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# Globally important agricultural heritage systems: the case study of ancient olive trees in the Territorio Sénia, Spain

**Bachelor's Thesis**

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**Declaration**

I hereby declare that I have authored this bachelor's thesis carrying the name "Globally important agricultural heritage systems: the case study of ancient olive trees in the Territorio Sénia, Spain" independently under the guidance of my supervisor. Furthermore, I confirm that I have used only professional literature and other information sources that have been indicated in the thesis and listed in the bibliography at the end of the thesis. As the author of the bachelor's thesis, I further state that I have not infringed the copyrights of third parties in connection with its creation.

In Prague 28.4.2024 _____

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# Globally important agricultural heritage systems: the case study of ancient olive trees in the Territorio Sénia, Spain

**Summary:**

The main objective of this bachelor thesis "Globally important agricultural heritage systems: the case study of ancient olive trees in the Territorio Sénia, Spain" was to provide an overview on the Globally Important Agricultural Heritage Systems with a special focus on Europe.

To achieve the aforementioned objectives, a brief overview of traditional agricultural systems was given for context to explain the significance of the Globally Important Agricultural Heritage Systems program in the third chapter. The program was introduced, together with its key aspects. Furthermore, a brief characterization of agriculture in Europe was included. Subsequent to this, the main attributes of all European Globally Important Agricultural Heritage Systems were briefly identified.

A more detailed description was provided for the agricultural system of ancient olive trees in the Territorio Sénia in Spain, which was used as a case study and described in more detail. The system's key cultural, environmental, economic, and social dimensions were described according to the context of GIAHS. Major threats and challenges faced and actions to counteract these were identified. The thesis was further enriched by a personal consultation with a local farmer to provide scope to this work.

In the fourth chapter, conclusions were reached. Overarching objectives were stated, and their accomplishment was shortly assessed. A brief summary of key information was included.

**Keywords**: agrobiodiversity, Europe, rural development, sustainability

# Content

# 1. Introduction

In the present day, one of the major challenges faced by humankind is our ability to foster the capacity to secure social, economic, and environmental sustainability of food production worldwide (Singh & Singh 2017; Çakmakçı et al. 2023). A number of traditional agricultural methods have been displaced in recent decades. Such systems are facing increasing pressure from intensification of agricultural practices, climate change, and more. These variables pose a threat to the existence of indigenous knowledge and biodiversity, which have built up over generations of management by local communities.

Traditional agricultural systems sustainably provide a wide variety of crucial goods and services, as well as food and livelihood security in rural areas of the world. It is important that these systems are safeguarded, as their ecological, economic, and cultural facets have developed under one-of-a-kind environmental and socio-cultural circumstances to develop equally exceptional agricultural landscapes. Their socioeconomic, ecological, and cultural significance and potential, as well as their experience in natural resource management and use (Koohafkan & Altieri 2011), make such systems insightful for rural and sustainable development across the globe.

The Globally Important Agricultural Heritage Systems program launched by the Food and Agriculture Organization of the United Nations represents global recognition of the value of traditional agricultural practices. The initiative was launched to identify and classify outstanding traditional farming systems from around the globe in order to foster their safeguarding (Zhang et al. 2017) through conservation efforts, capacity building, and knowledge-sharing initiatives. The active involvement of local communities and relevant stakeholders is a key aspect of the program's approach.

Europe harbors several Globally Important Agricultural Heritage Systems. These sites represent traditional farming systems that have been sustained for centuries and are rich in cultural and ecological significance. Each of these sites is unique, with distinct farming practices, natural resources, and cultural traditions. Recognition is a stepping stone in increasing awareness of their value for preservation for new generations.

The olive tree holds significant importance within Mediterranean culture. Apart from its historical, economic, and environmental value, it represents a key component of local cultural identity. The presence of around 6,000 ancient olive trees (Mancomunitat Taula del Sénia 2023), the largest concentration observed in the world, distinguishes the Globally Important Agricultural Heritage System of Territorio Sénia, located in Spain. Ancient olive trees are pivotal in the region's economic, cultural, and environmentally sustainable development as both a heritage (Mancomunidad Taula del Sénia 2018; Ninot et al. 2018) and a resource.

# 2. Aims of the thesis

The main objectives of the bachelor thesis is to provide an overview on the Globally Important Agricultural Heritage Systems with a special focus on Europe. More detailed description will be provided for the agricultural system of ancient olive trees in the Territorio Sénia in Spain enriched by personal consultations with a local farmer.

# 3. Literature review

## 3.1 Traditional agricultural systems

Agricultural landscapes worldwide are shaped primarily by farmers and herders of localized communities (Brown & Kothari 2011; Koohafkan & Cruz 2011) that have been harnessing these landscapes for centuries, building on generations of knowledge, experience, and contextual know-how (Agnoletti & Santoro 2022). Local expertise and traditional techniques are incorporated into these systems, which utilize diverse natural resources to carry out cultivation and production processes adapted to unique conditions. Given this, such systems illustrate the dynamic nature of humankind's exploitation of nature (Koohafkan & Cruz 2011).

Traditional systems offer crucial social, cultural, ecological, and economic services (Koohafkan & Altieri 2011). Agroecosystems and landscapes maintained using traditional methods maintain an integral role, particularly in regions where a combination of natural and anthropogenic factors pose a challenge to agricultural intensification (FAO 2006) across developing and developed countries worldwide (Agnoletti & Santoro 2022). Notably, traditional agriculture is renowned for its adaptability to changing and varied environmental conditions, characterized by a richness of biodiversity and low external energy input techniques (Zhang et al. 2017; Agnoletti & Santoro 2022). Adopting such ecological management can help maintain or enhance soil health and water quality, thereby preserving and restoring habitats (Agnoletti & Santoro 2022). Furthermore, recreational value is enhanced by the improved ecological quality and the variety of available landscapes associated with the use of traditional methods (Zhang et al. 2017).

### 3.1.1 Distinction of traditional agricultural systems

Agriculture directly influences nature as a whole. As such, it poses significant threats to ecosystems and their constituents. Simultaneously, agroecosystems are sensitive to drastic environmental changes (Singh & Singh 2017). The intrinsic qualities of traditional agricultural systems described above distinguish them from modern and intensive agriculture (Agnoletti & Santoro 2022).

The distinction between traditional agricultural practices and modern and intensive ones primarily lies in adopting sustainable approaches reliant on local resources. Modern and intensive agriculture is characterized by the employment of high external energy input use and, simultaneously, a notable susceptibility to degradation (Agnoletti & Santoro 2022). Its implementation has resulted in increased agricultural output, in parallel with several ecological challenges, including pollution, biodiversity decline, soil deterioration, and climate change (Çakmakçı et al. 2023). Homogenization of landscapes, with minimal consideration for local environmental conditions, is a common association of such practices (Ramakrishnan 2004). In addition, the widespread implementation of modern and intensive systems has resulted in socioeconomic declines in rural regions worldwide. This is due to the inability of communities employing traditional methods to meet the technological and production requirements to compete in comparison. The requirements include high yields and low costs of labor, among others, set by modern and intensive systems (Agnoletti & Santoro 2022).

### 3.1.2 Challenges of traditional systems

Traditional agricultural systems often face complex conditions that can entail the need for unconventional methods, geographic isolation of communities, or environmental limitations, to name a few (Koohafkan & Altieri 2011). Moreover, modernization and often unsustainable technological, economic, and cultural advancements have rapidly declined traditional farming systems worldwide. The consequent deterioration of rural heritage linked with a loss of indigenous knowledge, biodiversity, and emigration from rural areas present additional issues (FAO 2007; Koohafkan & Altieri 2011). Moreover, the capacity of traditional agricultural systems to compete in the global market against intensive or subsidized systems is of concern in terms of their ability to sustain the livelihood of rural communities across the globe. A trend of insufficiency in research and rural development decision-making targeted towards traditional systems further threatens their existence (Koohafkan & Altieri 2011).

## 3.2 Globally Important Agricultural Systems (GIAHS) program

In line with increasing awareness of the significance of their heritage and challenges faced by traditional agricultural systems around the world (Garcíta et al. 2020), The Food and Agriculture Organization (FAO) of the United Nations (UN) introduced the Globally Important Agricultural Heritage Systems (GIAHS) global initiative for their safeguarding (Akira & Evonne 2021), pursuing a balanced approach towards their conservation, adaptation, and development (FAO 2018). Collaboration with the Global Environment Facility (GEF), among other organizations, contributed to its development (Koohafkan 2007). The program's launching took place in 2002 during the World Summit on Sustainable Development in Johannesburg, South Africa (Akira & Evonne 2021). FAO defines GIAHS as "Remarkable land use systems and landscapes which are rich in globally significant biological diversity evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development" (FAO 2018).

GIAHS are dynamic and continuously evolving. They reflect an ever-changing combination of social, cultural, and institutional elements that interact and demonstrate how humanity has evolved and adapted over time (FAO 2022). Simultaneously, they maintain a valuable legacy of traditions, ways of life, and numerous landscapes (FAO 2007). Potential to promote sustainable socioeconomic development through the production of products and services based on inherently site-specific characteristics is also integral to GIAHS (Martins et al. 2022). Furthermore, the aforementioned systems are relevant as models of adaptation and mitigation in response to climate change (Agnoletti & Santoro 2022).

The GIAHS program's framework for the classification of protected land is far more complex in comparison to the conventional European networks of protection (Martins et al. 2022). The program was initiated to engage in the promotion of policies and incentives in line with the overarching principle of dynamic conservation of relevant compromised systems. The program has since established a global status for its contribution to rural development and agricultural heritage preservation. Since its inception, the program has played a role in the facilitation of the implementation of relevant policies into rural development policies of member countries (FAO 2018). Furthermore, capacity-building workshops have been

arranged for the benefit of communities, organizations, and government officials (FAO 2024a).

### 3.2.1 Chronological development of the GIAHS program

From its very start, the GIAHS program was a collaborative endeavour. Following its initiation, a four-year project development phase was launched, during which an inventory of potential systems was created and proposals were drafted. This phase was marked by a series of meetings, workshops, and focus-group discussions, where the program was conceptualized, selection criteria were formulated, and agricultural systems worldwide were assessed to identify sites for the initiative's prototypes. This collaborative effort led to the identification of around two hundred systems to qualify as GIAHS. The implementation phase then began with concrete actions (Koohafkan 2007), as numerous initiatives were executed locally and nationally in collaboration with partners, local communities, and related stakeholders. These initiatives were aimed at supporting member countries in the identification and preservation of relevant sites (FAO 2018).

Ultimately, leveraging extra-budgetary financial resources, six pilot systems were selected in the following countries: Algeria, Chile, China, Peru, the Philippines, and Tunisia (GIAHS Information Sheet) to establish the frameworks for recognition and assistance as well as the methods of dynamic management (Yiu & Nagata 2018). The project development phase lasted till around 2006, and in 2007, full-scale project implementation started (Koohafkan 2007). Over a decade, sixteen sites were chosen, and the dissemination of the GIAHS concept was pursued through these. In 2013, consensus was reached among FAO council members to formally integrate the GIAHS program into FAO's framework (FAO 2024a). Subsequently, the GIAHS program was officially endorsed as a regular program by 2015 (Jiao et al. 2022; FAO 2024a).

As of today, FAO has recognized eighty-six GIAHS across twenty-six countries (Jiao et al. 2024). Various sites have been designated worldwide, as depicted in Figure 1. spanning the following regions: Africa, Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa (Kajihara et al. 2018).

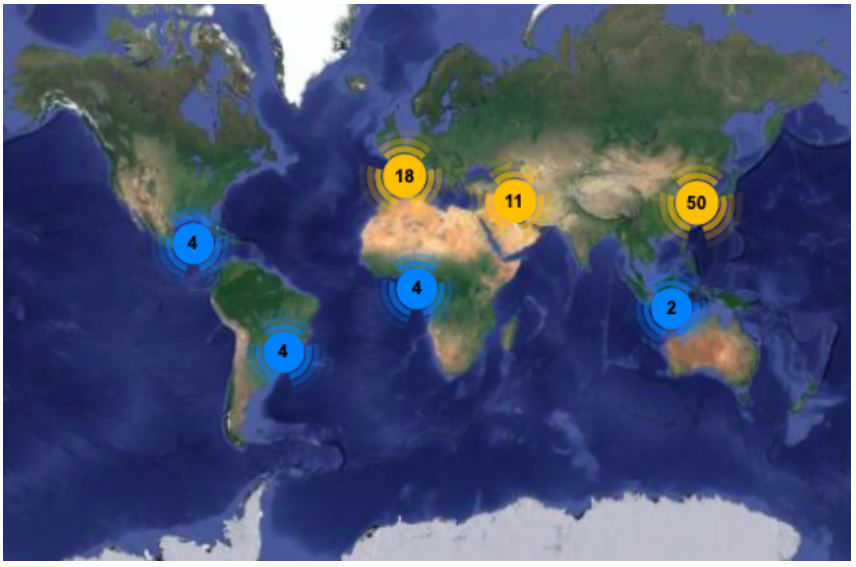

Figure 1. Map of designated GIAHS around the world (FAO 2024c)

### 3.2.2 Goals and objectives of the GIAHS program

According to Parviz Koohafkan & Altieri (2011), "The overall goal of the partnership is to identify and safeguard Globally Important Agricultural Heritage Systems and their associated landscapes, agricultural biodiversity and knowledge systems through catalyzing and establishing a long-term programme to support such systems and enhance global, national and local benefits derived through their dynamic conservation, sustainable management and enhanced viability."

Designation within the program goes beyond global recognition (L'Erario 2021). The primary objective of this initiative is to protect traditional agricultural systems, concurrently improving livelihoods and food security and implementing dynamic conservation measures targeting multiple facets (Reyes et al. 2020). It should be highlighted that the program's aim is not limited to static conservation (Agnoletti & Santoro 2022). Dynamic conservation is a key concept within the program, which requires taking into account the dynamic nature of the systems it aims to preserve, extending to their physical and abstract features. The effective implementation of dynamic conservation involves careful consideration and alignment of economic, social, and cultural dimensions and interests of all parties engaged (L'Erario 2021).

Facilitation of the development of policy frameworks and initiatives via the engagement of local institutions is a vital component of GIAHS. These are meant to provide viable alternative approaches to be employed, steering away from conventional methods (Koohafkan 2007). This is meant to increase capacity to safeguard and maintain GIAHS sites, generating revenue to enhance the systems' economic value while operating sustainably. The initiative seeks to foster the development of policies, regulations, and incentives that facilitate conservation, preservation, adaptation, and viability (Koohafkan & Altieri 2011).

With the objective of achieving an optimal balance across conservation, preservation, adaptation, and development, the program endeavors to explore strategies for alleviating encountered challenges while simultaneously increasing the value of the advantages relevant agricultural systems provide (FAO 2018).

The program aims to serve as a catalyst for the improvement and long-term viability of historical agricultural systems, the preservation of agrobiodiversity, and the retention of local knowledge for agricultural landscape management across the globe. The status as a GIAHS is to enhance the support of rural areas and foster opportunities to obtain financial support, in order to ensure the survival of unique agricultural practices (L'Erario 2021).

Furthermore, the objective is to aid relevant systems in establishing favorable policy conditions conducive to their continued advancement and further development in alignment with their individual specifications by accordingly implementing suitable institutional adjustments (Koohafkan 2007).

### 3.2.3 Strategy and approach

The program seeks to achieve its objectives through cooperation with stakeholders. This cooperation can entail guidance, fostering awareness for the preservation of indigenous

knowledge, facilitating the promotion of agricultural products, agro-tourism, and more (FAO 2018). The program's approach is founded upon the principles of participatory development that have substantially influenced national policies and approaches towards the management of rural areas (FAO 2022). The primary beneficiaries of the initiative indigenous populations, namely farmers and communities characterized by limited resource availability (Koohafkan 2007). An essential dimension of the program's approach involves the integration of consideration for local contexts and the promotion of community-led initiatives (FAO 2022).

The overarching strategy of the initiative is to implement a three-tiered framework: on a global scale, the framework is to simplify the identification, selection, and acknowledgment of the program. Additionally, it is to gather and share knowledge and best practices. The program aims to facilitate the incorporation of its concept into national-level sectoral plans and policies, as well as comprehensive, integrated initiatives. Moreover, on a national level, the objective aimed towards GIAHS protection is to enhance the development of legislative, regulatory, and incentive mechanisms. At the local level, the program seeks to support local communities and provide technical help for sustainable utilization of resources. It focuses on agricultural systems' conservation and adaptive management, maintaining traditional knowledge and boosting viability (Koohafkan 2007).

### 3.2.4 GIAHS selection criteria

In developing the program, two fundamental dimensions were identified as pivotal to a site's characterization: its historical and its contemporary relevance. Historical relevance illustrates the transformations GIAHS have undergone over time in response to social, environmental, and economic changes, portraying how farmers have adapted and utilized specialized knowledge and skills to shape the systems and landscapes in which they operate. Meanwhile, a site's ability to enhance human welfare while producing various goods and services for its community and society at large determines its contemporary relevance on a global level. This connects the program to national or international policymaking as well as to sustainable development, primarily the accomplishment of numerous environmental, human, and food security-related objectives (FAO 2018).

The following set of criteria is used to evaluate locations in terms of their suitability for recognition under the program. The criteria take into account a wide variation in each distinct site's specific geographic, climatic, and socioeconomic features (FAO 2017). The criteria reflect the framework of functionalities, goods, and services provided by GIAHS (Agnoletti & Santoro 2022):

#### 3.2.4.1 Food and livelihood security

GIAHS improve food security and livelihood, via a plethora of agricultural activities and approaches, which contribute to the growth of their economies through the facilitation of local community exchanges (FAO 2018). The incorporation of ecological principles from traditional agricultural systems constitutes a potentially important component for the development of contemporary food systems. These production systems serve as well-established models of effective community-based agriculture, fostering close cooperation between rural and urban regions (Koohafkan & Parviz 2019).

3.2.4.2 Agrobiodiversity

The preservation of agrobiodiversity is imperative. Beyond that, it has also been observed to significantly contribute to food security, support vulnerable systems and endangered species, enhance ecological resilience, and decrease reliance on external inputs (Agnoletti & Santoro 2022).

GIAHS sites exhibit a notable presence of diverse agricultural biodiversity, which is evident through the use of agroforestry patterns, polycultures, and rotations in both field and local landscape settings. . The aforementioned diversity is a direct consequence of farmers' pursuit of mitigating risks by the preservation and cultivation of a diverse genetic range of species and varieties. This approach aims to stabilize agricultural yields, promote diversity, and optimize outputs and ecological services while effectively utilizing often limited or otherwise challenging resources. GIAHS systems are commonly characterized by the presence of rare or endemic species and cultivars (FAO 2016).

3.2.4.3 Local and traditional knowledge systems

The utilization of traditional and indigenous knowledge systems in GIAHS serves as the fundamental framework for the management of agro-ecosystems, with the aim of preserving the integrity of the ecosystem and landscape (Koohafkan & Parviz 2019). The accumulation of knowledge of local ecosystems and their constituents has been facilitated by farms that have been passed it down from one generation to another (Koohafkan & Altieri 2011). GIAHS sites endeavor to safeguard traditional knowledge and practices indigenous to their respective regions, alongside adaptive technologies and natural resource management systems (FAO 2016).

3.4.1.4 Cultures value systems and social organizations

Agricultural system plays a crucial role in shaping a distinct cultural identity (FAO 2016). The ability of agricultural systems to deliver goods and services is reliant on the presence and maintenance of effective social structures within rural communities (Koohafkan & Altieri 2011). As systems developed over time, so did social organizations, value systems and cultural practices. This has led to their close association with the entire management of agricultural resources and the functioning of systems (FAO 2018).

3.2.4.4 Landscapes and seascapes features

Seascapes or landscapes that have evolved shaped by the interaction of natural forces and human interventions are key features of GIAHS (FAO 2016). As such, they represent cultural landscapes (Saito et al. 2020). Elaborate water and coastal management structures, varied land uses, and other complex systems, each reflecting unique dynamics can be observed (FAO 2016).

3.2.4.5 Action plan

As part of a proposal detailing the aforementioned criteria for suitability of designation, an action plan with a five-year duration for the dynamic conservation of the proposed GIAHS site needs to be drafted (L'Erario 2021). An analysis of threats, challenges, as well as thorough descriptions of the policies, strategies, actions to counteract these, that are currently being implemented or will be are recommended to be included (FAO 2016). Action

plans facilitate the implementation measures that ensure long-term sustainability of GIAHS. If a system is recognized, stakeholders must implement measures proposed within the plan L'Erario 2021), and monitor impacts (Salpina 2020). It is worth noting that all proposed actions have the potential to leverage external funding sources, including local, national, or international resources (L'Erario 2021).

### 3.2.5 Designation process

The principle of GIAHS designation is founded upon bottom-up processes. The initiation of such processes must always come from local communities that actively aspire to gain international acknowledgment for their ongoing reservation of notable agricultural heritage, often with the assistance of national governments, typically the Ministries of Agriculture. The formulation of a candidacy proposal is a collaborative effort involving multiple local and national stakeholders. Therefore, recognition is dependent upon the dedication of local communities, governmental bodies, NGOs, and research institutes (L'Erario 2021). A primary qualifying criterion for candidacy is FAO membership (Miyake et al. 2021).

Figure 2. visually depicts the process of designation. The first phase of the process is the drafting of a proposal for nomination to be submitted by a relevant national governmental body or alternatively, by a national GIAHS committee. The proposal is subject to examination by the GIAHS Secretariat in order to assess its compliance with a proposal template and sufficient incorporation of information aligning with the previously outlined selection criteria.

Following successful completion of the initial phase, proposals are passed on to the Scientific Advisory Group (SAG) (FAO 2016). SAG was established in 2016 as an expert group of seven members (Arnés García et al. 2020) re-appointed every two years (FAO 2024a). Primary objectives of the SAG are to uphold scientific standards of the program, offer assistance, and foster development (Arnés García et al. 2020). The SAG conducts an comprehensive evaluation, which includes analyzing the results of a field survey conducted at the proposed location. Upon determining that a proposal meets the outlined selection criteria, the SAG proceeds with recognizing the site as a GAIHS.

If the SAG determines that additional material is required, proposals are returned via the GIAHS Secretariat to be improved and subsequently resubmitted.. Simultaneously, the SAG has the authority to determine that the proposed site fails to satisfy the established criteria, hence resulting in a complete rejection of a proposal (FAO 2016).

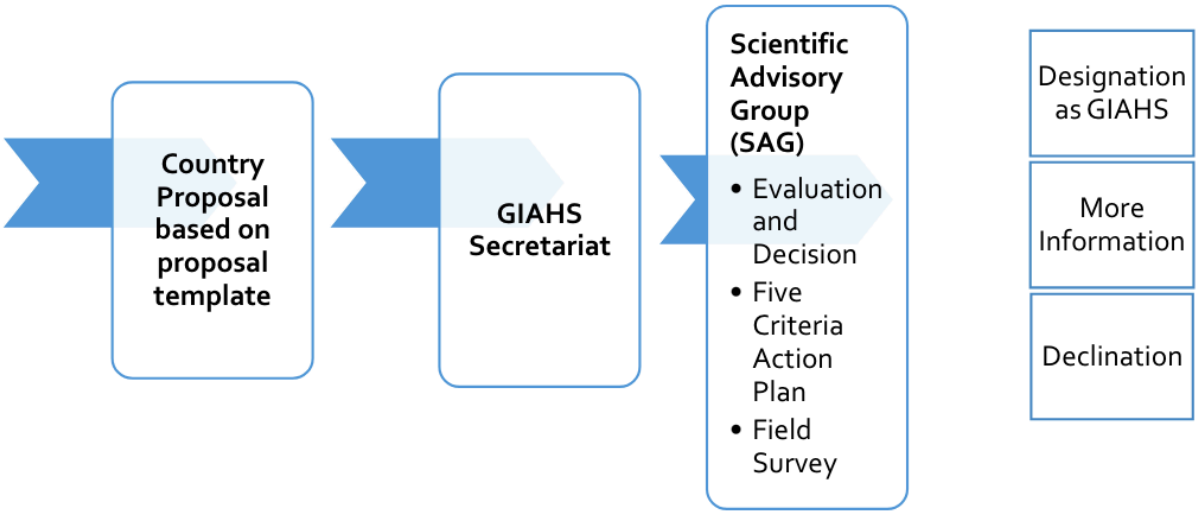


Figure 2. Visualization of proposal processing (FAO 2016)

### 3.2.6 Operational framework

The operational framework of the program is depicted in Figure 3. It encompasses the initial designation procedure, the subsequent creation and submission of proposals, the acceptance and screening of these proposals. The final step is a review and designation. The subsequent step to designation involves the execution of the action plan outlined in the proposal for the dynamic conservation of the given site.

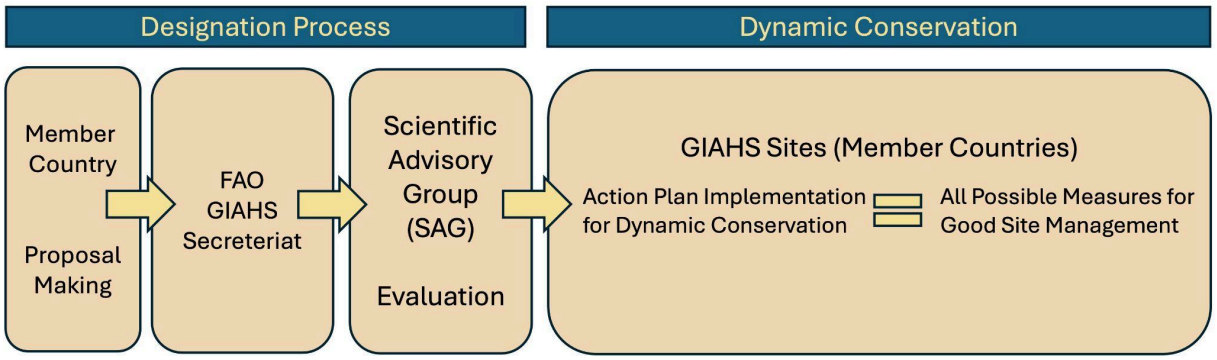


Figure 3. Scheme of the GIAHS operational framework created by the author based on (FAO 2021)

## 3.3 GIAHS in European context

### 3.3.1 Agriculture Heritage in Europe

Agriculture is closely connected to European societies, cultures, and landscapes (Arnés García et al. 2020). A well-established agro-industrial economy system has been developed. Its employment in Europe since the early 20th century has resulted in the gradual erosion of rural landscape heritage (L'Erario 2021). This reality has resulted in the increasing homogeneity of landscape features over the past few decades (Piras et al. 2023). The decline extends to both tangible and intangible components of the landscapes (L'Erario 2021), leading to the loss of traditional knowledge, practices, biodiversity, and cultural landscapes. In the present day, there are traditional agricultural systems in Europe that have managed to endure

despite changes in development by implementing innovative and adaptable practices to continue producing. Furthermore, the difficulty goods and services produced by such systems are facing in the market is gradually decreasing. This is attributed to growing customer demand for local, high-quality products manufactured using traditional, and most importantly sustainable methods (Arnés García et al. 2020).

### 3.3.2 Overview of European GIAHS

Traditional European cultural landscapes are rich in cultural biodiversity, which has fostered the development of resilient and sustainable agricultural systems (Arnés García et al. 2020). The primary objective of the interventions undertaken by the European GIAHS is to bolster local supply chains and agricultural businesses. Meanwhile, tangible and intangible aspects of cultural, ecological, and other heritages are promoted through dynamic activities. An additional aim among European GIAHS is to develop new approaches to local marketing and promotion, primarily targeted towards tourism (L'Erario 2021).

The key observed objective of all action plans proposed by European GIAHS is to ensure financial, social, and cultural sustainability through the implementation of novel initiatives concerning socioeconomic development. Another commonly observed objective is collaboration between local research institutions and various enterprises, such as those involved in tourism and processing. Behind this is the aim to enhance socioeconomic resilience through the facilitation of knowledge and experience exchanges. These action plans specify particular steps to be taken in order to preserve relevant landscapes while taking into consideration other measures (L'Erario 2021). The proposed actions are often highly contextual, striving to preserve historically significant structures or crops. They have been observed to have a direct, wide-reaching impact, including indirectly, on agrobiodiversity and local knowledge. Efforts directed toward ensuring the economic sustainability of agriculture indirectly promote generational turnover and continuous management, thereby preventing the abandonment of structures and practices. Notably, external funding to facilitate development is an important prerequisite for all European GIAHS (L'Erario 2021).

Thus far, a total of ten GIAHS have been formally recognized in five European nations. These sites include one in Andorra, one in Austria, two in Italy, five in Spain, and one in Portugal (FAO 2024b). All of these locations are situated in regions that exhibit complex geological, topographical, and climatic conditions, which render agricultural intensification particularly problematic (Arnés García et al. 2020).

#### 3.3.2.1 The Subalpine pastures of Andorra, Andorra

The agropastoral system of Andorra, designated a GIAHS in 2023 (FAO 2024b), encompasses a significant portion of the country's area, accounting for 27.4 % at 128 km². The value of this system is of significant importance for safeguarding and developing the quality of meat production, as it accounts for 15 % of the overall consumption in the national market. The livestock reared within the system exhibits agro-biodiverse species and local breeds, which have adapted to thrive in the environmental conditions of high-altitude regions of the system. The utilization of subalpine pastures, limited to a few months annually, has facilitated the practice of transhumance. A notable characteristic of this system is the prevalence of communal ownership of pastures. Hence, decision-making regarding their

exploitation involves a collaborative approach involving all relevant parties. Livestock farming follows an extensive yet controlled system to ensure adherence to ecologically sound practices. The implementation of extensive livestock farming within this system has displayed numerous beneficial impacts on the territory. Meanwhile, the ecological system influenced by livestock grazing provides a range of ecological services (Govern d'Andorra 2023).

#### 3.3.2.2 Traditional Hay milk Farming in the Austrian Alpine Arc, Austria

The Alpine Arc, recognized in 2023 (FAO 2024b), has limited arable land due to the mountainous nature of the Alps. Agricultural areas in this system, spanning 400 to 1400 meters above sea level, are primarily used for hay farming, an ancient agricultural practice in Europe. With its high nutrient content, hay is crucial for winter feeding, sustaining livestock during the vegetation-scarce cold season, and supporting farming communities for centuries. The method relies on grass in summer and hay in winter, conserving natural resources through their efficient use. Unlike other techniques, it prohibits fermented feeds and restricts concentrated feed, with grain sourced exclusively from Europe and free of genetic modification. Despite once dominating milk production until the 1970s, hay farming now accounts for only 15 % in Austria. It remains viable in regions with permanent grasslands, mainly mountainous areas, although it represents only about 3 % of milk production in Europe. Adapted to local conditions over time, its small-scale approach enables cultivation even on steep slopes (ARGE Heumilch Österreich 2023).

#### 3.3.2.3 Olive groves of the slopes between Assisi and Spoleto, Italy

An olive grove system, originating from the Roman era, spans an area of 9213 hectares along slopes extending from Assisi to Spoleto (Arnés García et al. 2020). The system received designation in 2018 (L'Erario 2021). An extensive terrace system, often surrounded by deciduous forests, varies in elevation reaching up to 500 and 600 meters. The olive trees of traditional cultivars, such as Moraiolo, Frantoio, and Leccino are cultivated in an open center bush shape. The olive oil derived from these is acquired through a traditional method of pressing employed for generations. Intensification is deterred primarily due to soil and climate constraints (Arnés García et al. 2020). The region serves as a significant hub for rural tourism, and the conservation of an ancient agricultural heritage and its associated components (Piras et al. 2023).

#### 3.3.2.4 Soave Traditional Vineyards, Italy

The traditional vineyards of Soave encompass an area of 12.000 hectares situated on steep slopes on a sloped gradient ranging from 30 % to 40 %, accounting for 60 % of the region's total area (Arnés García et al. 2020). This system received recognition in 2018 (L'Erario 2021). The vineyards are interspersed with olive trees or woods to mitigate soil erosion (Consorzio Tutela Vini Soave e Recioto di Soave 2018). Cultivation relies on two traditional cultivars, Garganega and Trebbiano di Soave (Arnés García et al. 2020), centered on manufacturing a distinctive wine known as the Soave (Consorzio Tutela Vini Soave e Recioto di Soave 2018) controlled origin denomination (DOC) (Stasi et al. 2011), which holds a prominent position as one of the most renowned Italian white wines. The region is predominantly privately owned at 98 % (Consorzio Tutela Vini Soave e Recioto di Soave

2018), so production is conducted on smallholder farms organized into social cooperatives, which employ a compensation system to ensure its members receive a fair annual income. Due to contour plowing and steep slopes in the system, implementing machinery is not feasible, prompting complete reliance on manual labor. The manual training of vines is conducted using a distinctive traditional technique known as the "Pergola Veronese" in this system (Arnés García et al. 2020).

#### 3.3.2.5 Barroso Agro-sylvo-pastoral System, Portugal

The northeastern Barroso region encompasses an area of around 112,740 hectares. It is characterized by a multifunctional system that revolves around interrelated livestock farming, crop production, and forestry, formally recognized in the year 2018 (Arnés García et al. 2020). Around 95 % of the region is predominantly covered by forests, scrubland, and land crop cultivation, of which 80 % is forest and scrubland. The primary activities of this system involve extensive (Arnés García et al. 2020), rough and semi-free grazing and management (Adrat 2018) of cattle, goats, pigs, and sheep. Local communities live in close proximity to marshes, grasslands, arable fields, and garden vegetables, creating a mosaic-like environment characterized by a spiral growth pattern, with the community situated in the center. The region's economy is reliant on small scale family-run farms, characterized by a notable level of food self-sufficiency. On the other hand, poor resource utilization, and minimal surpluses have been observed also (Arnés García et al. 2020; Martins et al. 2022).

#### 3.3.2.6 The Agricultural System of Valle Salado de Añana, Spain

The Añana Valley, extending over 1500 hectares, is the site of a salt cultivation system which has been functional for 7000 years (Arnés García et al. 2020). The site was formally recognized as GIAHS in 2017 (Silva-Pérez & González-Romero 2022) as solely devoted to salt manufacturing. The system is situated above saltwater springs, which have facilitated the establishment of gravity-based salt cultivation. Originating from a geological phenomenon referred to as a diapir, these saltwater springs derive from a salt deposit rising from depths of 3.5 km, which is replenished through the movement of water.

The process of salt harvesting, facilitated by a water irrigation system originating from the Roman era, involves extracting aquifers from brines and conveying them by canals to salt pans, where salt extraction occurs through natural evaporation. The system's geological characteristics limit crop cultivation (Arnés García et al. 2020). However the valley's steep slopes are lined with forests that play a crucial role in water regulation. Furthermore, these forests serve as the primary source of wood for constructing salt pans and channels utilized in the system (Santoro et al. 2020).

#### 3.3.2.7 Malaga Raisin Production System in La Axarquía, Spain

The La Axarquía region, spanning 28.039 hectares, is almost exclusively dedicated to the production of Muscatel raisins (Arnés García et al. 2020). The system was officially recognized by FAO in 2018 (Silva-Pérez & González-Romero 2022). Agricultural activities carried out include planting, tilling, pruning, weed control, grape harvesting, and drying. Additionally, mules are employed for transportation. Muscatel grapes yield a minimal profit margin, making family involvement a crucial aspect of this system (Arnés García et al. 2020).

Notably, muscatel grape cultivation holds significant importance in the agricultural economy of this mountainous region, as there are no other feasible alternatives cultivable (Regional ministry for agriculture, fisheries and rural development of the Andalusian government 2017). Moreover, 90 % of produced raisins are consumed domestically, while 10 % are exported (Canalejo Raya et al. 1999).

Cultivation aids in mitigating the erosion caused by periodically intense rainfall in the region. Raisins are derived from the sun-drying of fully ripe Muscatel grapes, which allows for their preservation and selling for immediate consumption. The renowned properties of these raisins are attributed to the artisanal sun-drying process, as well as the influence of local biotic and abiotic conditions (Regional ministry for agriculture, fisheries and rural development of the Andalusian government 2017).

3.4.2.8 Historical Irrigation System at l'Horta de València, Spain

The Horta system, recognized as a GIAHS in 2019, covers an area of 1,700 hectares. Its landscape is split into tens of thousands of individual plots, the majority of which are devoted to vegetable, fruit, and rice cultivation (L'Erario 2021). It is hypothesized that the system's origin lies in the eighth century, when Muslims developed irrigation canals and dams, ditches and hydraulic mills in the region (Melo 2020). An irrigation system is derived from the Turia River, through which a portion of its water is redirected into a primary man-made canal. Water is transported by gravitation to cultivated plots via smaller irrigation channels of seven additional canals stemming from the main canal. Local cultivation is reliant upon the irrigation's functioning, for effective water distribution (L'Erario 2021).

Notably, the region has been legally protected from urbanization since 2018. However, the system is nowadays confronted with challenges related to the emergence of more profitable sectors, urban planning pressures, and inadequate levels of generational turnover in the agricultural sector. Likewise, the system's landscape features and agrobiodiversity are under threat, as a number of regional species are at risk of extinction as a result of a lack of demand (L'Erario 2021).

3.3.2.9 Agrosilvopastoral system Mountains of León, Spain

The system, which encompasses an area of 10,444.82 km², is associated with the mountainous region of the Province of León and comprises an extensive multi-faceted ecosystem (Diputación de León 2022) that received official GIAHS recognition in 2022 (Martínez Pino & Valle Perulero 2022). Agrosilvopastoral systems are intricate, multifunctional systems capable of providing numerous ecosystem services (González Díaz et al. 2022). Agriculture, livestock, forestry, gathering, hunting, and fishing coexist in a variety of land uses. The conservation of native species, such as the Brown and Indian Rooster of León, is facilitated owing to the capacity of the system to cultivate, maintain, and adapt (Diputación de León 2022). A unique feature of the system is collective management of natural resources and the division of common tasks by each village and community, managed locally. The population meets regularly in councils, which function as assembly meetings in which each family holds one vote (Martínez Pino & Valle Perulero 2022).

3.3.2.10 Agricultural System of Ancient Olive Trees in Territorio Sénia, Spain

This location, renowned for a landscape of olive tree groves, known as the "sea of olive trees" (Mancomunidad Taula del Sénia 2018), received official recognition as a GIAHS in 2018 (L'Erario 2021). Ancient olive trees contribute significantly to the region's economic, cultural, tourism, and environmental sustainability as a living heritage (Mancomunidad Taula del Sénia 2018; Ninot et al. 2018).

This GIAHS features the largest concentration of ancient olive trees in the entire world, with over 6,000 specimens (Mancomunitat Taula del Sénia 2023), at a unique intersection of topography, history, language, and culture (Mancomunidad Taula del Sénia 2018). Spain is by far the leading producer of olives worldwide (Barranco & Rallo 2000). That being said, olive cultivation within the region of this system is renowned for preserving rare local olive cultivars, which contribute to the distinctiveness of the system's landscape. Similar to other established forms of heritage, ancient olive trees possess cultural and historical significance. Their ongoing production capacity further adds an additional dimension to the value of their safeguarding (Mancomunidad Taula del Sénia 2018).

## 3.4 The Ancient Olive Trees in Territorio Sénia: A case study

The region has a population of 112.000 inhabitants (Mancomunidad Taula del Sénia 2018) and occupies 2.070 km², split between three autonomous regions: Aragon, Catalonia, and Valencia. The territory of the system comprises twenty-seven municipalities, fifteen in Valencia, nine in Catalonia, and three in Aragon (Antich 2014; Schoebel A 2015; Mancomunidad Taula del Sénia 2018).

### 3.4.1 Inventory of millenary olive trees

Following the undertaking of inventories at regional levels, the Government of Andalucía, in collaboration with the University of Córdoba, conducted a study of "Prospecting and cataloging singular olive trees in Andalucía" in 2006. This study was used to establish the norms for the inventory conducted within this system. Ancient olive trees were specified as those with a trunk perimeter of at least 3.50 meters measured at 1.30 meters above ground (Mancomunidad Taula del Sénia 2018). Thanks to various grants, an inventory conducted during 2008-2009 (Ruta Oliveres Milenáries a) directed by biologist Romà Senar, was carried out by the local association of municipalities in cooperation with the Government of Catalonia, Ministry of Labour, councils, technicians, owners and oil mills (Mancomunidad Taula del Sénia 2018). Measurements, geolocation information, a photographic report, and other observations were recorded (Mancomunidad Taula del Sénia 2018).

As a result of the inventory, an initial 4.080 such olive trees were geolocated throughout twenty-two municipalities within the system (Mancomunidad Taula del Sénia 2018), roughly evaluated to be between 634 and 1082 years old (Ninot et al. 2018). Their concentration within the territory is shown below in Figure 4. The figure of specimens has since grown to 6.913 specimens based on Mancomunitat Taula del Sénia (personal exchange, April 4th 2024) as many owners began requesting that their trees be measured and classified (Taula del Sénia Commonwealth 2014). The inventory of ancient trees is revised annually by the association of municipalities. Conservation efforts have been directed towards the preservation of traditional olive varieties and ancient olive trees, as well as the surrounding

landscape, subsequent to the successful execution of the inventory (Mancomunidad Taula del Sénia 2018).

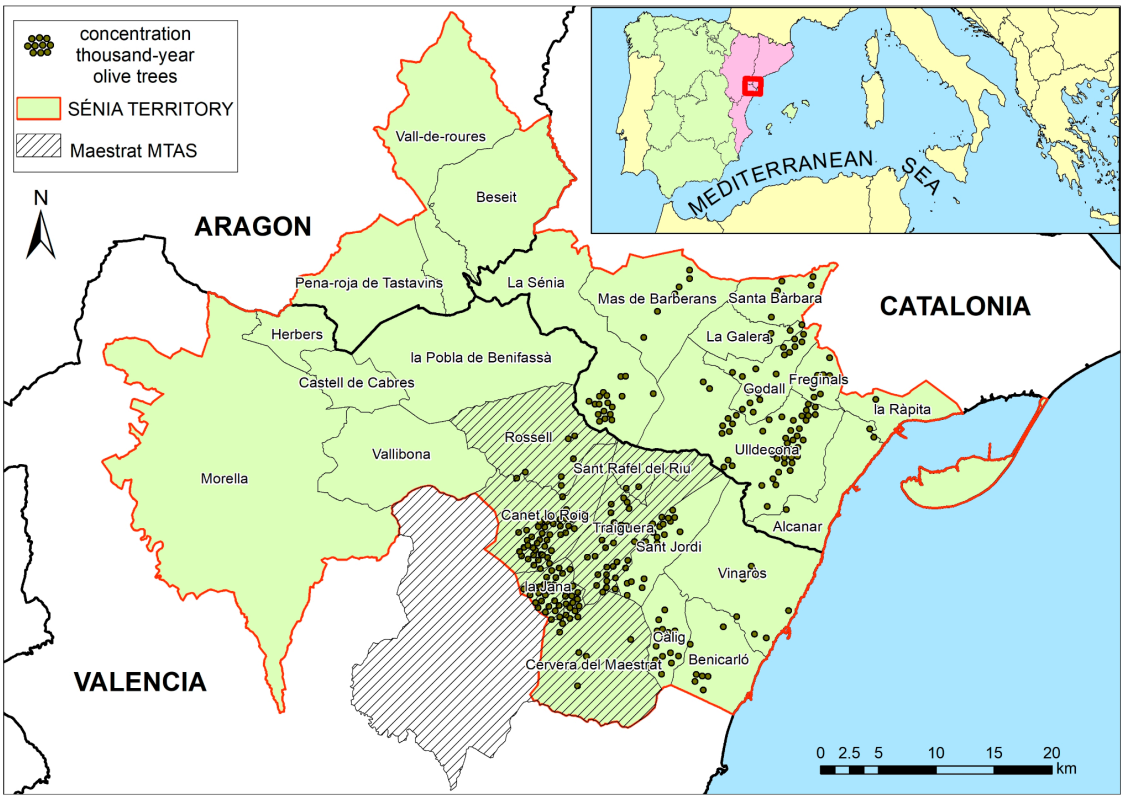


Figure 4. Map detailing the concentration of ancient olive trees (Membrado-Ten & Hermosilla-Pla 2023)

Tree size, particularly trunk thickness, is influenced by a variety of environmental and genetic variables, increasing over time (Ruta Oliveres Milenàries a). Due to the combined influences of human cultivation, such as trimming and natural processes, every olive tree has a distinctive character. As such, certain olive trees stand out for their own distinct attributes. Eight such unique specimens were dated at the Polytechnic University of Madrid, five of which are shown in Table 1. The findings indicated that their ages ranged from 1.704 to 1.000 years (Mancomunidad Taula del Sénia 2018).

Since 2007, the Spanish Association of Municipalities with Olive Trees (AEMO) has bestowed the prestigious title of the Best Monumental Tree in Spain upon five olive tree specimens. This recognition was not just for their age but for their unique attributes that make them prime examples of the olive groves in the territory. These trees, with their distinct character, promote the value of their heritage and preservation (Mancomunidad Taula del Sénia 2018).

Table 1. Highlighting notable specimens (Mancomunidad Taula del Sénia 2018)

| **Name** | **Visual depiction** |
|---|---|

| | |
|---|---|
| "Farga del Arión" was the first ancient olive tree to be bestowed the AEMO award, in 2007, for its age and size, at 1.704 years old, it is the oldest dated tree on the Peninsula and among the oldest in the world. Furthermore, its base extends to a circumference of 18 m, while the trunk exceeds 8 m at a height of 1.3 m. |  |
| "Olivo Mater" was recognized for its unique root development and large trunk perimeter of 6.3 m in 2011 with the AEMO award. |  |
| "Olivo de las Parejas" received the AEMO award in 2014. It is located in a natural museum of ancient olive trees, Pou del Mas in La Jana, along with twenty other ancient specimens. |  |
| "Olivo de las 4 Patas" was recognized for its unique "four leg" trunk base in 2016. |  |

| | |
|---|---|
| "Olivo de Sinfo" received the AEMO award in 2018. It is a Farga variety olive tree grafted in a wild one located next to the Roman Via Augusta, surrounded by ancient olive trees. |  (AEMO) |

### 3.4.2 Characterization according to GIAHS selection criteria

In this section, The Agricultural System Ancient Olive Trees Territorio Sénia will be characterized according to the GIAHS selection criteria described previously.

3.4.2.1 Food and Livelihood Security

Coastal towns accommodate 70 % of the total population in the region despite comprising only 12 % of the total area of land. The proportion of individuals over 65 years of age stands at 19 % of the population, with one-third of the inhabitants in half of the municipalities belonging to this demographic. As a result, the region is characterized by a significant disparity between mountain and coastal municipalities, as well as high aging rates and low population densities. In fact, sixteen municipalities comprising the area are under threat of vanishing altogether due to a considerable population decline and population counts below a thousand (Mancomunidad Taula del Sénia 2018).

3.4.2.1.1 Agricultural activity

The agricultural sector of the system is vital to the region, constituting 13.09 % of the workforce, which is notably higher than the national average of 6.10 %. Data in Table 2. highlights agriculture as the second most significant source of livelihood for the region's population, emphasizing the importance of preserving and supporting agricultural activity. Notably, the municipalities of Canet lo Roig and La Jana stand out for their extensive cultivation of ancient olive trees, which account for over 75 % of the olive groves in the area. Consequently, these municipalities predominantly focus on olive cultivation, which provides employment opportunities for around half of the locals (Mancomunidad Taula del Sénia 2018).

Table 2. Sources of livelihood in the territory, created by author based on (Mancomunidad Taula del Sénia 2018)

| **Source of livelihood** | **Ratio of total contribution** |
|---|---|
| Services | 65 % |
| Agriculture | 13 % |

| | |
|---|---|
| Construction | 11 % |
| Industry | 11 % |

Promoting the use of regionally sourced goods, together with fostering the development of relevant economic activities, is geared towards the rejuvenation of the cultural and economic elements of the system. The aim is to engage a diverse demographic while upholding sustainability principles that address environmental, social, and economic considerations, meanwhile prioritizing financial sustainability to ensure the initiative's viability (European Heritage Days). The system generates employment, facilitates the profitability and efficiency of small farms, and promotes economic diversification into non-agricultural sectors in order to alleviate rural poverty. This contributes to the overall strategy to combat depopulation in the region (Mancomunidad Taula del Sénia 2018).

Olive oil produced in the area has a crucial function from a commercial point of view but also for personal consumption in the local community. In fact, a significant number of individuals, ranging from farmers to workers in different fields, own properties on which olive trees are growing and deliver their harvested olives to oil mills to manufacture olive oil for personal use (Mancomunidad Taula del Sénia 2018).

Agricultural and livestock activity is mutually dependent. Extensive farming, which primarily involves the rearing of livestock and sheep in mountainous areas, can be differentiated from intensive farming, which entails the rearing of pigs and poultry throughout the region. Both practices provide benefits to the preservation of the environment, in addition to supplying organic fertilizers that are especially beneficial for rain-fed crops such as olive trees (Mancomunidad Taula del Sénia 2018).

Following the olive harvesting process, collected fruit is transported to oil mills for extraction of olive oil. This process of refinement generates byproducts that present economic and environmental processing challenges. One instance of such a byproduct is olive stone, which functions as an efficient fuel source for hot water and heating purposes in oil mills, in addition to swine and poultry farms in the region. Biomass is another byproduct of processing. The application of leftover biomass as a sustainable energy resource presents environmental and economic benefits that exceed those of other alternative fuel sources. In addition, organic fertilizers are produced from the residual materials and leaves of olives that remain following milling. Another byproduct of olive oil extraction is pomace oil. When grassland resources are scarce, pomace oil can be used as a nutrition source for livestock in the region (Mancomunidad Taula del Sénia 2018).

#### 3.4.2.2 Agrobiodiversity

##### 3.4.2.2.1 Traditional olive cultivars

The dominant olive varieties in the region are Farga, Morruda, Sevillenca, and Empeltre. The first three cultivars are indigenous to Catalonia and Valencia, while Empeltre is prevalent in Aragon. In fact, Farga, Morruda, and Sevillenca are rare in regions other than the three provincial councils. All of the previously referred to cultivars are traditional, well-suited for rainfed agriculture, and firmly established in the area of cultivation.

The four aforementioned varieties, shown in Table 3. are dominant within the system. Other varieties such as Canetera, Cuquello, Llumeta, Marfil, and Manzanal, collectively constitute not more than 10 % of the total (Mancomunidad Taula del Sénia 2018).

Table 3. Description of key traditional cultivars (Lacrima Olea 2024)

| **Name of cultivar** | **Characteristics** | **Photograph** |
|---|---|---|
| Farga | An old, resilient cultivar, characterized by low yields. Fruits are hard to harvest mechanically due to their retention capacity. |  |
| Morruda | Very productive with a prolonged harvest season Somewhat late ripening. Relatively cold and drought sensitive. |  |
| Sevillenca | Average productivity. Sensitivity to drought, with medium tolerance to frost (Lacrima Olea 2024). Fruits are well-adapted to be harvested mechanically (Rimontgó) |  |
| Empeltre | Productive cultivar. Well-suited for mechanical harvesting, and cultivation in low-quality soils and drought conditions. |  |

3.4.2.2.2 Farga olive variety

An analysis conducted by Ninot et al. (2018) of the millennial olive trees inventoried by the Institute of Agrifood Research and Technology (IRTA) found that the Farga olive cultivar predominated among the inventoried specimens, constituting 98 % of the analyzed sample.

The Farga olive tree (*Olea europaea* L.) is a traditional Spanish cultivar renowned for its exceptional high-quality oil production. An olive cultivar survey conducted by IRTA spanning from 1987 to 1998 identified the Farga cultivar in northeastern Spain, particularly in Catalonia and Valencia. Moreover, Farga is regarded as one of the earliest olive cultivars to be domesticated and cultivated in these areas, the reason for this is presumed to be its high vigor and capacity to adapt to unfavorable soil conditions. Consequently, it represents a prominent feature of the region, estimated to cover an area of around 17.000 hectares. Farga was used in the assembly of the initial olive draft genome reported globally, which serves as a significant asset in the investigation of the organism's evolution and domestication progression (Ninot et al. 2018).

The Farga variety is a robust cultivar that has been cultivated in traditional olive groves for centuries (Ninot et al. 2018), characterized by slow growth and substantial size, owing to which this cultivar is significantly resistant to drought, in comparison to other traditional varieties. Although droughts can periodically impact harvest, the damage to these trees is not irreversible. Despite their age, they can be pruned to shape and even revitalized after years of neglect within two or three years. Their resilience is further enhanced by the traditional cultivation methods employed in this system. The cultivar is renowned for its fruity aroma and well-balanced flavor profile. Thus, despite its comparatively reduced production volume in comparison to other varieties, its olive oil is exceedingly favored by consumers, particularly in the global market (Mancomunidad Taula del Sénia 2018).

Despite the high quality of oil produced from this olive variety, Farga was gradually replaced by higher-yielding but lower-quality olive varieties, such as Morruda, Sevillenca, and Empeltre, over the course of centuries. This shift occurred largely due to a preference for quantity over quality, given the cultivar's irregular production (Mancomunidad Taula del Sénia 2018).

3.4.2.2.3 Guarantee trademark “Aceite Farga Milenaria”

More than 20 % of ancient olive trees within the system produce certified oil under the Aceite Farga Milenaria guarantee mark (Mancomunidad Taula del Sénia 2018). This mark is the only certification guaranteeing the origin and quality of oil derived from ancient olive trees worldwide (Eternoil). In 2015, the association of municipalities registered the guarantee mark, with regulations governing its use approved by the Ministry of Agriculture, Food and Environment. The mark certifies the quality and origin of virgin extra olive oils exclusively derived from Farga variety olives from non-transplanted olive trees identified in the previously described inventory. The regulations establish guidelines for the whole production process, from collection to packaging (Mancomunidad Taula del Sénia 2018), including precise physical, chemical, and taste norms (Eternoil). Laboratories and official tasting panels validated by the International Olive Council evaluate the adherence to the norms above (Mancomunidad Taula del Sénia 2018).

3.4.2.2.4 Protected areas

Numerous forms of land protection are implemented within the region of the system. These include the Natura 2000 network (FAO), the largest system of habitat protection worldwide covering about 17.5 % of the EU (Evans 2012). Numerous Sites of Community Interest (SCI) and Special Protection Areas for Birds (SPAB) (Llamas et al. 2016; Mancomunidad Taula del Sénia 2018) cover 50 % of the total surface, along with Natural Parks such as Els Ports and Delta del Ebro in Catalonia and La Tinença de Benifassà in Valencia. The Biosphere Reserve encompasses all Catalan areas within the system. Owing to the efforts of public interest groups, many areas overlap with two or three types of protection, resulting in a total protected surface of 64 % of the territory (Schoebel A 2015; Mancomunidad Taula del Sénia 2018).

3.4.2.3 Local, traditional knowledge systems

Despite technological advances over time, the fundamental processes of olive cultivation have remained constant, making local and traditional knowledge indispensable. Traditions and knowledge unique to the region in question have been transmitted orally across generations, resulting in the development of local expertise. Following in the footsteps of their ancestors, a number of farmers in the region have launched restoration and recovery initiatives. Preserving distinctive traditional attributes of indigenous olive groves is of utmost importance; however, this requires the adoption of inventive methodologies that are adaptable to evolving circumstances (Mancomunidad Taula del Sénia 2018).

3.4.2.3.1 Traditional methods of cultivation

By incorporating energy-efficient practices at each stage of production for traditional rain-fed olive cultivation, it is possible to establish a sustainable system, which capitalizes on the natural environment surrounding it. Although productivity increases significantly in irrigated systems, associated environmental impacts render them unsustainable. Such models rely on olive trees that have a relatively brief productive lifespan as a result of which they must be replaced every 15 to 30 years, necessitating substantial investments and energy consumption. In this system, subsequent to the demise of elder olive trees, replacement trees are progressively introduced strictly when necessary. An overarching aim of this system is for its olive trees not to emit more carbon dioxide into the atmosphere than they are capable of sequestering (Mancomunidad Taula del Sénia 2018).

Out of the total 34.189 hectares of olive groves in the system, 33.527 hectares are devoted to traditional rainfed, extensive olive groves, thus, the 275 hectares devoted to irrigated and intensive systems represent less than 1 % in total. Evidently, olive groves in this system are well adapted to the climate and agricultural conditions of the region. The unique attributes of the cultivation frameworks in this system are a result of environmental and historical considerations indicative of the territory's agricultural heritage. Table 4. describes the five utilized exploitation models of cultivation: traditional rainfed, traditional irrigated, intensive, high-density, and super-intensive olive groves (Mancomunidad Taula del Sénia 2018).

Table 4. Created by author based on (Mancomunidad Taula del Sénia 2018)

| Exploitation models | Traditional rainfed T. Sénia | Traditional rainfed | Traditional irrigated | Intensive | High-density | Super-intensive |
|---|---|---|---|---|---|---|
| **Cultivation framework** | 12 x 12 m without framework | 10 x 10 m | 10 x 10 m | 6-7 x 5-6 m | 5-7 x 2-4 m | 4 x 1,5 m |
| **Number of olive trees/hectares** | 50-70 | 80-100 | 80-100 | 200-400 | 400-700 | +1,500 |
| **System of formation** | 1 foot/olive tree | 2-3 feet/olive tree | 1-2 tree/olive tree | HIgh goblet-shape crest | Goblet-shape crest with two branches/central axis | Central axis |

While there are certain distinctions, the cultivation model in this system can be incorporated into the traditional rainfed exploitation model. The cultivation formation system commonly featured in this region exhibits is larger in comparison to the standard rainfed model. Notably, there are instances where no discernible layout pattern can be observed, as shown in Figure 5. This may be attributed to the historical method of grove establishment and the utilization of wild olive trees to graft the Farga variety, rather than planting new ones. The system's model exhibits a considerably lower range of 50 to 70 olive trees per hectare, in comparison to the standard rainfed model. Another significant distinction is that the spacing between olive trees is almost always one foot, whereas in other traditional rainfed models this distance reaches three or two feet. As a result, these olive groves serve in combating climate change, as effective barriers against wildfires and contribute significantly to the reduction of pollution in the region (Mancomunidad Taula del Sénia 2018).

Figure 5. Examples from La Jana and Ulldecona respectively (Mancomunidad Taula del Sénia 2018)

3.4.2.3.2 Traditional methods of production

For centuries, olive fruit collection methods in this region remained largely unchanged (Mancomunidad Taula del Sénia 2018). Typically, olives were gathered from the ground after natural falling, resulting in low-quality oil that necessitated refinement (Taula del Sénia Commonwealth 2014). Alternatively, the fruits were removed from branches using long sticks and manually collected from the ground (Mancomunidad Taula del Sénia 2018). Since then, heeding guidance from specialists, notable advancements have been implemented across all aspects of olive oil production, spanning harvesting, transportation, processing, storage, as well as preservation (Taula del Sénia Commonwealth 2014). Consequently, harvesting has been streamlined through the adoption of key innovations such as nylon ground meshes, inverted umbrella-shaped meshes, and vibrators, resulting in reduced time and labor while enhancing overall quality (Mancomunidad Taula del Sénia 2018).

Despite having the option of modernization, pruning techniques have remained unchanged, in consideration of tree size and regional climatic conditions, utilizing saws and scissors. Efforts directed towards pest control, mainly fumigation using chemical products or attractants, are concentrated on the olive fruit fly, which inflicts damage upon olive fruits and compromises oil quality through increasing acidity that contributes to organoleptic impairments (Mancomunidad Taula del Sénia 2018).

Milling and pressing processes have remained relatively unchanged over the years, although advancements in technology and evolution have marginally modified them. Today, harvested olive fruits are stored in breathable containers, transported via vehicles equipped with trailers to oil mills. The olive fruits are promptly milled upon arrival using hammer mills. However, traditional stone presses used to be employed. Pressing is carried out using stainless steel beaters, following which a mixture of oil and water is obtained. Decanters are used to separate the resulting olive paste into three components: olive oil, vegetable water, and pomace. The produced olive oil is stored in stainless steel tanks, maintained at a consistent temperature, typically around 15°C (Mancomunidad Taula del Sénia 2018).

3.4.2.4 Cultures value systems and social organization

The olive tree holds a significant presence throughout the history of cultures of the Mediterranean (Mancomunidad Taula del Sénia 2018). The olive tree landscape is signature along the Mediterranean coast, representing an important element of the Southern-European identity (Taula del Sénia Commonwealth 2014; Rodrigo-Comino et al. 2021). It's intertwined with numerous religions and has played a prominent role not only in written works but also in folk wisdom, serving as a symbol of athleticism and peace. The ancient olive trees located within this system remain living witnesses to the rich cultural landscape and complex identity of this region (Mancomunidad Taula del Sénia 2018).

It has been verified that olive cultivation had become a standardized practice throughout the region prior to the era of the Romans, however, it only became widespread centuries later. The Roman cultivation framework was majorly adopted, with priority given to grains and olive trees. Notably, cultivation was more extensive in the southern part of the territory, where the indigenous population benefited from Arabian presence (Mancomunidad Taula del Sénia 2018) since the early eighth century (Cachia 2017), owing to which methods of olive cultivation and extraction were refined (Mancomunidad Taula del Sénia 2018). In the

thirteenth century (Berner 1986), a notable portion of the region's forests was cleared to harvest timber for shipbuilding. Subsequently, the cleared land was utilized for cultivating the most productive crops, including grains, carob trees, olive trees, and vineyards (Mancomunidad Taula del Sénia 2018).

During the eighteenth century, rapid growth of olive oil production and export led to the abandonment of many fields and their subsequent conversion to rainfed crops, primarily olive trees. Consequently, olive cultivation in the area underwent a transition into a profitable monocropping system, although the majority of olive oil produced was utilized for non-edible purposes, due to poor quality. Although the integration of modern equipment into the manufacturing process, aiming to improve olive oil quality, has demonstrated efficacy, it has simultaneously generated additional costs. Hence, at the start of the twentieth century, olive processing in the region saw the emergence of cooperatives, alongside the rise of privately-owned oil mills, which to this day bring together producers, fostering engagement in processing at a joint oil mill. Altogether, there are 22 oil mills, encompassing around 4,300 members (Mancomunidad Taula del Sénia 2018).

3.4.2.4.1 Stakeholders

Figure 6. illustrates a functional framework of participation and oversight of entities affiliated with the system. The owners of ancient olive trees who have preserved and cultivated them in spite of economic incentives to sell their trees are the immediate beneficiaries of this initiative, together with oil mills, and other sectors involved.


Figure 6. Scheme of the order of stakeholders involved, created by the author based on (Mancomunidad Taula del Sénia 2018)

Mancomunidad Taula del Sénia is an association of municipalities comprising 27 city councils that represent the Valencian, Catalan, and Argonian communities, established in 2006 through 2007 (Mancomunidad Taula del Sénia 2018), The overarching purpose of its

formation was to foster wide-ranging collaboration among governmental bodies and local authorities, while also promoting cooperation between the economic and social sectors (Antich 2014; Ministerio de Cultura). While city councils collaborate and coordinate with the association of municipalities, certain councils also execute specific initiatives at the local level (Mancomunidad Taula del Sénia 2018).

The management of all matters regarding ancient olive trees falls under the authority of the association of municipalities, which bears primary responsibility for planning, execution, and results of relevant aspects. Concretely, in 2018, the association's annual budget exceeded 534.000 euros, of which 17 % was designated to ancient olive trees. However, all decisions require joint agreement with the Asociación Territorio Sénia, consisting of an equal representation from the social and economic sectors at 50 %. (Antich 2014; Mancomunidad Taula del Sénia 2018). This includes stakeholders such as oil mills covered by the guarantee mark, olive tree owners, restaurants, tourist companies, and more. The association of municipalities represents the other half to foster consensus between public and private entities in decision-making. Since the establishment of this system of collaboration, new aims for the environmental, social, and economic recovery of the area have been established. Furthermore, actions in rural paths, reindustrialization, rural development, employment, technologies, tourism, and ancient olive tree conservation have been undertaken (Mancomunidad Taula del Sénia 2018).

The association of municipalities frequently conducts informative talks at various educational institutions, fostering deeper community engagement and awareness. The local community actively participates in events and celebrations centered around ancient olive trees, advocating against their exploitation. Additionally, schools within the region engage in an annual competition focused on regional themes such as ancient olive trees, artisanal crafts, and traditional dry-stone techniques (Mancomunidad Taula del Sénia 2018).

Furthermore, the Ministry of Agriculture, in conjunction with the Ministers for Agriculture of Valencia, Catalonia, and Aragon, as well as the provincial council presidents of Castellón, Tarragona, and Teruel, pledged assistance to the system (Mancomunidad Taula del Sénia 2018).

Cooperation is to be maintained with relevant institutions and agricultural research centers. Namely, IRTA (FAO), the Valencian Institute for Agricultural Research (IVIA) (Mancomunidad Taula del Sénia 2018; Aguilar-Hernández et al. 2020), and the Agri-Food Research and Technology Centre of Aragon (CITA) (Fischer et al. 2010; Mancomunidad Taula del Sénia 2018), the Andalusian Institute of Agricultural and Fisheries Research and Training, as well as international and national organizations. Universities involved are the University of Córdoba and the Polytechnic University of Madrid, in particular (Mancomunidad Taula del Sénia 2018).

#### 3.4.2.5 Landscapes and seascapes features

##### 3.4.2.5.1 Environmental & Climate Characteristics

FAO and the International Institute for Applied Systems Analysis (IIASA) collaborated to establish a framework for agro-ecological zoning that designates sites as moderately cold, warm, or subtropical. This system is located in the area of subtropics

(Mancomunidad Taula del Sénia 2018), within the Mediterranean climate, characterized by protracted periods of drought (Arnés García et al. 2020). However, there are numerous variations within the territory, with mountainous regions receiving more precipitation on average than other regions (Mancomunidad Taula del Sénia 2018).

3.4.2.5.2 Topographic Characteristics

Within this system, three distinct landscapes can be observed: natural, agricultural, and urban. In the natural environment, there are mountainous areas that make up 34 % of the territory, intermediate plains, and an extensive coastline (Mancomunidad Taula del Sénia 2018).

In the rough and steep mountainous agricultural zones, extensive livestock farming predominates, mainly sheep and cattle grazing on grasslands. Transhumance is a common practice in such regions. Due to their elevation and climate, olive groves are notably absent in these areas. On the other hand, intermediate plains are distinctive for their abundance of olive groves, which have been shaping the local scenery for centuries, although various other fruit trees, rainfed almond trees, carob trees, and grain crops are also cultivated. Coastal areas are characterized by irrigated agriculture, focusing on crops such as citrus fruits, artichokes, and a variety of vegetables. Additionally, rice paddies, as well as oyster and mussel farms, contribute to the agricultural landscape of the coast (Mancomunidad Taula del Sénia 2018).

3.4.2.5.3 Land use

Various landscapes can be observed in the territory of this system. The natural landscape is made up of 60 % coniferous and deciduous forests, scrublands, and grasslands. The remaining portion is covered by crop lands which occupy 36 %, and 4% of unproductive land and water bodies. The cultivation of olive trees is significant in the territory as it accounts for about 16.5 % of the system’s total area, at 34,189 hectares. About half of the olive tree groves are represented by traditional cultivars. Furthermore, rainfed crops represent 75 % of cultivated land, the rest of which is covered by rainfed fruit trees and irrigated citrus fruit trees respectively. This variety of land uses, together with the integration of various agricultural activities contribute to the agro-ecological value of the region (Mancomunidad Taula del Sénia 2018).

3.4.2.5.4 Landscape & seascape components

The combined effects of climate, topography, hydrology, soil composition, flora, fauna, and anthropogenic activity create a specific configuration, which defines a landscape (Dancausa et al. 2023).

**3.4.2.5.4.1 Dry-stone structures**

Traditional dry-stone structures are scattered across various landscapes within this system. Nowadays, they hold cultural significance, symbolizing the region's identity and farmers' ingenuity in overcoming environmental challenges. Historically, however, they served a practical function, critical to agriculture and livestock farming in the region. Such structures have been observed in mountainous areas associated with extensive livestock rearing, as well as in coastal and intermediate areas, amidst various types of crops and olive groves (Mancomunidad Taula del Sénia 2018).

However, these structures are threatened by a lack of awareness and maintenance, which endanger their preservation. In an effort to tackle the aforementioned threats, an inventory was undertaken by the association of municipalities aiming to identify significant dry-stone structures within all twenty-seven municipalities. As a result, more than 1,200 such structures were identified. Outside of the scope of the inventory, Territorio Sénia is the site of various other dry-stone constructions like wells, walloons, lime kilns, and extensive networks of stone walls spanning thousands of kilometers (Mancomunidad Taula del Sénia 2018).

Walloons, found in Figure 7. are crucial to the resilience of local landscapes against wind, drought, and other adverse conditions, through the protection of olive tree roots and conservation of moisture. Furthermore, these structures contribute significantly to local biodiversity by providing habitat for numerous species (Mancomunidad Taula del Sénia 2018; Ruta del Grial 2023 a).


Figure 7. Walloon located in the system (Canal56 Notícies 2021)

Dry-stone structures characteristic of this system contribute to mitigating strong winds, droughts, and other adverse conditions, while providing habitats for various species, playing a vital role in supporting local biodiversity. Dry-stone margins terrace cropland, prevent erosion, and delineate property boundaries, while dry-stone walls act as barriers for livestock and fire breaks on hillside slopes in forested areas. Pictured in Figure 8. is an example of dry-stone barracks, which historically served multiple practical purposes. Primarily, they functioned as shelters for farmers, their families, and pack animals from poor weather conditions. Additionally, these structures were utilized during periods of heightened agricultural activity, while in mountainous regions, they served as sanctuaries for shepherds (Mancomunidad Taula del Sénia 2018).

Figure 8. A dry-stone barrack (Mancomunitat Taula del Sénia)

**3.4.2.5.4.2 Olive trees**

The heritage, tradition, economy, environment, and visual elements of landscapes of this system have been significantly shaped by olive cultivation, dating back to the earliest phases of agricultural development in the area. Local landscapes have transformed over centuries, but areas known as "the sea of olive trees" characterized by a predominance of olive trees, have remained and now serve as an iconic landmark defining the region. Such an area can be found in Figure 9. Diverse landscapes featuring olive trees cultivated together with almond trees, carob, walnut, or fig trees, especially along property boundaries can be observed. Furthermore, olive cultivation occasionally occurs alongside irrigated orchards in coastal areas (Mancomunidad Taula del Sénia 2018).

Figure 9. Landscape of "the sea of olives" (Ruta Oliveres Milenáries b)

### 3.4.3 Challenges & threats

The major threats and challenges affecting this system and its constituents have been identified. Throughout centuries, numerous owners uprooted ancient olive trees as can be observed in Figure 10. for various purposes, such as for timber, use as firewood, or substitution by younger trees (Soriano 2017). Simultaneously, neglected millenary olive trees were sold by owners. A significant loss of the system's signature landscape resulted from the widespread practice of uprooting these olive trees for luxury ornamental use at the beginning of the millennium (Taula del Sénia Commonwealth 2014; Soriano 2017).


Figure 10. The uprooting of an ancient olive tree (Mancomunidad Taula del Sénia 2017)

#### 3.4.3.1 Competitiveness of traditional varieties

Local farmers struggle to reach sufficient profits due to rising costs, reduced yields associated with traditional cultivation methods, and competition from intensive agriculture. Intensive methods typically employ irrigated non-indigenous cultivars that generate lower costs and high returns, in comparison. Coupled with that is the fact that an overwhelming majority of cultivated olive groves operate on a small scale, often plots of less than a hectare in size. As a result, there is a trend of abandonment and selling of properties, which diminishes the local landscape and simultaneously increases fire hazard in the region (Mancomunidad Taula del Sénia 2018). Alternatively, relatively low oil prices paired with a lack of subsidies are attributed to factors that accelerate the previously stated issues (Ruta Oliveres Milenáries a). Neglected groves must therefore be revived, and consequently reintroduced into production, to harness their full environmental and economic potential for the system (Mancomunidad Taula del Sénia 2018).

#### 3.4.3.2 Aging and depopulation

An aging demographic of farmers and ongoing depopulation represent critical threats to the sustainability of the system. Population in the territory has decreased by 5 % over five years from 116,985 in 2012 to 111,021 in 2017. In rural parts, the decline has reached a point of risk of total abandonment for certain municipalities (Mancomunidad Taula del Sénia 2018).

Consequently, a deficiency of young educated individuals pursuing a career in agriculture within the system can be observed, which poses a significant challenge to the olive growing sector, as professional prospects are important to entice people to the local industry.

Furthermore, the development production methods without practical, specialized education is problematic. Therefore, there is a need for such education for all parties involved in the olive oil industry (Mancomunidad Taula del Sénia 2018).

Notably, there is now a number of relatively young individuals between the ages of thirty to fifty returning to the territory to engage in olive cultivation, and other activities within the agricultural sector. To capitalize on this interest and facilitate a generational turnover, it is necessary to prioritize the enhancement of production capacity of traditional and ancient varieties (Mancomunidad Taula del Sénia 2018).

3.4.3.3 Protection of ancient olive trees

The heritage of ancient olive trees requires a comparable level of legislative protection that is bestowed upon historical, cultural, and architectural heritages. Furthermore, individuals who cultivate these olive trees and produce oil from them could benefit from institutional support. However, it should be noted that in Spain, the adoption of legislation falls within the competency of autonomous regions (Ruta Oliveres Milenáries a).

In Valencia, the enacted Tree Protection Law in 2006 (Mancomunidad Taula del Sénia 2018; Ruta Oliveres Milenáries a) prohibited uprooting specimens with a circumference larger than 6 meters. The law was effective in preventing their plundering; however, many trees were still not covered by this legislature. Therefore, aiming to extend protection, within and outside the system, to specimens meeting the standard of the criteria used to inventory ancient trees, new regulations were published in 2018 (Mancomunidad Taula del Sénia 2018). Meanwhile, in Catalonia, a draft law known as Law 6/2020 was introduced in 2018 and ratified in 2020, which addresses the conservation and promotion of millenary olive trees. Beyond its aforementioned objectives, the law also aims to provide support to other entities involved (Ruta Oliveres Milenáries a).

The findings of an analysis conducted by Arnés García et al. (2020) on trends in territorial protection amongst European GIAHS sites indicate that the social organizations involved in the system of Territorio Sénia have assisted in the development of policies and other methodologies targeting the preservation of the local landscapes only marginally, in comparison to other sites involved in the research. On the other hand, evaluation of the effectiveness of regulations towards protection is problematic due to a deficiency of regulations and compensatory measures (Mancomunidad Taula del Sénia 2018).

### 3.4.4 Action plan

From the identification and brief analysis of the aforementioned challenges and threats, a strategy to follow and the initiatives to be developed were established within the action plan for the time period between 2018 and 2022. The action plan is inspired by and builds upon the previously carried out projects within the territory. Therefore, based on acquired experience, especially in the cooperation between public and private sectors, their results were taken into consideration while the action plan was drafted. It should be noted that the activities indicated in the action plan are subject to evaluation under the association of municipalities (Mancomunidad Taula del Sénia 2018).

3.4.4.1 Preservation and put on value of the ancient trees and their oil

Initiatives to foster awareness among the wider public, various institutions and producers are to be organized. Information campaigns to disseminate information regarding the potential in the restoration of private properties, on which abandoned olive trees are situated, are to be conducted. The aim is to entice both new and potential producers, therefore additional research is to be conducted into the profitability, market trends, and utilization of olive oil production in the regions. Lastly, measures for the safeguarding of ancient olive trees within the system are to be continually evaluated to ensure effective production and conservation methods are being employed (Mancomunidad Taula del Sénia 2018). With increasing awareness among the community, previously abandoned ancient olive trees are being put back into production (Taula del Sénia Commonwealth 2014).

3.4.4.2 Improvements in the quality and put on value of olive oils

To enhance the quality of the olive oil produced within the system, tailored education training is to be developed, following which specialized training is to be provided for all parties involved in olive oil production. Concurrently, a comprehensive manual outlining the best practices for high-quality oil production is to be developed in cooperation with specialists. The manual is to be founded upon local expertise and serve as a source of inspiration for other communities that could benefit from its application.

In addition, research is to be conducted to further enhance the distinct qualities of traditional single-variety olive oils produced from the Farga, Morruda, Sevillenca, and Empeltre cultivars. An oil coupage sourced from the previously referenced varieties is also planned to be produced, following comprehensive research into its quality and potential for gastronomic utilization (Mancomunidad Taula del Sénia 2018).

3.4.4.3 Dissemination and promotion of olive trees and their oil

To realize the dissemination and promotion of the unique heritage of this system, close cooperation with research centers and other institutions on a global scale is to be cultivated. Exchange of expertise regarding the methods and approaches for preservation of millenary olive trees worldwide is expected through the facilitation of specialized literature and information dissemination. Relevant information is to be distributed to the government of Spain, other institutions at the provincial, autonomous, and national levels, and to international organizations such as the European Union (EU), Council of Europe (CoE), and FAO (Mancomunidad Taula del Sénia 2018). Furthermore, a conference will continue to be held annually for the evaluation of progress and establishment of objectives for the safeguarding and enhancement of millenary olive trees and products derived from them (Mancomunidad Taula del Sénia 2018; Ruta del Grial 2023 b).

3.4.4.4 Oleotourism

So far, efforts to sustainably expand oleotoursim within the territory have led to the establishment of sightseeing pathways around ancient olive trees, viewing sites, and two natural museums, namely the Arion in Ulldecona and the Pou del Mas in La Jana. The development of oleotoursim has been possible thanks to the collaborations and agreements with property owners, farmers, olive oil mills, and municipalities involved (Taula del Sénia

Commonwealth 2014). Therefore, the aim of this initiative is to capitalize on the cooperation and engage areas with underdeveloped potential for oleotourism. The tertiary sector, involving ecotourism, trade, and tourism, is intricately linked to olive cultivation and production in this system. The establishment of nature museums and designated observational areas is intended to encourage visitors to engage with ancient olive trees while preventing damage to the adjacent environment. In addition to knowledge regarding the context and practical uses of olive cultivation in the area, visitors are granted access to operational and refurbished historical oil mills (Mancomunidad Taula del Sénia 2018).

Furthermore, in order to foster public interest in the system, relevant businesses are to be encouraged to produce goods that could contribute to oleotoursim within the system. In line with fostering interest, community engagement is to be prioritized through civic activities and festivals centered around ancient olive trees, and festive events, including celebrations marking the anniversaries of specimens that have surpassed one thousand years in age (Mancomunidad Taula del Sénia 2018).

3.4.4.5 Other economic sectors of the territory

The diversification of commercial products derived from the olive trees in the territory is targeted by this initiative. While olive oils represent the principal product produced, there is great potential in expansion of traditional table olives, olive pastes, bread, spreads, and other artisanal and cosmetic products. Consequently, although the millennial olive oil sector is the primary asset of this system, other sectors, including gastronomy, restaurants, tourism, and commerce, remain crucial for overall success and sustainability of the system (Mancomunidad Taula del Sénia 2018).

3.4.4.6 Aging and depopulation in inland areas

A thorough examination of the most affected parts of the region is to be conducted by the association of municipalities in collaboration with relevant provincial and autonomous governments. Inspiration is to be taken from successful case studies, due to a lack of expertise in guiding the development of an appropriate approach, to identify potential courses of action (Mancomunidad Taula del Sénia 2018).

3.4.4.7 Cooperation with other sites and dissemination of the GIAHS

It is intended for connections and agricultural development to be fostered, through international cooperation with farmers and technicians from other sites. The Olive groves of the slopes between Assisi and Spoleto in Italy are of particular interest due to the potential to share and exchange knowledge and experience related to olive grove cultivation (Mancomunidad Taula del Sénia 2018).

3.4.4.8 Information and communication technologies, social networks

As part of this initiative, a website for the distribution of information about the system and developments regarding olive trees, gastronomy and tourism in the territory was launched. The information is supplemented by photographs, videos, documents, relevant studies together with any additional information significant for enhancing public awareness. In order to reach the widest possible demographic, social media is to be leveraged also (Mancomunidad Taula del Sénia 2018).

3.4.4.9 Economic framework

All of the activities indicated in the action plan are expected to be funded by the total contributions, the sum of the resources available among the association of municipalities, councils, the Asociación Territorio Sénia and institutional contributions as per Figure 11. (Mancomunidad Taula del Sénia 2018):

| Funding sources of the action plan 2018 - 2022 | | | | | | |
|---|---|---|---|---|---|---|
| **Origin of funds** | **2018** | **2019** | **2020** | **2021** | **2022** | **Total** |
| Mancomunidad Taula del Sénia | 90.000 | 90.000 | 95.000 | 95.000 | 100.000 | 470.000 |
| Councils, Asociación Territorio Sénia | 40.000 | 45.000 | 45.000 | 50.000 | 50.000 | 230.000 |
| Institutions | 245.000 | 250.000 | 250.000 | 250.000 | 260.000 | 1.255.000 |
| Total resources | 375.000 | 385.000 | 390.000 | 395.000 | 410.000 | 1.955.000 |

Figure 11. Distribution of financial resources, created by author based on (Mancomunidad Taula del Sénia 2018)

### 3.4.5 Personal Interview

An interview was conducted with Mr. Amador Peset, owner of Aceites Peset, a company that produces olive oil certified by the Aceite Farga Milenaria guarantee trademark, and a leading figure in the recovery of ancient olive trees in the region. Mr. Peset shared his expertise and personal input, offering valuable insights to add scope to this thesis. Sections of the interview will be provided, the full version can be found in the appendix.

Mr. Peset was born into a family of farmers. “It all started because of the need to have more millenary olive trees, because with the 18 that my parents had, I did not make enough oil from these olive trees, which at that time 2012 thanks to the Mancomunidad de la Taula del Senia, had a lot of publicity and therefore this oil was sold very well. So I decided to look for millenary olive trees to be able to produce more oil, simply to cover my sales and try to earn a little more than with normal oil. But soon I realized that it was something different, something special and the oil became a second plan, the important thing was to save those trees, and every day I tried to look for abandoned olive trees to recover them and what was a number … became unimportant, at the moment I do not know how many I can take … the important thing is to achieve that in my town a millenary olive tree is not abandoned …”

Mr. Peset strived to carry on his family's legacy, directing his focus towards enhancing quality processes and embracing technical innovation. “I decided that I had to pick my olives from the tree, at their exact quality point, make everything as good as possible and put it in a nice glass bottle and with a design. At that time in our area this was not the norm, people took it in bulk to the cooperative and from there it was sold in vats to Andalusia or filled in 5 liter plastic. So I looked for a mill that worked only olives from the tree, then I bought on the internet from Italy without knowing if it would arrive or not, a packaging machine and one to put the caps and so I started to work, filling the glass bottles myself and putting the labels by hand, one by one.”

According to Mr. Peset, a major challenge faced in the area is a fundamental lack of support by the local authorities “the olive trees are all geo located and therefore we know how many there are and who are their owners, then the administration must support these people economically for each millenary olive tree that they conserve and it is very easy but at the moment there is not this resolve …”

# 4. Conclusion

- The main objective of the bachelor thesis was to provide an overview of GIAHS with a focus on Europe. Furthermore, a more detailed description of the agricultural system of ancient olive trees in the Territorio Sénia, enriched by a personal consultation with a local farmer, was to be provided. These objectives were fulfilled to a sufficient extent.
- The GIAHS program supports agricultural systems that employ traditional knowledge, contributing to biodiversity conservation and sustainable development. By safeguarding these systems, the initiative helps ensure food security and rural livelihoods, preserve cultural heritage, and maintain ecological balance.
- GIAHS in Europe are linked by a common aim to foster sustainable socioeconomic development through comprehensive collaboration of relevant stakeholders.
- The significance and potential for rural development in the area provided by the unique landscape of millenary olive trees of the agricultural system of ancient olive trees in Territorio Sénia were sufficiently shown. Furthermore, the significance of the Farga cultivar as a rarity for global biodiversity was identified.
- Ancient olive trees play a key role in local tradition and culture, which is evident from the local community's active engagement in their safeguarding. Furthermore, the olive oil sector in the region is essential for the local economy and provides an opportunity for the mitigation of population decline in the region. The cultivation of ancient olive trees in this region provides numerous prospects for rural development. Moreover, their contribution to local biodiversity, economy, culture, and traditions is integral to the system's overall viability.
- An interview with a local farmer and olive oil producer provided insight and illuminated the impact of the program's implementation from the perspective of a member of the local community.

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# 6. Appendices

Below, the full personal interview with Mr. Amador Peset can be found.

1. The overall objective of the GIAHS program is to identify and safeguard sites and their associated landscapes, agricultural biodiversity and knowledge systems to support these systems and enhance global, national and local benefits derived from their dynamic conservation, sustainable management and increased viability. With this in mind, how do you think being part of the GIAHS program has been beneficial for Territori Sénia?

Honestly to date, we have not noticed any progress with respect to having been appointed GIAHS, no political authority has personally addressed me to congratulate me or ask me what I need or what my problems are and as far as I know of the territory, no farmer like me has been benefited in any way.

2. Do you think the GIAHS program has influenced ecotourism in the area? If so, how?

So far it has not influenced anything, I have no more visitors than before or visitors who tell me that they come to know that we are GIAHS and I can affirm it because I always ask my visitors how they have found me, whether through the web or through tourist offices, or through some newspapers that have made reports on me and so far no one has told me that because I belong to GIAHS.

3. Are there other people working on the recovery of ancient olive trees in Territori Sénia with whom you would recommend me to contact?
No, really the only person who has been dedicated to recover these ancient olive trees from total abandonment has been me, for this reason if you look on the web, you will see that all the reports and interviews of recovery have been made to me, another thing is the marketing of some companies of sponsor an olive tree, etc .... that are advertising for a greater sale of its product, but that behind this work of recovery and the Taula del Senia has recovered some but very few, and all of some people who had them next to a road and to clean it have also taken advantage to clean the olive tree.

4. I have read that you come from a family of farmers, how do you think this influenced your work in the recovery of ancient olive trees?

It all started because of the need to have more millenary olive trees, because with the 18 that my parents had, I did not make enough oil from these olive trees, which at that time 2012 thanks to the Mancomunidad de la Taula del Senia, had a lot of publicity and therefore this oil sold very well.

So I decided to look for millenary olive trees to be able to produce more oil, simply to cover my sales and try to earn a little more than with normal oil.

But I soon realized that this was something different, something special and the oil took a back seat, the important thing was to be able to save those trees, and every day I tried to look

for abandoned olive trees to recover them and what was a number (I have 18, now 40, then 120 recovered) became unimportant, At the moment I do not know how many I can take, I do not care, if 150 or 175, this is not important, the important thing is to achieve that in my town a millenary olive tree is not abandoned, but it is difficult, because there are not many people willing to do the same as me and as I have commented to you in the beginning really the administration only wants us for the photography.

5. I have read that to continue your family's work you have focused on quality processes and technical innovation, can you tell me more about how you have adjusted the process?

Yes, in 2012 almost nobody made their oil in their brand, I decided that I had to pick my olives from the tree, at their exact quality point, make everything as good as possible and put it in a nice glass bottle and with a design. At that time in our area this was not the norm, people took it in bulk to the cooperative and from there it was sold in vats to Andalusia or filled in 5 liter plastic. So I looked for a mill that worked only olives from the tree, then I bought on the internet from Italy without knowing if it would arrive or not, a packaging machine and one to put the caps and so I started to work, filling the glass bottles myself and putting the labels by hand, one by one, but all the same.

6. You are the guardian of a part of Spain's heritage, these ancient trees tell the story and your story is an inspiration. How do you feel doing this work?

Personally I have to say that almost nobody appreciates my work in my town, province and community, only people from abroad appreciate it very much, that's why people from very lay people come to visit me, as well as televisions and newspapers from some parts of the world.

I have never recovered an olive tree thinking about who will thank me or which journalist will come to visit me.

I am sure that nobody is going to follow in my footsteps, the proof is that nobody has really started to recover these olive trees like me, out of passion and pride to be able to see an olive tree recovered, where there was only a dry trunk about to die from the invasion of weeds.

The authorities don't care, they only come to take a picture, an example: Sinfo's olive tree is in the middle of the field (as it should be), but without any protection, tomorrow a madman can go with a lighter and set fire to it, or a person with a chainsaw and cut it down.

Well if I want to avoid this, I have to be the one who pays a fence around the farm and put some cameras with wifi to detect intruders, the cost of fencing the farm is about 5000€ and wifi cameras about 1000€, so if I want to protect it I have to pay it myself, I am also only a tenant of the farm, because I remind you that all millennial olive trees recovered remain the owner's, I only have a lease of the farm for 5 years which is then extended annually for another year.

With the sale of the oil is not enough, a normal farmer can have 8 or 9 millenary olive trees at most, these produce one year if another not, so he will get about 70 kg on average every two years, at maximum 1€ per kg of olive, he will earn from this olive tree 70€ every 2 years. My

question is: Which farmer or young person who is not dedicated to the field, that every day is growing more and more, is going to lose the time that it costs to maintain an olive tree like this for this benefit?

And if the benefit is necessary for its maintenance, I do it because I like it and the benefit does not matter to me, but the majority does not, the majority sees it as a big tree that produces less than the small one and also gives more work.

And what is the solution?

Very easy, the olive trees are all geo located and therefore we know how many there are and who are their owners, then the administration should support these people economically for each millennial olive tree that is conserved and it is very easy but at the moment there is not this resolve.

Forgive me for being a bit pessimistic on this subject, but I have spent many years seeing how nobody really does anything, we only hang medals like the SIPAM that in the end only serve for them to go out to the photo while we put it and then as always we are left alone without any support.