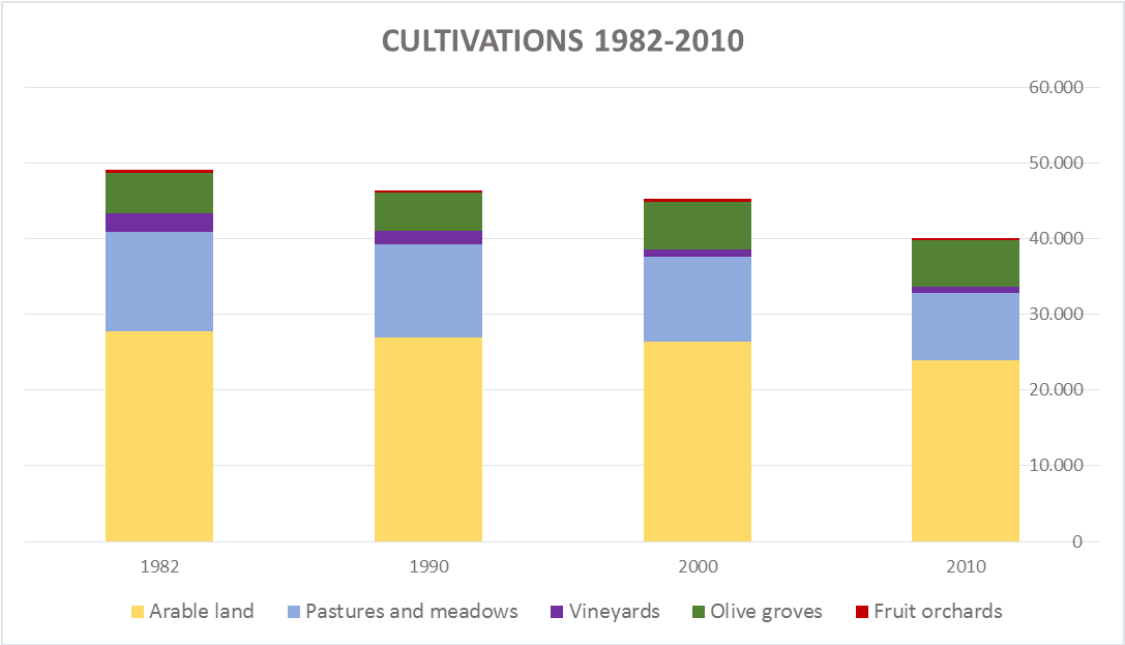


Figure 17: Surface of main crops 1929-2010

1.3 DOP Umbria olive oil: characteristics and production area

The proposed area is part of the Protected Designation of Origin (PDO, or DOP in Italian) Umbria olive oil, subzone called *Colli Assisi-Spoleto* (Assisi-Spoleto Hills). In fact, from an economic point of view, for some decades now all olive growing strategies in Umbria have had the aim of raising the quality of the product as the only way of bringing greater value to a product with elevated costs. The achievement of this aim was made easier by the Ministerial Decree of August 6, 1988 issued by the Ministry of Agricultural, Food and Forestry Policies, which approved the production regulations of "Umbria" extra virgin olive oil, which receives an EU certification of Protected Designation of Origin with Reg. 2325/97. The aim of the DOP is to assure the consumer, ensure a greater profit for the farmer, promote and certify the quality of the oil through the strict observance of the production regulation, and organize the sales chain. DOP Umbria (which covers 90% of the Region) is divided into subzones as there are different varieties and slightly different climates in the five districts in the area concerned. The proposed area is part of the subzone called *Colli Assisi-Spoleto* (Assisi-Spoleto Hills). The production regulations are sanctioned rules that must be respected by producers and transformers in order to use the DOP seal on the final packaging of the product. The DOP seal is given only to products of excellent quality with specific characteristics and only extra virgin oils can be DOP.

According to the production regulations of DOP Umbria olive oil, the final product must be produced with at least 60% of oil coming from the Moraiolo cultivar, while Leccino and Frantoio cultivars must not exceed 30%; under 30% of other local cultivars can be used. Production must not exceed 5,000 kg/ha in the intensive groves, and the maximum yield of oil cannot exceed 21%. Regarding oil production, only mechanical techniques are allowed in order to guarantee the high quality of the oil with no alteration whatsoever.

When extra virgin DOP Umbria olive oil is put on the market with the geographic indication "Colli Assisi-Spoleto," it must conform with the following organoleptic properties:

- color: green to yellow;
- smell: strong fruity scent;
- taste: fruity with strong bitter and spicy notes;
- maximum total acidity expressed in oleic acid, in weight, no more than 0.65 grams per 100 grams of oil.

Today the overall surface destined to olive cultivation in Umbria is about 27,000 ha (Torquati et al. 2007), which represent 8.5% of the region's cropped area. The olive production that varies, depending on the year, between 30,000 and 60,000 tons, with an average yield of about 18.5% and a final production of oil between 5,500 and 11,000 tons. The number of olive plants cultivated in Umbria is about 5.5 million.

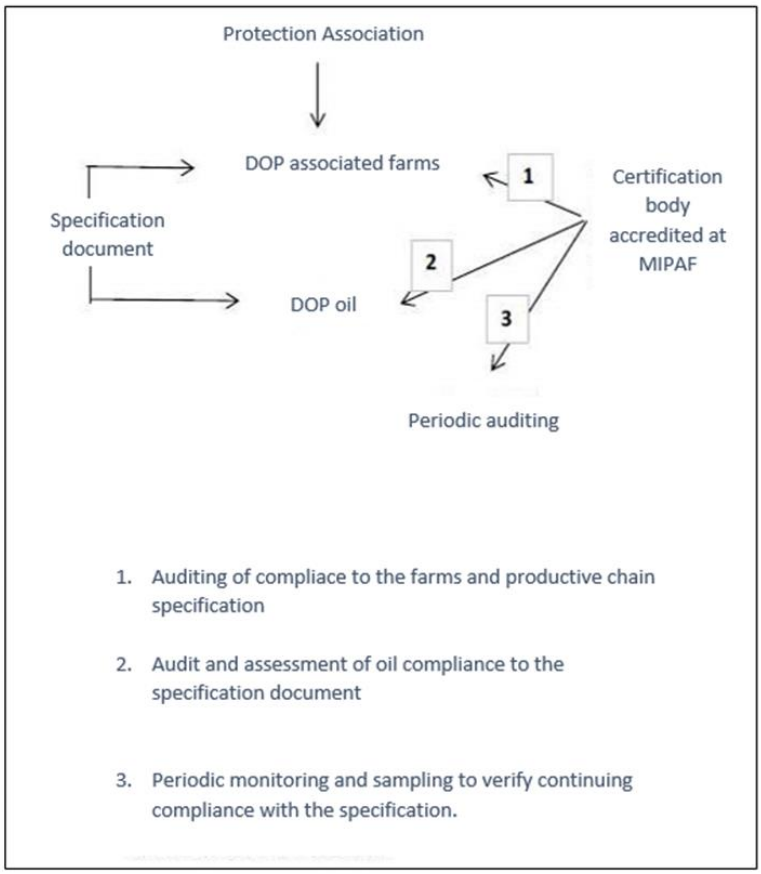


Figure 18: Certification process to achieve DOP

Figure 19: Left, a numbered label for bottles and cans of DOP Umbria extra virgin oil for the traceability of the product; right, the logo of DOP Umbria extra virgin olive oil

1.3 The Consorzio di Tutela dell'Olio extravergine DOP Umbria

Today the Consorzio di Tutela Olio Extra Vergine di Oliva DOP Umbria, is in charge of promotion. DOP Umbria was the first Italian designation of origin assigned to an oil to cover an entire Region. The Consorzio di Tutela defines plans to increase the quality of DOP Umbria production in terms of hygienic-sanitary safety as well as the chemical, physical, organoleptic, and nutritional properties of the product. Through the sale of numbered labels for bottles and cans, the Consorzio can control the traceability of the product. Furthermore, the Consorzio cooperates with the Central Inspectorate for quality assessment and the prevention of fraud in the protection, tutelage and safeguard of DOP Umbria from abuses, acts of unfair competition, counterfeiting, improper use of the Designation, and, in general, behavior forbidden by the law. The consortium is also in charge of the adjustment of the production regulations of extra virgin DOP Umbria olive oil in accordance with the development of new technologies and the evolution of image and market; it offers legal, technical, and scientific assistance and information with the aim of establishing the quality and the image of the oil under its tutelage in Italy and abroad; it promotes and takes part in promotional events in favor of DOP Umbria oil. Thus, bringing greater value to the product is one of the instruments used to develop the awareness of consumers of its elevated quality justifying higher retail prices.

2. Agro-biodiversity

The concept of agricultural biodiversity according to FAO, is part of the one more general concept of Biocultural Diversity, included in the preamble of the GIAHS criteria, and it's typical of the rural territory. This is stated in Florence declaration between the UNESCO and the Secretariat of the Convention on Biological Diversity (CBD) (UNESCO & SCBD 2014). The Florence Declaration on the Links between Biological and Cultural Diversity, signed in 2014, states that the current state of biological and cultural diversity in Europe is the result of the combination of historical and current environmental and land use processes and cultural heritage, and that the European rural landscape is predominantly a biocultural multifunctional landscape. The European rural landscape, therefore, represents a crucial and effective space for integration of biological and cultural diversity, and landscapes rich in biocultural diversity are often those related to small-scale farming and traditional practices.

The cultivation of olive trees carried out in the proposed area guarantees high levels of biodiversity, since it is characterized by traditional practices, with the absence of intensive crops.

Furthermore, the Umbria Region has developed a specific project of "Enhancement of genetic resources of the Umbria Region," as part of its program on plant biodiversity. This project, financed in the context of rural development, is coordinated by the Department for Plant Biology and Environment Biotechnologies of Perugia University. The main aims of the project are to preserve genetic biodiversity, design typing interventions for food farming products, qualify the agricultural landscape of the area, and establish a regional seed bank. The first step was to design a questionnaire to report local cultivars. This phase was followed by a field study to verify the collected referrals, and, finally, the collection of samples. The samples were then genetically typified and a seed bank was established.

Many local varieties were identified regionally as far as species of agricultural interest are concerned, especially cultivars of fruit trees and herbaceous cultivation. Aside from olive trees and grape vines, in the proposed area there are other crops of agroindustrial interest, i.e. local cultivars important for the enhancement of agro-biodiversity; these crops are illustrated specifically in the Food chapter.

2.1 Biodiversity and olive cultivation

The olive tree is one of the oldest cultivated fruit trees (Acerbo 1937; Elbaum et al. 2006), since the utilization of its fruit in late Neolithic has been established in Kfar Samirin's site in Israel (Galili et al., 1997). Domestic olives (*Olea europaea L.*) were selected by domesticating the wild olive (*Olea europaea L. subsp. Oleaster*) with which it retains remarkable genetic affinities (Zohary and Hopf, 1993). This fact is also proven by the observation that the growth of abandoned olive trees tends to regress to that of the *Oleaster*. The culture of olive trees was known to all the ancient

Mediterranean civilizations and is likely to have had independent and parallel origins in several areas (Pignatti, 1982).

It is obvious that olive cultivation has left its trace on the physiognomy, the economy, and on Mediterranean life itself, but also on the ecology. The population of the Mediterranean basin from east to west uses olive oil to cover its nutritional needs of fat (Jacotot 2001).

Considering the biotic forms, the flora in the olive grove ecosystem presents an exceptional resemblance to the flora of Mediterranean type ecosystems (Margaris 1980). Consequently, the artificial system of traditional olive groves, as opposed to other agroecosystems, is very similar to the natural Mediterranean ecosystems, even in its functional, efficient condition. The olive tree itself is the grafted form of a wild olive tree, which is a basic element of maquis vegetation, one of the principal types of Mediterranean ecosystems.

The existence of a significant number of diverse plants of the Mediterranean flora in cultivated olive groves establishes the conditions for the creation of a multitude of habitats for animals. The olive has a wealth of invertebrates (Gonçalves & Pereira 2012, Canale & Loni 2010), and the large number of insects and the rich flora ensure food for an important number of birds. Moreover, edaphic organisms have important ecological functions such as decomposition of organic matter, mineralization of nutrients and also as agents of biological control of the olive pests that spend a period of their life cycle in the soil (Santos et al. 2007). A list of important species in provided in the annexes.

As for the vegetation communities that characterize traditional olive groves, interesting herbaceous species can be found, as well as different species of Orchids (*Orchis papilionacea*, *Orchis morio*, *Orchis simian*, *Orchis ustulata*, *Ophrys apifera*, *Ophrys bertoloni*, *Ophrys insectifera*, *Himantoglossum adriaticum*), many of them protected by specific regional laws. Moreover, many small ferns and small crassulaceae grow in the spaces between the stones of the terraces.

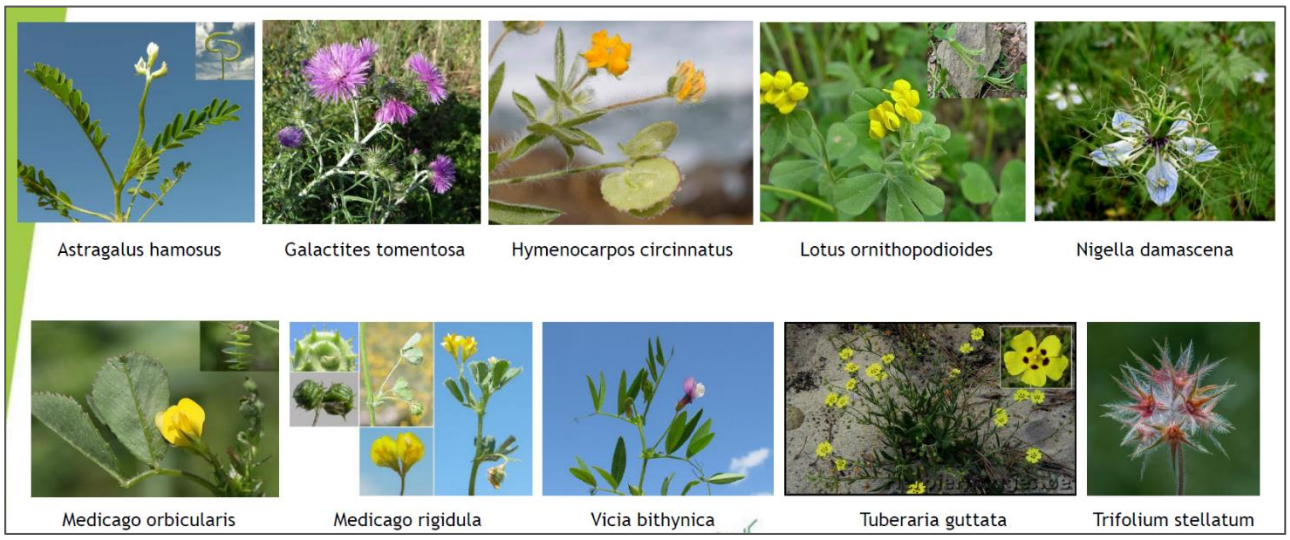


Figure 20: Some of the herbaceous species that can be found in traditional olive groves.

Figure 21: Some of the Orchids that can be found in this part of Umbria: Himantoglossum adriaticum, Ophrys apifera, Orchis ustulata, Orchis papilionacea, Ophrys bertoloni, Ophrys insectifera.

Among the reptiles, the Lacertidae family is common, represented by the common wall lizard (*Podarcis muralis*), the Italian wall lizard (*Podarcis sicula*) and the European green lizard (*Lacerta viridis*).

Figure 22: the common wall lizard (Podarcis muralis), the Italian wall lizard (Podarcis sicula) and the European green lizard (Lacerta viridis).

There are many birds, such as the common blackbird (*Turdus merula*), the great tit (*Parus major*), the Eurasian blue tit (*Cyanistes caeruleus*), the Eurasian blackcap (*Sylvia atricapilla*), the Eurasian

hoopoe (*Upupa epops*) and, among the Galliforms, the pheasant. Other birds include the common buzzard (*Buteo buteo*), the common kestrel (*Falco tinnunculus*), the little owl (*Athene noctua*) and the barn owl (*Tyto alba*).

Figure 23: Some of the most common birds in the area: the common blackbird (Turdus merula), the great tit (Parus major), the Eurasian blue tit (Cyanistes caeruleus), the Eurasian blackcap (Sylvia atricapilla), the Eurasian hoopoe (Upupa epops), the pheasant, the common buzzard (Buteo buteo), the little owl (Athene noctua) and the barn owl (Tyto alba).

Many mammals are commonly found in the proposed area and the surrounding mountains, some of them are more frequent in woodlands, but they often search for food in olive groves and in open spaces. Among the most common, it is possible to find: red fox (*Vulpes vulpes*), the beech marten (*Martes foina*), the European hare (*Lepus europaeus*), the crested porcupine (*Hystrix cristata*), the European roe deer (*Capreolus capreolus*) and the wild boar (*Sus scrofa*).

Figure 24: red fox (Vulpes vulpes), European roe deer (Capreolus capreolus), European hare (Lepus europaeus), beech marten (Martes foina), crested porcupine (Hystrix cristata) and wild boar (Sus scrofa).

Finally, the maintenance of the traditional olive grove is benign for the environment, since it brings low soil erosion rates and a high bio-diversity compared to intensive olive groves (Gómez et al. 2009). The importance of olive cultivation is even more important if one considers that the olive grove exploits marginally productive sloping lands that run the growing risk of deterioration. In these areas, traditional plantings with terraced slopes show low soil erosion rates (Graaff de and Eppink 1999).

2.3 Cultivated olive cultivars

The true genetic origin of today's cultivated olive *Olea europaea L. var. communis* is not known with certainty, but it probably is associated with a multilocal domestication of its cultivated forms, as recent research with molecular markers has indicated (Besnard and Berville 2000; Besnard et al. 2001). Some scientists believe that the ''European'' olive, which is the only *Olea* with sufficiently large fruit to be edible, is a hybrid of two or more different species. Other scientists consider the genus *Olea* and species *europaea* to simply represent a group of widely diverse plants with ''ecotypes'' or ''subspecies'' that are located in different geographic areas. In almost every location where cultivated olives grow, wild olive trees and oleaster shrubbery also exist. These plants may be seedlings of cultivated varieties spread by birds and other wildlife feeding on the

fruit, or they could be native forms of subspecies or ecotypes that already existed here before the introduction of the cultivated olive (Vossen 2007).

Umbria produces high quality extra virgin olive oil (EVOO) certified by the PDO (Protected Designation of Origin), in Italian DOP (Denominazione di Origine Protetta), a label developed by the European Union (Regulation (CEE) 2081/92) for the safeguard of high quality agro-food products typical of certain territories.

The production of DOP Umbria extra virgin olive oil has regulated production regulations approved by the Italian Ministry for Agricultural, Food and Forestry Policies in 1998 (Ministerial Decree 6th August 1998). There are five subzones of production. The area proposed for the inscription in the GIAHS program is part of the "Colli Assisi Spoleto" subzone. The olive oil produced in this subarea must be made with at least 60% of oil coming from the Moraiolo cultivar, while Leccino and Frantoio cultivars must not exceed 30%; no more than 30% of other local cultivars can be used. The production must not exceed 5,000 kg/ha in intensive groves, and the maximum yield of olive in oil cannot exceed 21%. As for oil production, only mechanical techniques are allowed, in order to guarantee the high quality of the oil and no alteration whatsoever.

2.3.1 Moraiolo

Moraiolo is one of the most renowned and exquisite olive cultivars, providing one of the best Italian oils. The tree is rustic, without specific necessities regarding farming and soil. As a contraindication, however, it lacks of vigor. It is a self-sterile cultivar, therefore it needs a pollinator nearby. The moraiolo is the most popular cultivar in the proposed area and is certainly the best cultivar to withstand the difficult pedoclimatic conditions due to its adaptability. In fact, it adapts easily to rocky terrains and to the reduced soil profile typical of these areas. It is characterized by a limited growth with the fruiting and main branches that rise upward in a distinctive way. It has small fruit and a late and scaling maturation, with strong resistance to detachment, to rapid temperature changes typical of spring, and to summer drought. Abortion is uncommon if compared to other cultivars, with a maximum percentage of 25%. The olives are spherical and black, with purple shades. Even if the olives have a limited weight, usually between 1.5 and 2 grams, the yield is high, equal to 20% and over. But what makes this olive special is the high polyphenolic concentration in its fruits. The concentration of oleic acid and of unsaturated and saturated fats is good. Productions obtained with this cultivar have excellent organoleptic qualities and excellent chemical characteristics that make it an appreciated component of the Mediterranean diet and an irreplaceable ingredient in local cuisine. Olives are harvested in November for the best yield, more precisely in the last two weeks.

Leaves	
Length (cm)	4.84
Width (cm)	1.19
Shape	Elliptic
Surface (cm2)	3.95
Fruit	
Length (cm)	1.59
Maximum diameter (cm)	1.26
Shape	spherical-ovoid
Weight of 100 olives (g)	143.60
Symmetry	Symmetrical

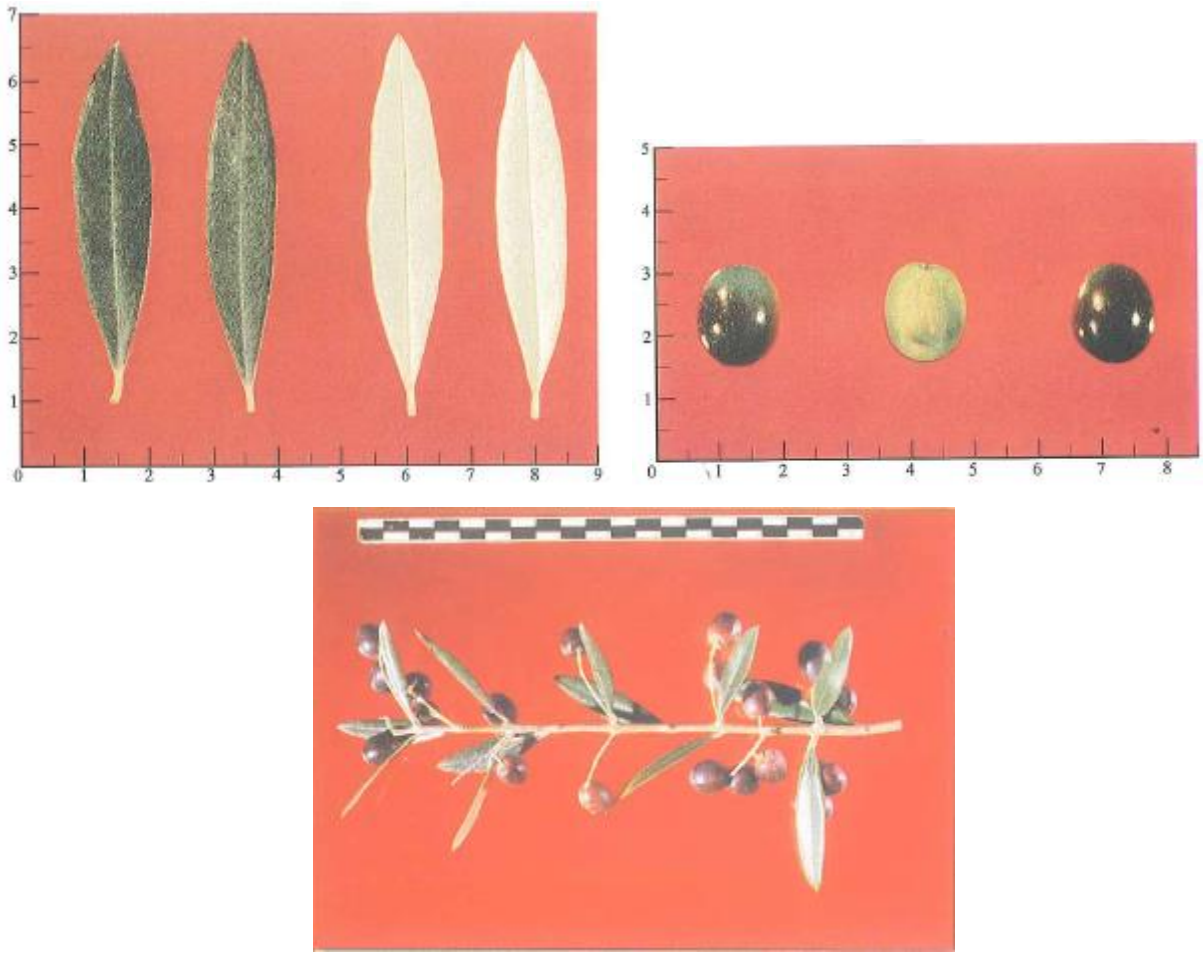


Figure 25: leaves, olives and branch of the Moraiolo cultivar

2.3.2 Frantoio

The Frantoio cultivar is widespread in central Italy. It is a medium-sized and vigorous tree, with a broad crown, and good resistance to diseases and cold. It produces ovoid olives with good yield, usually between 16 and 20%, from which it is possible to get a good quality and fine oil. Its flowering is contemporary to Moraiolo and Leccino cultivars, and it has medium resistance to low temperatures in the spring.

The total polyphenol content is medium-high and the one of total chlorophyll is high; the content of oleic acid and the unsaturated/saturated fatty acid ratio are high; the total triterpene alcohol content is low.

The analysis of the sensorial and compositional characteristics of the oil are excellent, so that the final product has characteristics that allow it to be commercialized in the higher market segments.

Leaves	
Length (cm)	5.61
Width (cm)	1.38
Shape	elliptic
Surface (cm2)	5.35
Fruit	
Length (cm)	1.81
Maximum diameter (cm)	1.26
Shape	ovoid-ellipsoid
Weight of 100 olives (g)	168.40
Symmetry	Asymmetrical

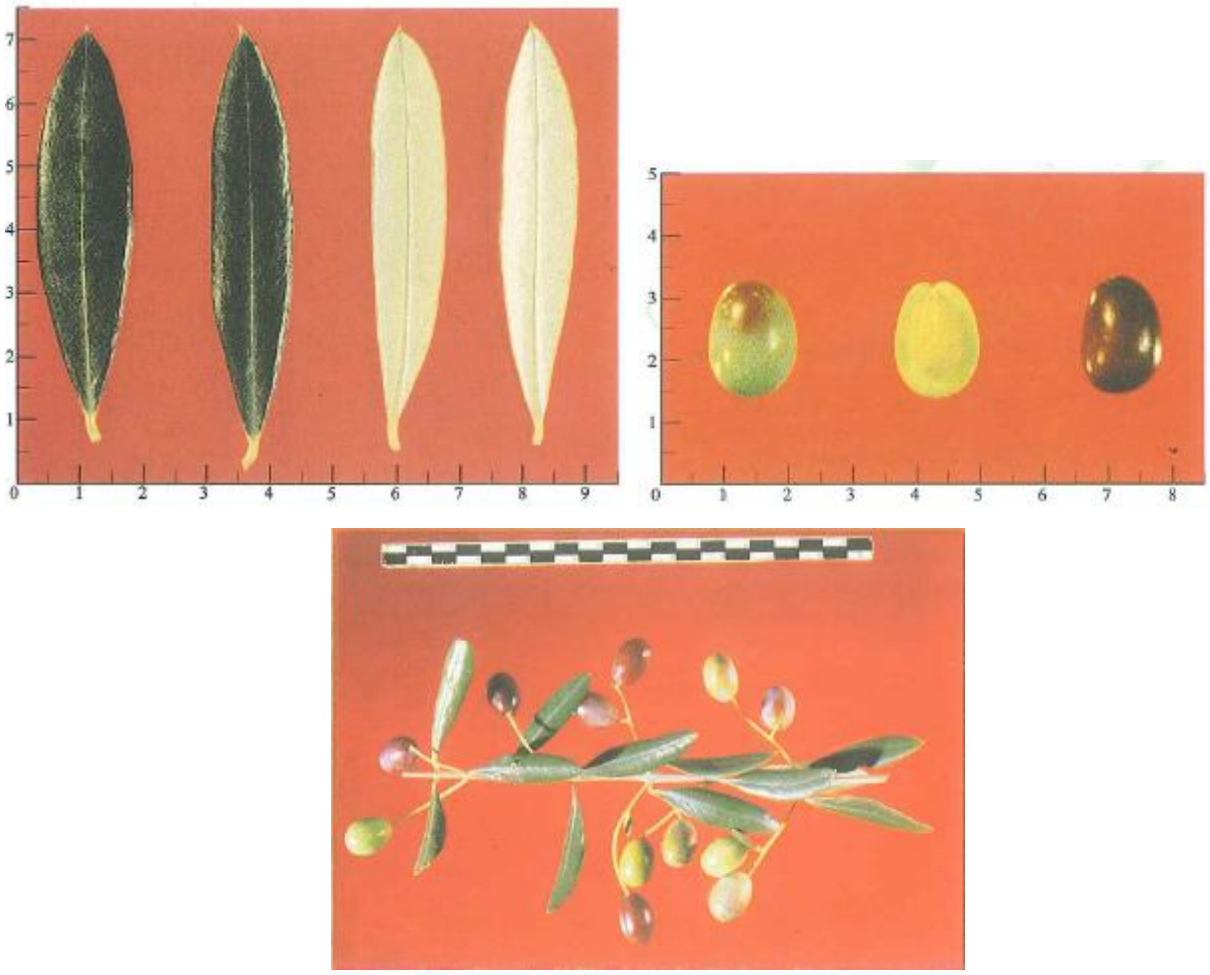


Figure 26: leaves, olives and branch of the Frantoio cultivar

2.3.3 Leccino

The Leccino cultivar is spread throughout Italy and other parts of the world, although its origin is probably to be found in Tuscany, due to its great resistance to the main adversities and the ability to adapt to different soils. It has a good resistance to low temperatures in the spring and is a self-sterile cultivar, therefore it needs a pollinator nearby. It is a medium-sized tree, with a broad and dense crown and upward branches.

The total polyphenol content is medium-low and the one of total chlorophyll is low; the content of oleic acid is high and the unsaturated/saturated fatty acid ratio is medium; the total triterpene alcohol content is average.

It produces medium quality oil if used in purity, but it is widely used together with other cultivars. Its resistance to low temperatures make it a widely used cultivars, especially in new plantations.

Leaves	
Length (cm)	5.72
Width (cm)	1.35
Shape	Elliptic
Surface (cm2)	5.67
Fruit	
Length (cm)	2.01
Maximum diameter (cm)	1.32
Shape	ellipsoid
Weight of 100 olives (g)	208.60
Symmetry	Slightly asymmetrical

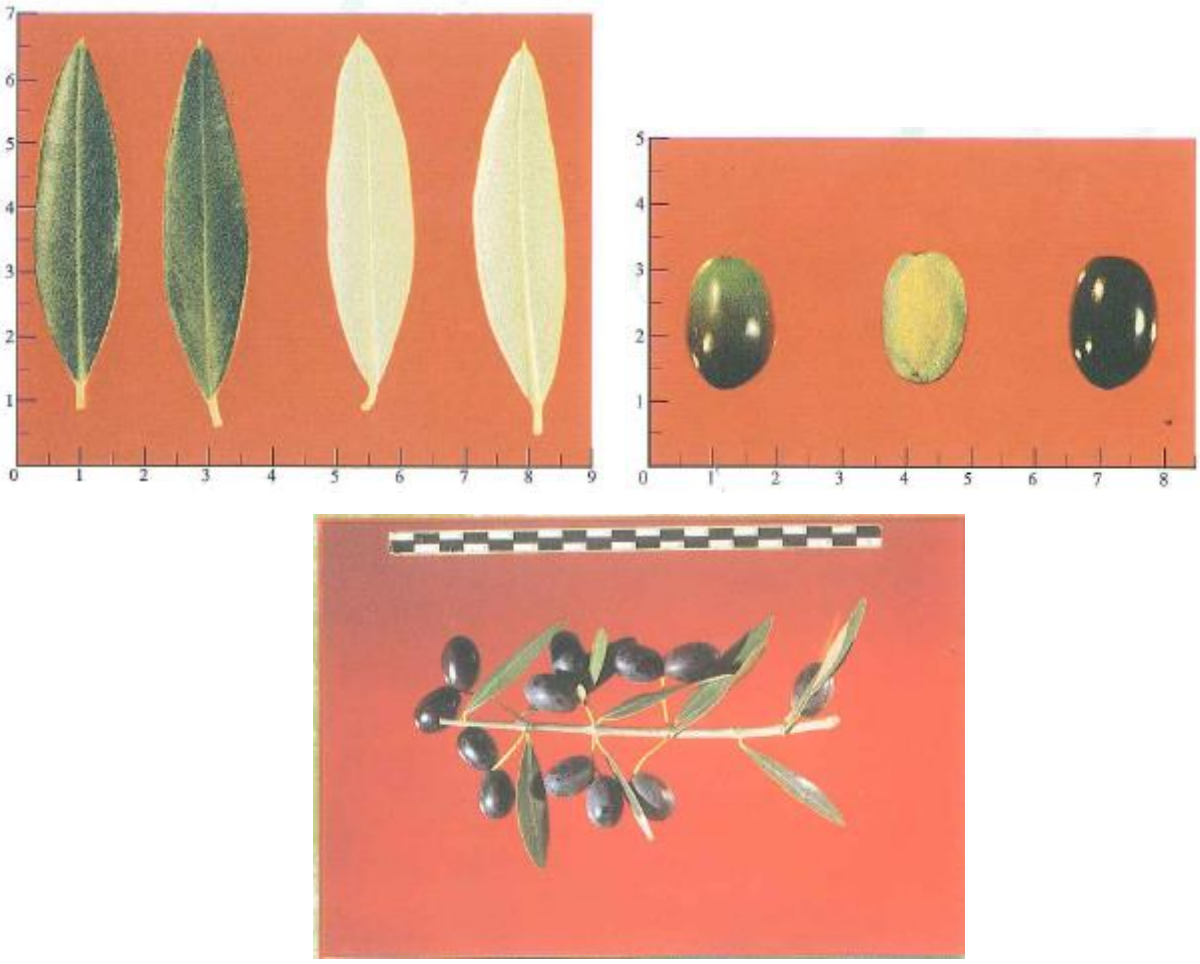


Figure 27: leaves, olives and branch of the Leccino cultivar

2.4 The role of traditional olive groves in the mitigation of climate change

The entire Umbria region promotes virtuous behavior for the divulgation of environmentally sustainable agricultural practices. In fact, greenhouse gas emissions mostly come from the energy sector: in the case of Umbria, agriculture's incidence is low, barely above 10% in 2010. In this scenario, we must consider that overall farming in Umbria has a low environmental impact: the agricultural land managed by high intensity input per hectare farms is 9.1%, while the national figure is 2.5 times greater (source: national rural network database). More than seven tenths of agricultural land is managed by farms with low intensity input per ha. Furthermore, 6.2% of the wooded land has environmental restrictions: this figure is 6 times greater than the national figure (1.1%). The contribution of the agricultural and forestry sectors to the mitigation of climate change mainly comes from the direct reduction of greenhouse gas emissions caused by agriculture (N2O from mineral fertilizers) and by carbon sequestration in the wood biomass of forest plants. The olive oil sector plays a very important role in the regional context. In Umbria 31,600 producers operate on a surface of a little more than 31,000 ha (60% circa of agricultural land in the region is dedicated to ligneous crops). Olive production systems can sequester atmospheric carbon through photosynthesis both of the herbaceous component (grass) and the arboreal (leaves). The carbon sequestered by balancing the photosynthesis process and respiration process is thus stockpiled both in the earth and in the woody parts of plants (for example the trunk and branches).

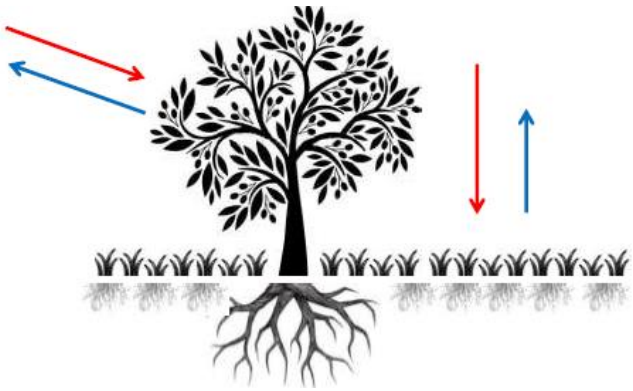


Figure 28: schematic illustration of the role of carbon sink in olive cultivation, with photosynthesis (red arrows) and respiration (blue arrows).

Recent studies have shown that the capacity for carbon sequestration on the part of olive groves can in average be compared with that of Mediterranean forests. The capacity for carbon sequestration of olive plantings varies not only in relation to climate conditions, but also depending on the type of agronomic management (implant density, plant size, grassing, etc.). The traditional cultivation practices employed in the proposed area (pruning, grassing, and green manure) have a fundamental role in transforming a significant part of atmospheric CO_2 into biomass and humus, increasing the flow of carbon from the atmosphere to the biosphere and the pedosphere.

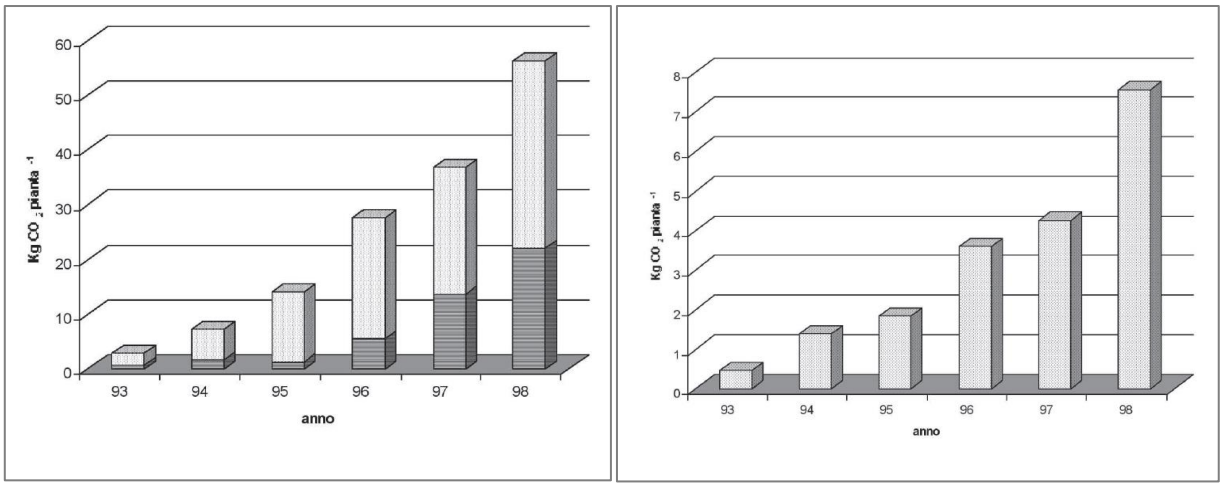


Figure 29: CO_2 fixed during the experimentation by the part of the olive trees above the ground (light gray) and below the ground (dark gray) (left) and CO_2 fixed by the leaves of olive trees (right) (Palese et al. 2004). During early years CO_2 is immobilized in permanent structures (trunk, primary roots, stump).

2.4.1 The first European project involving sustainable olive cultivation: OLIVE4CLIMATE

The University of Perugia is a leading proponent of the OLIVE4CLIMATE project, which has received funding from the European Union's LIFE fund for nearly 2 million and 400 thousand euro to study the relationship between olive cultivation and oil production, and climate change and desertification. The project led by the University of Perugia involves 8 partners (from Italy, Germany, Greece and Israel) among which are universities, research centers, production consortia and industries, with the aim of elaborating a systemic vision of the productive process of extra virgin olive oil to quantify and certify greenhouse gas emissions and their Carbon Footprint (CF), as well as the olive grove's (trees and soil) ability to sequester carbon dioxide from the atmosphere, determining the connection between sustainable farming techniques and the mitigation of climate change. Thanks to Israel's participation, researchers also intend to prove that the olive grove can be used not only as an instrument to reduce the amount of CO2 in the atmosphere, but also to contain processes of desertification thanks to the ability of this plant to adapt to arid climates, which, if properly managed, makes it possible to introduce new organic substances in the soil. Theoretical research will be combined with field studies in Italy, Greece, and Israel to respond to the challenge of implementing strategies to enhance the sustainability of the olive oil production chain through demonstrative actions, and promoting the cultivation methods that answer the need to mitigate climate change in the different production situations. OLIVE4CLIMATE aims to obtain many results in the sustainable management of the extra virgin olive oil production process. The idea is to create sustainable protocols for the management of olive groves and olive oil mills, including reuse of waste in the productive cycle. All this will make it possible to promote extra virgin and virgin olive oil through an adequate labeling that certifies the reduced or even positive impact of the product on the environment, designing the instruments capable of acknowledging the contribution of olive groves to the mitigation of climate change (such as the

creation of a market of “Carbon credits”), also in relation to desertification, thus opening the way for specific economic returns for virtuous companies.

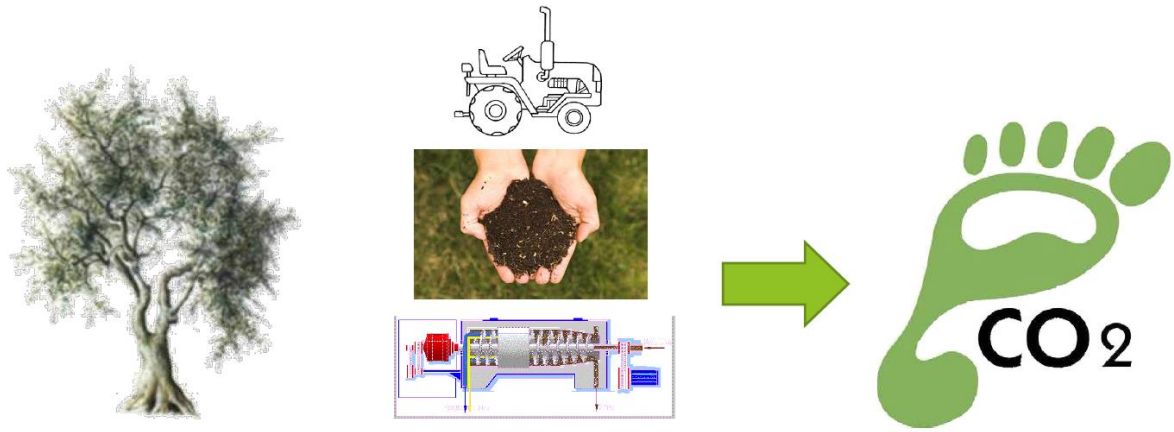


Figure 30: The aim of the OLIVE4CLIMATE project is to determine the quantity of carbon sequestered by trees to evaluate the contribution of olive farming to post-Kyoto policies in terms of CO2eq and any generated credits, which would be potentially marketable if adequately quantified and certified.

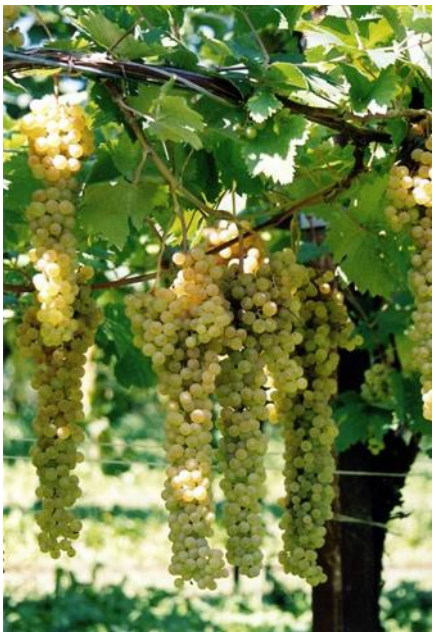
Figure 31: Conference presenting the OLIVE4CLIMATE project (Perugia, September 12, 2016).

2.5 Other crops

Other agricultural activities are commonly associated the cultivation of olive trees and are part of the agricultural system. The most common ones are the cultivation of cereals, fodder, vines, fruit trees, and mixed crops. All these activities are less important than olive oil production, from the point of view of the dedicated area, but they represent important incomes for the farmers and they show that the agricultural system was self-sufficient regarding agricultural products.

Olive oil was produced mainly for trading with the other Italian regions, while other products were produced above all for self-consumption. Nowadays, also the other products are particularly important for the local economy, since all of them characterized by high quality.

- **Wine**. Typical of the valley of Spoleto, is the cultivation of *Trebbiano Spoletino*, a variety of indigenous white grapes. In 1553 the scholar from Bologna, Leandro Alberti, described the pleasant plains between Foligno and Spoleto in his *Descittione tutta Italia*: "On each side of the via Flaminia you can observe, in this beautiful plain, fruitful fields embellished by several rows of grape vines paired with many rivulets of clear waters. And further you can observe great multitudes of almond and olive trees where in winter time the great thrushes nest, descending from the mountains in search of olives for their nourishment. This pleasant plain produces wheat and other fodder, and good wines and other fruits are extracted from it. Thanks to its beauty, as well as its fertility, it can certainly be listed as one of the beautiful and fruitful places of Italy." This was the period when mixed agriculture asserted itself as a manner of producing cereals, grapes and tree leaves useful to feed the animals without having to reserve part of the fields for hay. Thanks to the "flexibility" of this variety of grapes, *piantate*, i.e. fields with rows of maple trees that supported the vines, were established on the plains, on the hills, and even on the mountains. On hillsides, the rows were alternated with rows of olive trees. The first mention of the *Vinum Tribulanum* dates back to Pliny the Elder and his *Naturalis Historia* (1st century A. D.), in which it was described as a wine of noble origins. In modern times, this variety was considered a "luxury" cultivar because of the particular wine that could be extracted from it, simple and delicate in taste. Because of its great productivity, wine farmers called it "debt banisher." As the years went by, the cultivation and related production of Trebbiano



Spoletino gradually decreased because of the need to eliminate the cumbersome mixed cultivation, until it nearly became extinct. In recent years this precious variety was rediscovered and 22 wineries were established, triggering an increase in production. Because of its peculiarity, the Trebbiano Spoletino cultivar has been added as number 243 to the National Registry of Vine Cultivars, and has been classified as a DOC wine by the Ministry for Agricultural, Food and Forestry Policies with the publication, on November 30, 2011, of the production regulation for DOC SPOLETO wines. DOC SPOLETO territory includes portions of the municipalities of Campello sul Clitunno, Castel Ritaldi, Foligno, Montefalco, Spoleto, and Trevi, and its surface is about 23,600 ha at 200-550 meters a.s.l.

- **Saffron** was extremely widespread in ancient times. This spice with a unique and inebriating scent had different meanings. It was, for example, a symbol of unhappy love, evoking the myth of young Crocus who was in love with the nymph Smilax and other significations. Its use was varied: it was employed to color clothing, to prepare ointments and scents, to color the bandages of Egyptian mummies. The use of saffron in cooking dates back to the Middle Ages and the Renaissance, when it was used to color and flavor foods. In fact, it gives food a particularly intense aroma and taste, aside from the typical ocher color. Production of saffron in Umbria is first mentioned in the 13th century. Castel della Pieve (Città della Pieve) was considered the most important production area, while Valnerina is first mentioned in historical sources in the 15th century. In the 16th century Cascia became affirmed as one of the most active centers in the trade of this spice, mainly used as a pigment and later for its pharmaceutical and cosmetic properties. In the 17th century the cultivation of saffron was progressively abandoned, to be revived only in recent years. In particular, lately a group of farmers has reintroduced saffron in Valnerina and in some municipalities of the Apennine range between Gualdo Tadino and Spoleto, prompting the creation of new producers' consortiums.

- **Cannara onions**, aka *cannara flat (yellow and red)* have a white rounded bulb with convex (flattened) poles. They are sowed in full field in the month of May, while hoeing takes place in April and is repeated several times. Considering the peculiarity of the product, phytopathic control is carried out with copper-based products. The harvest takes place in July and August, and the onions are left out in the field to dry. Later come the cleaning and selection phases, when the product is divided by

type and size. The bulbs are then “braided” and ready to be sold. This is actually not a specifically local cultivar, but an onion belonging to three cultivars (Florence Red, Rovato Borrettana, Parma Gold), which becomes a particularly appreciated high-quality product when grown in this partially swampy sandy-clay soil.

- **Trevi black celery** is, without a doubt, one of the most unique vegetables cultivated in the Province of Perugia. Its stalks remain green even when fully ripe. This vegetable is known at least since the 19th century, when it was mentioned in some historical documents. Black celery was served to the passengers of the ships that, at the times of the Papal States, sailed to America from Genoa, Livorno, Naples, etc., because it was an “excellent second course that kept for a very long time and was an aphrodisiac.” The features of black celery, the cultivation of which experienced a downfall after the Second World War with the arrival of American celery, are its length – greater than most other varieties, it can measure as much as 1 meter – its dark green stalks, the fact that it has no strings, and its strong scent. If let grow without special attention it is very dark, and takes on a lighter coloring only if buried under the ground: a white-stalk celery, without strings, with a sweet and pulpy heart. The operations carried out to obtain “Trevi black” are rigorous and have remained unvaried for centuries. Sowing takes place in April under a waning moon. Traditionally it took place on Good Friday because, according to local farmers, vegetables planted in this period grow faster and flower later, and to this day many farmers follow this rule. Trevi farmers are extremely jealous of their seeds and each reproduces his own taking them from the best plants at the end of every season. In mid-October, the celery is ready to be harvested and is sold mainly on the local market, at most reaching the city of Perugia. The particularly intense flavor of Trevi black celery is enhanced in local cuisine, in dishes that are regularly offered during the yearly festival (and throughout the month in some restaurants of the area): the classic oil dip, black celery *parmigiana*, and stuffed celery. The latter is a rich recipe that brings together vegetables, sausages, and extra virgin oil, and is representative of the uniqueness of the foodstuffs of this area, whose central theme is: the complicit encounter of the civilization of lard with the culture of oil. The sale of the celery usually takes place directly “from the field to the market.” On the third Sunday in October, the Black Celery Festival is held in Trevi.

- **Cave di Foligno bean**. Near the town of Foligno two varieties of bean have been cultivated for over a century – green and yellow – both with thin skin, easy to cook, and excellent in taste. Cave is more a neighborhood of Foligno than a town unto itself. It rises on a hill barely 200 meters a.s.l., on the right bank of the Topino river. For over a century a bean in two extremely rare varieties has been cultivated here: the *giallo* (yellow) and the *verdino* (green). It seems that the most ancient of the two is the *giallo*, from the beginning of the 20th century. Main (and sometimes only) food of farmer families until the '50s, production reached 10 tons circa, but, as has happened in the rest of Italy, with the advent of progress there was a depopulation of the countryside, generating a migration towards the city and new jobs. This is the reason why today the quantity produced is much diminished, barely reaching 1000 kg. And this is the reason why Cave beans are an absolute rarity, hard to find and unique in quality. Because of their limited production, they are known only by a small number of experts who manage to acquire them in limited amounts. However, everyone may have a chance of tasting them during the famous "Cave bean festival" that takes place in the last week of October, when the entire production is used up. In Cave, this particular bean acquires a unique organoleptic profile and flavor, thanks to the fertile low-calcium soil that endows it with intense flavor and scent. It is cultivated without chemical fertilizers, pesticides, or herbicides. Harvest takes place between August and September by reaping. Then, once the beans have been dried in the sun, they are beaten and shucked (hence the expression "shucked Cave bean"). After drying, which takes place in special areas, they can keep up to a year if preserved carefully in hermetic glass jars. Their extremely fine skin makes them easy to cook, pleasant to eat, and very versatile for the preparation of dishes such as soups, pasta, and side dishes. A veritable delicacy are the amazing *fagioli all'uccelletto*, with tomatoes, oil, sage, garlic, salt, and pepper. A curiosity: we do not know why the dish bears this name even though it does not contain poultry (uccello = bird). A plausible answer is the one given by the great gastronome Pellegrino Artusi who thought the name came from the use of the same herbs employed in the preparation of roast birds.

- **Black truffle**. Umbria, and the area proposed, is also well known for the production of truffles. Traditionally truffles were gathered in the oak woods of the area, using dogs or pigs. Over the last 20 years, many truffle plantations have been established in Umbria, using *Quercus ilex* and other trees with mycorrhizae. These plantations have a negative aesthetic impact on the local landscape and they should be object of careful evaluation. Fortunately, in the proposed area, their total surface is still less than 1%, according to 2011 data. The prevalent variety of truffle present in the proposed area is the Select Black Umbria Truffle (*Tuber Melanosporum*): it grows in calcareous soil with a high clay content, and lives in symbiosis with other plants, especially oak and holm oak, but also beech and chestnut. Its size can vary from that of a nut to that of an apple; it is roundish and often irregular; its surface is rough to the touch, but not sharp-cornered. It has a strong aromatic smell, and blackish-reddish pulp with fine white veins.

- **Honey**. Another activity carried out in the proposed area is the production of honey through the presence of beehives. Two varieties of honey are mainly produced: *millefiori* and acacia. Bees are an excellent indicator of the health of the environment and of the olive groves, which means that the treatments carried out in olive groves are carried out according to the rules on integrated control, for example regarding active ingredients used. Moreover, bees are useful to the olive grove ecosystem as a whole, since, by encouraging the cross-pollination of the annual wild plants that frequently cover the soil of the olive groves, they contribute to maintain a greater level of plant and, consequently, animal biodiversity.

- **Asparagus and chickens**. The practice of raising chickens and cultivating asparagus (*Asparagus acutifolius*) in olive groves is a particularly useful consortium that guarantees high quality products and that exploits the characteristics of each component to enhance the others. Wild asparagus is a plant that, like the olive tree, adapts to stony, poor soils, withstands drought and high temperatures. Unlike the olive tree, however, asparagus prefers the shade, so that beneath the olives cover, the asparagus grows very well. The chickens provide manure for the olive groves and, at the same time, they control the weeds, while they do not eat the asparagus because they are provided with thorns. This practice can represent an important income, since it is possible to control the weeds in the olive groves without using chemicals, providing manure to the olive trees, obtaining other appreciated products such as asparagus and high quality chickens.

3. Local and traditional knowledge systems

3.1 Traditional olive groves

3.1.1 Planting techniques

Most of the olive groves of the area are fruit of the interventions supporting new groves designed at various times by the Papal States beginning in the second half of the 18th century until the Unification of Italy. The olive trees were planted with a regular layout to make counting them easier for those responsible for controlling and giving out incentives. The work passed on to the newly born Italian State, contributing to the transformation of the landscape all along the hilly regions surrounding the basin of the Tiber river and its many tributaries. In the first decades of the 20th century the olive tree was still considered of the utmost importance both economically – for its rich product – and socially – for the vast use of labor in the winter season. The cultivation was mainly associated with herbaceous or arboreal crops in the sharecropping farms at the lower limit of the specie's altitude profile, on the valley edge, where the soil is more fertile. Mixed cultivation played an important role in the economy of small producers, with the intention of making farmer families independent. Monocultures were mainly carried out at greater altitudes, where it was the prerogative of medium and large properties. The two types of cultivation are different in the density of the grove, with the olive trees much further from one another in mixed cultivation to make it possible to plant fodder and cereals between them.

Municipality	Assisi	Foligno	Spello	Campello sul Clitunno	Spoleto	Trevi
Number of olive trees per hectare in monocultures	282	250	269	280	280	220
Number of olive trees per hectare in mixed cultivations with fodder or cereals	73	110	108	119		110

Tab 1: Number of olive trees per hectare in monocultures and in mixed cultivations with fodder or cereals, according to the Agrarian Cadaster of 1929.

In the second half of the 20th century, the surface devoted to olive farming and the number of olive trees progressively decreased, mainly because of the structures antiquated, compounded by the damage caused by frost in 1929 and 1956, which led to the death of many trees that were not sufficiently replaced. Furthermore, over the last decades the uprooting of plants in the areas nearest the plains where mixed cultivation had been practiced, the abandonment of the olive groves in areas difficult to reach, and the lack of incentives for the creation of new groves have determined an ulterior contraction of the surface cultivated with olive trees. For pedoclimatic and

orographic reasons, in these areas there aren't many farming or work alternatives, so the income of many farmers comes entirely or mostly from olive cultivation.

Olive groves are regularly fertilized using organic manure coming from *Chianina* cattle, a native bovine breed known and used for centuries in Central Italy.

3.1.2 Pruning techniques and traditional management of phytosanitary problems

In the past, pruning was mostly tied to the necessity of curing the plant, eliminating dry and withered branches attacked by parasites, but it was also often used to collect wood for the fire. However, in ancient agronomy handbooks there are several references to strictly biological aspects, and pruning was also used to control production. A veritable revolution in the area of olive pruning in evolved countries and especially Italy took place during the last century. Pruning and cultivation underwent serious changes, often to adapt to new scientific or technical knowledge, to the availability of specialized labor, and the productivity of the olive grove. Traditionally, the olive groves present on the Assisi-Spoleto slopes are grown in an open center bush shape. The open center bush can be obtained both by planting a single 2-3-year-old plant, which is cut a few centimeters from the ground immediately after it is planted and then let it grow freely for 2-3 years, or placing two or three 2-3-year-old olive trees in the same hole at an appropriate distance from one another, then letting them grow undisturbed for 2-3 years. In both cases, a bushy crown is obtained. The management of the crown is based on many years of pruning with the suppression of main branches preemptively annulated to maximize their productive potential, substituting them with offshoots. The crown will have to be kept open in the center, removing the vigorous offshoots that develop vertically inwards, and the tops should be made lighter by thinning out the lateral offshoots that can make them too thick. The pruning is completed with the removal of exhausted fruit-bearing branches and regular trimming of the tops to contain upward growth. Keeping the environment in mind, the planting distance between open center bush plants varies from 5x5 m to 7x7 m. It is a farming system adopted by family run farms because of the elevated use of manpower for harvesting and pruning, where the only possibility of minimizing labor is the use of mechanical systems.

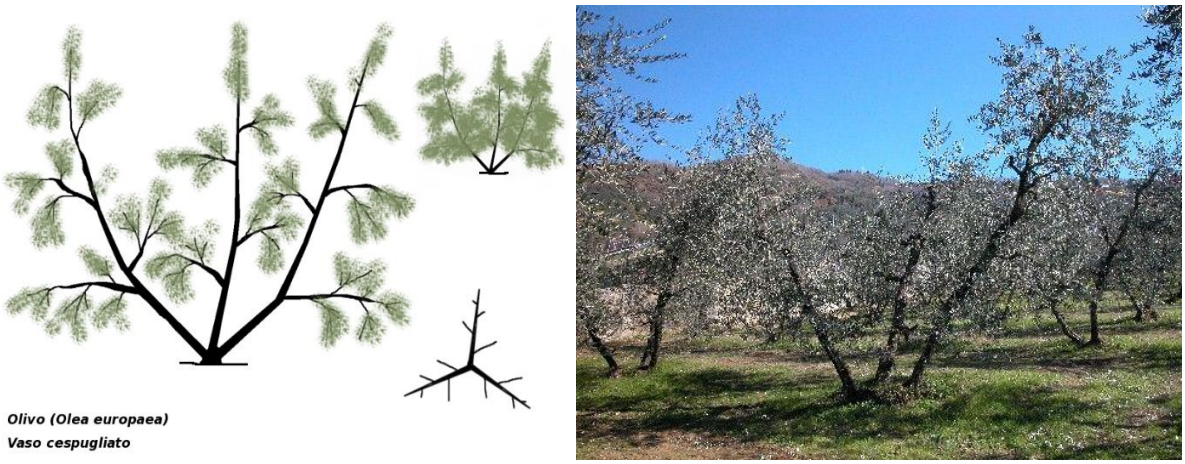


Figure 32: Open center bush

The traditional pruning techniques are particularly effective in controlling phytosanitary problems. In fact olive trees in the area are frequently threatened by two common diseases:

- The olive fruit fly, or *Bactrocera oleae*, is a diptera brachycera and is one of the olive's worst enemies in the regions in which it is present, heavily influencing the quality and quantity of production in most of the area of cultivation. In Umbria there can be two or three generations in one year. The adult measures 3-4 mm and has transparent wings with small dark marks on the extremities, grey chest with long dark longitudinal markings, and a yellowish mark between the abdomen and the chest. The female is easily recognized because, unlike the male, it has a sack in the end part of the abdomen containing the ovipositor. The female deposits, in average, 2-4 eggs a day in the summer and 10-20 eggs in autumn. Attacks tend to increase in the more humid and cooler regions of the cultivation area, varying greatly depending on the cultivar, and become less frequent in areas with hot, dry summers.

Figure 33: Seminar organized by the Consorzio di Tutela Olio DOP Umbria on March 16, 2015 in Assisi to discuss all the issues related to olive cultivation and the olive fruit fly.

- The olive peacock spot, or *Spilocaea oleaginea*, is a fungal plant pathogen and one of the greatest threats for olive trees. The name "peacock spot" comes from the shape and color of the spots that the disease causes on the olive leaf, similar to the eyespots on the feathers of a peacock. Peacock spot attacks all the green organs of the plant. The symptoms of this disease are visible on the upper surface of leaf in the form of roundish, concentric brown rings with a yellowish halo around them. The fungus spreads through agamic spores (*conidia*), that flourish in rainy or humid periods of 2-3 days. These spores, carried by wind or rain, deposit on the healthy organs of the plant and penetrate the cuticle, developing the mycelium in the sub-cuticular layer. Attacked leaves fall off the plant at a later stage. The incubation of the disease, i.e. the time elapsed between the infection caused by contact of the spores with the plant and the appearance of the spots, can vary, in our environment, between 3 and 5 months. This fungal pathogen is widespread in the entire olive cultivating area. It remains vital in the tissues of the plant year-round, with periods of dormancy during the unfavorable seasons, i.e. winter (below 5°C) and summer (above 25°C).

One of the most interesting traditional techniques used to repair the affected by caries (or *lupa*) is called *slupatura*. It is carried out by removing with the chainsaw, axes, chisels (or other useful tools for this purpose) the parts of decayed wood, then trimming the edges until it reaches the healthy wood, and finally disinfecting the wounds with products based on copper.

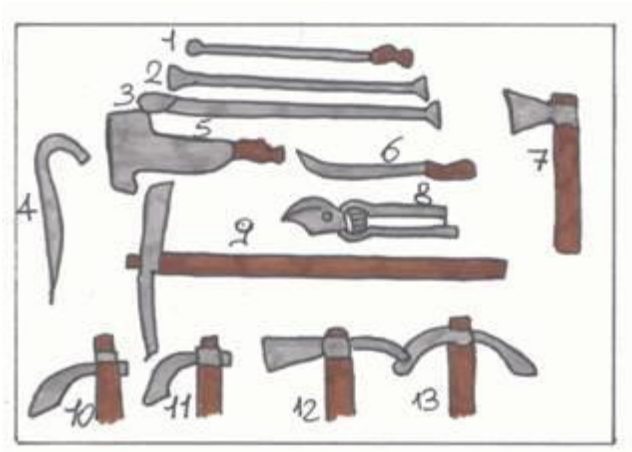


Figure 34: The slupatura *is traditionally used to remove caries on olive trees (left). It is carried out using traditional tools right).*

3.1.3 The olive harvest

The harvest is the last phase of the production process, closing the annual cultivation cycle. From a productive point of view, it represents the final act of the various cultivation operations carried out throughout the year, both on the tree and on the land. Thus, it is a particularly delicate phase of the productive cycle. In fact, if it is poorly performed, it can compromise the efforts carried out through the implementation of the various cultivation processes, negatively affecting the final quantity and/or quality of the fruit, at least as far as the operations that take place in the field are concerned. The production of extra virgin olive oil is, to this day, carried out with the aim of achieving the greatest quality possible. Hand harvesting of olives at the beginning of October, when the fruits are not too ripe, is the prerequisite for a fresh, low-acid product. When harvesting by hand, nets are spread under the plants to collect the fruits dislodged by “grazing”, which is carried out with a specific hand-rake, which is used to comb the branches to remove olives with as few leaves as possible without damaging the structure of the tree. When the nets are retrieved, the olives are transferred to large vats, which are carried away by tractors so the fruit can be processed at its utmost freshness and integrity.

Figure 35: Painting by famous painter and sculptor Norberto Proietti (Spello 1927- Spello 2009) (above) and pictures of hand harvesting of olives (below).

3.1.4 The processing of the olives

The processing of the olives is also particularly important to ensure a product of the utmost quality. The oil is obtained by cold pressing (temperature inferior to 27°C) the crushed olive paste to avoid overheating, thus safeguarding all the important nutritional and biological components, among which monounsaturated fats, antioxidants, and vitamin precursors. It is thanks to this chemical "heritage" that the oil produced in this area has important nutritional properties: the monounsaturated fats, among which oleic is predominant, and the antioxidants have an important control action on total and LDL cholesterol, thus reducing the accumulation of both. The processing of the olives takes place through seven phases:

- Weighing: carried out at the olive oil mill at delivery
- Storage: to reach an amount sufficient for a processing cycle
- Washing: immersion of the olives in special washers

- Crushing: pressing with emission of cellular juices
- Kneading: mixing of the oil paste
- Extraction: separation of wort from pomace
- Centrifugation: separation from water

The continuous cycle oil mill is still a relatively popular system in traditional oil mills where it is necessary to take some precautions so as not to lower the quality of the oil. You must keep in mind that with this system the exposure of the olive paste to air increases, causing the loss of antioxidant compounds in the oil, even if there is an increase in aroma, so the oil tends to be sweeter. This type of plant has: a deleafing and washing system; a pressing and kneading system with stone millstones; a system of oil extraction by pressing; a vertical centrifuge system (or separator) for separating the oil. The extraction process consists in the milling of the olives through the millstones. By pressing the paste in the filtering containers you obtain a wort made up of oil and vegetation water and olive residue with very low humidity. The separation of oil from vegetation water takes place in the next passage, in the vertical centrifuge.

Figure 36: Olive oil mill

3.2 Traditional agricultural system: the multifunctional role of terraces

The diffusion of agricultural systems throughout a territory with an extremely varied morphology such as that of the slopes between Assisi and Spoleto has always had to face the challenge of nature's reactions, especially since in modern times cultivated areas have begun to spread to higher altitudes, occupying steep inclines with a fragile equilibrium. When adapting the fields, local communities had to face the challenge of surface and rain water run-off, or, on the contrary, their stagnation, each time evaluating which was the minor risk or in any case designing a farmland among the most anthropized and at the same time harmonic. Olive cultivation is traditionally practiced on slopes with fairly variable, but usually steep, inclines. The border between the upper end of the cultivated area and the woods is often clear-cut and geometrical, forming horizontal, vertical, or oblique boundary lines that, breaking the slopes and the continuity of the woodlands, enhance the contrast between the dark green compact irregularity of the woods and the silver green sparse geometries of the olive groves. When surfacing rocks tend to prevail, the borders between olive groves and woods lose their continuity because portions of grove are interspersed with the woods, creating a more natural and harmonic transition. The lack and/or inadequacy of plant covering that makes the inclines fragile, an easy prey to erosion and hydrogeological instability, has led to the need to defend these territories from hydrogeological risks and the plains below from flooding. Thus, with hard, massive, and century-long work the profile of the slopes of mountains and hills has been transformed to obtain strips or patches of land suitable to be farmed and to preserve from erosion the small amount of available land, which was sometimes brought up from the valley by workers carrying it on their backs, thus giving the steep inclines the features typical of the area between Assisi and Spoleto. Thanks to these efforts, olive groves are a constant feature of the hilly landscape. The presence of dry stone terraces or of earth terraces is minimal on the plains and on moderately steep hills, while at higher altitudes, where the incline increases, it is frequent and quite visible even from a distance.

Terraces are considered as one of the most evident anthropogenic imprints on the landscape, covering a considerable part of terrestrial landscapes. Terraced agricultural systems have an important multifunctional role: terracing has been used to conserve water, alleviate flooding risks, reduce erosion, expand high-quality croplands and restore degraded habitats; more recently, this practice has been found to improve other ecosystem services (ESs), such as carbon sequestration, food security as well as recreation (Wei 2016; Agnoletti et al. 2015; Agnoletti et al. 2016). Terraced agricultural systems are also considered of primary importance for the adaptation/mitigation of climate change and in particular as a key management strategy to minimize climate-induced disasters in fragile landscapes (Andrew and James, 2011).

Historically, terraces represented a complex system for managing slope dynamics (from the conservation of the soil to the triple function of runoff, drainage and the collection of rainwater, etc.). The deterioration of a hillside, artificially in equilibrium, leads to the reactivation of erosion

phenomena (Arnaez et al. 2011), the loss of fertile soil and the increase or disordered evolution of runoff (Tarolli et al. 2014). With the abandonment of the terraces and the cessation of maintenance works on the drainage systems, the soils begin to be saturated and the hydrogeological processes previously controlled by human intervention tend to restore the original profiles of the slopes (Poyatos et al. 2003; Lesschen et al. 2008). The dry stone walls are important to reduce slope length, trap erosion sediments and reduce soil erosion (Bazzoffi 2009). According to Van der Zanden et al. (2003), Italy has one of the highest density of dry stone walls together with other Mediterranean countries. Those results allowed to model for first time ever the contribution of stone walls in reducing erosion at European scale (Panagos et al. 2015).

The role of terraces in the control of surface run-off is well known (Llorens *et al*. 1992; Gallart *et al*. 1994), just like its role in the control of superficial erosion and increasingly superficial instability phenomena (Bellin *et al*. 2009; Romero Diaz *et al*. 2007; Shrestha *et al*. 2004). In previous studies (Preti 2001, 2002) the subject was discussed of the increase of hydrogeological risk related to terracing. Other studies carried out in the mountainous regions of Tuscany and Liguria (Agnoletti 2007; Agnoletti et. *al*. 2012) have brought to light the relationship between the abandonment of terraced areas and hydrogeological instability. The colonization of the woodlands can be connected to the deterioration of terraced systems (both as effect and as a cause), and thus to an increase in the risk of erosion and landslides. In Italy, from the '50s on, the progressive abandonment of agricultural areas has caused the deterioration of the adaptations of the inclines, leading, in some cases, to the collapse of the structures. The study of the adaptations of slopes has gained special importance over the past few years with the growing awareness of their economic, environmental, historical and cultural importance, aside from the well-known hydrogeological functions carried out by terraced landscapes, such as erosion control, stabilization of the slopes, the lengthening of the time of concentration and the possible reduction of the volume of surface run-off.

Inside the proposed area, works were carried out with different systems in function of the incline of the ground, and three types can be identified:

- Dry stone terraces
- Earth terraces
- Dry stone *lunette*

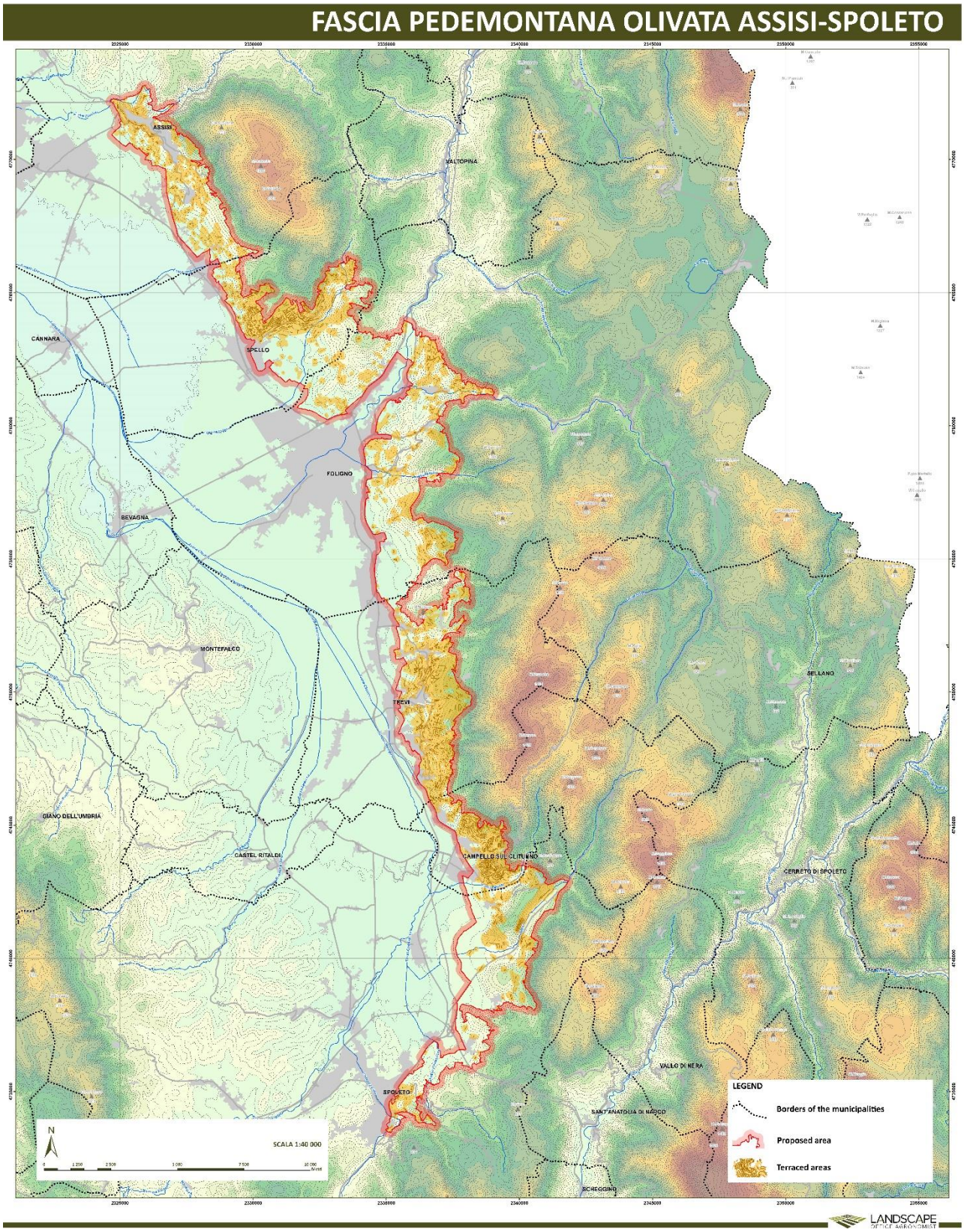
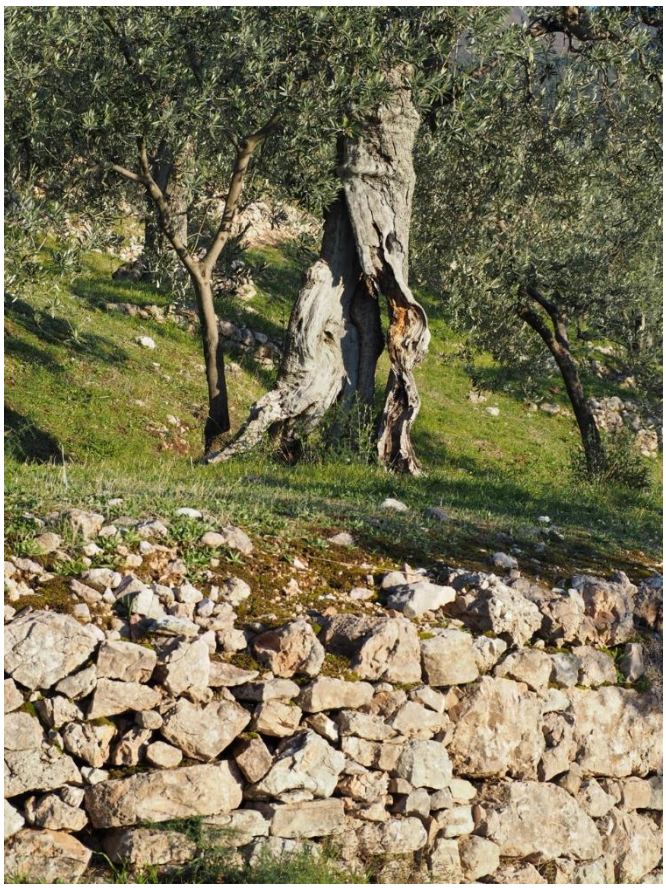


Figure 37: map of the main terraced areas (author: Andrea Sisti - Landscape Office Agronomist S.r.l.)

3.2.1 Dry stone terraces

Terraces in the strict sense of the word are a series of dry stone walls that shape the incline into more or less regular arable embankments, generally constructed with stones found on the spot and set one on top of the other so as to ensure perfect drainage of excess water. It is a system that, if properly implemented, gives great stability. The walls were used to create "*pianette*," i.e. flat surfaces that can hold the rows of olive trees with a variable depth (in average between 5-6 meters) in function of the incline of the terrain and the height of the wall (one meter at most). Wooden jigs were used to align the stones with a string. Peculiar elements of the walls are the crown and the tenons, both functional to the structural stability of the wall. The crown stabilizes the summit of the wall, protecting against its disintegration, while the tenons reduce the movement of the structural stones, limiting stone on stone slippage.



The terracing of the area between Assisi and Spoleto was carried out on rocky hills with an incline greater than 40%, erecting dry stone walls that ensured the containment of the soil in the terraces, which were flat or slightly inclined. The operation began in the second half of the 18th century together with the construction of *lunette* when, to expand the cultivation of olive trees to the upper hills, the need arose to use steeper terrains. The use of terraces depends on the availability of hard materials, such as limestone, accumulated by the removal of stones from the soil. The walls can vary in height and be parallel and continual, follow the curves of the land, or be fragmented, depending on how steep the inclines are and how wide the terraces. Compared to embankments, the stone structure becomes more evident than the soil so much that seen from below the latter tends to disappear, while it remains visible from above. You should bear in mind that terraces include, in fact, several forms of adaptation to different local conditions; thus you can find walls consolidating the foot of a small escarpment ("underscarp walls") or crowning a small escarpment ("overscarp walls"). Finally we should remember the various finishing touches of terraces, an expression of the different customs and needs of those who built and used these hydraulic-agrarian adaptations, among these, protruding stones used as steps.

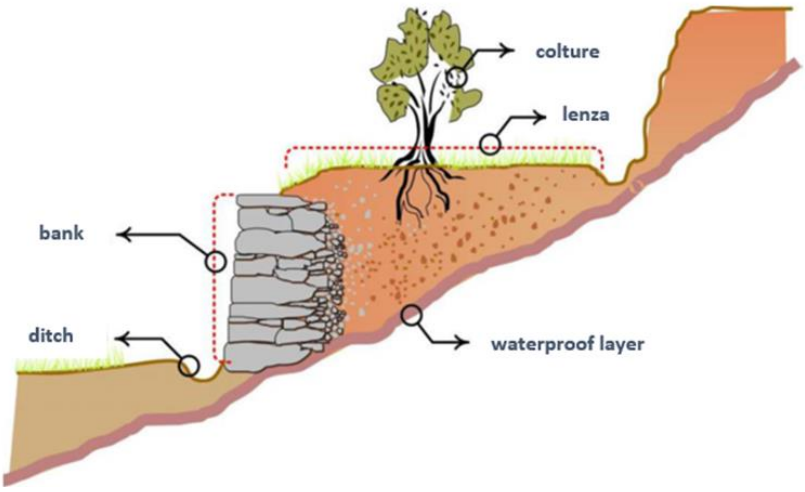


Figure 38: The sstructure of a traditional dry-stone terrace. Lenza (pianetta in dialect) is the technical term indicating the part of the terrace on which the cultivation is carried out.

The average size of the dry stone terraces is the following:

- Height from the ground: 1.20 meters with con le foundations varying from 0.20 to 0.30 meters depending on the different depth of the soil.
- Width: 0.50 meters.
- Length: 120 meters.

The total volume determined is therefore equal to 84 m^3.

Figure 39: Terraced olive groves near Trevi

Figure 40: terraced olive groves near Spello.

3.2.2 Earth terraces

The simplest adaptation are earth terraces, which were built beginning in the 14th and 15th century: thin, long terraces are created, as adherent as possible to the orography of the area, with few movements of soil around natural horizontal spaces and banks created with the solidification of the soil, sometimes simply pressed, in other cases with the brink solidified by clumps of grass or rocks in the steeper spots. The alteration of the slope isn't major, the breadth and shape of the terraces are quite varied, as they are based on the shape of the slope. Planting, though it usually follows the line of the banks, is not regular, the trunks closer or farther from one another. The earth terrace system was employed on hills with inclines under 40%, adapting an escarpment in rammed earth. As they are created by shifting earth, it is the simplest hill adaptation system. The level areas are narrow and long, often inclined, and follow the orography of the area, supported and separated from one another by very steep, but not vertical, grassy inclines, erected by pressing the earth, in some cases reinforced with stones and boulders in the steepest sections. The breadth and shape of the embankments depends on the orography. The olive trees are usually in a single line following the edge of the embankment. Thus the regular incline of the slope becomes a series of descending terraces, which however do not create an excessive alteration of the hill from an aesthetic point of view, though the shades of green of ledges, escarpments, and crowns of the trees create evocative plays of color, volume, light, and shadow, which can vary throughout the day and in different seasons, giving the landscape a sense of rhythmic liveliness.

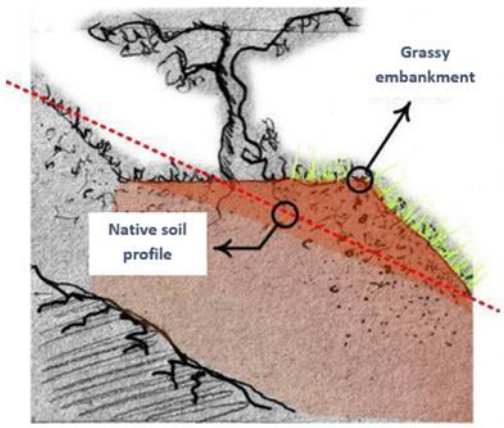


Figure 41: earth terraces near Trevi.

3.2.3 Dry stone *lunette*

The *lunette* system was adopted on the steepest, most inaccessible inclines with surfacing rocks. The limited amount of precious soil around the plant is sustained and contained with semicircular dry-stone walls of various heights, often staggered among adjacent rows. The rock is excavated to create a step on which to set the first stones with which the half-moon shape of the *lunetta* is formed, a semicircle between 3 and 6 meters in diameters. The base stones can be large in size,

but in most cases, when large boulders are not available, the base is built with the rocks themselves. The base is used to create a containment wall that, adjusting to the terrain, forms a coplanar circuit. The dry-stone walls erected above them are nearly never arranged in rows; rather, the stones taken from the fields are arranged in such a way that all the facets of the stone are adjacent to one another. Here lies the ability of those who construct these kinds of structures: in creating a grid pattern. If this is not possible, the stones are fastened to one another with wedges or smaller stones filling in the empty spaces. The constructions are erected entirely without mortar so as to let water flow away without hindrance. The wall is built in counterslope with an inclination of about 10 degrees. As the wall rises, the space behind it is filled with stones, pebbles and detritus so as to create a drainage, which rises as the height of the wall increases. The olive tree is planted by digging a 60 cm hole in the rock, about 1 meter in diameter. Once the plant is inserted, the drainage and the hole are filled with soil. Finally, the *lunetta* is filled with a 20-centimeter layer of soil. The olive tree is planted in the center of the *lunetta*. This system makes it possible to use land that would otherwise remain unproductive or at best used for pasture. The *lunette* system is used with inclines in average superior to 45%, where other types of terrace wouldn't be feasible.

The average size of the dry stone *lunette* is the following:

- Height from the ground: 1.40 meters with con le foundations varying from 0.20 to 0.30 meters depending on the different depth of the soil.
- Width: 0.30 meters.
- Length: 4 meters.

The total volume determined is therefore equal to 1.28 m^3.

Figure 42: olive groves with dry stone lunette near Trevi.

Figure 43: olive groves with dry stone lunette in Collepino.

3.3 Management of water resources

The Umbrian Valley is a territory that is morphologically characterized by the Spoleto-Foligno basin, tectonic in nature, an ancient lake watershed, bordered by the parallel mountain ranges of the Umbria-Marche Apennines: to the west the rounded mountains of the Martani Mountains, to the east and north-east from Mount Serano to Mount Subasio, with the highest peaks in the Sibillini Mountains and the high Valnerina. Hydrographically the network of the Topino and its tributaries, and the Marroggia-Teverone-Timia system, tributaries of the Tiber, characterize the plain. The Nera, instead, runs through the gorges of its namesake valley. As always happens, the territory's waters – spring, flowing, or stagnant waters – have conditioned the presence and the development of human settlements, roads, economic, civil and cultural life. The issues connected to the supply, control and safeguard of the same water through aqueducts, wells, cisterns, and fountains, are always at the root of human history and object of the attention of public, private, secular, and religious powers. The abundance of water is one of the reasons why manufacturing plants flourished (not only mills, but also paper factories, tanneries, wool mills and dye works, soap works, and small wax, sugar almond and chocolate manufactures). The Benedictine monks were among the first to bridle the power of water. The sale, in the 18th century, of most of their properties led to the exploitation of water as a resource on the part of local communities and the important houses of the time, who sometimes built sumptuous villas next to the factories. The plants, mostly active 'till the beginning of the 20th century, could not withstand the competition of

industrial production, which sometimes reconverted their activities, as was the case of Serrone, whose mill was turned into a hydroelectric plant in the 20th century.

The olive grove slopes between Assisi and Spoleto are, to this day, marked by a bountiful presence of springs connected to thaumaturgical and therapeutic sanctuaries, mostly Christianized but founded on pagan holy places, such as the famous Clitunno Springs. In Roman times, aside from several villas and sacellums, in this area there was an important sanctuary dedicated to Jupiter Clitumnus, probably derived from an extremely ancient spring-water cult. Today's layout is fruit of the work of Count Paolo Campello della Spina, who between 1860 and 1865 made room for the lake and repopulated the fauna and flora typical of the location.

Figure 44: Clitunno Springs (Campello sul Clitunno)

Remains of Roman aqueducts are visible in the municipality of Spello, dating back to the Augustan period, or in the municipality of Spoleto, on the slopes of Mount Borgiano, where remains were discovered of Roman hydraulic infrastructures, presumably dating back to the 1st century BC, bearing witness to the fact that today's waterworks retrace the ancient Roman aqueduct.

There are also many fountains, connected to the springs or to the more articulated aqueduct system, which in larger and better organized communities took the place of cisterns and wells.

Hot springs emerged in connection with recovery works carried out between the 15th and 17th century to regulate the regime of the watercourses, mostly torrential, and to dry out the swamplands to cultivate the plains.

Finally, many bridges and mills bear witness to the hydrological bounty of the area and the importance of this resource. The bridges are part of an articulate, changing and functional waterway and road system. The water mills are characterized by a horizontal hydraulic wheel, more suitable than the vertical for waterways with a variable flow rate, with low installation and

maintenance costs. The horizontal blade system is made of large wooden scoops mounted in a crown around a hub connected to a vertical shaft that passes through the lower, fixed stone millstone, directly transmitting movement to the superior millstone, which instead rotates, grinding. In Borgo Garibaldi, at the foot of the historical city center of Preci, there is a fully functioning hydraulic mill.

Figure 45: Water mill recently restored in Preci (municipality of Foligno) (left) and the Ponte delle Torri in Spoleto (right) built in the 14th century on the remains of a roman aqueduct. It is still possible to walk across it.

4. Cultures, value systems and social organizations

4.1 The role of the olive tree in local religious traditions

The olive tree occupies a predominant place in the Mediterranean world because it has always been typical of its agricultural landscape, its eating habits, and its cultural and religious symbolism. Since ancient times, the olive tree was considered a transcendent symbol of spirituality and holiness. Synonym of fertility and rebirth, of resistance to the hardships of time and war, symbol of peace and valor, the olive tree represented, in mythology as in religion, a natural element of strength and purification. In Bovara (near Trevi), a town considered holy by the pagans, there is one of the oldest olive trees in Italy, Saint Emiliano's (or, rather, Saint Miliano's) olive tree. In an ancient 9th century codex that narrates the martyrdom of Saint Emiliano, first bishop of Trevi, we read that "they tied him to a young olive plant" where he was beheaded. It was the year 303 or 304 AD. From time immemorial the olive tree in question is thought to be by local population a monumental plant you can admire in the town of Corciano. It is a majestic plant, with a 9-meter trunk circumference at the base and an 8-meter crown circumference. The trunk is no longer whole, but deeply fissured and split, as happens to very old olive trees because of the torsion process that the plant undergoes in time. Recent studies carried out with radiocarbon have confirmed that it is an ultra-millenary tree (1830 +/- 260 years old).

Figure 46: Left, 13th century sculptor from Umbria, Martyrdom of Saint Emiliano bishop of Trevi (detail) Spoleto, Museo del Ducato. Right, Bovara di Trevi, millenary Saint Emiliano olive tree; the circumference of its trunk is 9 meters.

The presence on the walls of Spoleto of the Oil Tower is an archaic heraldic signal. According to tradition, from this tower Hannibal's army was "showered" with boiling oil when, after a victory on the Trasimeno, it tried to seize the city in accordance with its initial intention of marching on Rome. Discouraged by Spoleto's resistance, Hannibal decided to head towards the Piceno region. In the passage from Ancient to Medieval times, oil preserved its cultural significance as indispensable instrument in liturgy: as much for holy anointments, as to keep the votive lamps burning. For centuries the Christian tradition has used olive oil in the celebration of some sacraments: confirmation, ordaining of priests, extreme unction. And a blessed olive branch is distributed to all the faithful on Palm Sunday, in memory of the resurrection and as symbol of peace.

Figure 47: Left, Assisi, Piazza del Comune, Temple of Minerva, goddess of the olive tree. Right, Spello, Tower of the Consular Gate surmounted by an olive tree, which has the significance of a heraldic symbol

Figure 48: Spoleto, left vista, right Oil Tower

The olive tree became part of local culture also thanks to its identification as a symbol of peace used by Saint Francis of Assisi (10th century AD), to the point that it has nearly become the heraldic emblem of Umbria. In the religious tradition of the olive grove slopes between Assisi and Spoleto, tales of the apparition of the Virgin above or close to olive trees often recurs. By revealing herself to innocent children, she exhorted the local populations to devotion and the construction of places of worship. One of these episodes took place in the summer of 1399 in an olive grove near Assisi where soon after a small church dedicated to the Madonna of the Olive was built. Inside is an evocative fresco. The original Madonna of the Olive cult evolved in the context of rural devotion with the main function of protecting the population from misfortune, and also propitiating their means of sustenance. This cult has left indelible traces in Assisi's toponomy, with the name of a church, a road, and several votive images.

Figure 49: Preaching to Birds*, fresco by Benozzo Gozzoli (Montefalco, 1452), with Monte Subasio and its "fertile slopes" in the background (left) and the fresco of the Madonna of the Olive in Saint Francis's Church in Assisi (right).*

Beginning in the 15th century, with the increase in the consumption and value of oil, there is a documented presence of a consistent amount of olive trees cultivated in *clausurae* (term from which the word *chiusa* comes, which is still used today to indicate a piece of land cultivated with olive trees). The term often recurs in 15th century statutes and 16th century registries, where many times the *chiusurato arativo* and *chiusurato sodo* are mentioned. The *chiusa* is also repeatedly mentioned in the 18th century in the papers of the Collegio Lucarini in Trevi regarding specific olive farming work: *hoeing, working, and pruning of the chiusa* or masonry works to restore the fallen wall of a *chiusa*. The *chiuse*, to this day enclosed by dry-stone walls or hedges and natural terraces, were sometimes seeded with fodder or wheat and tended to by the *laborantes*, who in the Assisi statutes are always marked as *de Asisio*, i.e. inscribed in the city registry, hence we can deduce

that the olive trees were tended to part-time by artisans who were regularly registered in the corporations. It is interesting to focus your attention of the different meanings of the word *chiusa*, which can, on occasion, cause some confusion. In the Assisi area in the 15th century a *chiusura* was a piece of land with at least five fruit-bearing trees belonging to the city's inhabitants. Amidst the olive trees there were also almond and hazel nut trees. Only later did *chiusa* come to mean an olive grove that was not subject to collective use, defined by the minimum number of *piantoni* per hectare, established in the 18th century by municipal regulations: *chiuse are where there are five piantoni per modiolo.* In the same century, Jacobilli translated the term *chiusa* as "olive grove," and to this day in local dialect a *chiusa* is a piece of land dedicated exclusively to growing olive trees. Thus, initially a *chiusa* was a piece of olive-grove land inside the walls of some cities or inside convents, of which there are still traces today in Assisi, Spello, Foligno, Trevi, and Spoleto. Beginning in the 17th century, *clausurae* also indicated olive-grove land far from residential areas and enclosed by dry-stone walls or hedges to protect them from grazing animals.

Figure 50: Lamp preserved in the Museo dell'olivo e dell'olio (Fondazione Lungarotti, Torgiano)

Figure 51: Assisi, Sacro Convento with hortus conclusus

Figure 52: Historical olive grove inside the fortified town

Figure 53: Sassovivo Abbey in Foligno: the term chiusura, chiusa, already present at the beginning of the 13th century in the papers of the Santa Croce Abbey in Sassovivo in Foligno, both concerning the concession in emphyteusis of small portions of land, and in property transfers.

4.2 The use of olive oil in local cuisine

As a food, olive oil was one of the main products of classic times. In the Roman world, it was the only seasoning used for cooking and dressing. In imperial times, olives were served with every meal, even the fanciest: as Martial said, they were the beginning and the end of the meal, that is they were served both as appetizers, and at the end of the meal when guests sat around drinking. The fall of the Roman Empire and the invasions of the so-called barbarians led to a standstill in olive cultivation. The new peoples that arrived in the Peninsula came from northern and eastern Europe and had a diet that was quite different from the Mediterranean, centered around butter, beer, and meat. Beginning in the Middle Ages, in Umbria and in other parts of Italy oil was not a structural element of people's diets except for the upper classes (except for during Lent), while the use of lard was much more widespread. Olive farming was relatively intense, but of limited and basically local importance, its aim being the town's self-sufficiency. Historical sources show that great importance was given to this cultivation in the vast estates of religious institutions. When discussing the use of oil in monasteries, we must bear in mind that "lean" days were over half of the year according to the liturgical calendar. Also, we must remember that frequently the monastery itself owned the olive trees from which oil for internal use was produced, a noteworthy fact from an economic point of view.


Figure 54: Olive oil is an important ingredient in many typical dishes, such as garlic bruschetta

Oil was a precious good that had to be used sparingly, to the point that its spilling was considered an ill omen. Olive oil is used in many recipes in popular cuisine. The strong flavor of the extra virgin olive oil produced in this area makes it particularly suited for the preparation of dishes with a sharp taste, such as garlic bruschetta, grilled meat, or roasted red meats.

4.3 The use of olive oil in traditional medicine

Oil has always been used in traditional and official medicine alike because of its emollient and soothing properties, or as foundation in the preparation of balms and creams; it is essential in the preparation of cosmetics and an effective defense for the body because it protects the arteries, the stomach and the liver, and has antioxidant properties that contrast free radicals. In his *Tesoro della Sanità* (1586), physician and botanist from Gualdo Tadino Castor Durante suggested to eat olives at the end of every meal to favor digestion, observing, furthermore, that in central Italy they were much used in all phases of the meal, combined will all foods. To cure bronchitis, you rubbed the child's back with a wool cloth soaked in sheep's milk cream, but you could also use iron oil, which was not difficult to make and could be used to treat several diseases. To prepare iron oil, you put a piece of iron on hot coals and left it there until it became white-hot; then you soaked it in a container full of oil. Some preferred to invert this procedure, heating the oil and then putting the piece of metal in it. Oil became part of popular rituals to remove the evil eye, which caused, according to popular superstition, persistent headaches.

Figure 55: Olive oil soap

Today not only does modern science confirm the qualities of extra virgin oil, but it recommends it both from a dietary point of view, and from a medical and cosmetic one. Thanks to Vitamin E, which contrasts cellular aging, Vitamin A, which prevents the dehydration of the mucosa, and Vitamin D, which favors calcium absorption, modern cosmetics have rediscovered olive oil, using it to contrast free radicals and produce creams and other products for cosmetic and dermatological use. Minor phenol components, which are never more than 1 gram/liter, have a soothing, softening and anti-inflammatory effect and are an effective protection against UVA rays. Many local farms that produce extra virgin olive oil have become specialized in the production of cosmetics, from soaps to skin creams. Especially the soap, which contains no scents or colorants, has antioxidant properties, is hydrating and soothing, and is entirely natural and well tolerated by the skin.

4.4 Promotion of the oil and olive tree culture

The interest of tourists in the olive grove slopes between Assisi and Spoleto is gradually increasing both nationally and internationally, and can be largely attributed to the unique and sober beauty of the olive grove landscape and the harmonious relationship it establishes between city and countryside, past and present, mundane and mystical, work and culture, myth and science. The Museo dell'Olivo and the Museo della Civiltà dell'Ulivo bear witness to the importance of the olive tree and oil in the culture of the local populations. The first can be found inside the castle walls in Torgiano (PG), in a small cluster of Medieval houses where an olive oil mill used to stand; the second is in the evocative locales of the former San Francesco convent.

4.4.1 Villa Fabri Foundation

With regional law 9 in 2010, the Umbria Region established the nonprofit Foundation "Villa Fabri," the headquarters of which are in 17th century Villa Fabri, in the Trevi municipality. The aims of the Foundation are: preserving and enhancing nature and the environment; promoting and enhancing culture and art; developing and enhancing the region's landscape, culture, environment, food, and the relation between these. The Foundation intends to create connections, and develop synergies and cooperation with other public or private institutions that operate in the areas of interest of the Foundation, or that share their spirit and aims. Among these: the enhancement of landscape, history, environment, food, and the relations between these; the development and management of the RUGiad'A network (the regional network of Umbria's parks and gardens) the aim of which is to enhance and promote this patrimony on a regional, national and European level in connection with the EGHN (European Garden Heritage Network); the development of activities of the Regional Observatory for Biodiversity, such as the monitoring of cultural, plant, and animal diversity through the collection and validation of data and observations, published and unpublished, their archiving and elaboration even in GIS environment, including the application of preservation measures contained in the Management Plans, and the implementation of the programs of rural development connected to them; the qualification and increase of the territory's cultural, environmental, and tourist offer, also thanks to an adequate programming, planning and organization of activities and events connected to RUGiad'A; the development of events intended to promote activities that take place at Villa Fabri; refresher and formative study activities, and research in the areas in which the Foundation operates. Promoting founders of the foundation are the Umbria Region and the Municipality of Trevi. Natural persons and legal entities, public or private, and public or private institutions can participate in the Foundation, sharing its aims and contributing to its livelihood and the realization of its objectives.

Figure 56: Left, the villa seat of the "Villa Fabri" Foundation; right, the Foundation's logo

4.4.2 The Museum of Olive Culture

The Museum, established by the Trevi Munipilality with a significant financial contribution from the Umbria Region and the European Union, is dedicated to the culture of oil and the cultivation of the olive tree. Its seat is in the halls of the former convent of San Francesco, a 13th century structure restored in the 19th century by Giuseppe Valadier near the homonymous church and the municipal Picture Gallery. The museum exalts the close relationship between olive farming, its product, and the transformation and evolution of the environment in which it has grown for centuries, with its social and economic implications.

A tour guided by a local farmer will lead visitors through the olive cultivation cycle and the production and preservation of oil, giving information on the various processing and extraction techniques, without forgetting the typically local rituals, the superstitions, and the religious beliefs. A brief but complete display in four sections: botany, becoming acquainted with oil and the olive tree, the olive tree as symbol of peace, the history of the olive tree. With the help of films and various multimedia the visitor is informed about modern pressing and cultivation systems. The museum also lets you taste and learn to tell between different types of oil, and supplies recipes containing olives and oil.

Figure 57: Ex convent of San Francesco in Trevi, seat of the Museum of Olive Culture

4.4.3 The Strada dell'olio extravergine di oliva DOP Umbria

The Association "Strada dell'Olio Extra Vergine di Oliva DOP Umbria" (DOP Umbria Extra Virgin Olive Oil Route) was established on August 5, 2004; it is a nonprofit volunteer organization for the enhancement and promotion of the territory, with a strong olive-oriented vocation. The "Strada dell'Olio extravergine DOP Umbria" follows a single itinerary that involves the entire regional territory interested by the production of DOP Umbria extra virgin olive oil. The Strada dell'Olio is

an eminent element of integration for the varied artistic, naturalistic, historical, religious, culinary, and agricultural resources that animate the regional territory. It winds through lands that are often marginal compared to the more established tourist routs, turning the trip into an occasion to rediscover natural resources and popular traditions, amidst secular olive trees, evocative olive groves, olive oil mills – some of which of great historical relevance – museums, and artistic heritage, among which the Torre dell'Olio in Spoleto (PG).

Figure 58: Logo of the Association "Strada dell'Olio Extra Vergine di Oliva DOP Umbria"

4.4.4 The Olive and Bruschetta Festival

Born in 1963 from an idea of the tourist board of Spello and the Spello Municipality, its aim is to enhance olive farming in all its phases (cultivation, pruning, and harvesting techniques; milling of the olives and preservation of extra virgin olive oil) and divulge the unique landscape of the territory of Spello. The folkloristic and traditional aspect is covered by the Benfinita festival, with the parade of the *Frasche*, farm carts that climb into town from the countryside on which an olive tree is built and decorated with cured meats, cheese, and fruit as prize for the overseer at the end of the harvest. During the parade, old men sit on the cart and play the accordion while the young dance traditional dances. The carts are decorated by the Terzieri, by volunteers, by the school and by private citizens. The parade takes place on a Sunday and is the reenactment of popular farming traditions that today become the occasion to celebrate the excellent products of the land and a moment to reflect on the value of the cultural roots of the territory. At the end of the parade, the three best Frasche are awarded prizes.

4.4.5 Festivol

For eleven years now, in the month of November, a festival takes place in Trevi: "Festivol - Trevi among oil, art, music, and taste buds," an event that celebrates new oil and the first pressing. There are new oil tastings, visits to the oil mills, a farmer's market, *bruschetta*, but also many collateral events that range from concerts in the streets of Trevi to flee markets, from urban and naturalistic hiking to olive harvesting, from guided tours of the city to concerts in unique locations such as Villa Fabri.

4.4.6 The Olive Trail

Conceived by members of the CAI in Spoleto and then created with the contribution of the CAI in Foligno, the trail winds along 75 km at 500-600 meters in altitude with easy climbs, offering trekkers extremely interesting geological, historical and artistic information, as well as magnificent views. It begins in Spoleto and traverses some of the most evocative towns and castles in the area, such as Trevi, Spello, Poreta and the Abbey in Sassovivo, near Foligno. Accessible year-round, the Olive Trail also benefits from the proximity of the highway and the train tracks. This proximity makes it possible to personalize the itinerary, splitting it up as you like.

Figure 59: Hilltop castle in Pissignano, immersed in olive groves (left) and the olive-grove covered slopes leading up to the town of Trevi

Figure 60: Francesco's trail is another hike in the proposed area, tied to the figure of the Saint who is also the Patron Saint of Italy. The trail begins at the La Verna sanctuary (in the province of Arezzo, Tuscany), where Francesco received the Holy Stigmata, and reaches Assisi, the town in Umbria where the Saint was born.

4.4.7 Other events

The food and wine festival "Frantoi Aperti" (Oil Mill Open House, www.frantoiaperti.net) takes place once a year and interests the entire Assisi-Spoleto area. Frantoi Aperti is an event born twenty years ago with the aim of enhancing DOP extra virgin olive oil in Umbria. It was the idea of the Association Strada dell'Olio, in cooperation with the Consorzio di Tutela DOP Umbria, Città dell'Olio, and the support of the Comunità Montana Monti Martani, Serano e Subasio. Every weekend in November is devoted to tasting, guided tours, popular music concerts, traditional games for young and old, cooking classes, petting zoos, hikes, and horseback riding. There are free shuttle buses from the towns to the main olive oil mills in the area. Thus, you can combine tasting with tours of theaters, medieval castles, churches, abbeys, and mansions.

Figure 61: Flyer of the festival "Frantoi Aperti" that takes place yearly in the area in November

At the same time as "Frantoi Aperti," in the 11 magnificent castles of the territory of Assisi (a city that is a UNESCO world heritage site) UNTO takes place, Unesco Natura Territorio Olio (Unesco Nature Territory Oil, *unto* in Italian means "oily"). The event's aim is to enhance the historical and cultural heritage of Assisi tying it to the produce typical of the area with the sale of DOP Umbria extra virgin olive oil and other typical products. You will find local farmers with their goods, artisans, artists, and you will be able to visit the oil mills and discover the 11 beautiful Castles distributed in the territory of Assisi, take guided nature walks, and visit petting zoos.

Figure 62: Flyer for UNTO, Unesco Natura Territorio Olio, which involves the territory of Assisi

During the "Festa dei Frantoi" (oil mill festival), which takes place every year in Campello sul Clitunno in November, you can visit the oil mills and sample the produce and the new oil typical of the area in the dedicated "taste corners" set up inside the oil mills for visitors. During the festival, a walk is organized along the "Via di Francesco" between dry-stone walls and secular olive trees (Pissignano-Campello alto-Pissignano – 10 km circa). "Andi e rivieni" is another project that promotes and enhances Umbria oil and was founded by the Association Strada dell'Olio Extravergine d'Oliva Dop Umbria in 2005, with the opening of the first information desk in Trevi in 2007, with the aim of promoting the world of oil also with tourists. "Oro di Spello," promoted by the city of Spello, and "Olivolio Spoleto," promoted by the Accademia Nazionale dell'Olivo e dell'Olio and by the city of Spoleto, are also events that take place yearly to promote olive oil. In particular, during the 2017 edition of "Olivolio di Spoleto," a conference was held on "The innovation of process and product in the Italian olive and oil production chain."

4.5 Cultural promotion of other typical products

4.5.1 The Strada dei Vini del Cantico

The Association "Strada dei Vini del Cantico" was established in 2002 with the aim of promoting the historical, cultural, environmental, economical, and social identity of the municipalities that participate in the project. Its main activities are: promoting economic development through an integrated tourist offer built on the quality of products and services; enhancing and promoting the touristic offer of vineyards and farms, food related activities, the production of food and wine specialties, and the production of a sustainable economy; enhancing the natural, historical, cultural, and environmental features of the territory; promoting the development of modern

businesses; establishing and controlling the quality standards of members; promoting the image and the awareness of the Strada through activities of marketing and representation during events and fairs, and the publication of promotional material. The Strada dei Vini del Cantico wants to help visitors discover the ancient towns, cities, castles, churches, and abbeys, making it possible for them to experience a journey through the past with reenactments, festivals, and traditions that every year generate moments of great liveliness and interest. Visitors will experience the natural rhythms of the earth, discover the places where noble wines are born thanks to the endeavors and the talent of man, to savor the tastes of tradition and of the work of farmers, with a great variety of dishes and flavors. The Strada dei Vini del Cantico can be followed by taking historical routes, minor roads with breathtaking views, by car but also by bike, on horseback, and on foot.

Figure 63: Logo of the Strada dei Vinci del Cantico Association

4.5.2 The Cannara onion consortium

Onions are one of the most important local products in the Cannara area, so much that since 1981 they are object of a famous festival that takes place yearly in Cannara during the first two weeks of September and December. Producers, locally known as “cipollari” (from *cipolla*, onion), are mainly family-run companies that have handed down cultivation techniques orally from father to son, in some cases for over 4 generations. In 2003, with the support of the municipality, the “Consorzio Cipolla di Cannara” was established, uniting most local onion farmers and producers. The main function of this partnership, aside from the promotion and the protection of the bulb, is to organize and assist the members throughout the production chain, from planting to harvest, from preservation to marketing, to ensure the quality and genuineness of the end product. The main aim of the “Consorzio Cipolla di Cannara” is to ensure that the onions sold by members of the consortium are actually farmed inside the designated territories and present the peculiarities of this product.

Figure 64: Left, the logo of the Consorzio della Cipolla di Cannara; right, flyer of the onion festival in Cannara that is organized annually in Cannara at the beginning of September

4.5.2 Cascia saffron association

The "Zafferano di Cascia" association includes twenty-five members, mostly producers. After a period of de facto activity begun in 2001, which followed an experimental phase commenced in 1999 with the cooperation with the Unione Provinciale degli Agricoltori di Perugia, the CEDRAV and the Facoltà di Agraria of the University of Perugia, in September 2003 the producers founded the Associazione dello Zafferano di Cascia – Zafferano purissimo dell'Umbria. The product is sold in the form of stigmas marketed under a single registered trademark that identifies their provenance: Zafferano di Cascia – Zafferano purissimo dell'Umbria. The product is on sale at the farms of the members of the association, in some specialized stores, and at select local restaurants that have shown interest in the rediscovery of the spice's role in Umbria tradition. Every year the minimum price of the product is decided during the Santa Caterina di Alessandria festival on November 25th, in accordance with an old Medieval tradition. Festivals about typical products and restaurants connected to the production of the territory are privileged channels for raising awareness of this spice. From 2001 a saffron market-show takes place in the town of Santa Rita, during which the association organizes guided tours in the fields, photographic shows, and conferences.

Figure 65: Logo of the "Zafferano di Cascia" Association (left) and flyer of the Mostra Mercato dello Zafferano Purissimo di Cascia (right)

4.5.3 Black celery festival and market in Trevi

Trevi black celery is a variety of celery that is grown only in Trevi. It has unique properties that make it extremely appreciated, but as it is produced only in an extremely limited area and since its farming is extremely laborious, it is very expensive and consequently has a limited market. To preserve the integrity and the survival of this typical production, on the third Sunday of October a black celery market has been held in Trevi for nearly 50 years. In 1965, the Pro Trevi Association established the Trevi Black Celery Market and the Celery and Sausage Festival, rediscovering a tradition popular between the two Wars, when during the October markets the land owners were hosted in Casa Petrucci, near Piazza del Mercato, to dine on the first sausages of the year. In fact, as there were no efficient refrigeration systems, pigs were slaughtered only in the cold season and the first cured meats were produced in October for the Thursday markets. This tradition was carried on until the end of the '50s.

Figure 66: Celery on display under the colonnade of the Palazzo Comunale (1948, left). The Trevi black celery and sausage festival (right)

5. Landscape and seascapes features

Being the result of the integration of economic, environmental and social processes in time and space, landscape plays a fundamental role in the area. From the economic point of view the quality of the landscape is an added value that cannot replicated by a competitor, especially when combined to tourism. The full quality of typical food today is expressed by the combination of landscape features and organoleptic features. The environmental features are also the result of human intervention that shaped both morphology (as in the case of terraces) and biodiversity. Finally, quality of life is also related to the quality of rural landscape, as defined by the National Statistical Agency (ISTAT) in the Indicators of Well Being of the population (ISTAT 2014). In consideration of its values, the nominated landscape has been included into the Italian National Register of Historical Rural Landscape and Traditional Agricultural Practices (Agnoletti 2013).

5.1 The physical landscape

The proposed area is located along the Umbrian Valley, between 200 and 600 meters a.s.l., along the western Apennine ridge that goes from Assisi to Spoleto. The Umbrian Valley is the largest alluvial plain in Umbria, formed about three million years ago by a vast branch of the ancient Tiberino lake that developed along the border with Marche, flanking a section of the central Apennine ridge. The valley stretches north-west and south-east amidst mountain ranges, crossed by a highly developed hydrographic network (Maroggia, Tessino, Clitunno, Teverone, Topino, and Chiascio) and rich in torrential waters flowing down from the limestone walls of the Apennine ridge. The inclines vary from rolling terrain to very steep, with inclines greater than 50% (the geomorphologic map, the map of the slopes and the map of the slope exposure can be found in the Annexes).

The soil, mainly deriving from the mechanical disintegration of limestone, is characterized by good structure and fertility. There are also inclines with rocky outcrops exposed to the south.

The continuous remodeling of the slopes through the construction of extensive hydraulic systems, such as dry stone walls, not only allows to cultivate slopes that would otherwise be too steep, but constitutes a defense from hydrogeological risk and an efficient system for the preservation of water and soil. All together they represent one of the most important distinctive features of the landscape of this area, contributing to its uniqueness and integrity.

5.2 Relevance in the landscape context

For the most part, olive farming in Umbria, including the olive grove slopes between Assisi and Spoleto, has stayed at the margins of the process of intensification of the cultivation that has interested agriculture over the last two decades and has determined profound alterations of the traditional agrarian landscape. If this has on the one hand determined the progressive

marginalization and economic unsustainability of cultivation, on the other it has preserved the archaic beauty of many olive grove landscapes, fruit of the work of generations of olive farmers. In 1975, French geographer Henri Desplanques wrote that the agrarian landscapes of the hills of Tuscany, Umbria, and Marche were created "as if there were no concern other than beauty." The lack of interest in the intensification of olive farming, with the consequent outdatedness of most of the structures, is mostly due to the pedoclimatic limitations. In fact, the low temperatures in winter that limit the vegetative activity and the productive potential of trees, together with the steepness of the slopes, have discouraged investments in modernizing the olive groves. In the olive grove region between Assisi and Spoleto we can still find historically intact landscapes, with Medieval olive groves, such as the one inside the walls of Assisi, under the Basilica of Saint Francis, and the ones around the historical city center in Spello, in the Collepino-Chiona area.

Figure 67: Fortified town of Campello Alto, with inside what is left of the historical olive grove

Here we can still find untouched distinctive elements, bearing witness to the relationship between rural houses and the so-called Medieval "chiuse," in which the cultivation of the olive tree took place inside the walls or near the town. The reason for this was that outside the walls grazing was free and the animals would have damaged the olive trees. The area inside the Municipality of Foligno shows the strong tie olive groves have with abbeys, such as the one in Sassovivo and the ones found along the Via Lauretana in the Belfiore-Pale area. Along the entire olive grove area, there is a territorial organization connected to different elements, which ensures the persistence of the historical and landscape integrity: monastic hermitages, Benedictine abbeys, the many Romanesque churches along the Medieval routes, the oil mills, the embankments, the terraces, and the *lunette*. The overall state of conservation of the olive grove slopes is good, since the fields

are farmed and productive. Over 70% of today's landscape preserves historical land use. The traditional territorial adaptations, which give the land its typical undulation, are mostly embankments, with *lunette* and terraces where the incline is more marked. These are carried out in dry-stone masonry, with stones coming from the soil itself, filled in with recovered earth, which contribute to the preservation of the integrity of the landscape limiting superficial erosion. Most olive groves still have a regular distribution. You can find several *lunette* inserted in the midst of a regular order, often marking the presence of century-old plants. In today's landscape, other important traditional uses of the land may be found, such as mixed cultivations (part olive, part vines, etc.) and tree-planted meadows.

Figure 68: Alternation of olive groves, arable land, and vineyards in the landscape of the olive grove slopes between Assisi and Spoleto (Collepino, GESAAF 2017)

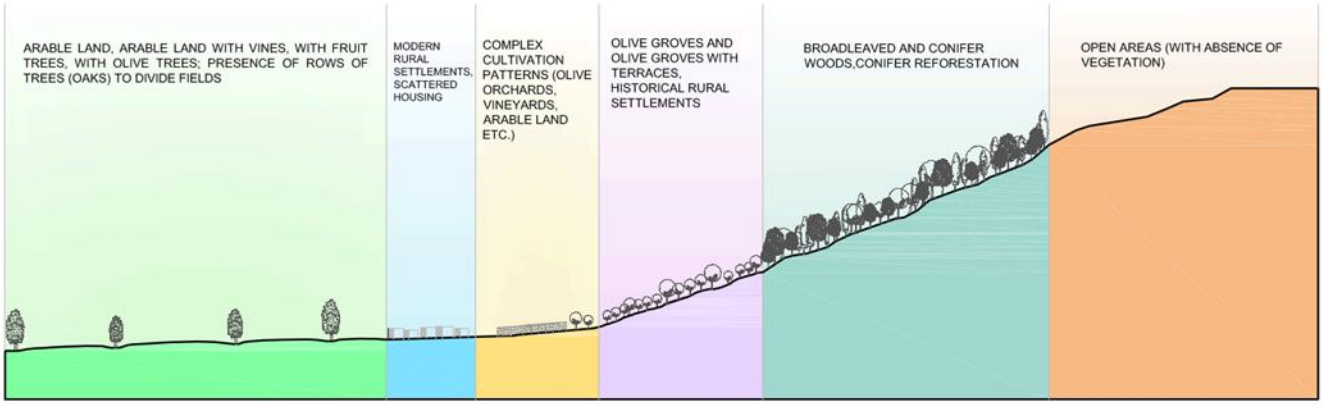


Figure 69: simplified scheme of the landscape features according to the altimetry and their ecological role on the local slopes.

As you can see in the simplified representation, the flat valley floor (between 180 and 220 meters a.s.l. circa) is mostly occupied by arable land, mixed cultivations (arable land and vines, arable land

and olive trees, arable land and fruit trees), vineyards and urban areas. The arable land is often divided by rows of trees, mostly oak, sometimes with the presence of secular plants. In the higher plains (from 200/220 meters a.s.l. to 300 meters a.s.l. circa) we find complex cultivation systems, with olive groves, arable land, arable land with vines or olive trees, and vineyards. Rural architecture is more widespread here rather that further up hill. The hillside area (between 300 meters a.s.l and 500 meters a.s.l.) is mostly occupied by olive groves, both regular and irregular in layout; in this area hydraulic-agricultural adaptations are frequent, as well as dry-stone terraces and lunette or embankments. Here there are scattered settlements, but also the historical cities of Assisi, Spello, Foligno, Trevi, and Spoleto. The higher reaches (between 500 meters a.s.l. and 1000 meters a.s.l.) are mostly occupied by woods of broadleaved and mixed trees. Finally, in the last section, which goes from about 1000 meters a.s.l. to the crest, there is a lack of vegetation.

Figure 70: tree-spotted arable land with oak trees as elements of historical continuity of the landscape at the foot of the olive-grove slopes

Figure 71: Meadows with olive trees and arable land with onions and big oak trees and vines mark the valley floor of the olive grove slopes between Assisi and Spoleto

5.3 Relevance of the settlements and of the built-up component

5.3.1 Settlements and infrastructures

All of the historical buildings and settlements of the proposed site are related to the economic and social history of the area and connected to agricultural activities. Scattered throughout the countryside we mostly find farmhouses and tofts, as well as manor houses, villas, and in general buildings for residential and agricultural use with their annexes, but also a fair number of religious buildings or complexes (churches, convents, abbeys, sanctuaries, hermitages, aedicules, and votive chapels), military structures (towers, citadels, and castles) and civilian buildings with specific, non-residential uses (old mills, trading posts, remains of bridges and old roads, funerary constructions, etc.).

Centralized building is mostly found in the main historic cities, in some minor historic centers, and in a multitude of small rural towns. Historical cities are complex settlements with urban areas often still defined by one or more walls and articulated in an original nucleus and later additions (the so-called "*borghi*"). They are often dozens of hectares in surface and of Roman or pre-Roman foundation, with a hegemonic role over the surrounding territories from their origins, confirmed, institutionalized, and increased in later historical phases. Minor centers, such as Spello, are also mostly of Roman or pre-Roman origins, but they never strengthened their hegemony during the Medieval commune period, so their urban development was limited (between 10 and 20 hectares).

The most important cities in the olive-grove area (Spoleto, Trevi, Foligno, Spello, Assisi) are all arranged along piedmont axes, which became roads with the construction of the Consolare Flaminia. The connection between these settlements and the rural territory has always been very strong, since the towns became important and rich centers during the centuries, thanks to the income coming from trading agricultural products. This is confirmed by the fact that in many historical buildings can be found references to agricultural activities.

Assisi is Roman in origin, but Medieval in appearance, anchored to the massive Franciscan complex placed at its summit, commenced in 1228, barely two years after the Saint's death. In Roman times, the broad valley offered good agricultural and pastoral resources, aside from making a speedy connection with the Via Flaminia possible. The Franciscan complex is made up of two, superimposed, single-nave churches. In the lower church you can admire the beautiful paintings by Simone Martini and Ambrogio Lorenzetti, and the magnificent Madonna Enthroned with the Child, St. Francis and Four Angels by Cimabue, while the upper church is entirely decorated in frescos by Giotto, Cimabue, and painters of the Roman school. The Duomo, dedicated to Saint Rufino, patron of the city, was erected in the 12th century on top of an earlier Roman basilica. Close to Assisi you can also find many other Franciscan places, and the surrounding environment has certainly influenced the thought of the saint, which is strongly connected to the rural world as nature was considered the direct result of the creation, and so highly respected.

A stone's throw away from Assisi is **Spello**, magnificent town rich with Roman heritage nestled on a spur of Mount Subasio. For a period, this was the domain of the Baglioni family who commissioned Pinturicchio to paint the family chapel next to the Santa Maria Maggiore church, producing one of the masterpieces of 16th century pictorial art. The city of Spello is enclosed in elegant city walls with monumental ancient gates. The tower near the main gate, called Porta Consolare, is surmounted by an olive tree, testifying the importance of this cultivation for the town itself. Emperor Augustus chose Hispellum as his favorite city in Umbria, and its fortune remained unvaried even in later centuries. At the foot of the city and just outside the sanctuary, the inaccessible swamplands, a legacy of the great lake that occupied the Umbrian Valley (the Lacus Umber), underwent a serious reclamation and adaptation, as can easily be seen by observing the area from above, as it repeats the orthogonal design of Roman centuriation. Spello's fortune met its fatal destiny with the arrival of the barbarians, who took all its riches and reduced it to a small village. It fell under the hegemony of the Spoleto Duchy and permanently lost its autonomy and splendor, until it flourished once again in Medieval times with the establishment of the Commune.

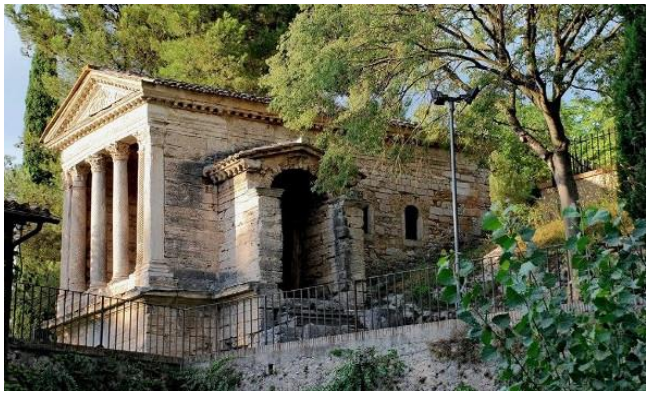
From Perugia you can also easily reach **Foligno**, a lively commercial and industrial city, famous throughout the region and beyond for the Quintana joust, which takes place in June and September. The city, first a prefecture and then a municipality, is often mentioned in Roman literary sources and itineraries. Today, Foligno's historical city center is focused around the great Romanesque Duomo, which was reworked several timed until neo-classical times, and the

nearby Palazzo Trinci, built between the 14th and the 15th century for the lords of the town. The church of Santa Maria Infraportas, dating back to the 11th-12th century, holds many Medieval frescoes. Near Foligno, about 6 km away, rises the abbey of Sassovivo, founded by the Benedictine monks in the 11th century around the homonymous springs and was an important research center in the Middle Ages. The Abbey is surrounded by a beautiful oak wood and by some olive groves.

Trevi is a center that rose along the oriental branch of the Via Flaminia. The hill preserves beautiful, not vary long, city walls in *opus vittatum*, a cement nucleus covered in small regular limestone blocks, with quadrangular towers and three gates. Trevi is surrounded by wonderful olive groves with earth terraces, while in the area of Picciche one of the two copies of the *Lex Luci*, the law regulating wood cutting in the woods sacred to Jupiter (*locus*), was found in the church of Santo Stefano, testifying the ancient connection between the town and the management of natural resources.

Continuing southwards we arrive in **Spoleto**, an extremely important Umbrian center, which, also thanks to its very famous festival Due Mondi, is one of the main and most frequented tourist destinations in Umbria. The Umbrian town of Spoleto controlled the rural territory, on which its economy depended, thanks to a series of small fortified enclosures (or *castellari*) positioned on the ridges that dominate the roads and strategic spots. Romanization was completed with the foundation of the Latin law colony Spoletium in 241 BC and the opening of the western branch of the Via Flaminia, inaugurated in 220 BC by consul Gaius Flaminius to make communication between Rome and the recently conquered territories in northern Italy easier. In the period between the second triumvirate and the Augustan age, the city and the territory were included in the Umbria Region and an imposing reorganization of the territory began, both regimenting the waterways and recovering swamplands, and redefining the centuriated areas after the founding of the colony in the fertile plain. Throughout the 5th century, the city and the territory experienced a period of great

flourishing, which was mainly based on agricultural activities and trade, culminating in the birth of the Duchy in 570 AD. Today, many traces of the Roman period, such as the theater, the Druso Arch, the remains of the temple from the 1st century AD, and the Sanguinario bridge near the grandiose amphitheater, can still be appreciated by visitors.



10 km north of Spoleto there is a small fortified town composed of two nuclei: **Campello Alto**, which developed around the Castle, and **Campello Basso**. The Castle, built in the 10th and 11th century by Rovero di Champeaux, Baron of Burgundy, still preserves its original walls and is completely surrounded by olive groves. A single gate marks the entrance to the town, where the church of San Donato, which contains a precious baroque wooden altar, and the Palazzo Comunale stand. The true jewel of this area is represented by the Fonti del Clitunno. The clear waters fed by underground springs are surrounded by weeping willows and poplars that give the location an evocative and romantic atmosphere. Not far from the spring is the church of San Salvatore, aka Tempietto del Clitunno, a small paleo-Christian *sacellum* (shrine). A UNESCO World Heritage site, it bears witness to the presence of the Lombards in Italy between 568 and 774 AD, and is one of the most ancient examples of Umbrian sacred art. Nearby, the castle in Pissignano, a hamlet near Campello, is worth a visit. Built on a hillside in the 9th century and surrounded by olive groves, it presents a typical triangular structure and still preserves its original walls with massive polygonal towers and two tower-gates.

5.3.2 Historical rural settlements

Finally, the small rural towns are very modest settlements built in Medieval or Modern times in the territory of a larger city, with an extension that can vary from less than one hectare to 7-8 hectares at most. Some were born as fortified units, or “castles,” feudal or communal in origin; others as simple villages, or “*ville*,” with the spontaneous aggregation of several houses near a bridge or an important fork in the road, or around a specific civilian or religious building (churches, abbeys, staging posts, etc.), as shown by many place names to this day. Among the remaining *ville*: Villa Vecchia, the house called Le Loggie; Villa Fabbri; the S. Pietro Monastery; Villa Campello and Villa Spinelli. One of the historical mills is still visible in Tevi, owned by Chiacchierini, near the springs of Collecchio. On the hills, buildings were erected that were strictly functional to the

cultivation of olive groves, commonly called *chiuse*. A typical *chiusa* still stands in the locality called *fontanone*. Traveling along the ridge near Trevi-Pissignano you will notice another peculiar trait of the olive-grove landscape: scattered rural pleasure houses and temporary houses used for agricultural reasons. In Campello Alto and the surrounding areas we can observe the relationship between the castles (Pissignano, Campello Alto, Poreta), and the "dovecotes," which leave a distinctive mark on the land. The dovecotes were important for the production of "dove manure." You can still easily spot them because they jut out of the roofs of rural buildings: north of Trevi the tower under the convent of San Martino; the dovecote house near the artificial lake in Pisciano, the dovecote belonging to the Natalucci family.

5.3.3 Rural houses

Before sharecropping and associative agricultural contracts, in which the lessee and the sharecropper formed an association to cultivate the farm with the aim of splitting produce and earnings in half, became widespread, the farmers' house was inside urban areas or castles, from which they travelled daily to attend to their work in the fields or in the olive groves. In the 16th century, when living outside of fortified centers was no longer dangerous, rural buildings began to be built outside the city walls and the "scattered house" period began. The structure of these new houses, mainly funded by the aristocracy or the city bourgeoisie, was very similar to that of the shop-houses or the warehouse-houses in the city. On the ground floor, instead of the shop or the warehouse, there were the stables for the animals; on the top floor the residential area and storage space for the produce. The residential floor was accessed directly from the outside with the porticoed staircase typical of the rural architecture of the Spoleto valley. Through the centuries and up to a few decades ago, farmers did not have a single specialization, but possessed the skills and abilities of many jobs, making it possible for them to save on management costs and be self-sufficient. Out of necessity, farmers performed other jobs, such as carpenter, bricklayer, smith, woodcutter, woodcarver, etc. This made it possible to construct a building in an agricultural location inexpensively and autonomously. The construction materials retrieved near the construction site were manufactured directly by the future tenants of the building, who delegated only the more complex operations to specialists. These could be: the stone cutters needed to process the stones for the fireplace, the oven, the angle bars, and the wells; the *fornacchiari* who produced quicklime from the *calcinai* in the holm oak woods, fundamental ingredient of mortar, while its aggregates were carried to the construction site by the

carters; the “mixers” or “flatteners” whose chore was to make bricks in raw clay, ready to be fired in the kiln; the master builder, essential for the construction of the main walls of the house. The latter was the coordinator and in charge of the construction site; he was an expert in measures and design, and thus decided the structure and size of the house, instructed the others on the operations that should be carried out, coordinated the work of the builders, and personally took charge of the more complex operations such as the setting of the rib of an arch or the jig of a vault.

5.3.4 The dovecote house

Among Umbrian rural dwellings, the dovecote has a prevailing role. Its name comes from the upper part of a tower devoted to the breeding of pigeons, aka rock doves. It is not an annex such as the chicken coop, the oven, or the barn, nor an added decoration. Rather, it is the essential element of houses scattered throughout the countryside in southern Umbria. This building, which from the later Middle Ages till the end of the 18th century was the “motor of the conquest” of the areas outside city walls, became established over time as the best structure for the development of occupation and farming of the agricultural areas in Umbria as elsewhere. With the dovecote, Medieval man comes “out of the cover” of the safe urban space to settle, at first timidly and then with greater determination, in the plains and along the hillsides. At the beginning of the 13th century, in the countryside surrounding the fortified cities of Spoleto, Campello, Trevi, Foligno, Spello, and Assisi there were no permanent settlements. The houses outside the walls were temporary, little more than huts, built with sticks and branches on which mud was applied as a protection from the cold. The poor economy of the rural fortified villages was essentially based on the produce obtained from the gardens planted inside the city or castle walls. An “essential” production, as stated in communal statutes, based on the production of garlic, onions, spelt, and legumes. This very limited and poor economy needed to differentiate and open up to the cultivation of crops with greater productive capacity such as vineyards, olive groves, cereals, hemp, and fodder. The will to recover and till the fields outside the walls was paired by the need to protect the lives of those who intended to “colonize” the fallow lands. For this reason, they had to have a safe and stable home. These two needs were supported by a structure that had become part of the landscape of the countryside of the proposed area since feudal times: the dovecote house. During the first constructive phase,

between the 14th and the 15th century, the tower was divided into four levels with a single room in each. The ground floor, with direct access to the outside without any connection to the upper floor, was used to house animals and tools. The first floor was the homesteader's residence and was in origin accessed by a retractable outside ladder, and later by masonry stairs. The third floor was used for storing fodder, seeds, and cereals, which needed a dry environment. The fourth floor, under the roof, was used for breeding pigeons.

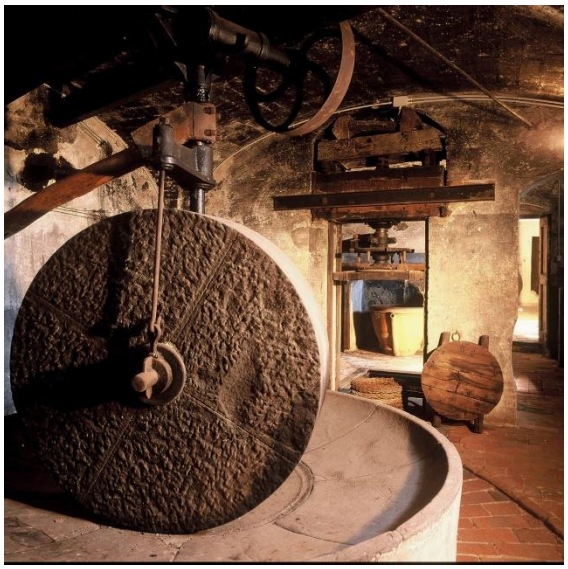
Figure 73: Left, dovecote in Corciano, Castelvieto; right, dovecote near Assisi

During the second constructive phase, between the second half of the 15th century and the beginning of the 16th, dovecotes underwent a significant evolution. They lost their identity as defensive structures, they became lower, the layout tended to be quadrangular, the angle less rigid, the stones used for construction were no longer squared but roughly hewn, the alignment of the stones more irregular. More importance was given to the dovecote: the roost for the pigeons was no longer a simple stone slab, but it became an elaborate decorative element, with colored and shaped bricks. The "eyes," or holes through which the pigeons accessed the dovecote took on the shape of rose windows, the plaster on the outside walls was decorated in phytomorphic or geometrical motifs. On the façade of the tower, arched windows opened. This new, more comfortable and functional architecture spread through the countryside and along the communication routes. Olive trees were planted around the tower, following the mixed cultivation practice. If in the 16th century there was a marked colonization of the countryside through consistent financial investments on the part of the economic powers of the city, in the 17th century the phenomenon became widespread. Besides the houses for the sharecroppers, houses for the nobility were built as places of "leisure and relaxation." In this new cultural climate, the dovecote

became an appendage of the villa or of the rural home. It turned into a symbolic, esthetic element, though still functional to the production of the precious “dove manure” with which the hemp fields and olive groves were fertilized. Where it was already present, the dovecote was modified to lose its rustic rural look. The gable roof became a hip roof and a decorative iron element was placed on the top. The roost for the pigeons was shaped out of decorative stucco elements; the façades painted with allegorical figures, angels, emblems, grotesques, and spirals. The dovecote tower disappeared, absorbed by a “palace” with orderly perspectives and molded windows.

5.3.5 Oil mills

To practice olive farming it was necessary to construct buildings to transform the olives into oil: the oil mills. Today, in the proposed area, can be found 34 used oil mills, a significantly high number. In the hilly regions lacking the option of hydraulic power, the millstones were activated mainly by beasts of burden. This made it possible to place olive oil mills anywhere, if possible near a well or a cistern, ensuring they were set at fairly even distances from one another. In the olive grove area there are still several historic oil mills. One of the best preserved is found in Collecchio, near Trevi. The original structure was restored a few years ago and is perfectly preserved on the ground floor of a rural building. The oil mill, still functioning until a few years ago, occupies two rooms built under the dovecote. The entrance is from the southern side through a door with a round stone arch and a cobblestone ramp, a typical paving in this area made with bricks and stones from the nearby *fosso jume*. The ramp was used to grant easy access to the donkeys that carried the sacks of olives. On the outside wall there are iron rings fastened to the masonry wall, which were used to tie up the donkeys or mules that were used to carry the bags full of freshly picked olives. The area in which the olives were pressed is a large rectangular room separated by a brick diaphragm arch in correspondence with one of the walls of the dovecote. The whole room is paved in pounded lime and cobblestones from the ditch. The ceiling is in load-bearing oak beams crossed by *spranghette* in chestnut wood. The *spranghette* are small chestnut branches chopped in half and placed one next to the other with the cut surface facing downwards. The walls are in masonry and use roughly hewn local stones, plastered and whitewashed with limewash. To the right of the entrance door the is a wooden loft that could be reached using a peg ladder and was used as “bedroom” by the workers during the long days and nights of olive grinding. To the left is the stone fireplace with brick uprights and a large oak-wood lintel. The fireplace was necessary both to heat the room and to warm up the water used for the extracting the oil with the large wooden presses that were used to squeeze, using only the strength of the arms, the filtering containers, piled one on top of the other with the ground olive paste in between them. From



these the oil was extracted, dripping down into a container placed under the press. In this specific case, the monumental press with a wooden screw is placed in front of the fireplace. At the back of the room is the large millstone used for crushing the olives, with a cylindrical masonry base on top of which a stone surface was placed, with a brick rim so the olives wouldn't spill. At the center of the surface there is a vertical wood beam that rotates on metal bearings. It is connected to the wheel or millstone, originally made from a single large limestone block, carved and worked until a perfect cylinder of at least 1.5 meters in diameter was obtained. On the other side of the vertical beam, a long wooden stick ending in a yoke was fastened. This was attached to the donkey, who was forced to walk around the millstone to make the wheel turn for days. Next to the millstone was a small room that contained the jars where the oil was kept.

5.3.6 Caprarecce

To this day in olive groves you can still see the small buildings farmers used occasionally. They were modest rectangular constructions that used the incline to access the two floors of the house. The room on the ground floor was used to keep animals, especially goats, hence their name (*capra* in Italian means "goat"), which were used to weed the olive groves. Mules or donkeys used to carry manure and olives also found shelter in these buildings. On the top floor there was a room with a fire place where the olive farmers could stay. During the olive harvest, the olives were unloaded here on the brick floor before being taken to the oil mill at the end of the harvest.

5.3.7 Terra murata

The diffusion of olive farming in the 15th century markedly increased the wealth of the lands between Assisi and Spoleto. In this context, the cultivation of olive trees found space not only in open lands but also inside the city walls, especially in Assisi where there are still several examples of *terra murata* (walled-in land). Overall, there are many noteworthy examples: inside the walls of the Rocca di Spoleto there is an olive grove interspersed with almond trees; the *terra murata* around the Rocchicciola preserves an olive grove where mixed cultivation was practiced; around the San Francesco convent a long high wall protects a large olive grove belonging to the monks; the same arrangement is to be found in the area adjacent to the convent of Santa Chiara.

5.3.8 The pastine

The *pastine* was a small piece of land where olive trees where cultivated in nurseries. In most cases it could be found inside the city or the castle or the villa walls, in a location protected from

vandalism and enemy incursion. The land set aside for the growth of the small olive cuttings was the garden inside the city walls which was an essential source of food for the inhabitants of the city. Today, with the cultivation of the cuttings in nurseries, *pastine* have disappeared, but they live on in the memories of olive farmers. The term is also used to describe a piece of land that was anciently object of a *pastinatum* contract, which preceded sharecropping and provided for the preparation of the piece of land and the planting of olive and other trees on the farmer's part, as seen in documents from the 13th and 14th century.

5.4 Analysis of the main planning and territorial protection tendencies

The proposed area undergoes different types of planning and protection that can be summarized as follows:

- Regional planning
- Municipal planning
- Environmental restrictions
- Protected areas

5.4.1 Regional Landscape Plan

The Piano Paesaggistico Regionale (PPR) (Regional Landscape Plan) is the only instrument for landscape planning of the Umbria Region. Its aim, in accordance with the European Landscape Convention and the Code of the Cultural and Landscape Heritage (D.Lgs. January 22, 2004, n. 42), is to govern the transformation of the territory in such a way as to preserve the typical traits of the Umbrian landscape pursuant to objectives of landscape quality. In the Atlas of Landscapes, the PPR classifies the olive grove slopes between Assisi and Spoleto under profile 2_SS_Valle Umbra. The Valley is classified by the PPR as a key landscape of the region, with a distinctive identity, mainly owing to its long history and unique morphology. The olive groves and other productive uses of the soil are not only considered quality agricultural productions (DOP, IGP, etc.), but also classified among identity resources as symbolic social resources. This term describes the social values, the inclinations, and the knowledge of local society, and space utilization practices, esthetic values, the forms of imagination and symbolic imagery. In the description of the identity-shaping structures of the Umbrian Valley are the historical hillside cities, the hillside olive groves between Campello and Trevi, and the production of DOP oil. The social and symbolic resources here are the strong relationship between historical settlements, urban and land use morphology, and the agricultural production uses of the same land. The guidelines adopted by the PPR confirm, for rural territories, the orientation of the community funds for rural development, which aim, in particular, to increase biodiversity and preserve landscape differences, to protect the rural landscape and its fundamental elements, to spread eco-friendly agro-forestry practices, to actively protect the historical, cultural and natural heritage, to improve and increase the attractiveness

and usability of locations through the upgrade of the rural and landscape heritage, to improve living conditions and the possibility of the local population's permanence in the location, and to promote activities of territorial marketing that associate the quality of the products with the landscape of the rural area. In particular, the PPR considers the requalification of landscapes near urban areas a relevant occasion to preserve the diversity and polymorphism of the Umbrian landscape, which is exposed to the threat of a progressive abandonment of traditional cultures, the place of which is taken by residential and tourist structures. The incentivisation of agricultural multifunctionality is a key activity for the preservation and strengthening of the landscape identity of rural territories, using the quality of the landscape as a strategic resource for the development of rural areas and marketing of typical products.

Regional law 13/2009, "Regulations for the government of the territory and planning and for the relaunch of the economy through the requalification of the existing building heritage," integrates law L.R. 27/2000, "Territorial City Plan," inserting art. 22 bis Oliveti:

1. Olive groves, aside from qualifying regional productions as per art. 19, clause 2, letter a), represent an identifying element of the Umbrian territory.
2. The PPR, the PTCP and the PRG, also in actuation of clause 1, designate regulations that protect production areas, limiting possible transformations intended to construct buildings and infrastructures and providing for procedures and terms in case of mandatory replanting.
3. Implementation plans, building projects, and those for public works or works of public interest, in conformity with clause 2, can also provide for the explantation of parts of the olive grove strictly necessary for the implementation of the plan, indicating a replanting in a different site.
4. The authorization for cutting down olive trees is granted by the competent territorial municipality in the following cases: a) should their physiological death, i.e. permanent unproductivity owing to non-removable causes, be proven; b) trees that damage the olive grove because of excessive density; c) for the execution of public works or works of public utility; d) for the construction of buildings in conformity with the present urban-construction instruments.

5.4.2 Municipal Plans (PRG)

Landscape regulations provided for by the Piano Regolatore (PRG), or municipal city plan, of the City of Assisi, regulate interventions to make admissible transformation compatible and fitting with the landscape of the municipal territory. The regulations provided for by the PRG of the City of Assisi are aimed to preserve and recover the relationship between natural and man-made elements: morphology, land use, historical and cultural identity, environmental and settlement characters and types. The general rural landscape planning criteria of the City of Assisi are based on the validity of constructions, permanent transformations of locations, and agricultural practices that ensure the protection of the elements that characterize the natural landscape (relevant trees,

oak trees dividing the fields or on terracing and embankments). It allows for interventions aimed to protect terracing and embankments. Outside of residential areas, new constructions have to be compatible with historical and landscape features. Interventions in rural areas with the aim of the economic development of the farms have to pursue the preservation and enhancement of the local landscape. The adaptation and management of sloping land has to provide for the correct management of surface water. Restoration work is allowed for votive aedicules, rustic fountains, wells, entrance gates to farms etc.

The general regulations for the protection of the territory's appearance in the PRG of the City of Spello prescribe that every transformation of the territory must be carried out with criteria, techniques, and expedients aimed to minimize the impact on the environment and the landscape. Every transformation and use must be in proportion to the location and the specific ecosystem's capacity, with the aim of not altering its distinctive features or the existing balance. In transformation interventions, planning choices must respect the orography, the type of soil and the existing vegetation.

The PRG of the City of Foligno regarding the general objectives of the projects for extra-urban areas makes the following distinction: between landscape and environmental objectives, i.e. the ecological recovery, protection and enhancement of the natural and man-made landscape with particular reference to rural constructions; and functional objectives with the aim of regulating and supporting agricultural and zootechnical activities as well as other productive and leisure-culture activities in the respect of environmental compatibility.

The PRG of the City of Trevi, as regards the locations included in the perimeter of farm areas, prescribes that new constructions or enlargements of existing ones, should they be admitted, must be in alignment with the materials and traits of the type of farmhouse typical of the region. Supporting walls typical especially of the hilly areas where olive trees are grown, such as terraces and embankments, can only be object of ordinary and extraordinary maintenance, and conservational restauration. Collapsed parts must be repaired with traditional techniques. New modelling of the ground is forbidden, and in case of improvements these must be always approved by the competent authority. All external adjustments (land moving, tree planting, paving, fences, arbors, etc.) must be in alignment with the traditional ones and be adequately detailed in the plans. Supporting walls must be built in the traditional manner, dry-stone or with other materials, but still covered in local stone, as per tradition, with slabs at least 10-cm thick. Should there be an authorization for cutting down a tree, the proprietor is obliged to replant, even in a different site, a number of trees double of those cut down and consistent in height (2 meters circa).

The PRG of the City of Campello sul Clutunno divides the rural territory into E agricultural zones and E1 agricultural zones. In E zones the construction of buildings functional to the management of the farm are admitted (farm houses, storage buildings, silos, stalls, and plants for the transformation of agricultural products), as well as the refurbishing of existing buildings. Buildings of particular architectural or historical value, both residential and agricultural, cannot be altered

by consistent movements of soil that would alter the original layout (rows, terracing), and where it is possible it is mandatory to preserve the typical crops and the local species of trees. E1 agricultural zones are the most ancient ones. Here restoration, consolidation, and interior refurbishing are admitted with prior authorization. The preservation of the existing crops, especially olive groves, is mandatory. As for the construction of agricultural annexes, it is allowed exclusively for agricultural entrepreneurs.

The PRG of the City of Spoleto divides rural areas into: Areas of special agricultural interest, Agricultural areas, and Woodland areas. The areas of special agricultural interest are those where high-quality crops are produced. The development of agricultural and food production chains is promoted with the possibility of building plants for the transformation of typical products or ones with a protected trademark. Farms producing high quality typical products can erect new productive buildings notwithstanding the land use index (ratio between gross usable surface and the territorial surface in a specific area) with prior approval of a PAC.

5.4.3 Environmental restrictions

Environmental restrictions are applied by national laws, in particular law 1497/39 on the protection of natural beauties recognized to be of great public interest, and law 431/85 (Legge Galasso). Portions of the proposed area are affected by the environmental restrictions provided for by law 1497/39, and parts are affected by the restrictions regarding wooded areas and the respect of a distance of 150 meters from waterways provided for by law 431/85.

Furthermore, the Ministerial Order promulgated on August 29, 1956 acknowledges that Trevi and the surrounding land are “of great public interest, because aside from being a complex of great traditional and esthetic value, with its position on the crown and high slopes of the hill, surrounded by the green of the olive groves, it also offers, thanks to its elevated position, many locations accessible to the public from which you can enjoy the view of the charming valley below.”

5.4.4 Protected areas

The proposed area is mainly a non-protected area, but some protected areas can be found along its borders and, for a limited surface, also inside the proposed area. These protected areas are of the following types:

- Mount Subasio Regional Park
- Sites of Community Importance (SCI) of Natura 200 network

These protected areas have been created to preserve the “natural” features of the surrounding mountains and for these reasons they do not interest the cultivated areas. Anyhow, it is

interesting to understand the specific aims of these areas and the relation of the protected features with the olive groves.

Mount Subasio Regional Park

The Mount Subasio Regional Park has a surface of about 7,177 hectares and was established by Regional Law n. 9/1995. The Park extends around the Mount Subasio (1290 meters a.s.l.), perhaps the most famous mountain in Umbria, which overlooks the vast valley and hilly landscape. According to geobotanical, fauna, geological, historical and cultural emergencies present on the territory, the area of the Park has been divided into homogeneous Zones. It was decided to exclude the establishment of Zone A, "integral reserves", in which the natural environment is preserved in its integrity, since the entire area is affected by profound and significant human intervention. Over the course of the centuries, this intervention has deeply altered the natural environment, but it has contributed to the creation and to the preservation of an environment and of a landscape of high cultural value. The Park is divided in: Zone B "General-Oriented Reserves", Zone C "Areas of Protection" and Zone D "Areas of Economic and Social Promotion".

Regarding the aims of the Mount Subasio Regional Plan, the Management Plan identifies two main aims:

- Conservation
  - a) conservation of typical ecosystems, recovery and preservation of genetic resources;
  - b) conservation and protection of local species of flora and fauna of particular interest;
  - c) protection of geological landscapes and response to emergencies, in particular the areas with the highest hydrogeological risk;
  - d) protection of environments with high landscape value;
  - e) recovery of degraded environmental situations.
- Fruition and enhancement
  - a) Historical-cultural-religious: recovery and promotion of places with particular historical, cultural and religious value;
  - b) Scientific-education: dissemination of scientific knowledge, implementation of educational programs for the conservation of nature, organization of environmental education activities;
  - c) Touristic-recreational: free use of locations in direct contact with nature, i.e. walking, hiking, etc.
  - d) Touristic-sports: adequate infrastructures for hang gliding, horseback riding, etc.
  - e) Economic: silvicultural and grazing activities, agricultural cultivation, handcrafts;

f) Artistic-cultural: promotion of the historical and religious heritage, of cultural traditions, and of specific forms of anthropization.

The first aim of the Regional Park is to preserve the grassland located on the summit of Mount Subasio, but the Management Plan takes into account not just the protection itself, but also the economical (grazing, cultivations) and recreational activities (hiking, sports) that are commonly practiced in the area. In fact, agricultural activities are allowed even in Zone B, the highest level of protection according to the Park zoning. These activities can be carried out, but only if they are compatible with the genetic and morphologic characteristics of the area, meaning that the morphology cannot be modified. Agricultural activities must be of traditional type and must respect the local landscape. Only the people living in the municipalities comprised in the Park boundaries are allowed to carry out agricultural activities, and transhumance is subject to specific authorization. Anyhow, the proposed GIAHS areas is only marginally affected by the presence of the Regional Park, since only 646 ha of the total 7,177 ha fall inside the proposed area boundaries.

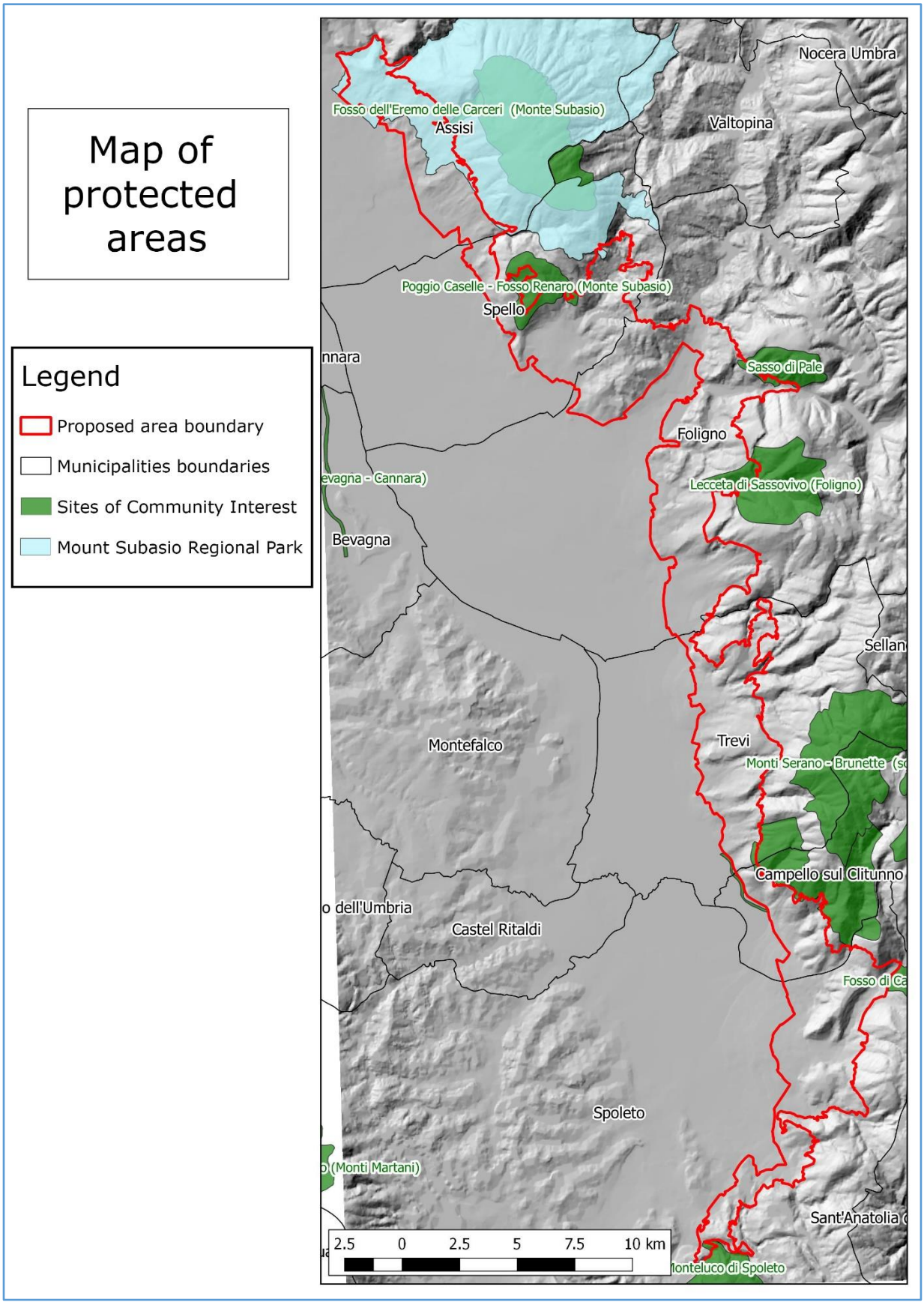


Figure 74: map of protected areas.

Sites of Community Importance

Regarding the Sites of Community Importance (SCI), these areas were established by the European Commission Habitats Directive (92/43/EEC) as areas that contribute significantly to the maintenance or restoration of a favorable conservation status of a natural habitat type or of a species. The Sites of Community Importance are part of a European network called Natura 2000 network. The proposed GIAHS area is affected by the following Sites of Community Importance:

- IT5210030 Fosso dell'Eremo delle Carceri (Monte Subasio). Only 0.07 ha of this 50-ha SCI are comprised in the proposed GIAHS area. It is mainly represented by a *Quercus ilex* forest surrounding the Santuario Francescano of Eremo delle Carceri, characterized by centennial oaks and by the presence of a freshwater crab (*Potamon fluviatile*) and by the Sardinian warbler (*Sylvia melanocephala*), an uncommon bird. Although the site is affected by tourism, it is not subject to significant environmental vulnerabilities, since people can walk only on enclosed paths. Vulnerability: very low. The priority habitats are: Habitat 9340 Quercus ilex and Quercus rotundifolia forests; Habitat 91AA Eastern white oak woods.
- IT5210035 Poggio Caselle - Fosso Renaro (Monte Subasio). The SCI has a total surface of 300 ha, but only 125 ha fall inside the proposed GIAHS area boundaries. The site is characterized by many olive groves, and by the presence of *Juniperus communis* and *Juniperus oxycedrus*. The priority habitats are: Habitat 6210* Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites); Habitat 6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea; Habitat 91AA Eastern white oak woods.
- IT5210038 Sasso di Pale. The SCI has a total surface of 312 ha, but only 32 ha fall inside the proposed GIAHS area boundaries. The site is characterized by a small mountain with steep slopes and by a cave. Due to its peculiar morphology, the site is important for preserving the most significant evergreen oak forests growing on rocky terrain in the Umbria Region, as well as for noteworthy formations of Mediterranean vegetation developed on the debris at the base of the cliffs. The priority habitats are: Habitat 6210* Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites); Habitat 6220* Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.
- IT5210042 Lecceta di Sassovivo (Foligno). The SCI has a total surface of 639 ha, but only 87 ha fall inside the proposed GIAHS area boundaries. The SCI extends around the Sassovivo Abbey and is characterized by the forest surrounding the abbey made up of *Quercus ilex* mixed with deciduous species. The forest comprises centennial evergreen oaks. The priority habitat is: Habitat 6210* Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites).
- IT5210050 Valle di Pettino (Campello sul Clitunno). The SCI has a total surface of 795 ha, but only 27 ha fall inside the proposed GIAHS area boundaries. It is a site entirely covered by forests, mainly of *Quercus ilex* mixed with deciduous species. The priority habitats are:

Habitat 6110* Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi; Habitat 6210* Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites).

- IT5210064 Monteluco di Spoleto. The SCI has a total surface of 486 ha, but only 8 ha fall inside the proposed GIAHS area boundaries. The SCI is characterized by a large *Quercus ilex* forest with centennial trees, mixed with deciduous species. The forest is home to *Monotropa hypopitys* (Dutchman's pipe, false beech-drops, or yellow bird's-nest), which is a herbaceous perennial plant, considered rare at national level. Among the fauna, the presence of *Accipiter nisus* (rare), *Buteo buteo*, *Muscicapa striata*, *Sylvia melanocephala* (non-common) is confirmed. The highest part of the site is strongly affected by tourism, while the sunniest slopes were affected some decades ago by residential urbanization. Despite this, the vulnerability of the site is very low, almost limited to fire risk. The priority habitats are: Habitat 9340 *Quercus ilex* and *Quercus rotundifolia* forests; Habitat 9540 Mediterranean pine forests with endemic Mesogean pines.

According to the legislation of the Sites of Community Importance, any land use change inside the identified habitat is prohibited, unless it is intended for the recovery or the valorization of the habitat itself. Inside the identified habitat, the construction of new buildings or the expanding of existing ones is also not allowed. Finally, it is forbidden to remove and damage hedges and tree-lined rows of indigenous herbs, isolated or groups of indigenous trees, dry stone walls, terraces, springs and other features typical of the traditional and historical agrarian and cultural landscape.

5.5 Regional Observatory for Biodiversity, Rural Landscape, and Sustainable Planning

The Regional Observatory for Biodiversity, Rural Landscape and Sustainable Planning established by Regional Deliberation n. 968 on 13.07.2009 is a research center with an interregional scope, intended to monitor species and habitats of importance for the community, as provided for by art. 17 of Directive 92/43/CEE. The Observatory's main objective is to collect and make available regional information on biodiversity through a single informative system open to the public. The central focus of the Observatory is, in fact, biodiversity in its vastest and most complete sense, thus including all possible dimensions, with particular attention given to the rural environment. Thus, the Observatory also studies and monitors the transformations of the rural environment and the natural elements present in landscape mosaics, as well as the general processes of the relevant policies to evaluate the "cumulative" effects on the landscape with the aim of designing corrective actions in critical circumstances. The leitmotiv of their observations and studies, and the key to their interpretation, is the strategy of sustainability. The Observatory's headquarters are in Villa Fabri in the municipality of Trevi. The Villa represents a veritable reference point for the theme of biodiversity, interregional, national, and international in scope. The Observatory also

supplies the information necessary for an economical evaluation of biodiversity, which is at the base of a sustainable use of resources. Last but not least, the Observatory carries out activities of divulgation, formation, and planning in accordance with European funding, also considered of the utmost importance. The Observatory also supports the development of a regional Strategic Plan on Biodiversity, aims to protect said resource in regional plans and programs, locally implements international conventions on the tutelage of biodiversity and landscapes (Florence Convention in 2000, Rio Convention on Biodiversity in 1992, World Heritage Sites in 1972, CITES in 1973, etc.). Experts in the areas of botany, zoology, settlement, rural landscape, and in the economic value of biodiversity are part of the Observatory's technical-scientific staff.

The Observatory was founded to carry out specific tasks and functions, which can be summed up as follows:

- **Monitoring**: of cultural, plant, and animal diversity through the collection and validation of data and observations, published and unpublished, their filing and elaboration also in GIS environment, including the implementation of the preservation measures contained in the Management Plans and the establishment of the related POR and PSR plans;
- **Advanced training:** in the form of master's programs and advanced specialization courses in subjects specifically related to the preservation and tutelage of biodiversity offered by Universities, local administrations, research centers, professionals, entrepreneurs, associations, and NGOs;
- **Planning and consultancy:** for private and public institutions, supporting and evaluating plans, projects, and programs for urban-territorial transformation, for the use of resources, and for recovery, restoration, and adaptation;
- **Dissemination of knowledge**: in the areas of didactics, divulgation, information, education, and awareness;
- **Support**: of the Protected Areas Service, Enhancement of Natural and Landscape Systems, of the Umbria Region in all subjects with a high environmental profile and/or in planning with great territorial significance;
- **Events:** organization of national and international events and/or conferences, European projects.

Figures 75: Two flyers for events organized by the Regional Observatory in Trevi; on the left, the May 21-22, 2016 event titled "World Biodiversity Day"; on the right, the event that took place on December 5, 2014 titled "The Historical Olive Grove Landscape of the Umbrian Valley"

5.6 Description and changes of the traditional landscape features: a multitemporal analysis

The landscape of the olive grove slopes between Assisi and Spoleto has been studied through aerial photographs from 1954, orthophotos from 2011, and field surveys. An extremely detailed series of maps was produced, using the minimum mapping unit of 500 m^2. A multitemporal analysis was carried out using VASA multitemporal methodology that calls for the comparison in different periods with GIS software, with the analysis of land use in the different dates, analysis of the landscape dynamics, and calculation of specific indexes for the evaluation of the structure of the landscape mosaic. The maps produced by the multitemporal analysis may be found in the annexes.

5.6.1 The landscape in 1954

In 1954 the landscape of the olive grove slopes between Assisi and Spoleto, reconstructed through the photographic interpretation of black and white aerial pictures, was occupied in over half of its surface by olive groves (55% of the total surface): 37% olive groves with irregular layout, 18% with regular layout. Other land uses occupied a very limited surface: arable land with olive trees occupied 15% of the total surface; variously composed woods at different stages in their evolution (scrublands, woods of broad-leaved trees, conifer woods, and mixed woods) took up 12% of the area; 4% of the surface was covered by urbanized areas; 2% was arable land; and 2% pastures. Other land uses occupied about 10% of the territory, each for a portion lower than 1%: intercropping, meadows and meadows with trees, pastures with trees or bushes, abandoned olive groves, riparian vegetation, hedges, trees, scattered olive groves, etc.

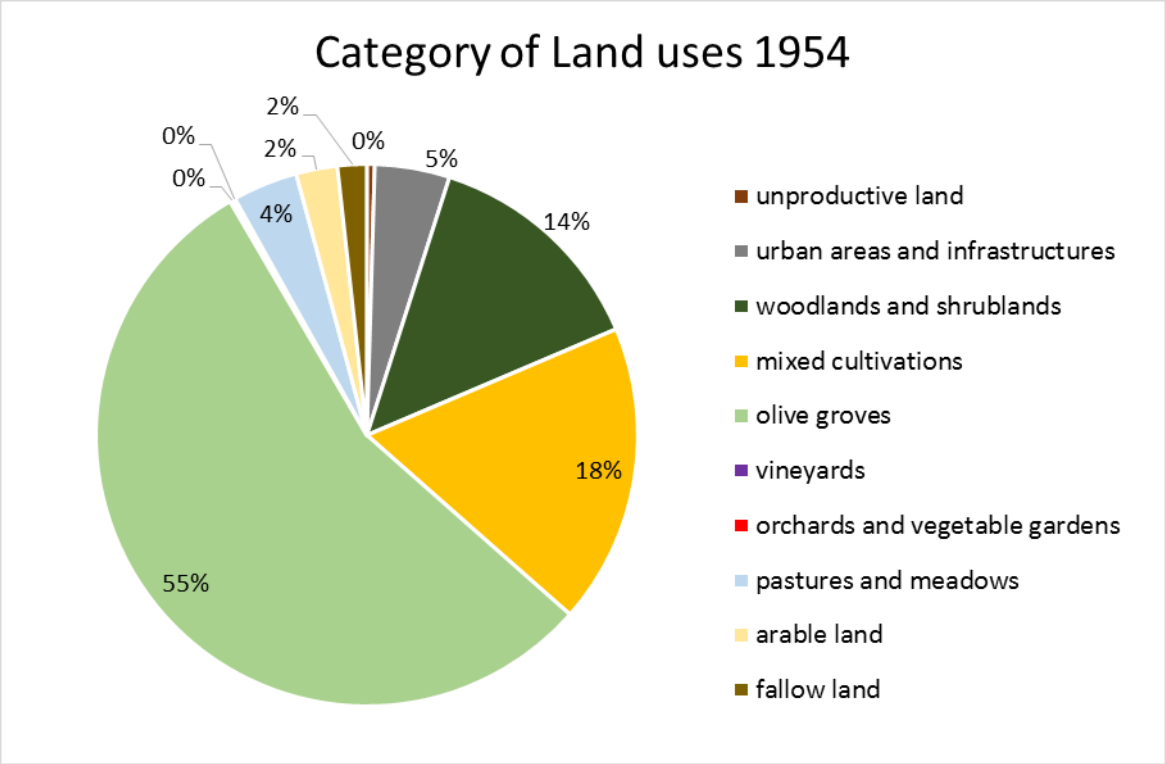


Figure 76: Category of land uses in 1954.

Land uses 1954	Surface (ha)	Surface (%)
Water bodies	12,99	0,14
Rocky outcrops	29,40	0,32
Urban areas	389,38	4,27
Conifer trees	0,55	0,01
Broadleaved trees	3,29	0,04
Scrublands	308,91	3,39

Conifer forest	4,20	0,05
Broadleaved forest	768,94	8,44
Mixed forest	12,60	0,14
Cemetery	1,70	0,02
Intercropping vine-olive trees	56,41	0,62
Fruit orchard	0,56	0,01
Fallow land	158,46	1,74
Olive groves with irregular layout	3340,72	36,66
Olive groves with regular layout	1596,02	17,51
Abandoned olive groves	5,05	0,06
Scattered olive groves	70,66	0,78
Vegetable gardens	11,22	0,12
Pasture	166,33	1,83
Pasture with trees	59,73	0,66
Pasture with shrubs	17,91	0,20
Meadow	60,18	0,66
Meadow with trees	49,75	0,55
Arable land	224,78	2,47
Arable land with trees	43,71	0,48
Arable land with olive trees	1322,19	14,51
Arable land with vines	66,36	0,73
Arable land with vines and olive trees	142,93	1,57
Hedges and rows	133,89	1,47
Riparian vegetation	19,88	0,22
Roads	16,62	0,18
Vineyards	17,99	0,20
Total	**9113,31**	**100,00**

Tab. 2: land uses in 1954

5.6.2 The landscape in 2011

For the contemporary landscape, reconstructed with the photographic interpretation of orthophotos from 2011 and field studies, 41 different land uses were identified. The proposed area is occupied for half of its surface by olive groves (nearly 50%): 26% with a regular layout, 23% with irregular layout.

Other soil uses occupy a very limited surface: 14% are variously composed woods (8% broadleaved forests, 3% mixed forests, and 3% conifer forests); 9% of the territory is urbanized, 8% is arable land, 5% meadows, 3% scrublands, and 2% vineyards. Other land uses occupy 10% of the territory, each with a share equal to or lower than 1%: intercropping, meadows with trees, pastures, abandoned olive groves, riparian vegetation, trees grown for their wood, etc. Some land uses that were not present in the past are present today: tree growing for wood, mining activities,

greenhouses, and truffle fields. These elements, which are not representative of the historic rural landscape, do not occupy vast surfaces: overall, they cover less than 2% of the total surface and can be considered elements of vulnerability that have to be monitored, but are not a threat for the integrity of the historical landscape.

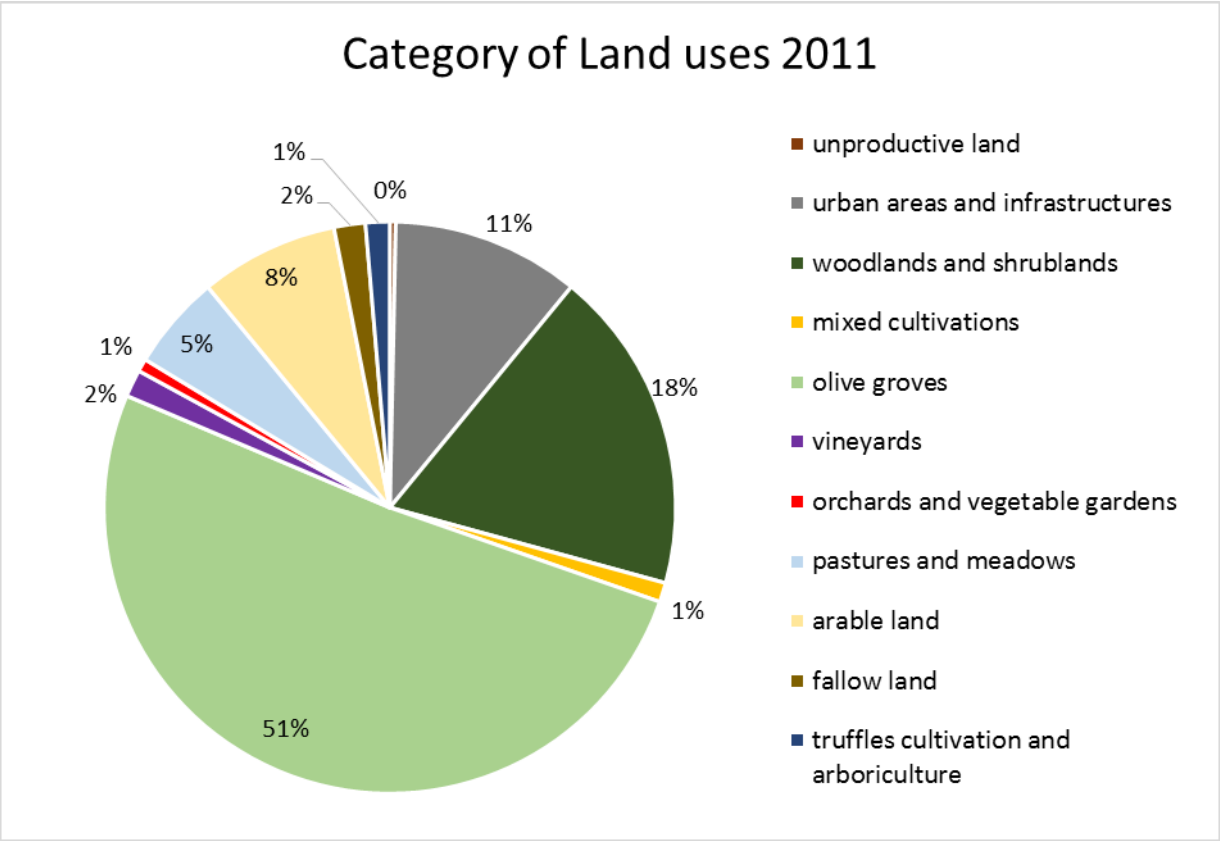


Figure 77: Category of land uses in 2011.

Land uses 2011	Surface (ha)	Surface (%)
Water bodies	2,72	0,03
Rocky outcrops	1,17	0,01
Urban areas	852,78	9,36
Conifer trees	3,41	0,04
Broadleaved trees	116,52	1,28
Arboricolture	81,21	0,89
Shrubland	266,62	2,93
Construction site	2,26	0,02
Mining area	26,52	0,29
Conifer forest	248,01	2,72
Broadleaved forest	726,88	7,98
Mixed forest	257,65	2,83
Cemetery	6,70	0,07

Intercropping vine-olive trees	12,16	0,13
Railway	1,24	0,01
Fruit orchard	13,38	0,15
Sports facility	9,82	0,11
Fallow land	161,80	1,78
Olive groves with irregular layout	2325,64	25,52
Olive groves with regular layout	2117,43	23,23
Olive groves with fruit trees	2,05	0,02
Olive groves with cypress	1,03	0,01
Abandoned olive groves	146,73	1,61
Scattered olive groves	61,88	0,68
Vegetables gardens	52,62	0,58
Pastures	41,92	0,46
Meadows	440,31	4,83
Meadows with trees	6,17	0,07
Arable land	713,67	7,83
Arable land with trees	1,22	0,01
Arable land with fruit trees	3,02	0,03
Arable land with olive trees	62,19	0,68
Arable land with vines	10,06	0,11
Arable lands with vines and fruit trees	1,69	0,02
Arable land with vines and olive trees	6,16	0,07
Greenhouses	0,43	0,00
Truffles cultivation	43,36	0,48
Riparian vegetation	48,81	0,54
Roads	94,68	1,04
Vineyards	140,43	1,54
Vineyards with fruit trees	0,96	0,01
Total	**9113,31**	**100,00**

Tab. 3: land uses in 2011

5.6.3 Landscape dynamics

Analysis of the dynamics shows that 54% of the surface preserved its main traits unaltered, confirming the high quality of the landscape of the proposed area: in particular, 56% of hedges and trees, 53% of regular layout olive groves, 51% of scattered and irregular layout olive groves, a little more than 50% of the forests, 34% of arable land, and 25% of intercropping fields present in 1954 remained unvaried, as well as 16% of fallow lands, and 10% of meadows.

There are, however, some significant transformations. Intensification has interested 14% of the territory in the proposed area. These dynamics have mainly interested: intercropping fields (arable land with trees, arable land with olive trees, etc.), mainly leading to the conversion of these land

uses into arable land in 37% of cases and vineyards in 19% of cases compared with 1954; rocky outcrops (10% of their surface in 1954 has become a mining area, 10% regular layout olive groves); the fallow land, converted in 25% of its surface in 1954 into regular layout olive groves and 6% into arable land. 20% of irregular layout olive groves has become regular. 14% of the pastures present in 1954 (pastures, pastures with trees, and pastures with bushes) have been converted into regular layout olive groves, 7% into meadows and irregular layout olive groves, and 4% into vineyards. The meadows (meadows and meadows with trees) have become intensified in 27% of their surface of 1954, having been converted into arable land and 15% into regular layout olive groves.

Afforestation has involved 10% of the territory. It is mainly concentrated on rocky outcrops (70% of the surface in 1954), on pastures (53% of the surface in 1954), on fallow land (30% of the surface in 1954) and on nearly 15% of meadows.

Extensivization has interested 10% of the territory and mainly concerns arable land (nearly 40% of the surface in 1954), intercropping fields (15% of their surface in 1954 is now meadows), regular layout olive groves (16% of their surface in 1954 is now irregular), and abandoned olive groves (10% of their surface in 1954 is now meadows).

Anthropization has affected 8% of the total surface. These dynamics have mainly involved hedges and trees (8% of the surface in 1954), forests (18% of the surface in 1954), 10% of fallow lands, 8% of the surface of irregular layout or scattered olive groves, 4% of regular layout olive groves, 17% of abandoned olive groves, 6% of pastures, 13% of meadows, 9% of arable land.

Finally, deforestation has interested 4% of the total surface. 12% of the surfaces occupied by hedges and trees in 1954 are today regular layout olive groves (7%) and irregular (5%). 30% of the forests present in 1954 have been converted into olive groves.

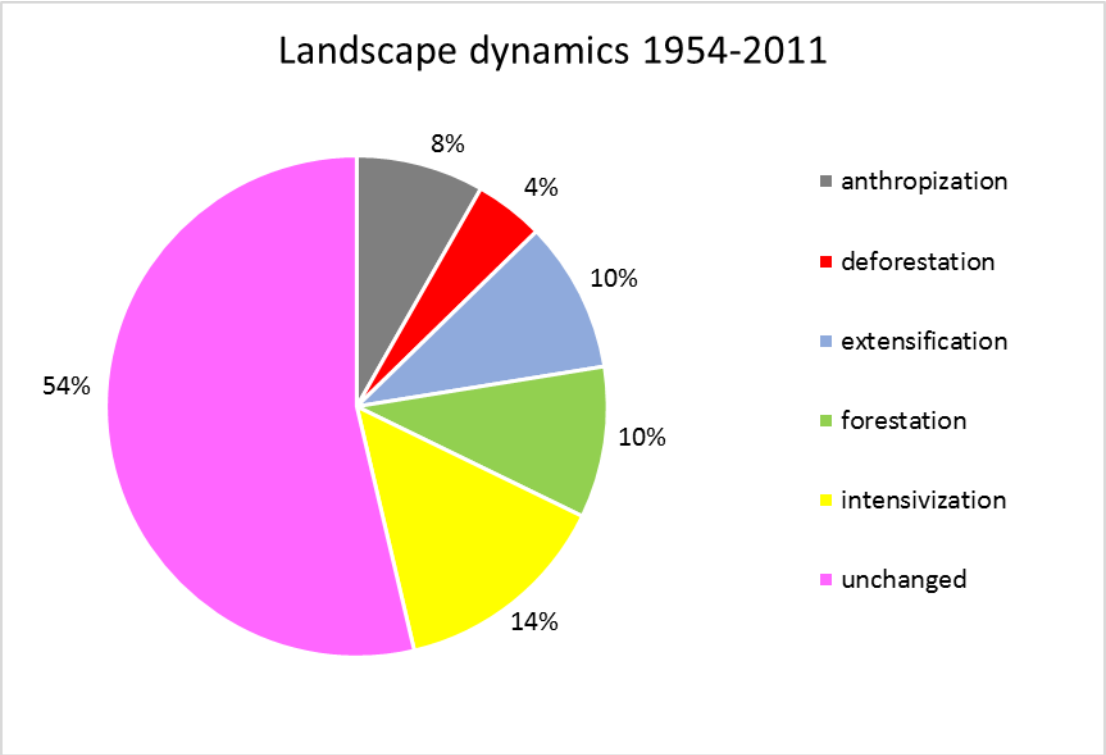


Figure 78: Landscape dynamics for the period 1954-2011.

5.6.4 Increase in urban areas and scattered settlements

An in-depth study was carried out on the built-up locations of the proposed area with the aim of evaluating the increase and dispersion of urban areas and scattered settlements. The specific maps are found in the annexes.

From the photographic interpretation of 1954 pictures it became evident that built-up areas occupied about 390 hectares of the entire surface. Most of this surface interested the historical nuclei of Assisi, Spello, Foligno, Trevi and Spoleto, but there were also a large number of farm houses, villas, and in general buildings for agricultural and residential uses with all their annexes, which we could generically define "ordinary rural construction," but also a conspicuous number of religious buildings and complexes (churches, convents, abbeys, sanctuaries, hermitages, aedicules, and votive chapels), military constructions (towers, citadels, and castles), or civilian structures with specific non-residential functions (ancient mills and staging posts, ruins of bridges and roads, funerary constructions, ecc.), which we will call "isolated special construction."

From the photographic interpretation of the orthophotos from 2011 we can see that the built-up area has more than doubled, with an extension of 850 hectares circa. The most substantial increase was registered in the area south-east of Assisi, in the plains of the City of Foligno, and in the municipality of Campello sul Clitunno.

Scattered rural buildings have also increased, but without “savage” allotments. In general, urban expansion was more moderate than in many other Italian areas and regions, both thanks the very morphology of the proposed area, and to the environmental restrictions provided for by law 1497/39 applied to many parts of it.

5.6.5 Landscape indexes for the evaluation of the landscape mosaic

The use of indexes for the evaluation of the landscape makes it possible to analyze the main transformations that have interested the structure of the landscape mosaic. As we can see from the number of patches of total average surface and of agricultural surface, the landscape was less fragmented in 1954. The patches in the mosaic were nearly half as many and their individual surface was nearly twice as big as that of those that compose the rural landscape today. This result can be explained by the minor quality of aerial photography in 1954, which did not allow for the same level of detail in photographic interpretation as the color orthophotos of 2011.

Landscape evaluation indexes	1954	2011
Total surface	9113	9113
Number of patches	7563	13802
Number of land uses	32	41
Hill’s Diversity Number	8.2	10.7
Average surface of patches	1.21	0.70
Average surface of agricultural patches	1.28	0.67

Tab. 4: landscape evaluation indexes

To better draw attention to the transformations undergone by the landscape of the olive grove slopes between Assisi and Spoleto, it seemed useful to use the Sharpe Index, that shows which land uses are responsible of the greatest changes. As you can see in the chart, the most significant trends over the past 60 years are the concentration of mixed cultivation (mainly of arable land with olive trees), of hedges and trees, and of irregular layout olive groves. On the contrary, the opposite trend is found mainly in regular layout olive groves, arable land, meadows and urban settlements.

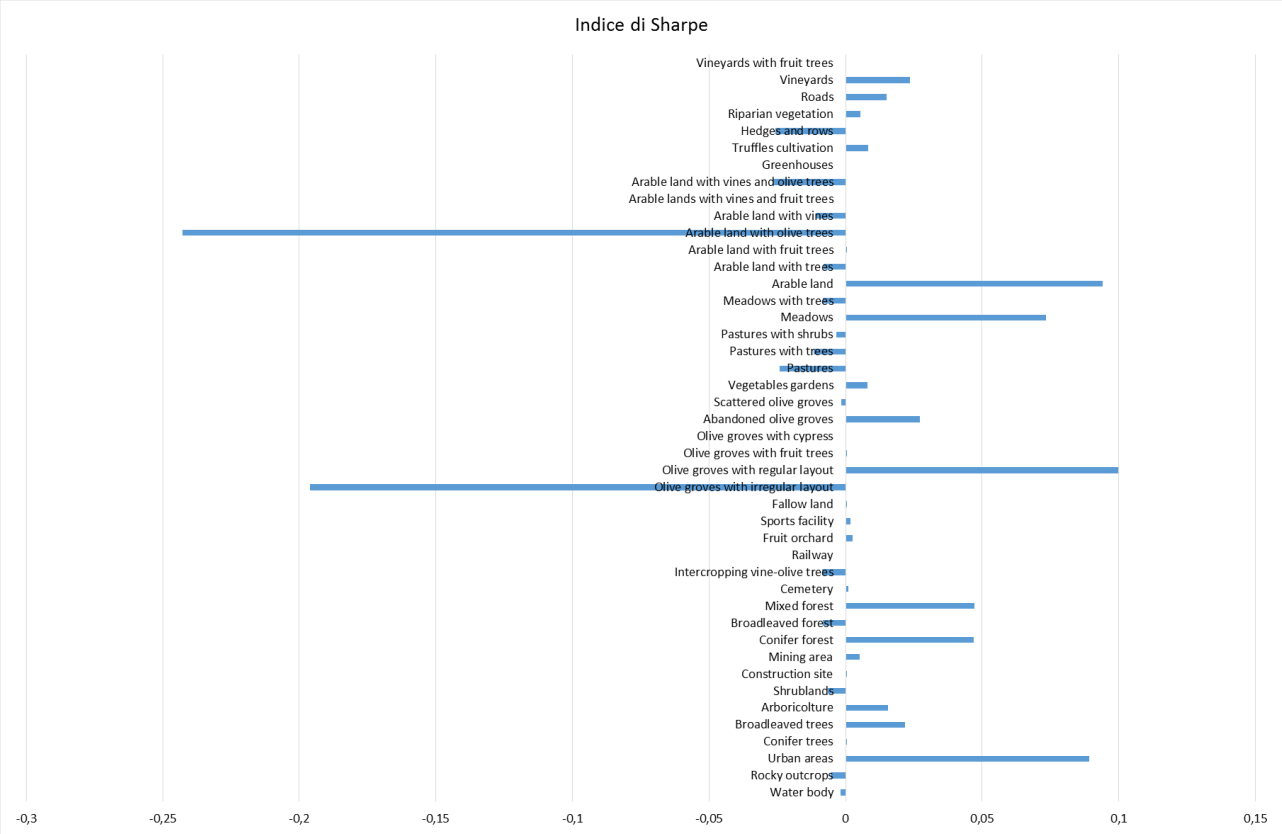


Figure 79: Sharpe's Index

5.6.6 The Historical Index

Calculating the historical index made it possible to show that the historical land use that most risks disappearing is that of mixed cultivation: arable land with trees, arable land with vines and olive trees, and arable land with vineyards. Rocky outcrops, which do not represent an agricultural land use per se, have produced elevated values on the historical index because, as shown by the dynamic analyses, afforestation has nearly converted this land use into woods in different phases of growth and with specific compositions. In the cartography of the Historical Topographical Index (see annexes) we find the historical index values assigned to those land uses that today are still in the same location as 1954. The cartography of the historical topographical index does not coincide with the integrity index, because when calculating integrity all the present-day landscape patches occupied by land uses considered of historical significance are taken into consideration, regardless of their topographic coincidence with 1954.

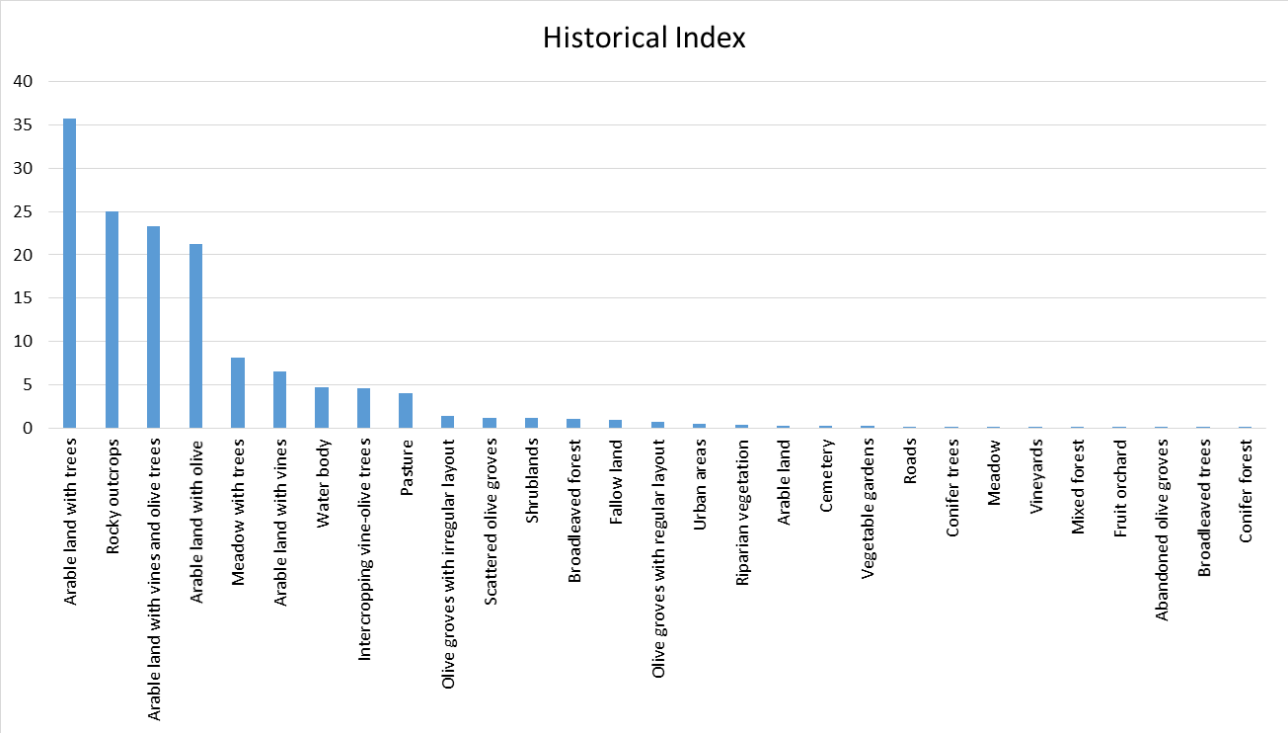


Figure 80: Historical Index

5.7 Assessment of the integrity of the historical landscape

The analysis of the level of integrity of the historical rural landscape makes it possible to synthetically asses the grade of preservation of the historical landscape based on the land uses present today in the proposed area. The specific cartography may be found in the annexes. This type of analysis makes it possible to classify the landscape in a system of Classes of increasing value, from I to VI, as provided for by the eligibility criteria for the National Registry of Historical Landscapes of the Italian Ministry of Agricultural Policies. Furthermore, based on the results of the VASA analysis, an Integrity Chart was produced with GIS software.

According to this analysis, the proposed area has a Class V grade of integrity, bearing witness to the fact that the overall quality of the historical landscape of this area is high and mostly presents a high degree of conservation.

Percentage of historical landscape on the total surface	Grade of Integrity
0%-20%	Class I
20%-35%	Class II
35%-50%	Class III
50%-65%	Class IV

65%-80%	Class V
80%-100%	Class VI

Tab. 5: Chart of the grade of landscape integrity evaluated by the Italian Ministry of Agricultural Policies. The proposed area is in Class V.

5.8 Landscape restoration: St. Francis' Woods in Assisi

The area below the outcrop of the Basilica of St. Francis in Assisi called St. Francis' Woods shows the influence of the Franciscan order that parceled these lands into holdings following the classical sharecropping model until the Italian Unification that led to the end of the Papal States in 1870, when these goods became property of the Italian State. In 2008, the FAI (Fondo Ambiente Italiano) acquired part of the property of St. Francis' Woods, and in 2010 restoration works were commenced. The landscape is to this day marked by mixed cultivation and woods, arranged in a territory dominated by a hilly morphology, with steep inclines and small valleys. The scattered settlements present an architecture typical, both in materials and in form, of buildings erected to respond to agricultural needs. This is an extremely fascinating landscape in which small scale cultivation is articulated in different forms with traditional architecture and breeding techniques, composing a landscape mosaic that is representative of the sharecropping system, which impressed its shapes on the Umbrian countryside over the centuries. The restoration of St. Francis' Woods aims to recover of these traits, integrating this area in the surrounding landscape from productive, historical and esthetic points of view. This is one of the first examples of restoration of the historical Italian agricultural sylvan pastoral landscape: an increasingly necessary operation for the preservation of Italian cultural identity and environment, but also to offer the opportunity of exploiting the landscape as an added value for the economic development of the rural territory.

Figure 81: View of St. Francis' Woods at the foot of the Basilica in Assisi

Figure 82: Entrance to the visitor's center in St. Francis' Woods belonging to the FAI (Fondo Ambiente Italiano)

The monastic orders that around the year 1000 AD began to settle in the different mountainous areas of the Apennine, finding the ideal place for prayer and work in the wooded areas, played a particular role in the history of the Italian rural landscape. Their role as pioneers, tilling, recovering, planting, and cultivating, is a facet of the broader picture of deep changes that led to economic and political growth after the dark centuries of the late Middle Ages, which saw the development of commercial and agricultural activities, and the blossoming of new forms of land management such as sharecropping. Having overcome the traditional vision of the forest as antithesis of the city, an inhospitable place inhabited by creeping shadows and wild beasts, or as the private hunting grounds of the feudal lords, many religious groups found a favorable environment in the sylvan pastoral areas for their ideal of a secluded life while still being able to offer hospitality to travelers. The Mendicant Order of the Franciscans was founded by Saint Francis of Assisi in 1209 when the Franciscan order was approved by Pope Innocent III. The Franciscans cultivated and managed the land based on their personal consumption needs rather than for the marketplace. In fact, the monks were ordered not to cut down the whole tree when they needed wood so it would grow back. The edges of the vegetable garden were to be left wild so the green of the grass and the magnificence of the flowers could sing the beauty of God. Unlike other monastic orders, the main aim of the Franciscans was preaching, and this led to the need of moving constantly and transferring to a new convent, usually every three years. Thus, the characteristics of the religious order prevented them from consolidating noteworthy agricultural and forestry possessions. Each convent had only enough land for the vegetable gardens used for personal consumption, the flower beds to decorate the church, and a forest to produce wood for the fire and for construction. Thus, the landscape was marked by a certain complexity of forms, of structures and of management styles that are typical of Italian sylvan agricultural and pastoral systems. With the aim of drafting a plan for landscape recovery interventions, a profile was elaborated using the VASA multitemporal methodology, not only on the FAI's property but also on a buffer zone, so as to reconstruct the characteristics of the historical landscape and to understand its changes.

Figure 83: Physiognomic landscape units into which St. Francis' Woods were divided

By analyzing the data from the elaborated profile, physiognomic landscape units with a historical-landscape basis were pinpointed. These represent the elementary units into which the landscape of the analyzed area was divided, bearing in mind the morphology of the territory, the vegetation and the historical dynamics. After analyzing the single unit and the entire complex of St. Francis's woods, for every physiognomic landscape unit, a management strategy that considers previous use, current situation, management vocation, preservation of the historical landscape, and risk of fires was assigned. In particular, among the cultivation objectives we find the recovery of pasture with trees, of the woods for pasture, of mixed cultivation, of olive groves, and of coppice. Mixed crops are one of the characteristic features of the Umbrian historical rural landscape and could be found in the woody areas of Tuscany, Umbria and Marche: the vines, supported by trees, were planted in regular lines that marked the borders of arable land in rectangular patches. By keeping the vine above the ground multiple advantages were obtained: it made it possible to cultivate the land between two rows, while the vine itself was protected from grazing animals with no need for fences; furthermore, the vine was protected from the dampness in the soil, and the pruned branches were used to feed the animals. Another typical element of the historical rural landscape are pasture woods, low in density, useful to favor the expansion of the crowns to maximize the production of fruit. As early as Roman times, Umbria was known for its pigs, bred and fattened in the downy oak woods. Furthermore, improvements were carried out on hiking trails, with the installation of informative panels along the way and the restoration of buildings. These include the 13th century Benedictine monastery of Santa Croce of which the only remains are the homonymous church and the Ponte dei Galli, the mill that has been turned into a refreshment spot, and the rectory used for welcoming visitors. For the occasion, artist Michelangelo Pistoletto created a work of land art, the "Third Paradise": 121 olive trees in two lines forming three intersecting circles of which the center one is bigger, with a 12-meter post in the middle symbolizing the union of sky and land.

Figure 84: Left, "Third Paradise" land art work by Michelangelo Pistoletto; right, the recovery of the olive groves

Figure 85: recovery of mixed cultivations

Figure 86: Protection of riparian vegetation and recovery of the trail accessing St. Francis' Woods

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Annexes