INSTITUTE OF GEOGRAPHY

LAND SYSTEMS AND SUSTAINABLE LANDMANAGEMENT UNIT

AGRICULTURAL LAND USE TRAJECTORIES AND FARMERS' PERCEPTIONS WITHIN ABANDONED LANDSCAPES

A Case Study of Five Valleys:
Val Borbera, Val Spinti, Val Grue, Val Curone and Val Ossona
(Northern Apennines, Italy)

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Abstract

Many European landscapes, notably rural and mountainous areas in the Mediterranean, have experienced agricultural abandonment. These processes, driven mainly by the modernisation and intensification of agriculture and socio-economic dynamics such as emigration, have resulted in abandoned landscapes. With researchers and policymakers recognising the abandoned land's possible contribution towards sustainable development, abandoned landscapes have gained more attention. Hence, attempts have been made to classify the diverse trajectories of post-abandoned landscapes and analyse corresponding future scenarios. However, these landscapes are often complex and driven by factors operating at different temporal and spatial scales and resolutions, making such classification attempts challenging.

Therefore, this thesis aimed to provide a more fine-grained analysis of abandoned landscapes by combining and triangulating different data. This thesis was conducted within the international research project SIPATH (Operationalizing Sustainable Agricultural Intensification Pathways in Europe), focusing on a case study region in Northern Italy. The study area is located in the south-eastern part of the province of Alessandria in the Region of Piedmont. Land use trajectories were identified and analysed using agricultural census data collected from archival and online public services from 1970 to 2022. Information about the currently practised agricultural activities, farming types and farmers was collected through interviews with local farmers while also adding observations from field surveys. Policy measures affecting the farmers' decision-making were identified through these interviews.

The findings confirmed that the area has experienced some drastic abandonment processes within the considered timeline, resulting in a decrease in agricultural surface, a decline in arable land and permanent crops and an increase in woodland. Some new but small trends were observed, which could be indicators for post-abandonment landscapes, such as the creation of a natural park or the promotion of local products and recreational activities. The current agricultural land use is heavily shaped by the consequences of abandonment, with some farmers being driven to shift their focus to animal husbandry, grazing activities, and grasslands due to interference with wildlife. Because of economic challenges and insufficient profit, the interviewed farmers primarily operated smaller family farms with the support of family members. Although farmers in the research area tended to be older, a new dynamic of younger so-called "newcomers" was visible. Farming in rural areas is however generally associated with challenges due to a lack of support and facilitation through policies, according to the interviewed farmers.

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List of Abbreviations

CAP	Common agricultural policy
GAL	Gruppo di azione locale
ISTAT	*Istituto Nazionale di Statistica*
LAG	Local action groups
masl	Metres above sea level
SAT	*Superficie Agricola Totale* (total agricultural surface)
SAU	*Superficie Agricola Utilizzata* (utilised agricultural surface)
SDG	Sustainable development goals
SI	Sustainable Intensification
SIPATH	Operationalising Sustainable Agricultural Intensification Pathways in Europe
SNAI	*Strategia Nazionale per le Aree Interne*
PAC	Politica agricola comune
PSR	Progetti di sviluppo regionale
RDP	Rural development programs
WSL	Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft

List of Translations

Italian word	**English translation**
Agrumi	Citrus
Allevamento	Farmer with livestock
Altre legnose coltivazioni	Agricultural woody crops
Altra superficie	Other surfaces
Altri allevamenti	Other livestock
Arboricoltura da legna	Wood arboriculture
Area territoriali	Territorial area
Avicunicoli	Avicunicoli/Birds
Bosco	Woodland
Bovini e bufalini	Cattle and buffalo
Caprini	Goats
Cereali	Grains
Cintura	Belt
Collina interna	Interior hill
Coltivazioni foraggere avvicendate	Forage crops grown in rotation
Coltivazioni ortive	Horticultural crops
Coltivazioni permanenti	Permanent crops
Equini	Equines
Forma giuridica	Legal form
Fruttiferi	Fruit orchards
Impresa individuale	Individual enterprise
Intermedio	Intermediate
Istituzioni pubbliche	Public institutions
Metri sopra il mare	Metres above sea level (masl)
Montagna interna	Inner mountain
Olivo	Olive
Orti familiari	Kitchen gardens/Family gardens
Ovini	Sheep
Panchina gigante	Big bench
Periferico	Peripheral
Persona fisica che non esercita attività di impresa	Person not engaged in a business activity

Prati permanenti e pascoli	Permanent grassland and pastures
SAU – Superficie Agricola utilizzata	Utilised agricultural surface
Seminativi	Arable land
Società di capitali	Joint stock companies
Società cooperativa esclusa cooperativa sociale	Cooperative society excluding social cooperative
Società di persone	Company of people
Suini	Swine
Viticultore	Winemaker
Vite	Vine

1 Introduction

1.1 Research Topic and Problem Statement

Since the beginning of the 20th century, many different landscapes, especially marginal mountainous areas in European Mediterranean regions, have experienced abandonment processes. Although changes in land use dynamics and processes of agricultural abandonment have been present in such regions for a long time, since the end of the Second World War a heavy increase in such phenomena has been observed, posing various challenges for landscapes and especially for the people living in the affected areas (Dossche, 2022; Lasanta et al., 2017; Lasanta et al., 2015; MacDonald et al., 2000). These landscapes were traditionally dominated by agro-silvo-pastoral systems that resulted to be highly adaptive, diversified and economically valuable landscapes (Cevasco et al., 2015; Dossche, 2022; García-Ruiz et al., 2020; Pinto-Correia, 1993). This land use system was characterised by mostly coppice woodland, grazing activities differentiated by winter and summer grazing and smaller mixed cultivations (arable cultures) (Dossche, 2022; Farina, 1991; Pasquale et al., 2004).

The abandonment of more peripheral and mountainous areas started already in the 19th century, being intensified up to the 20th century. Since the end of the Second World War, these abandonment processes have been further accelerated by industrialisation and globalisation dynamics. An intricate interplay of drivers such as modern advancements in agricultural practices, like the heavy mechanisation of processes and use of chemical fertilisation, globalised and free market dynamics and new European agricultural rules have led to an intensification in other, more suitable regions and a counteracting extensification in geomorphologically, geographically and climatologically more challenged areas, such as the mountainous Mediterranean regions. With an increase in imports of agricultural goods and their low productivity, these challenged regions could not compete with national and global markets, leading to a further marginalisation. The prospect of better economic opportunities has driven local populations to move to cities or more urbanised areas. This resulted in extensive agricultural land abandonment with the withdrawal of land management (Antrop, 2005; Dax et al., 2021; Dossche, 2022; Filho et al., 2017; Terres et al., 2015).

The consequences of land abandonment are numerous, and impacts have been observed on environmental and socio-economic levels. The expansion of shrubs and woodland as a result of plant succession has been one of the main consequences of abandonment (Lasanta et al., 2017). Depending on local factors, this outcome can positively or negatively affect the landscape (Fayet et al., 2022b;

Haddaway et al., 2013; Lasanta et al., 2015). While the increase in vegetation can lead to higher biodiversity, contribute to carbon sequestration, reduce soil erosion, and optimise the water cycle, it can also negatively impact the area by inhibiting traditional land management, changing the ecosystem's dynamic and sustainability of the area by also increasing the risk of fire (Lasanta et al., 2015). There is disagreement though between researchers on whether biodiversity improves or declines with agricultural abandonment. While some argue that human activities are needed to promote biodiversity (Blondel, 2006; Garcia-Ruiz et al., 2020), others explain that forest and vegetation regeneration is crucial to improving biodiversity (Garcia-Ruiz et al., 2020; Navarro-Pereira 2012).

The result of these drastic changes and processes is agricultural land abandonment, which, according to Fayet et al. (2022b), is defined as "the cessation of agricultural activities and the (complete) withdrawal of agricultural management on land" (Fayet et al. 2022b, p. 1). The abandoned landscapes are perceived to no longer be interesting for political, economic and social investment. Due to this abandonment of agricultural practices, rural mountain areas have transformed into monotonous, homogenous and less valuable landscapes, losing their multifunctionality and stability.

Landscapes are complex and manmade systems shaped by history and human practices and therefore, besides environmental and functional factors, contain also a cultural dimension which is also affected by agricultural abandonment processes. The abandonment can often lead to a "loss of historical cultural and environmental values" (Dossche, 2022, p. 8) as well as a loss of cultural heritage elements and local identity (Antrop, 2005; Cocca et al., 2012; Dossche et al., 2016).

The scientific literature on how to manage these abandoned areas is divided. To avoid a homogenous landscape with minimal diversity and socio-environmental value, some researchers have recommended actively managing abandoned fields to avoid negative impacts and maintain their functionality (Benjamin et al., 2008; Cevasco et al., 2015; Lasanta et al., 2017; Lasanta et al., 2015; Pelorosso et al., 2011). Within strategies of actively recovering and restoring cultural and traditional landscapes, often referred to as "ecological restoration strategy", clearing old, abandoned fields with the best topographic characteristics is seen as a critical component to reduce the risks of fire, improve biodiversity and facilitate and promote extensive stockbreeding (García-Ruiz et al., 2020). In contrast, some authors have argued that only passively managing abandoned land could favour and promote the regeneration of vegetation, forests and natural habitats (Lasanta et al., 2015; Lasanta et al., 2017). One of the leading and most frequently discussed passive land management strategies is rewilding. Researchers have explained that assisting the regeneration of natural habitats and the reintroduction of specific species can lead to benefits for ecosystem services (regulating and cultural services), and

the improvement of biodiversity. Passive management “emphasises no management or low levels of management” (Navarro & Pereira, 2012, p. 904) and although sometimes minimal intervention is needed, an increasing number of studies show that after their reintroduction, vegetation and wildlife were able to grow, regenerating forests and allowing nature to find a natural balance. This makes rewilding a viable passive management option (García-Ruiz et al., 2020; Navarro & Pereira, 2012).

Aware of the value of abandoned land, the negative impact that agricultural abandonment can have on nature and society and their role in sustainable development, many international institutions, conventions and policies have elaborated on or implemented measures to preserve and revive traditional and complex cultural landscapes. These areas could significantly contribute to achieving climate targets and future goals, especially with the possibility of increasing carbon sequestration through forestation and cultivation (Fayet et al., 2022a, 2022b). Among these institutions and policies are the Institute for European Environmental Policy (IEEP) and the European Union’s Common Agricultural Policy (CAP) (García-Ruiz et al., 2020; Lasanta et al., 2015; Lasanta et al., 2017). According to Fayet et al. (2022b), the opportunities that abandoned land provides for nature restoration are “in line with the EU Biodiversity Strategy for 2030 and the post-2022 global biodiversity framework for biodiversity protection and ecosystem restoration” (p. 7).

Given the potential role and relevance of abandoned land, attempts have been made to classify these post-abandoned landscapes as outcomes based on their possible trajectories once the abandonment process has finished, searching for spatial patterns in their occurrence. However, research has shown that these abandoned landscapes often show high complexity created through the intricate interplay and diversity in trajectories, drivers and actors against various individually unique contexts (Fayet et al., 2022b). Although important, this type of empirical research has often demonstrated that abandoned landscapes are highly complex and challenging to understand, let alone classify. Consequently, there is a need for a more nuanced and fine-grained analysis of the spatio-temporal abandonment process to understand the current landscape, as this diversity reflects the potential for societally desirable pathways and outcomes, which may be blurred and lost in large-scale analyses (Antrop, 2005; Cevasco et al., 2015; Dossche, 2022; Fayet et al., 2022b; Pointereau et al., 2008).

1.2 Goals and Research Questions

This thesis was conducted within the international research project SIPATH (Operationalizing Sustainable Agricultural Intensification Pathways in Europe), focusing on a case study region in Northern Italy.

The overreaching goal of this research was to underline the importance of a more nuanced and fine-grained analysis of the spatio-temporal abandonment processes and outcomes by providing an overview of the agricultural land use changes and the current agricultural landscape of the study region.

The main objectives of this thesis were 1) to illustrate the historical agricultural land use changes and trajectories over the considered timeline (RQ1), 2) to create an overview of the current agricultural land use and farming types and (RQ2 and RQ3) 3) to overview the policy measures and incentives influencing the agricultural activities of the farmers in the study area (RQ4):

- **Research Question 1 (RQ1):**
  What has been the **development trajectory of agricultural activities** in the study area?
- **Research Question 2 (RQ2):**
  What types of **agricultural activities** are currently practised?
- **Research Question 3 (RQ3):**
  What types of local **farms and farmers** are currently present?
- **Research Question 4 (RQ4):**
  How are local **farmers' agricultural activities** influenced by international, national and regional policies?

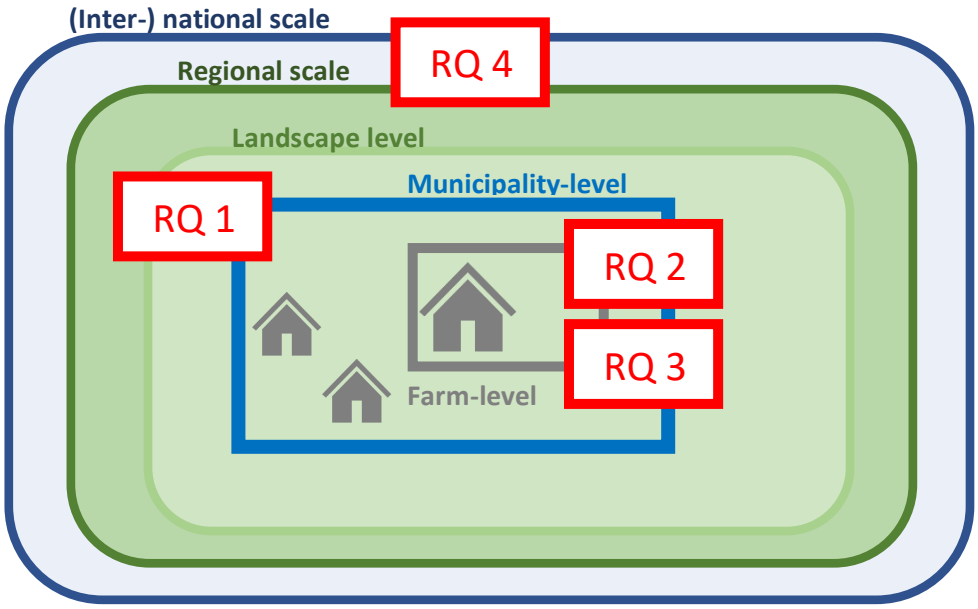


Figure 1. Allocation of the RQs in the complex nested reality of landscape research (adapted from Diogo et al., 2022)

As seen in Figure 1, these research questions were allocated within the concept of scales of Diogo et al. (2022). For Research Question 1, census data on the municipality level was analysed to create an overview of the development trajectories of the research areas' agricultural land use. This analysis provided information and allowed statements about the characteristics of these abandoned landscapes. Research Questions 2 and 3 analysed the current agricultural activities, farmers and farm types on the farm and municipality levels to overview the current agricultural landscape. For Research Question 4, interviews on the local level were executed to analyse how policymaking on a regional and (inter)national scale has affected the farmers.

1.3 Research Focus and Study Area

This research project focuses on the southeastern part of the Alessandria province in Piedmont, Northern Italy (see Figures 2 and 3 below). The research area comprises 30 municipalities (listed in Table 1), whose total surface area is 549.46 km^2. The region is hilly and mountainous (between a minimum of 173 masl and a maximum of 1,700 masl), and described as a rural mountain landscape (Dossche, 2022). The municipalities are all members of three Mountain Municipality Unions (*Unione Terre Alte*, *Unione Curone-Grue-Ossona* and *Unione Borbera-Spinti*). This case study has been chosen for this thesis since it represents a homogenous area through the municipalities' membership of the mentioned unions, and research has already been conducted on this delimited study area (see Dossche, 2023).

Figure 2. Study area located in the region of Piedmont on a map of Italy

Figure 3. Study area with the 30 municipalities

Table 1. List of the 30 municipalities of the study area

Municipalities		
Albera Ligure	Cerreto Grue	Montacuto
Avolasca	Costa Vescovato	Montegioco
Berzano di Tortona	Dernice	Montemarzino
Borghetto di Borbera	Fabbrica Curone	Pozzol Groppo
Brignano-Frascata	Garbagna	Roccaforte Ligure
Cabella Ligure	Gremiasco	Rocchetta Ligure
Cantalupo Ligure	Grondona	San Sebastiano Curone
Carrega Ligure	Momperone	Stazzano
Casasco	Mongiardino Ligure	Vignole Borbera
Castellania	Monleale	Volpeglino

Geomorphologically, the area is characterised by varied topographies containing the five main valleys of Curone, Grue, Ossona, Spinti and Borbera, and the highest point of 1,700 masl at Monte Ebro and Monte Chiappo to the southeast. The research area is also part of the Northern Italian Apennine Mountain Range, bordering on the southeast with the region of Liguria, as well as bordering to the east and southeast with the regions of Lombardia and Emilia-Romagna (Dossche, 2022; Fontefrancesco et al., 2022). In 2019, a regional park in the Upper Borbera Valley, containing the municipalities of Carrega Ligure and part of the municipality of Cabella Ligure, was created (*Parco Naturale Alta Val Borbera*).

Historically, the area was dominated by an agro-silvo-pastoral system, characterised by coppice woodland, arable land, large pastureland and intensive free grazing on commons since trade with animals and animal products, such as dairy and meat, provided significant economic income. Typical for the Apennines, the woodlands are composed of chestnut and summer oak in the lower parts and fir, pine, and beech forests at higher elevations, with both vegetations used for firewood and chestnut collection and sale (Cevasco et al., 2015; Dossche, 2022; Fontefrancesco et al., 2022). The region has undergone various demographic changes in the last 200 years. Due to new work opportunities as a result of new industries and economic marginalisation, the area was experienced a stark depopulation between the late 19th century and the first half of the 20th century (Fontefrancesco et al., 2022).

This demographic decline intensified after the Second World War, when the lack of competitive strength in increasingly globalised market, strenuous work associated with agricultural activities and the prospect of better work and employment drove people to migrate towards cities and other countries (Cevasco et al., 2015; Dossche, 2022; Fontefrancesco et al., 2022). The area is now primarily characterised by depopulation and is consequently populated predominantly by the middle-aged (40–65) and elderly age (> 65) groups (Fontefrancesco et al., 2022). While historically, the region was predominantly locally governed in many socio-economic matters, a different political dynamic, which is more heavily influenced by authorities on a higher level, especially European ones, is now present (Dossche, 2022; Dossche et al., 2016; Fontefrancesco et al., 2022).

These various socio-economic changes and dynamics mentioned above, combined with the unfavourable topographic conditions and remote characteristics of the area, were driving forces that led to an extensive (agricultural) land abandonment resulting in marginalised rural landscapes (Dossche, 2022; Dossche et al., 2016). The consequences were the regrowth of successive/secondary vegetation, often a mix of shrubs and woodland, the spreading of wildlife and the degradation of structures and characteristics of former agricultural practices such as terraces and infrastructure. Plant succession also heightened the risk of fire. The depopulation also led to declining public and

commercial services, increasing less favourable, more challenging conditions for habitants and people considering moving to this rural region. This issue has also been highly influenced by the geomorphological characteristics and remoteness of the area (Dossche et al., 2016; Fayet et al., 2022b; Fontefrancesco et al., 2022).

More recent challenges also affecting the area have been the African Swine Fever outbreak and a massive landslide in Carrega Ligure. Several restrictions have been implemented for farmers residing in the delimited high-risk zone of the disease, leading to economic issues. The landslide happened on one of the main roads leading into the municipality, separating the village of Carrega.

2 State of the Art

2.1 Agricultural Land Abandonment

Already in the early 1990s, Pinto-Correia (1993) addressed the apparent processes of abandonment and migration around the Mediterranean Basin. She discussed that many of these abandoned landscapes showed characteristics of marginalisation, especially regarding economical topics. The profits made by those who cultivated these marginalised lands often failed to cover their expenses, so their profitability was low or almost non-existent. Moreover, environmental marginal characteristics such as steep slopes and poor soil quality have posed difficulties for cultivation, influencing the local land use pattern. Further marginalisation on a global level has also occurred due to the inability to compete with more intensive production modes in the global market.

By reviewing the literature on abandonment and comparing European mountain case studies, MacDonald et al. (2000) assessed the agricultural land use changes and consequences of abandonment. Although identified as a challenging process that goes as far back as the 19th century, research has shown an especially drastic increase in the amount and extent of abandoned agricultural lands since the end of the Second World War (Haddaway et al., 2013; Lasanta et al., 2017). The rising concern of large-scale abandonment has been reflected in the vast amount of research conducted and literature published over the last two decades, with many authors offering summaries of the main space-time processes and drivers in Europe (see Cocca et al., 2012; Filho et al., 2017; Lasanta et al., 2017; Terres et al., 2015; Ustaoglu & Collier, 2018). Accordingly, much literature can be found regarding the consequences of abandonment while identifying and analysing possible opportunities (see García-Ruiz et al., 2020; Lasanta et al., 2015; MacDonald et al., 2000; Plieninger et al., 2016; Quintas-Soriano et al., 2022).

The drastic land use changes in prevalently mountainous Mediterranean areas such as the Apennines have also been recognised by research, resulting in an increase in the literature with a specific focus on these geomorphologically and geographically challenged areas (see Cocca et al., 2012; Dax et al., 2021; Mazzoleni et al., 2004; Quintas-Soriano et al., 2022; Terres et al., 2015). For example, Farina (1991) thematised the impact of abandonment on vertebrate fauna in montane landscapes of the Apennines in North Italy. In his conclusion, he suggested alternative land use strategies such as recovering and maintaining marshes, riparian habitats, and montane woods.

Then, Malandra et al. (2018) published a meta-analysis of case studies conducted in the Apennine areas, summarising the most significant land use changes, such as forest expansion, agricultural land

reduction and livestock farming. Various studies focusing on land abandonment across Europe have highlighted more economic and infrastructural issues, explaining that mountainous areas, unable to compete in global markets, are at a higher risk of abandonment and marginalisation (Dax et al., 2021; Dossche, 2022; Lasanta et al., 2017; Pinto-Correia, 1993; Terres et al., 2015).

The region of Piedmont in Northern Italy comprises parts of the Apennine Mountain Range and has been the focus of research by Dossche et al. (2016) focussing on landscape identity. Their results showed a detachment between the people and the landscape, highlighting the importance of the temporal dimension when seeking to understand the landscape identity's formation processes and evolution. The history of the Val Borbera, also a part of the study area of this thesis, was analysed and described by Fontefrancesco et al. (2022) concerning local ecological knowledge (LEK). They investigated how abandonment processes influenced, changed or transformed the local rural communities, specifically their LEK, while highlighting the importance of such resources and the potential to preserve and strengthen local and cultural diversities. Their results showed that detachment from the environment due to these socio-economic changes had led to an identity crisis.

Dossche (2022) further examined these rural landscapes' histories and evolution while identifying the driving forces for such spatial and existential changes using qualitative and quantitative methods. The results highlighted the complexity of landscape as a construct and representation of continuous interactions between the land and its users. Her research further demonstrated that the study area of Val Borbera is an example of a rural area struggling with a lack of competitive strength in the global market, drastic demographic changes and abandonment processes.

Then, one year later, Dossche (2023) published a paper called *"Is shrinking really a Bad Thing? – A socio-demographic photograph of inner areas".* The publication focuses on the same case study area applied in this thesis. The author explains that rural areas are often looked at and analysed only considering one aspect, such as the indicator for depopulation, which does often not create a holistic picture of the area. Therefore, a combination of five different indicators is proposed to create a better overview and deeper understanding of the current and past demographic dynamics.

2.2 Policies and Procedures Post-Abandonment

Many researchers have sought to identify the effects of implemented policies and possible improvements, acknowledging the importance and role of policymakers and agricultural policy measures in overcoming current and future challenges, such as the loss of biodiversity and achieving global food security. The policies' effects have been analysed by numerous researchers on the scale of various agricultural, environmental and economic factors such as biodiversity, water and soil quality, farm income, farm productivity and agritourism growth. Some studies published in the Italian context were Cortignani and Dono (2018), Galluzzo (2017) and Bergamini et al. (2019). Gottero and Cassatella (2017) even went further by identifying and criticising the inefficiency of Rural Development Programmes 2007–2013 (RDPs). They argued that these programmes did not include actions to enhance the landscape while preserving and recovering farmland.

While much research has been conducted regarding the causes and drivers of land abandonment, considering it an end state, more recent studies have strived to understand post-abandonment processes. Fayet et al. (2022b) analyse these so-called post-abandonment trajectories (i.e. possible land trajectories after being abandoned) through an extensive literature review and additional expert reviews. Thereby, various possible future pathways for abandoned farmlands were identified. Seven primary overreaching landscape outcomes and their drivers were composed, simultaneously emphasising the importance of supporting policy and economic measures to favour desired outcomes.

A further study by Fayet et al. (2022a) evaluated the potential that abandoned agricultural lands can contribute to sustainability objectives, specifically the goals of the European Green Deal. Their results showed a lack of consideration of abandoned lands in policies. As a result, the authors called for a more integrated policy and spatial planning approach.

3 Theory and Conceptual Framework

This chapter demonstrates and summarises the theories used in this thesis, explaining the relevant core statements and the reasons for using these theories. Moreover, it shows the definitions and understanding of certain core concepts and terms.

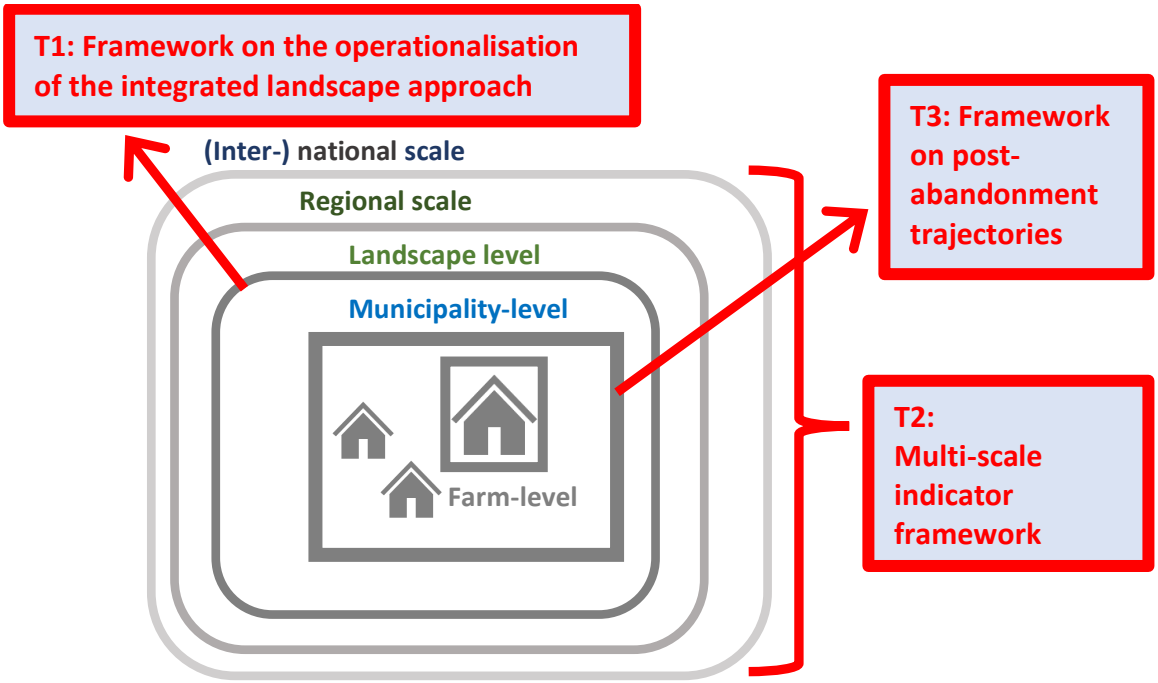


Figure 4. Allocation of theories in the complex nested reality of landscape research (adapted from Diogo et al., 2022)

Figure 4 shows the allocation of the chosen theories (i.e. T1, T2 and T3) on the adapted multi-scale system of Diogo et al. (2022), which is explained in Section 3.2. The landscape approach (see section 3.1) aims to create system knowledge by exploring and understanding land use patterns and changes on a landscape level, similar to this thesis. Diogo et al.'s theory guided seeking, collecting and analysing data at different geographical scales and organisational levels. Fayet et al. (2022b) was used on the municipality scale to interpret possible new trends and dynamics. Further information is provided in the following theory descriptions (see Sections 3.1, 3.2 and 3.3).

3.1 Framework on the Operationalisation of the Integrated Landscape Approach (T1)

Landscape research approaches have been varied, with researchers and literature having different understandings of what landscape is, resulting in a vast number and variety of definitions. The consistent theme in the diversity of definitions is that landscape is characterised by two dimensions: material-physical and immaterial, including sensory, symbolic and aesthetic components (Antrop & van Eetvelde, 2019). The Council of Europe Landscape Convention (2000) described landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (p. 2) whose holistic view of the landscape, Bürgi et al. (2017) endorsed in the creation of their framework. According to Bürgi et al. (2017), the landscape approach has become a significant concept in the field of sustainability, due to its ability to analyse the interconnections and trade-offs between larger scales beyond the limitations created by sectoral thinking and approaches. Integrative approaches such as the landscape approach are crucial for addressing and understanding the complexity of present and future global challenges (Bürgi et al., 2017; Freeman et al., 2015; Sayer et al., 2013). However, the authors argued that there is a need for a more practical and collective approach integrating different theories and definitions of the existing literature on the integrated landscape approach, to create a common ground for researchers.

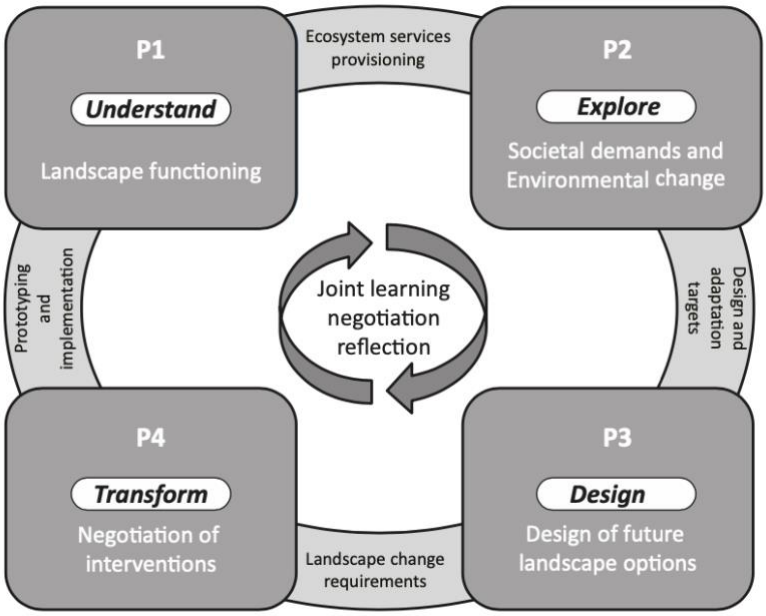


Figure 5. The joint learning circle (Bürgi et al., 2017)

Therefore, they proposed a framework to operationalise the integrated landscape approach. Reflecting the core characteristic of landscapes as an interrelation between a society with different stakeholders and nature, the authors viewed the integration of stakeholders, scientific knowledge and methods as crucial in creating a learning circle. As seen in Figure 5, their framework presented the integrated landscape approach as a "process of joint learning, negotiation and reflection" (Bürgi et al., 2017, p. 4), comprising four pillars: Understand (P1), Explore (P2), Design (P3) and Transform (P4).

Pillar 1: Understanding of the functioning of the landscape

Bürgi et al.'s (2017) dualistic understanding and definition of landscape is based on the space and place theory (Hartig et al., 1997), which sees the landscape as both a physical *space* with elements such as roads and fields as well as a (historical) *place* of great importance in social and cultural studies. Furthermore, the authors explained landscapes as spaces where supply and demand dynamics exist. In the form of ecosystem services (ES), if not overexploited, they provide natural, social and cultural capital stock to demanding users.

By combining the ecological knowledge of local land users and the scientific community, Pillar 1 (P1) aims to obtain an understanding of landscape functioning. Therefore, to obtain a comprehensive understanding of the whole landscape as in the "composition, configuration, management and social capital of the landscape and the relevant land uses" (p. 5) beyond a local small-scale analysis must occur, including knowledge from local actors, policymakers and researchers. Landscapes and their components and dynamics within the system can constantly change and shift, with past human-environment interactions still influencing the current state. Therefore, it is crucial to execute a long-term analysis of the "main systems component", their functioning and interaction, to conduct spatially-explicit assessment *of ecosystem services* including historical development and variability" which is the responsibility of the scientific community (p. 5). The conclusion of P1 is, therefore, system knowledge about the landscape's ES and land use.

Pillar 2: Exploring societal demands and environmental change

Considering that due to changes in the systems' functions and changes in demand, ecosystem provision can shift, P2 aims to examine present and possible future societal demands of ES. Since the drivers of these changes can occur on a local scale and a larger regional or (inter-)national scale through telecoupling effects, the demand and preferences of stakeholders on various scales are analysed through participatory approaches. With challenges arising due to climate change and evolving socio-economical processes, examining societies' current and future needs, vulnerabilities and coping mechanisms is crucial to determine future demand and supply scenarios. Through scenario

analysis and vulnerability assessment, scientists can provide additional information regarding these possible societal and climate changes. Therefore, the desired outcome of P2 is to provide "an overview of synergetic and conflicting changes in societal demand for ES under different global change and climate change scenarios, which can be translated into a set of design and adaptation targets, which forms the basis for designing future landscape options" (Bürgi et al., 2017, p. 6).

This joint learning cycle framework was chosen as an "umbrella" concept since it offers an approach that aims to create a holistic understanding of processes and interactions on the landscape level by providing specific steps to operationalise the approach. This thesis endorses Bürgi et al.'s emphasis on the importance of system knowledge to be able to design fitting transformation strategies and interventions. Therefore, this research is situated within the first two pillars, particularly the first, since it explores land use patterns and changes within the research area. The framework also highlights the importance of combining local knowledge with scientific information. This thesis aims to produce an overview of the development of agricultural land use trajectories by combining scientific data, such as census data and literature, with local knowledge acquired through interviews. Therefore, it implements key messages and concepts of Bürgi et al.'s framework to analyse different data types and deliver system-specific information.

3.2 Multi-Scale Indicator Framework for Sustainable Intensification Assessment (SI) in Europe (T2)

Diogo et al. (2022) discussed the negative environmental impact of agriculture and agricultural activities, highlighting the importance that sustainable intensification (SI) could have in reaching sustainable development goals (SDGs). The challenge is to contribute through agricultural activities to achieve the goal of food security through high productivity while not damaging or harming the environment and quality of life. According to the authors, SI "proposes three underlying principles to tackle these challenges: i) increasing agricultural productivity*;* ii) improving resource-use efficiency and reducing the use of harmful inputs; and iii) halting expansion in important biodiversity hotspots by confining food production to existing farmland" (Diogo et al., 2022, p. 129).

Nevertheless, the concept of SI has been criticised for lacking depth in its definition and not having all dimensions of sustainability embedded in its scope. Social and economic aspects of sustainability and SI's possible various impacts in form of trade-offs on biodiversity, climate change and human well-being have been said to be insufficiently integrated into the concept. These impacts and outcomes of SI do also heavily depend on context-specific conditions, such as institutional settings, historical backgrounds and socio-economic situations. The critics have argued that previously conceptualised assessments for SI are only applicable for "place-based judgements in the context of smallholder farms in developing countries" (Diogo et al., 2022, p. 129). They do not consider large-scale processes and are therefore unsuitable for assessments in high-income economies, which are often embedded in complex international dynamics and markets. The researchers also highlighted that integrating social factors, such as normative values and individual perceptions of actors, must be considered to understand and assess socio-economic processes.

Therefore, Diogo et al. (2022) identified a research gap with a "need for developing procedures and criteria to generate analytical frameworks for integrated SI assessment that can provide a comprehensive outlook of sustainability outcomes from local to global scale, while capturing context-specific socio-ecological processes" (p. 129). Hence, in a first step, a comprehensive system representation was established to examine how and through which factors the outcomes of SI could be influenced or changed while impacting society, recognising that human perception and needs vary depending on psychological and societal factors such as beliefs, norms, values, interests and concerns. Therefore, the authors argued that "multiple scales and levels of analysis need to be simultaneously adopted to capture non-equivalent perceptions and narratives" (pp. 130–131). Consequently, relevant geographical scales for the assessment are defined as seen in Figure 6: agricultural fields, landscapes, regions and the global Earth system.

- **Landscape:** Landscapes are socio-ecological systems composed of different elements such as natural and anthropogenic components, including “levels of organisation”:

  Agricultural fields and farms are essential since through the farmers’ decisions and goals the management intensity and landscape structure are determined or changed, and resource use is managed.

  Communities are networks of people usually connected through similar values, norms and social relationships.

  Agro-ecosystems of related fauna and flora result in “geographical patterns of landscape structure”.

- **Regions (e.g. countries, sub- and supra-national regions):** Policymaking often happens on this scale. Trade-offs and telecoupling happen between different regions, which can shape the context and conditions in which farmers operate.
- **Earth system (global scale):** This system comprises all social-ecological systems, coupled and interconnected.

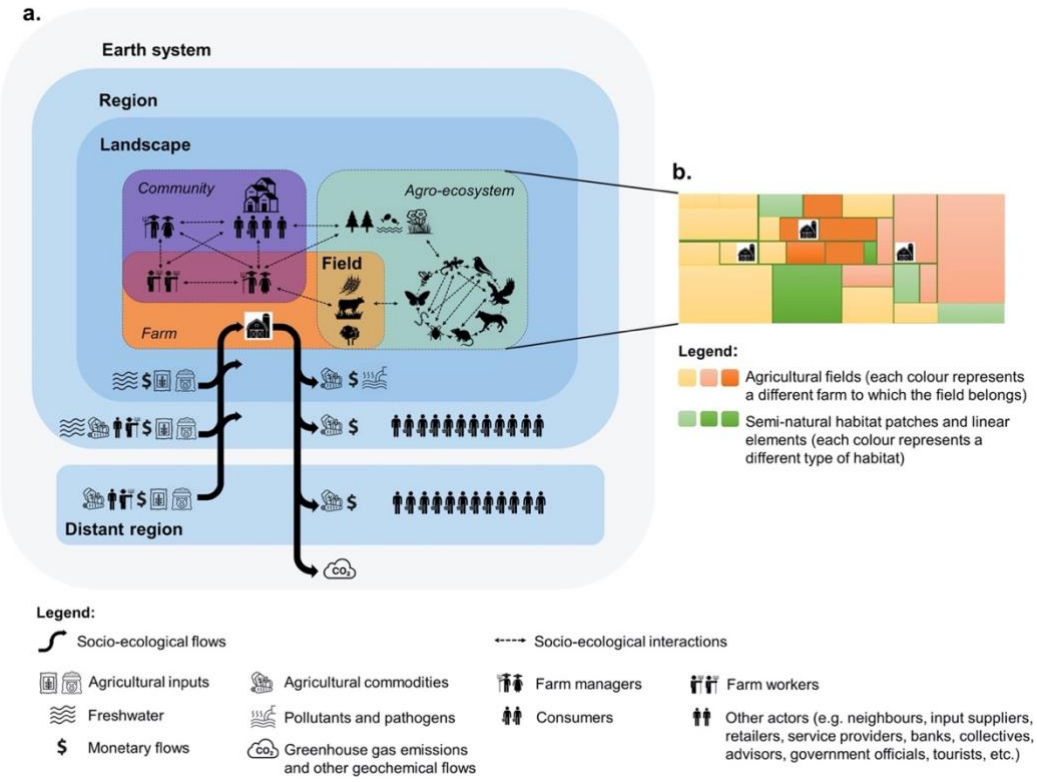


Figure 6. Geographical scales and organizational levels of analysis for SI assessment (Diogo et al., 2022)

In a second step, the authors defined indicators for the sustainability assessment, known as “system attributes”. These attributes are often highly (context-)specific to different groups of people. Applying hierarchical levels similar to the guidelines of the *sustainability assessment of food and agriculture systems* (SAFA) of the United Nations Food and Agriculture Organisation (FAO), the indicators are divided into dimensions, themes, sub-themes and indicators. As a last step, the authors “illustrate the application of the approach by developing a multi-scale indicator framework for SI assessment in Europe” (p.132). This process resulted in the identification of some major processes and effects that are often overlooked in SI assessments.

Not all aspects and steps of Diogo et al.’s (2022) theory were important for this thesis, so certain parts were omitted or addressed only briefly. The crucial part of the authors’ theory for this thesis is the identification and illustration of the geographical scales and organisational levels of a system (pp. 130–131). This theory was chosen for this thesis since it concurs with the authors’ notion that a “comprehensive systems representation” needs to be created to be able to understand complex trade-offs and processes.

This is firstly done by adopting the first two steps/pillars of understanding (P1) and exploring (P2) from Bürgi et al.’s theory (2017), and therefore aiming to obtain and create comprehensive knowledge regarding the system. This adoption also resulted in an understanding of the complexity and multiple structures of the system, which correspond to Diogo et al.’s (2022) explanation and premise that different (hierarchical) scales and levels constitute a system. Since this thesis collected various types of data on different types of levels, Diogo et al.’s definitions and illustration (see Figure 6) of the different geographical scale was used and adapted to allocate this thesis’ research questions (see Figure 1), methods (see Figure 9) and other theories (see Figure 4).

3.3 Conceptual Framework of Post-Abandonment Trajectories (T3)

Stating that research so far has been mostly focused on the drivers and consequences of land abandonment, viewing abandonment as an end state, Fayet et al. (2022b) aimed to highlight the opportunities of abandoned farmland, especially in helping reach environmental sustainability goals. The authors determined these alternative pathways that can occur after abandonment as *post-agricultural abandonment trajectories*. Therefore, post-abandonment and post-abandonment trajectories are defined as the "changes in land cover and land use observed after the cessation of agriculture activities" (Fayet et al., 2022b, p. 2). The authors hereby especially emphasised the transitional character of landscape development, with the concepts of abandonment and post-abandonment being very relative definitions with no clear starting or ending points.

Some of the observed processes after the cessation of agricultural activities were recultivation, natural succession and forestry. Therefore, the outcome of their research was to create a categorisation of different abandonment trajectories resulting in seven possible landscape outcomes.

First, a literature review assessed different land abandonment outcomes and consequences with their causes and drivers. European case studies were analysed, mainly from the two Mediterranean countries of Spain and Italy. Expert interviews with specialised actors from landscape management and planning, policy development and nature conservation were then conducted to add information and insights to the reviewed material.

The first part of the results was identifying an initial overreaching inventory of land transition. Figure 7 shows that three 'alternative directions for the post-abandonment trajectories' were established: a return to agricultural uses, revegetation and urban transformation.

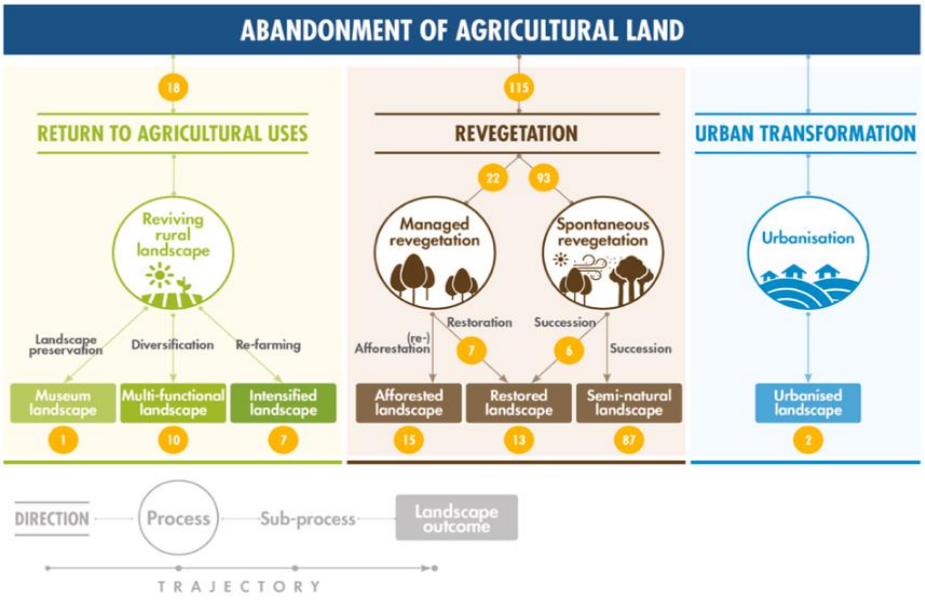


Figure 7. Conceptual framework of post-abandonment trajectories (Fayet et al., 2022, p. 3)

- **Return to agricultural uses:** Through new economic and social activities the rural landscapes are recovered and managed again. This is done by the sub-processes of re-farming, diversification and landscape preservation.
- **Revegetation:** This process occurs when a landscape is either actively (re-)afforested and restored, or when spontaneous revegetation without human management occurs.
- **Urban transformation:** Abandoned landscapes are included in urban planning, so urbanisation processes occur.

These directions were further analysed, identifying seven categories of landscape outcomes with their respective specific drivers and characteristics that could develop after agricultural abandonment: museum landscapes, multi-functional landscapes, intensified landscapes, afforested landscapes, restored landscapes, semi-natural landscapes and urbanised landscapes.

This theory was chosen to provide an additional perspective on abandoned landscapes by not looking at them merely as negative end results, instead exploring and examining opportunities and alternative outcomes. By having created categories of possible landscape outcomes and trajectories with their respective characteristics and drivers, Fayet et al. (2022b) allow to compare the information collected in this thesis with their concept. Hence, certain trends and tendencies that were identified could be indicative of post-abandonment processes. The theory allowed therefore to create hypotheses and identify opportunities for possible further research that go beyond the abandonment process.

4 Methods and Research Design

The following chapter discusses methodological approaches, such as a mixed-methods approach, and the data sampling and analysis concepts.

This research makes use of an empirical case study, which can be understood as a "study of singularity conducted in depth in natural settings" (Bassey, 1999, p. 47). It enables conducting a more in-depth, small-scale exploration and analysis of a specific region or area. Case study research allows using a wide range of methods, ultimately combining them to create a more insightful and detailed understanding of the particular research object (Clifford et al., 2016; Yin, 2014).

4.1 Mixed-Methods Approach

The overall chosen methodology for this master's thesis was a mixed-methods approach. Mixed methods are an integrative approach where the researcher collects and analyses quantitative and qualitative data (Baur & Blasius, 2014; Creswell, 2009; Creswell et al., 2007; Kuckartz, 2014). Creswell (2009) explained that this approach "is useful when either the quantitative or qualitative approach by itself is inadequate to best understand a research problem or the strengths of both quantitative and qualitative research can provide the best understanding" (p. 35). Therefore, integrating these two strands can contribute to a better understanding of the research subject and strengthens the study (Creswell, 2009; Creswell et al., 2007; Kuckartz, 2014). Data triangulation is then executed by linking various information and data collected with different sources and methods.

Following a mixed-methods approach, this thesis gathered quantitative and qualitative information, such as census data (statistical data), local actors' knowledge through guided interviews and field data through field surveys. Combining the data and executing data triangulation added value to the research by facilitating an understanding and interpretation of the research subject's complexity while leading to data collection completeness (Dossche, 2022; Flick, 2011). Figure 8 shows an overview of the different methods and data used throughout the research.

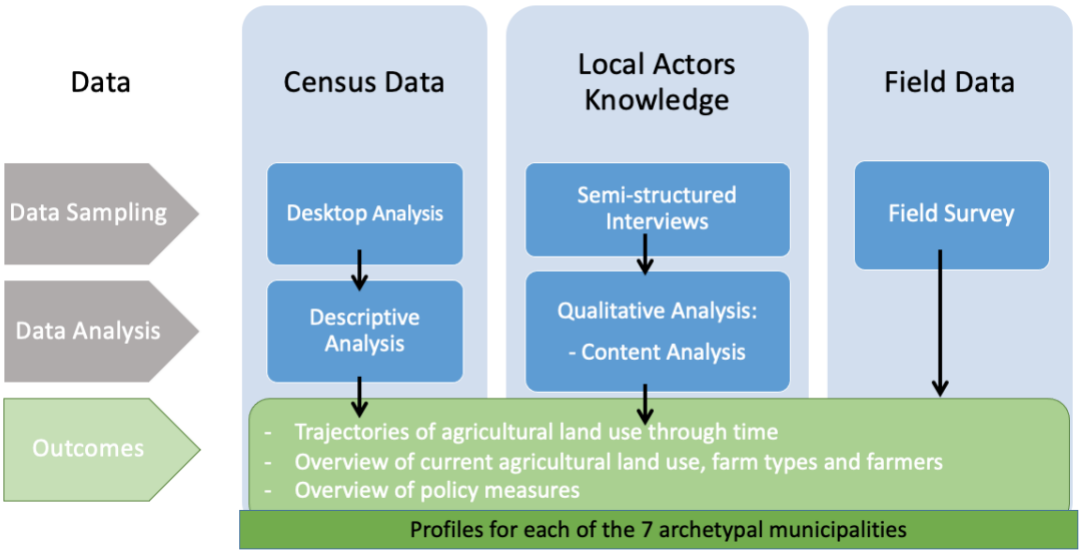


Figure 8. Illustration of types of data, data sampling and data analysis

Figure 9 shows the allocation of the data sampling methods within the concept of Diogo et al. (2022). The interviews were conducted on the farm level by interviewing farm owners. The census data provided agricultural land use information on the municipality, allowing to create an overview of the rural landscape of the research area. The field survey added information to the collected quantitative and qualitative data, characterising the observed landscapes.

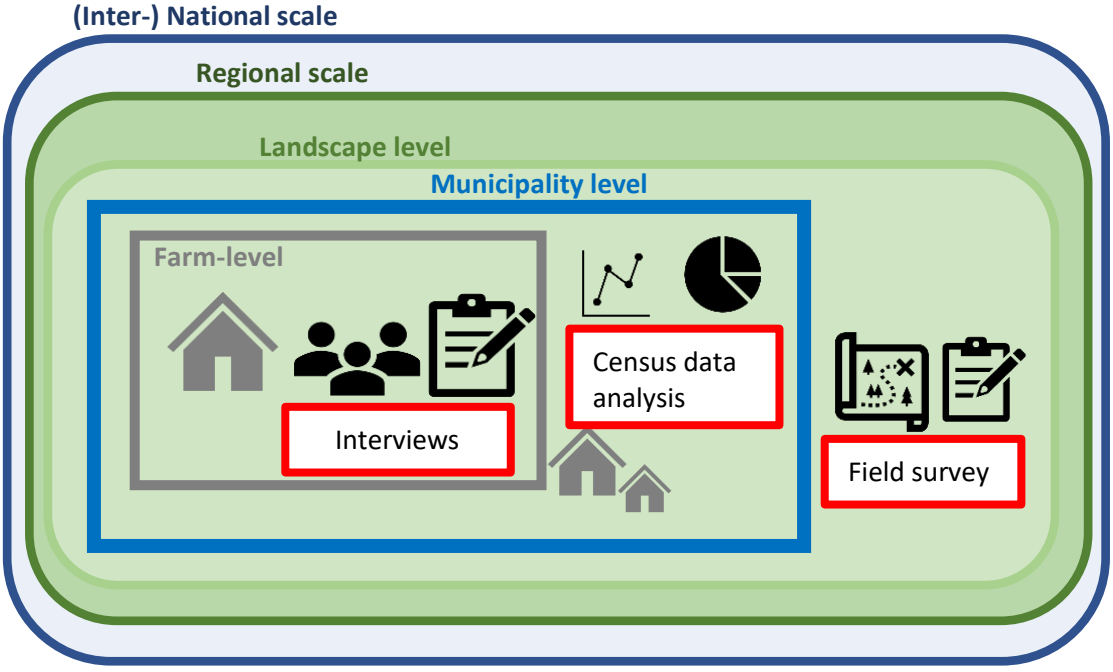


Figure 9. Overview of methods and levels/scales (adapted from Diogo et al., 2022)

4.2 Data Sampling

This section describes the data sampling process by explaining all the data types used and how they were collected. The chosen sampling methods were desktop analysis, census data collection, a field survey and semi-structured (guided) interviews.

4.2.1 Identification of Archetypal Municipalities

The 30 municipalities in the case study area varied in morphology, landscape features, land use and land cover, resulting in diverse landscapes. Those landscapes were not abandoned in the same way and at the same moment. Some continued having agricultural land use, while others have been largely invaded by woodland. A first categorisation step in the research process was needed since it would have been impossible to extensively analyse all 30 municipalities. Therefore, the goal was to create a classification scheme to identify a limited number of municipalities which are representative for the landscape dynamics in the whole research area. The in-depth analysis, therefore, only occurred for these so called “archetypal municipalities”.

These archetypal landscapes were represented by seven municipalities, chosen based on two abandonment criteria and selected considering the geographical position and diversity within the research area. Both criteria were based on the agricultural census data of 2022 and its categories provided by the Piedmont region (see section 4.2.2 for explanation). The chosen abandonment criteria are the amount of *woodland surface* and the amount of *used agricultural surface (SAU)*, both in relation to the *total agricultural surface (SAT)* since they are subcategories of the latter. The criteria indicate three levels of abandonment depending on their percentage: high, moderate and slight (see Table 2).

The first criterion for selecting the archetypal landscapes was the amount of woodland in confront with the totally agricultural surface (SAT). This criterium was represented through the percentage of woodland on the SAT and shows a higher level of abandonment in case of a higher percentage of woodland in correspondence with the SAT. The second criterium included the amount of *used agricultural surface (SAU)*, still in relation to the *total agricultural surface (SAT).* Again, the representation of the weight was shown through the percentual value of *SAU* on *SAT*. In this case, the lower the percentage of *SAU*, the higher the level of abandonment.

As previously mentioned, the weight of *woodland surface* on the total *SAT* is a good indicator of abandonment. Highly abandoned landscapes have over 50% woodland cover, moderately abandoned ones have 30–50% and slightly abandoned ones have less than 30%. For the percentual value of *SAU*

on *SAT*, less than 50% indicates highly abandoned landscapes, 50–70% indicates moderately abandoned and more than 70% indicates slightly abandoned.

Table 2. Abandonment matrix

Criterion	Highly abandoned	Moderately abandoned	Slightly abandoned
Woodland/SAT	x > 50%	30% < x < 50%	x < 30%
SAU/SAT	x < 50%	50% > x > 70%	x > 70%

As a result, the municipalities were positioned in a matrix considering the two criteria, concluding in seven archetypes of abandoned landscapes (Table 3).

Moreover, an extra dimension was added to the classification; being the presence of orchard production at municipality level. The presence and amount of orchards is represented by its surface on municipality level, and is therefore another subcategory of the total agricultural surface (SAT). The presence of orchards is a good indicator for a lower level of abandonment since it requires a frequent management of the land and high investment on plot level. Table 3 indicates the municipalities with a surface over 10 ha of orchard production in bold.

Table 3. Matrix of identification of seven archetypal municipalities

Criterion	Highly abandoned (Woodland/SAT > 50%)	Moderately abandoned (30% < Woodland/SAT < 50%)	Slightly abandoned (Woodland/SAT < 30%)
Highly abandoned (SAU/SAT < 50%)	Carrega Ligure Albera Ligure Grondona	Fabbrica Curone **Montacuto** **Stazzano** Rocchetta Ligure Roccaforte Ligure Gremiasco	
Moderately abandoned (50% > SAU/SAT > 70%)	Mongiardino Ligure Cabella Ligure	Borghetto die Borbera Castellania Momperone Vignole Borbera Pozzol Groppo Garbagna Cantalupo Ligure	San Sebastiano Curone Dernice

Slightly abandoned (SAU/SAT > 70%)		**Brignano Frascata** Avolasca **Casasco**	**Volpelino** Montemarzino Montegioco **Monleale** Costa Vescovato **Cerreto Grue** **Berzano di Tortona**

The final choice of the archetypal municipalities was also related with their geographical position (morphology), accessibility (especially by car), and their classification by the Italian *National Strategy for "Inner Areas"* (SNAI). The SNAI uses a classification system for rural mountain areas which are viewed as so-called *"Inner areas" (Italian: Aree Interne)*, taking into consideration the distance and therefore needed time to reach (public) services such as health, education and transportation services (Dossche & Primi, 2022). The 30 municipalities of the study region fall into the three categories of *belt*, *intermediate* and *peripheric*.

Finally, the seven municipalities chosen with this approach were Carrega Ligure, Gremiasco, Cabella Ligure, Pozzol Groppo, Casasco, Dernice and Costa Vescovato (underlined in Table 3).

4.2.2 Archival and Digital Census Data Collection

The agricultural development overview was created using census data collected by the Italian national institute for statistics called *ISTAT (Istituto nazionale di statistica)* through the *censimenti generale dell'agricoltura*. A *censimento* includes census data on various subjects such as demography, economy, environment and occupation. The ISTAT produces these official statistics. As a public research body, *ISTAT* constantly collects, monitors and analyses data in interaction with the academic and scientific world (ISTAT, 2022). The specific type of *censimento* relevant to the present thesis was *censimento generale dell'agricultura*, containing data on agriculture in Italy.

Seven census data collections have been executed at approximately ten-year intervals. The digitally available data of the *censimenti* only goes back to 2000, when the fifth *censimento* occurred. Therefore, during the first field stay, a visit to the archives of ISTAT Genova collected data from the *censimenti* before 2000. The data was then digitalised and aggregated into an Excel table containing agricultural information on the municipality level from 1970 to 2022. The categories of the considered *censimenti* did not always correspond, but by organising the data, an overall organisational scheme was created, as seen in Figure 10. The final tables appear in Annexe 1. The data of the first *censimento* in 1960 was not included, since the scale of the data collection in this *censimento* was often done on

a different level (regional) and was therefore not compatible with the rest of the data and the analysis on municipality level.

At the time of the data collection and analysis, the sixth *censimento* for 2020 had not yet been published. For this reason, data collected and published by the region of Piedmont (https://www.regione.piemonte.it/web/) was used to analyse the land use trajectories. Table 4 summarises the census data and sources:

Table 4. Description and sources of census data

	Format and source	Census data
1970	Archival paper documents from ISTAT Genova	Number of businesses and total surface per municipality Surface of the following categories: • SAT - SAU - Woodland - Other surface - Wood arboriculture • SAU - Arable land - Permanent crops - Permanent grassland and pastures - Family gardens • Arable land - Grains - Horticultural crops - Forage crops grown in rotation • Agricultural woody crops - Vine - Olive - Citrus - Fruit orchards
1980	Archival paper documents from ISTAT Genova	
1990	Archival paper documents from ISTAT Genova	
2000	ISTAT online database of the 5th *censimento* https://www.istat.it/it/censimenti-permanenti/censimenti-precedenti/agricoltura/agricoltura-2000-	
2010	ISTAT online database of the 6th *censimento* http://dati-censimentoagricoltura.istat.it/Index.aspx	
2022	Online database from the *Regione Piemonte* http://www.sistemapiemonte.it/fedwanau/elenco.jsp	

Figure 10 shows the organisation of the census data. The main category was the *SAT* (total agricultural surface), composed of the sub-categories of the *SAU* (utilised agricultural surface), *woodland*, *other surface* and *wood arboriculture.*

The category of the SAU was further divided into sub-categories of *arable land*, *permanent crops*, *permanent grassland and pastures* and *family gardens*. *Arable land* then included the sub-categories of *grains*, *horticultural crops* and *forage crops* grown in rotation. An additional section in the census data was *agricultural woody crops* divided into *vine*, *olive*, *citrus* and *fruit orchards*.

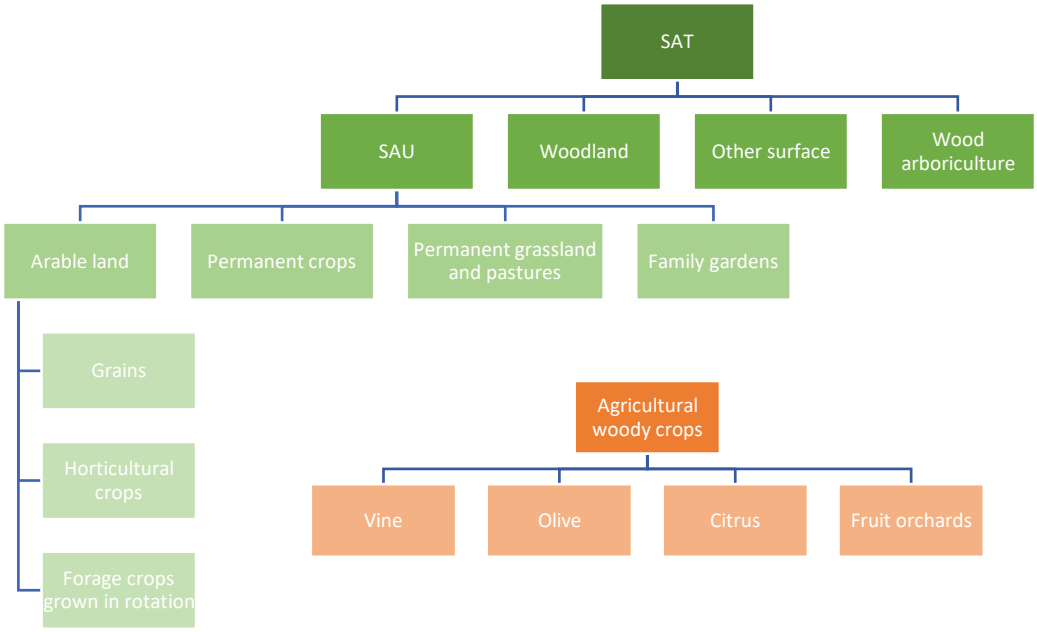


Figure 10. Census data categories

Table 5 below includes the translation of the definition of the two main categories of *SAT* and *SAU* on the website of the *Regione Piemonte*.

Table 5. SAT and SAU definitions (Source: Regione Piemonte, http://www.sistemapiemonte.it/fedwanau/viewer)

Category	Explanation
SAT	Total farm area (*SAT*) expressed in hectares, including utilised agricultural area (SAU), wood arboriculture, forests, unused agricultural area and other areas.
SAU	Utilised agricultural area, expressed in hectares. The SAU of the farm comprises areas under arable crops, agricultural woody crops, family gardens, and permanent meadows and pastures.

4.2.3 Field Survey

The purpose of the field survey was to observe and inventories landscape elements and current land use, as well as abandonment and post-abandonment signs, allowing to validate or even reinforce the assumptions and hypotheses gained through the preliminary census data. It offers the possibility to observe and analyse land cover and land use patterns. The field survey method applied in this thesis was based on Dossche's (2022) methodological approach. Thus, as seen in Figure 11, similar to Dossches methodical proceedings, a survey form containing different types of indicators and attributes (see Annexe 2) was used to collect information for each chosen observation point.

These observation points were chosen considering the "interior" perspective of Antrop and van Eetveldes (2019), who argued that to obtain a horizontal landscape perspective, the observer must be standing in it, with panoramic and elevated viewpoints offering the best overview. In contrast, when standing on flat ground, the view could be obscured by vegetation and buildings. Therefore, for this thesis, strategic elevated lookout points were chosen. The field surveys were executed during two field visits in December 2022 and March 2023. The first field visit lasted nine days, the second field visit in March was longer, lasting nineteen days, thus arriving at a total of twenty-eight days of field visits. As seen in Table 6, a total of 36 observation points were selected. Some observation points had to be visited twice due to restricted visibility caused by foggy and rainy weather. This also allowed to observe seasonal changes in agricultural land use.

The complete field survey can be found in Annexe 2. The field survey form was divided into three main parts, shown in Figure 11. The first part collected general information on the observation point, such as the coordinates and the accessibility of the location, a short description of the observation point and a short overview description of the observed landscape. The next section investigated indicators of abandonment split into biophysical, management and infrastructure elements. These indicators and attributes were established using and leaning on methodological proceedings and knowledge from previous literature (see Dossche, 2022; Farina, 1991; García-Ruiz et al., 2020; Prévosto et al., 2011; Van Eetvelde, 2007; Varotto & Lodatti, 2014; Vink, 1980). Some of the visible indicators for abandonment included secondary and successive vegetation (mostly shrubs), spreading woodland, low accessibility (no clear passages, steep areas), degraded and abandoned terraces and abandoned buildings and agricultural infrastructure (barns and fences). The last part of the survey form assessed indicators of post-abandonment processes.

SIPATH Spinoff abandoned landscapes – Field survey form

Name: Date:
Municipality/hamlet: Pictures:
Observation point: Coordinates:

Short description of the landscape (Topography, open/closed landscape, geomorphology…)

Description observation point (situation within landscape)

Accessibility of the observation point

1. Indicators of abandonments

Biophysical	Y/N	Description
Steep slopes		
Degrades/poor soils		
Land/mud slides		
Forest proximity		
Secondary/successive vegetation		
Other:		

Management:	Y/N	Description
Presence of agricultural activities		
Presence of non-agricultural activities (wood production, craftmanship,…)		
Degradation of terraces		
Mechanization/Technology access		
Small landscape elements (trees, treelines, hedgerows, stone walls,…)		
Clearly visible passages		
Absence or abandoned structures of natural risk prevention		
Other:		

Infrastructure:	Y/N	Description
Abandoned housing		
Abandoned agricultural/rural infrastructures (fences, barns,…)		
Degradation of road structure		
Other:		

2. Indicators of post-abandonment

Return to agricultural uses → revival of the rural landscape	Y/N	Observation
Landscape preservation: Restoration or maintenance of traditional landscape features (hedgerows, terraces, …)		
Diversification of land uses with low-impact management activities: Presence of various functions beyond agricultural and forest-based commodity production		
Re-farming: Agricultural land are cultivated (cropland) or managed (grassland) in a monofunctional way		
Revegetation → managed or spontaneous	**Y/N**	**Observation**
(Re-) afforestation: - Trees planted for commercial purposes (timber industry, wood biomass) - Trees planted to address soil erosion or improve water quality		
Restoration: Restoration of natural vegetation by assisting vegetation recovery (site preparation, seedling, pruning, removal of invasive plants)		
Succession: Absence of human management leading to spontaneous revegetation (secondary succession, old-field succession, or forest regrowth)		

Figure 11. Field survey form

Table 6. List of observation points per archetypal municipality

Municipality/hamlet	Observation points (OP)	Total OP
Gremiasco	OP1, OP2, OP3, OP4, OP5, OP6	6
Dernice	OP10, OP11, OP12, OP13, OP14, OP15, OP16	7
Carrega Ligure	OP20, OP21, OP22, OP23, OP24	5
Cabella Ligure	OP30, OP31, OP32, OP33	4
Pozzol Groppo	OP40, OP41, OP42, OP43, OP44	5
Casasco	OP50, OP51, OP52, OP53	4
Costa Vescovato	OP60, OP61, OP62, OP63, OP64	5
	Total	36

4.2.4 Semi-Structured (Guided) Interviews

One of the methods chosen for data collection was semi-structured interviews. A guideline was used to shape the conversation between the interviewer and the interviewees to ensure the various interviews and the qualitative information obtained were comparable. Therefore, the same guideline was used for all interview partners.

A semi-structured guideline often consists of various types of questions, some formulated in a closed manner, such as “yes” or “no” questions, while others invite narration, where the informants expound on issues they feel are essential. Hence, although guided, the semi-structured character of the interview allows additional questions to be introduced spontaneously to avoid misunderstandings and ambiguities or to follow up on insightful statements and stories (Baur & Blasius, 2014; Clifford et al., 2016).

Fourteen interviews were conducted in person during the second field trip in March 2023. More than one person was present for two of those interviews, ultimately resulting in 16 interviews, with the duration of interviews ranging between 30 minutes and one hour and 13 minutes. Most of the interviews were done on the interview partners’ farms, hence giving also the possibility to take some pictures and get a visual impression of the farm type and farming activities. The questions of the interview guideline covered 1) information about the farmer and farm type, 2) agricultural production, 3) (post-)abandonment indicators and 4) policy measures influencing the farmer (see Annexe 3 for the interview guideline). With the interviewees’ consent, the interviews were recorded. In this way completeness of the statements and data can be guaranteed while the interviewer could concentrate fully on the interview. Subsequently, the interviews were analysed.

Interview partners were selected based on two criteria. The first criterion was that they had to be farmers and the second criterion was that they had to have their business located and registered in one of the seven archetypal municipalities. The respondents were kept anonymous by only revealing age, gender and type of farming. Table 7 overviews the types of farmers interviewed for each of the archetypal municipalities.

Table 7. Types of interviewed farmers per municipality

Municipality/ hamlet	Types of farmers	Gender	Age
Costa Vescovato	Farmer	female	54
	Winemaker	male	31
Gremiasco	Livestock farmer	male	47
	Livestock farmer	female	37
Pozzol Groppo	Winemaker	female	over 65
	Farmer	female	43
Casasco	Winemaker	male	45
	Winemaker	male	22
Dernice	Farmer	male	59
	Farmer	male	55
Cabella Ligure	Livestock farmers	male	42
		female	30
	Farmers	female	55
		female	27
Carrega Ligure	Livestock farmer	male	59
	Livestock farmer	male	63

Figure 12 below shows the age distribution of the interviewed farmers by gender, using the same age categories as the census data of the *censimenti* (see Section 4.2.2). Seven females and nine males were interviewed, ranging between the age of 25 and over 65 years old and under 25 to 64 years old, respectively.

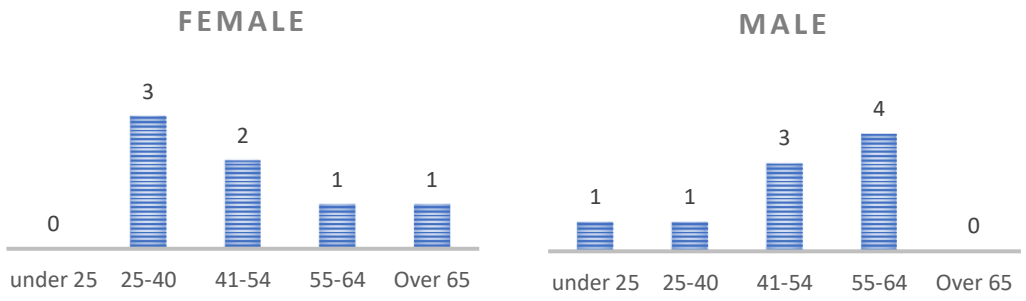


Figure 12. Age distributions of female and male interview partners

4.3 Data Analysis

4.3.1 Descriptive Analysis of Census Data

Various types of diagrams were produced for both the entire study area and for each archetypal municipality to visualise the development trajectory and current agricultural activities for the considered timeline. Line diagrams illustrated and facilitated the analysis of the land use trajectories, comparing the development trajectories of the different census data categories (see Figure 10). The first diagram showed the relationship between the *SAT* and *SAU*. The second compared the rest of the SAT categories of *woodland, wood arboriculture* and *other* surfaces with each other.

Furthermore, an additional diagram compared the sub-categories of SAU: *arable land*, *permanent crops* and *permanent grassland and pastures*. However, the sub-category of *family gardens* was left out since it did not significantly contribute to the surface. Cake diagrams demonstrated the current agricultural activities, farm type and farmers. The resulting diagrams can be found in Annexe 4 within the profile for the specific archetypal municipality. The descriptive analysis of the diagrams was part of the results in Sections 5.1 and 5.2. The census data analysis was also an important first step that allowed the possibility of building hypotheses and assumptions to be further explored through the field surveys and interviews.

4.3.2 Qualitative Content Analysis

Several interview questions were formulated in a closed and standardised manner so that a “yes” or “no” answer could be collected, analysed and illustrated quantitatively. On the other hand, the analysis of the qualitative data acquired through the openly formulated interview questions was conducted leaning on the principles of qualitative content analysis according to Mayring (2000). This qualitative evaluation procedure helps to understand and analyse the content, information and meaning of data acquired from interviews, standardised surveys, observation protocols from field studies, documents, files, newspaper articles and internet materials. The interview questionnaire was created by composing different sections with specific and different themes. Therefore, a certain structure in themes and subjects was already given. The openly-formulated questions were analysed using deductive categories (concepts, narratives and keywords from previous research and the literature), with an inductive category formation to identify further opinions and subjects important to the interview partners.

4.4 Data Triangulation

After the data collection and analysis, the data triangulation was executed with different outputs, as can be seen in Figure 13. The profiles of the seven archetypal municipalities were created using the census data on municipality level and the information of the field observations. To answer research RQ1 and RQ2, census data combined with field data was used to show the land use trajectories and current land use. To give an overview of the farm type and farmers currently present in the study region and answer RQ3, census data of 2022 from the *Regione Piemonte* database as well as interview information was used. RQ4 on the policy measures influencing the farmers activities was answered using the local actor's knowledge collected through the interviews.

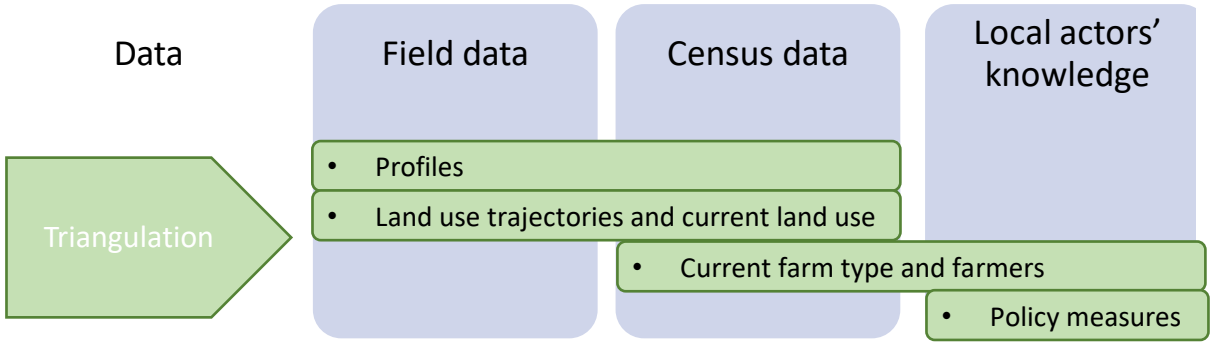


Figure 13. Triangulation of different data types for different outcomes

5 Results

The results are presented in four sections: First, the abandonment trajectories of the overall study area and more in-depth descriptions of the seven archetypal municipalities and their current land use is presented. Second, the types of farms and farmers are presented. A third part illustrates the challenges experienced by farmers. Finally, an overview of the policy measures influencing the farmers was created. The result of this research created profiles for each of the seven archetypal municipalities to overview the development of agricultural land use and the current situation which can be found in Annexe 4.

5.1 Abandonment Trajectories and Current Agricultural Land Use

The following section describes the development trajectory within the considered census data period between 1970 and 2022 by examining the overall development of the whole study area (5.1.1.) and then detailing the seven archetypal municipalities (5.1.2.) to answer RQ1. To answer RQ2 on the current land use dynamics, census data of 2022 was combined with field observations.

5.1.1 General Development Trajectories of the Study Region

The development trajectories of the *SAT (total agricultural surface)* are composed of the categories of *woodland*, *wood arboriculture* and *other surfaces,* as well as the *SAU* (*used agricultural surface*), which can be seen in Figures 14a, 14b and 14c. Overall, a strong decrease in the *total agricultural surface (SAT)* was observed, with at least two-thirds of the municipalities showing a decline of over half of the surface between 1970 and 2022. Notably, some municipalities with the highest *SAT* numbers at the start of the observed timeline (e.g. Borghetto di Borbera, Cabella Ligure, Cantalupo Ligure, Fabbrica Curone, Grondona and Mongiardino Ligure) demonstrated a reduction to less than 30% of their original *SAT* surface five decades later. The only municipality that experienced an increase in *SAT* was Cabella Ligure. This increase though is caused by a drastic increase in *woodland* in 2022. A similar trajectory was observed for the *used agricultural land (SAU)* category. An overall strong decrease in the *SAU* surface area was visible in the census data, with 22 of 30 municipalities currently having at least 50% less than in 1970.

Although *woodland* also showed an overall decrease in surface over the observed timeline, some municipalities showed some changing developments over the last few decades. In contrast to many areas with a constant decline in *woodland* over the observed timeline, a little less than half the

municipalities demonstrated an increase in surface between 2010 and 2022. Notable were Albera Ligure, with more than double the size, and Carrega Ligure, with eight times more surface than in 2010. The results also showed a clear relative increase in *woodland* surface as a component of the *SAT*.

There were no records of *wood arboriculture* in the *censimenti* before 1990. Since 1990, *wood arboriculture* surface has significantly increased for most municipalities, with 24 of 30 showing an increase from 1990 to 2022 and some variable developments in between. Nine municipalities went from no *wood arboriculture* to some having a growth of over seven hectares, with a few having a slight increase between 0.05 and 3.18. The category of *other surfaces* had an overall decrease in size except for the four municipalities of Carrega Ligure, Cerreto Grue, Rocchetta Ligure and Volpeglino, which had an increase in surface from 1970 to 2022. Some had a highly significant decline of over 13 times less *SAT* surface in 2022 than in 1970.

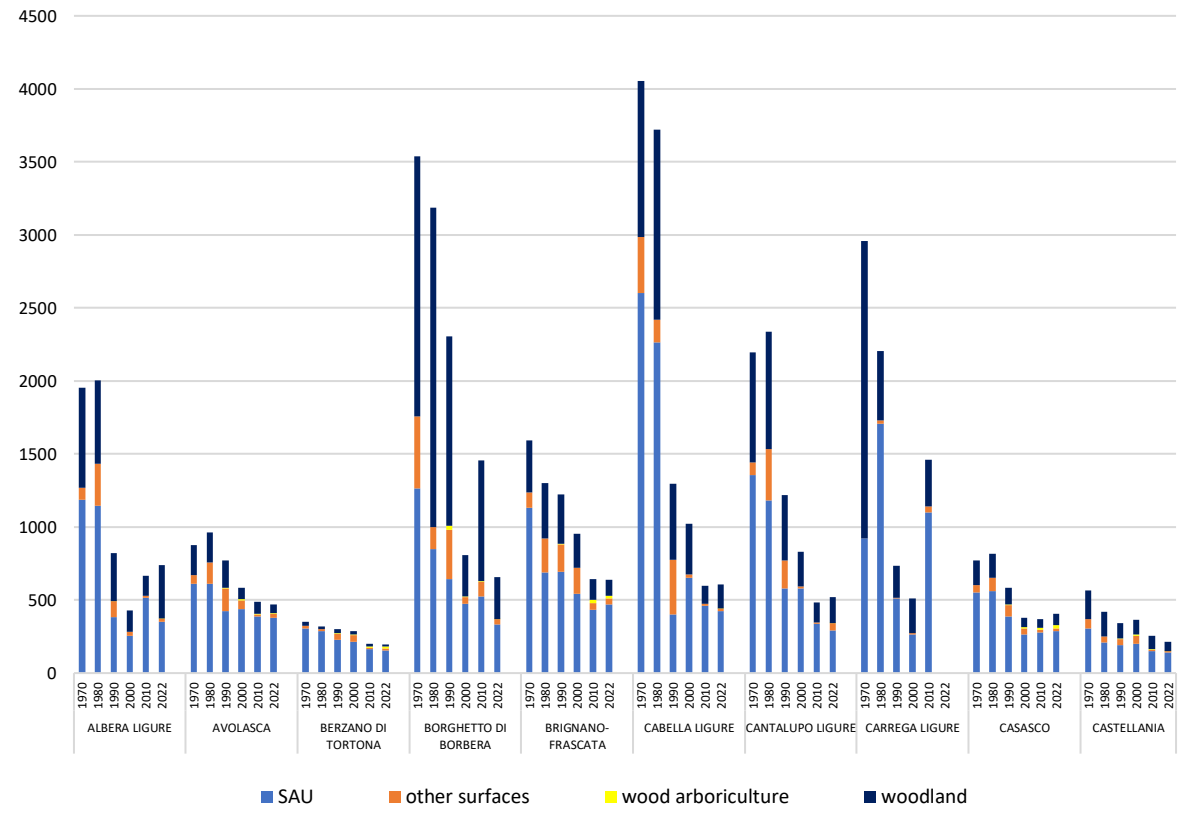


Figure 14a. SAT surface development for study region (part 1) (ISTAT, 2023; Regione Piemonte, 2023)

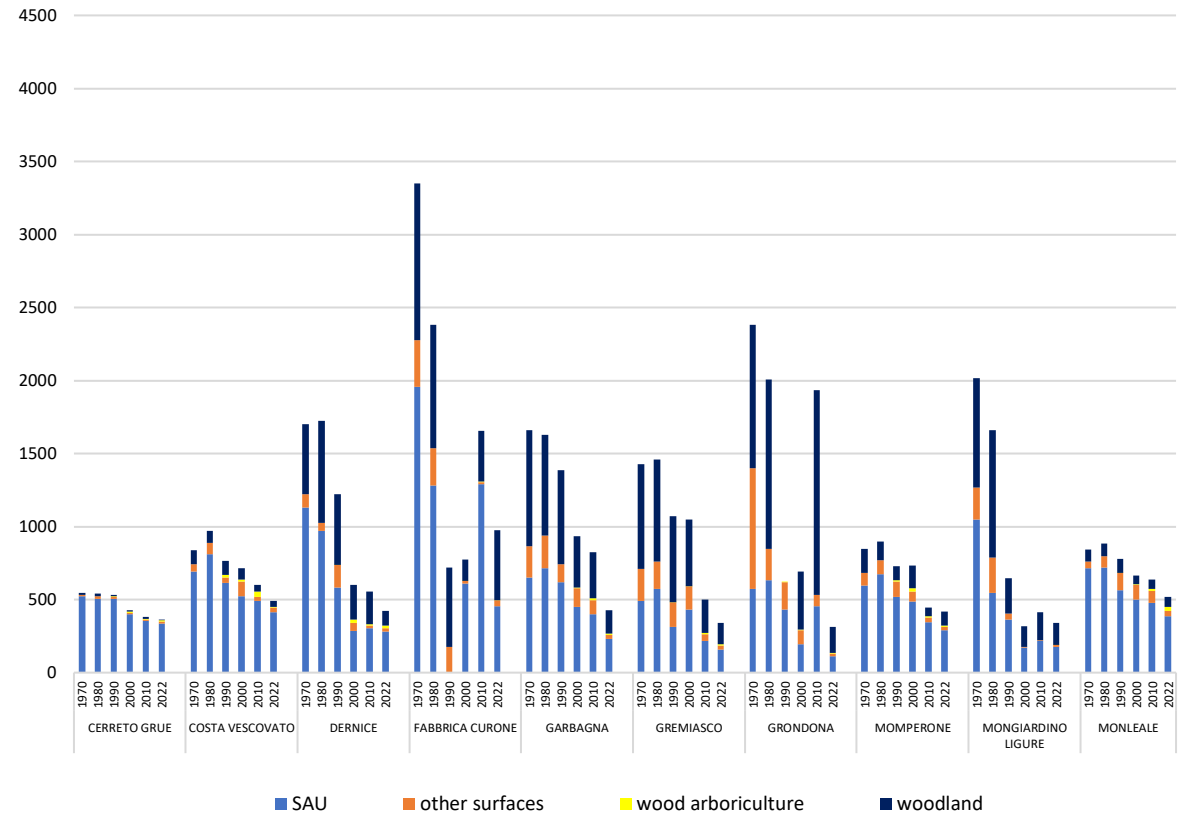


Figure 14b. SAT surface development for study region (part 2) (ISTAT, 2023; Regione Piemonte, 2023)

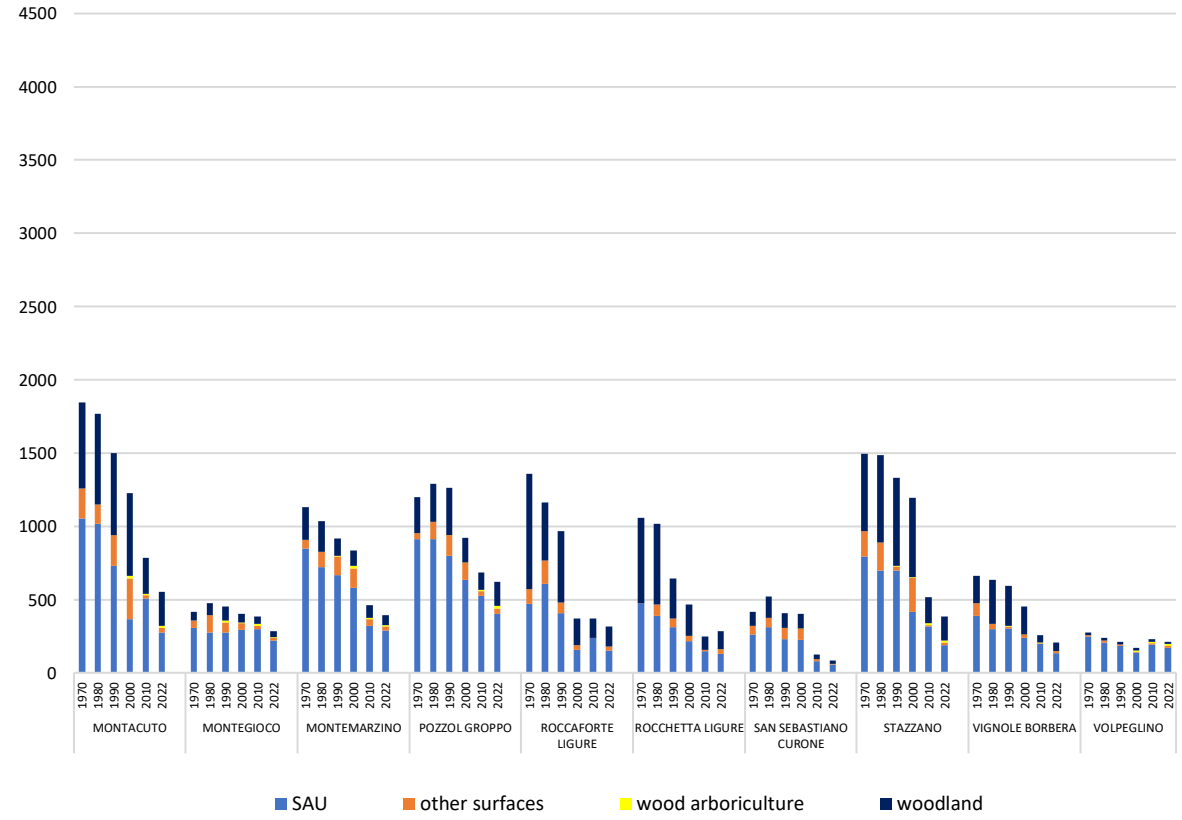


Figure 14c. SAT surface development for study region (part 3) (ISTAT, 2023; Regione Piemonte, 2023)

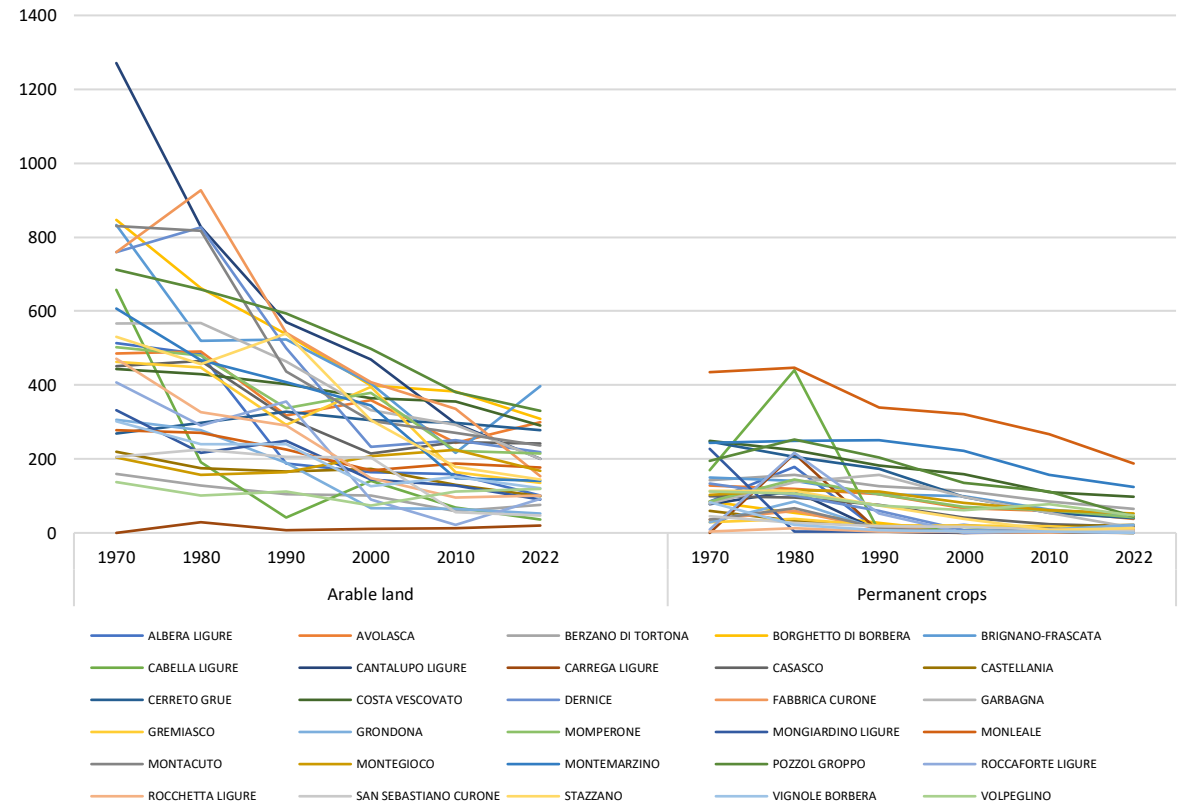


Figure 15a. Arable land and permanent crops development for study region (ISTAT, 2023; Regione Piemonte, 2023)

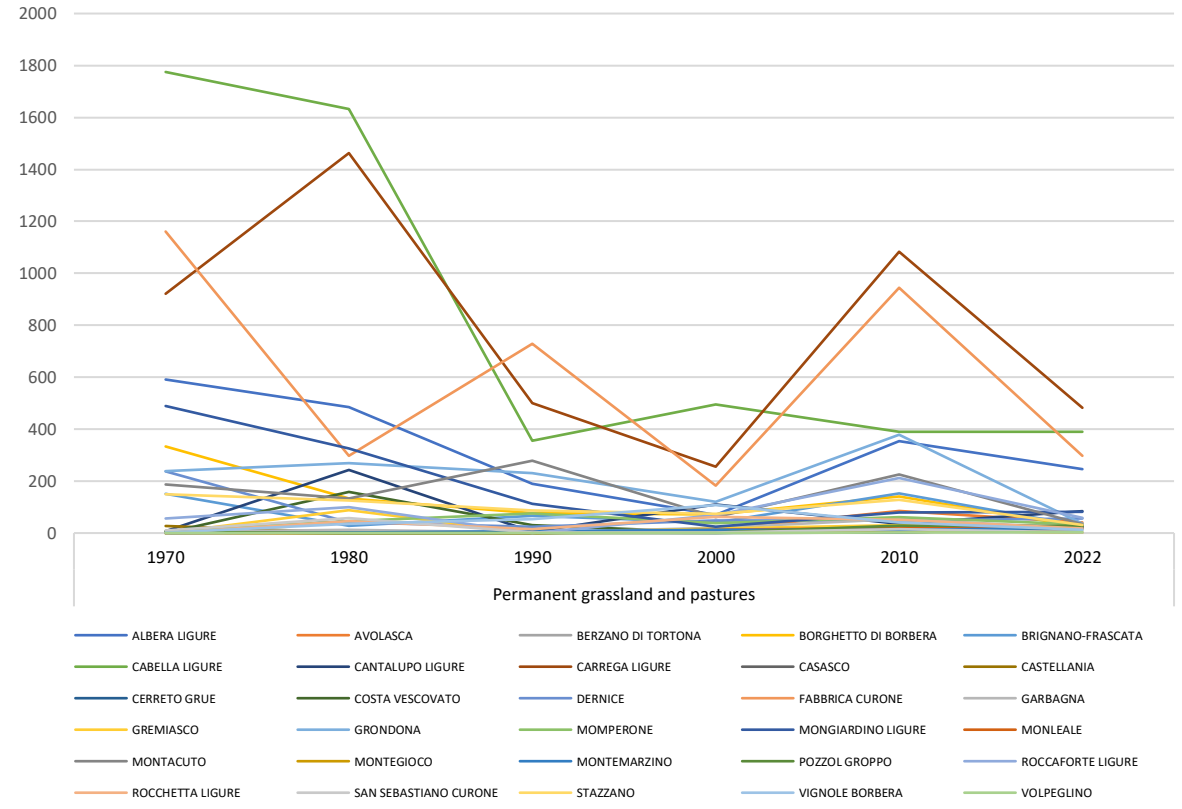


Figure 15b. Permanent grassland and pastures development for study region (ISTAT, 2023; Regione Piemonte, 2023)

The above diagrams (Figures 15a and 15b) show the developments in census data of the *SAU* sub-categories of *arable land* (*seminativi*), *permanent crops* (*coltivazioni permanenti*) and *permanent grassland and pastures* (*prati permanenti e pascoli*). The category of *family gardens* was intentionally omitted due to very small numbers being less significant. *The arable land* surface showed an overall mostly steady decrease over the observed period, except for seven municipalities, with a slight increase from 2010 to 2022 (see Figure 15a). *Permanent crops* showed an overall decrease in surface from 1970 to 2022. However, this decline was not gradual or constant over time, with 7 municipalities even showing a slight increase between 2010 and 2022 (see Figure 15a). In contrast, the diagram of *permanent grassland and pastures* demonstrated very different variations of development trajectories. Over half of the municipalities had an increase since 1970. Others showed a significant (but not constant) decrease between 1970 and 2022 (see Figure 15b).

5.1.2 Trajectories and Current Land Use of the Archetypal Municipalities

The following section discusses the development trajectories and current agricultural landscape of the seven archetypal municipalities by summarising and describing the diagrams found in the profiles of each municipality. The information is best understood when accompanied by the municipality profiles in Annexe 4. The section below was created by combining census data and field survey information.

Cabella Ligure

The census data for Cabella Ligure showed an overall constant decrease over the observed timeline, with less than one-fifth of the *SAT* surface in 1970 (4,053.86 ha) still present in 2022 (608 ha). The *SAU* also significantly decreased, from over 2,600 ha in 1970 to only 425 ha in 2022. While *woodland* was also a significant contributor with approximately 27% of the *SAT* surface since 1980, in 2010 and 2022, *SAU* comprised more than 70% of the *SAT*. Observations during the field survey showed vast areas and plots, especially in the steeper parts, of abandoned agricultural land. This can often be detected through the presence of overgrown and abandoned terraces, clear overgrowth and invasion through secondary and successive vegetation of former terraced land plots and expansion of smaller landscape elements, such as treelines and hedgerows (see Figure 16 and Figure 17 in the back). In the past, these small elements were used to create borders and terraces between fields, mostly to manage the steepness and possible erosion of the field. *Wood arboriculture* was consistently non-existent between 1970 and 2010, with a slight increase of 0.05 hectares in 2022. *Other surfaces* decreased overall over the years, with a notable drop in size between 1990 and 2022 and only 16.57 ha left in 2022. The *woodland* surface showed high numbers in 1970 and 1980. Then, in 1990, a sudden decline

of almost two-thirds happened. After a constant decrease, from 2010 to 2022 a slight increase was again recorded.

The detailed *SAU* diagram shows that *permanent grassland* and *pastures* were overall the biggest contributors to the *SAU*, showing a similar development trajectory with a sudden decrease between 1980 and 1990. In 2022, most of the *SAU* was still *permanent grassland and pastures*, matching the observations during the field survey, where mostly agricultural activities such as pastures for grazing activities and grassland for animal feed production were present (Figure 17 in the front and Figure 18). Higher, steeper slopes that were difficult to access showed some signs of grazing activities in the form of cow manure (Figure 18). The sub-categories of *arable land* and *permanent crops* also decreased overall, with low numbers contributing very little to the *SAU*.

In the category of *agricultural woody crops,* the sub-categories of *vines, olive and citrus* were non-existent to just slightly over 0 ha during the observed timeline. *Fruit orchards* recorded in 1970, 1980, 2000 and 2010 decreased to zero: In 2022 no *agricultural woody crops* were present in the census data or the field survey observations. *Cattle* dominated livestock*,* which decreased by half over the observed timeline, with 222 animals in 2022. *Sheep* numbers were overall very low, while *pig* numbers dropped to zero in 2022, with a small number of *goats* off and on throughout (Figure 19).

Figure 16. Abandoned and overgrown terraces (Cabella Ligure)

Figure 17. Grasslands and abandoned terraces (in the back) (Cabella Ligure)

Figure 18. Abandoned steeper slopes and secondary vegetation in pastureland (Cabella Ligure)

Figure 19. Goats of livestock farmer (Cabella Ligure)

Carrega Ligure

The municipality of Carrega Ligure experienced a significant decrease in *SAT* from 1970 to 2000. From 2000 to 2010 and then again from 2010 to 2022, the area substantially increased in *SAT* by reaching the 3,000 ha mark, with 3,133 ha in 2022. The *SAU* chart line shows more variability, with increases in 1980 and 2010, both immediately followed by notable decreases. While the *SAU* only comprised one-third in 1970 and one-sixth of the *SAT* in 2022, between 1980 and 2010, the *SAU* contributed significantly as the biggest sub-category to the *SAT*. *Wood arboriculture* remained consistently non-existent until 2022, when a minimal increase of 0.05 ha was recorded. *Other surfaces* showed minimal numbers over the entire timeline, reaching a maximum of 39.64 ha in 2022, barely contributing to the *SAT*. The *woodland* surface was significantly higher in 1970, contributing the most to higher *SAT* numbers, yet between 1980 and 2010, a decrease occurred. From 2010 to 2022, significant growth in the surface was visible by reaching 2,591 ha, making it the biggest sub-category contributing substantially to the rise in the *SAT*. In 2022, it is responsible for approximately 82% of the *SAT*. Field survey observations found many indicators of secondary vegetation and woodland invasion spreading on formerly agriculturally used areas (Figure 20), supporting census data showing a significant increase between 2010 and 2022. Some indicators were the vast areas of former agricultural terraces not being maintained and overgrown by successive vegetation mixing with forest plots (Figures 21 and 22). Especially steeper and less easily accessible parts were fully overtaken by vegetation. Some (former) grassland patches were observed to be uncared for, with shrubs taking over. Smaller landscape elements such as treelines and hedgerows had also expanded and mixed in with secondary vegetation and woodland.

The detailed *SAU* diagram shows that *permanent grassland and pastures* were overall the biggest contributors to the *SAU with arable land* and *permanent crops* being small in size and also experiencing a decrease over the observed timeline. In 2022, the *SAU* was still comprised largely of *permanent grassland and pastures*, with a little *arable land*. Most agricultural activities observed during the field survey were grazing and patches of hay production for livestock feed production. Smaller vegetable gardens were seen in proximity to the villages and housing.

Agricultural woody crops were non-existent during the timeline, except in 2010, when a few *fruit orchards* were recorded. There was little to no *agricultural woody crops* during the field visits, with none recorded in 2022 in census data. *Livestock* was primarily comprised of *cattle*, with an overall slight decrease, while *sheep* and *pigs* were almost non-existent. A smaller number of *goats* were recorded over the years (Figure 23).

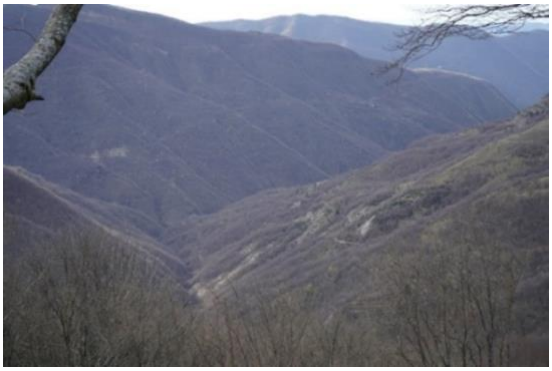


Figure 20. Mixed woodland on abandoned steeper slopes (Carrega Ligure)

Figure 21. Abandoned terraces and stone walls (Carrega Ligure)

Figure 22. Used terraces in the front and secondary vegetation/woodland spreading (Carrega Ligure)

Figure 23. Goats of livestock farmer (Carrega Ligure)

Casasco

The diagram showed a decrease in the *SAT* from 1970 to 2010, from 771.20 ha to 370.24 ha. However, from 2010 to 2022, a slight increase was detected, to approximately 405 ha in 2022. A similar decrease was observed for the *SAU,* declining from 551.59 ha in 1970 to 286.50 ha in 2022. The contribution of *SAU* to *SAT* stayed similar over the considered timeline, always over half the *SAT*. In 2022 it was responsible for 70% of the surface and was the primary sub-category contributing to the *SAT*. *Wood arboriculture* was absent from 1970 to 1990, when a small increase occurred. *Other surfaces* experienced a decrease in size beginning in 1980, with a slight increase in 2022. *Woodland* census data decreased by almost one-third from 1970 to 2010, with an increase of approximately 17 ha in 2022. During field observations, often a mix between abandoned plots with enlarged treelines and secondary vegetation as well as cultivated fields were observed (Figures 24 and 25). Especially steeper and less accessible areas were mostly vegetated by woodland mixed in with successive/secondary vegetation.

Arable land was constantly responsible for 81% to 95% of the *SAU*, therefore showing a similar decrease in size over the years. *Permanent crops* constantly decreased until 2022. *Permanent grassland and pastures* were almost non-existent until 1990, since 2000 a slight increase was

recorded. Both sub-categories were very small in 2022, with a maximum of approximately 28 ha for *permanent crops*. This was consistent with the field survey observation. Many plots with arable land were present (Figure 26 in the front), especially in less steep areas, but also some smaller plots in steeper areas south of the municipality. Some very small vegetable gardens around the villages and some pasture and grassland were observed.

Vineyards were the dominant *agricultural woody crop*, experiencing a significant decrease in size, with 87.79 ha in 1970 dropping to 6.25 ha in 2022. *Olive* and *citrus* cultivations were absent over the period, while *fruit orchards* were small in surface, with a maximum of 21.87 ha in 1980 dropping to 2.61 ha in 2022. Some extensive plots of vineyard cultivation were observed during the field survey (visible in Figure 26 in the back). Some smaller fruit orchards were present on less steep slopes, reflecting the small surface number in census data (Figure 27). The *livestock* categories of *sheep*, *swine* and *goats* were overall low or non-existent. *Cattle* were present with 230 animals in 1970, dropping to none in 2022.

Figure 24. Plots of cultivated and abandoned land (Casasco)

Figure 25. Overgrown treelines and secondary vegetation (Casasco)

Figure 26. Cultivated land (arable land) in the front and vineyards in the back (Casasco)

Figure 27. Fruit orchards (Casasco)

Costa Vescovato

The census data of Costa Vescovato showed an overall decline in the *SAT* over the considered timeline, with only half the size in 2022 with approximately 490 ha as in 1970. Especially in steeper areas, abandoned agricultural land was observed during the field survey. Former agricultural terraces and plots were overgrown with secondary vegetation, often mixed with woodland (visible in Figures 28 and 29). For the *SAU,* a similar trajectory of decline was observed. As the biggest sub-category of the *SAT* during the considered timeline, in 2022, it accounted for almost 85%. *Wood arboriculture* showed slight growth with minimal numbers until 2010, with a significant drop in 2022. *Other surfaces* showed a less stable trajectory, with many significant expansions in size followed by very significant declines. Thus, in 2022, they were similar in size, like *woodlands* with 32.14 ha. *Woodland* showed an overall decrease in size, with 36.99 ha in 2022 being one-third of the size as in 1970.

The dominant sub-category of the *SAU* was *arable land,* significantly contributing over all the years to *SAU* numbers with a slight overall decrease in size. In 2022, *arable land* is 291.29 ha. The second category was *permanent crops,* also with a surface decrease, dropping from 248.38 ha to 97.76 ha. *Permanent grassland and pastures* remained small overall, with a maximum of 158.35 ha in 1980 and close to no surface in 1970 and 2000. In 2022, both sub-categories of *permanent crops* and *permanent grassland and pastures* only contributed slightly to the *SAU*. The field survey showed various land uses, with arable land and different crops strongly present (Figures 29 and 30). Smaller family gardens were often seen close to housing.

Agricultural woody crops were mostly *vines*, with a significant decrease over the observed timeline in 2022 (14.4 ha), one-sixteenth of the size in 1970. *Olive* and *citrus* cultivations were not recorded, and *fruit orchards* remained low, reaching a maximum of 2.25 ha in 1980. In 2022, very small *fruit orchards* of less than 1 ha were recorded. During field survey observation, larger plots of vineyards and small-sized fruit orchards were visible (Figure 31). *Cattle* and *swine* were the two most significant livestock categories, which significantly decreased over the considered timeline. *Sheep* and *goats* were almost non-existent.

Figure 28. Cultivated and abandoned (steeper) plots (Costa Vescovato)

Figure 29. Abandoned steeper slopes with secondary vegetation and cultivated plots (Costa Vescovato)

Figure 30. Cultivated plots (arable land) and abandoned steeper slopes in the back (Costa Vescovato)

Figure 31. Vineyards and abandoned land (in the back) (Costa Vescovato)

Dernice

The municipality of Dernice had a substantial loss in the *SAT* over the considered timeline, starting with approximately 1,700 ha in 1970 and decreasing to just over 422 ha in 2022. The *SAU* also significantly declined, from 1,129.90 ha in 1970 to 282.80 ha in 2022. As the biggest contributor to the *SAT*, it was responsible for more than half the *SAT* since 2000. In 2022 it was responsible for more than 60% of the *SAT* with 282.80 ha. The second major category was *woodland*, which peaked in 1980 with almost 700 ha, only to decline to 102.78 ha in 2022, comprising approximately one-fourth of the *SAT*. *Wood arboriculture* showed an inconsistent slight increase since 1990, with 14.61 ha in 2022. The category of *other surfaces* reached its maximum size in 1990 with 153.13 ha, followed by a notable decrease. In 2022, these smaller categories of *other surface* and *wood arboriculture* did not significantly contribute, with surfaces less than 25 ha. During the field survey, only smaller plots with agricultural activities were observed, with the majority of the surface being covered by woodland and secondary/successive vegetation. The area had many steeper slopes with substantial erosion and a tendency for landslides (Figure 32 in the back), where agricultural land use was impossible. Secondary vegetation was largely spread and often mixed with woodland (Figure 33).

The *SAU* was mostly comprised of *arable land*, with an overall decrease, while consistently responsible for 60% or more of the *SAT*. *Permanent crops*, *permanent grassland and pastures* did not significantly contribute to the *SAU*, showing a decrease overall. The smaller areas that were observed to be used agriculturally during the field visit were mostly used as arable land, grassland and a few small gardens near the settlement. It was however visible that secondary vegetation had started spreading on many plots (Figure 34). Multiple farms with livestock were present.

Census data showed that *agricultural woody crops* were consistently *vines* and *fruit orchards,* with no *olives* and *citrus* present. Nevertheless, surface numbers stayed low overall. *Vines* peaked in 1970, with a significant decrease until 2022, except for another peak in 2010. After a sudden increase in 1980, *fruit orchards* consistently declined, almost reaching 0, similar to *vines*, in 2022. The census data concurred with field observations where vineyards and fruit orchards were seldom observed but present (Figure 35). *Livestock* over the considered timeline was predominantly *cattle*, which significantly decreased from 616 animals in 1970 to 39 in 2022. *Sheep* minimally increased, while *swine* slightly decreased over the years. *Goats* were present with 39 animals in 2022, showing no specific development trajectory.

Figure 32. Small village and steep slopes (in the back) (Dernice)

Figure 33. Abandoned steeper slopes (Dernice)

Figure 34. Spreading of secondary/successive vegetation (Dernice)

Figure 35. Cultivated plots with vineyards and abandoned plots (in the back) (Dernice)

Gremiasco

The census data of Gremiasco showed a clear, significant decrease in the *SAT* over the observed timespan. While in 1970, over 1,400 ha were recorded, in 2022, only one-fourth remained, with 340.99 ha. The *SAU* showed an overall but less steep decline in surface with some variability in between, becoming in 2022 the most significant contributor to the *SAT* with 159.31 ha. With about 30% remaining from 1970, the *SAU* was responsible for more than half the *SAT* in 2022. This outcome was visible in field survey observation, where steeper and harder-to-access plots were abandoned (Figure 36). Abandonment indicators for former agricultural activities, such as neglected terraces and overgrown treelines and hedgerows, were largely present in the landscape. *Wood arboriculture* stayed insignificant, ranging from 0 to 7.9 ha. *Other surfaces* experienced an overall decrease, from 219.81 ha in 1970 to 27.2 ha in 2022. *Woodland* was up until 2010 the category contributing most to the *SAT*, but it experienced an overall decline from 717.30 ha in 1970 to 148.67 ha in 2022. In 2022 it was the second largest *SAT* category, concurring with the observation of former agricultural land being overgrown by successive/secondary vegetation, often mixing with woodland. Treelines and other smaller landscape elements had been abandoned and spread into bigger patches of vegetation (visible in Figures 36, 37 and 38).

The *SAU* was predominantly *arable land*, demonstrating a similar, almost parallel decrease trajectory over the years, with 135.08 ha in 2022. Since 1990, *arable land* was responsible for at least 75% of the *SAU*. *Permanent crops*, *permanent grassland and pastures* were minimal overall in size, not significantly contributing to the *SAU* category. Accordingly, the field observations identified predominantly arable land and grassland (Figures 37 and 38).

For *agricultural woody crops*, only *vines* and *fruit orchards* were present during the timeline. *Vines* started in 1970 at approximately 24 ha, with a sharp drop almost to 0 in 2022. *Fruit orchards* showed slight increases and decreases over the years, with a significant decline since 2010, down to only 3.28 ha in 2022. During field observations, smaller patches of fruit orchards and vineyards were noticed, consistent with census data (Figure 39). *Cattle* were by far the biggest livestock category until 1990, with between 345 and 481 animals. However, a significant decrease was recorded, with only 41 animals in 2022. After a peak in 2000 with 85 animals, the *swine* category declined to 0 in 2022. After no clear trajectories, *goats* and *shee*p are not present in the area in 2022.

Figure 36. Different land use plots, abandoned steeper slopes and spreading of secondary/successive vegetation (Gremiasco)

Figure 37. Cultivated land (some arable land), grassland and abandoned steeper slopes (Gremiasco)

Figure 38. Arable land and abandoned steeper slopes (in the back) (Gremiasco)

Figure 39. Fruit orchards and abandoned steeper slopes (in the back) (Gremiasco)

Pozzol Groppo

The census data for the municipality of Pozzol Groppo showed an overall decrease in the *SAT*, from 1,197.43 ha in 1970 to 620.91 ha in 2022. The *SAU* demonstrated a similar steep and overall decrease, with 2022 showing less than half the size in 1970. Since 2000, the *SAU* was responsible for 65% or more of the *SAT*. *Woodland* was the second biggest sub-category of the *SAT*, with an increase until 1990, followed by a decrease until 2010. In 2022, a slight increase in the surface was visible with 165.61 ha. The field observation concurred that bigger areas of abandoned agricultural land were visible, especially in steeper areas (Figure 40). Secondary/successive vegetation invaded those fields, often mixing in with woodland. Smaller landscape elements, such as treelines and hedgerows, were overgrown and expanded (Figure 41). *Other surfaces* significantly decreased starting in 1990, while w*ood arboriculture* stayed insignificant over the observed period, with a slight increase to 15.49 ha in 2022. The data showed that *other surface* and *wood arboriculture* in 2022 were still quite small, with 37.99 ha and 15.49 ha, respectively.

The overall biggest sub-category of the *SAU* was *arable land*, with a decrease of over half of the surface. In 2022 it was responsible for over 80% of the *SAU* surface with 329.37 ha. *Permanent crops*

had had a constant decrease since 1980 with 44.52 ha in 2022. *Permanent grassland and pastures* were non-existent until 2000, followed by a slight increase with 27.77 ha in 2022. Concordant with the data, the field visit identified bigger plots of arable land (Figure 42). Grassland with some livestock activities such as stables for cows were present.

Agricultural woody crops were mainly *vines*, showing a significant decrease over the timeline of approximately 80% since 1970, with 35.64 ha in 2022. After an initial increase, *fruit orchards* slightly decreased between 1990 and 2022, declining from 76.15 ha to 11.71 ha. Concordant with this census data multiple vineyards and fruit trees were seen during field observations (Figure 43). In 1970, the municipality had a high number of *cattle,* with 556 animals, but a drastic decrease to 84 animals by 2022. *Sheep* overall increased to 35 animals in 2022. *Goats* ranged between 23 and 29 animals since 1990, peaking at 82 in 2010. *Swine* remained low overall and were no longer present in 2022.

Figure 40. Small villages and abandoned steeper slopes (Pozzol Groppo)

Figure 41. Spreading treelines and abandoned land (Pozzol Groppo)

Figure 42. Cultivated plots (some arable land) and spreading of secondary/successive vegetation (Pozzol Groppo)

Figure 43. Vineyards, cultivated and abandoned fields in the back (Pozzol Groppo)

5.1.3 Overview of Agricultural Trajectories

The following section summarises the main agricultural trends observed in the descriptions provided above.

- **An overall decline in the *SAT***

  An overall decline in the *SAT* over the considered timeline was observed. In at least two-thirds of the municipalities, the size of the *SAT* in 2022 was half of 1970. Some municipalities had an even more drastic decrease of over 75%. The archetypal municipality of Casasco showed a slight increase from 2010 to 2022 in surface, which however was mostly caused by an increase in *woodland*.

- **Disappearance of the *SAU***

  The *SAU*, a component of the *SAT*, had a similar, sometimes almost parallel, decrease in surface. Interestingly, Carrega Ligure showed a significant increase in the *SAU* in 2010, followed by an instant drop, with woodland becoming instead the most significant contribution to the *SAT*. Of the archetypal municipalities, only Casasco slightly increased its *SAU* from 2010 to 2022.

- **Invasion of woodland**

  Although *woodland* experienced an overall decline, several of the archetypal municipalities such as Cabella Ligure, Carrega Ligure, Casasco and Pozzol Groppo showed a surface increase starting in 2010. Carrega Ligure stood out, with an increase of approximately 2,260 ha, surpassing the *SAU* as the biggest sub-category of the *SAT*. Thus, *woodland* was responsible for the drastic increase in the *SAT* in 2022 in Carrega Ligure.

- **Permanent grassland and pastures replacing arable land**

  In some municipalities, such as Casasco, Costa Vescovato and Dernice, the surface of *permanent grassland pastures* increased, while *arable land* decreased.

- **Vineyards present only in certain municipalities**

  Although *Vineyards* were at some points present during the considered timeline in all archetypal municipalities, some municipalities with more suitable characteristics have had bigger surfaces such as Casasco, Gremiasco, Costa Vescovato, Dernice and Pozzol Groppo. An overall sharp decline in surface can be observed. Costa Vescovato, Casasco and Dernice slightly increased from 2010 to 2022. Carrega Ligure and Cabella Ligure currently do not have recorded *vine* surfaces.

5.2 Current Farm Types and Farmers

5.2.1 Overview of Age of Farmers and Legal Form of Farms

The following section provides a short overview of the farmers age and legal form of farms present in the seven archetypal municipalities in 2022.

The age of the farmers shown in Figure 44, was predominantly older, with the biggest age category in the female and the male categories being *over 65*.

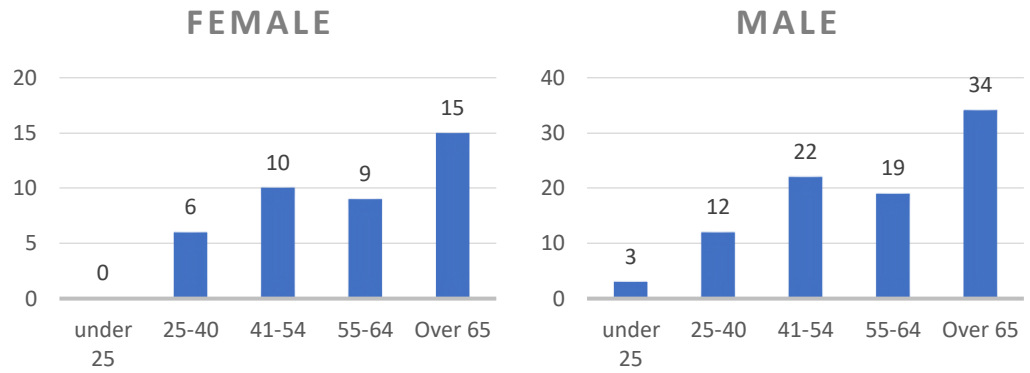


Figure 44. Age of female and male farmers of the seven archetypal municipalities

The legal form of the farms present in 2022 is shown in Figure 45. In total, 123 agricultural businesses were recorded, with the vast majority of 108 farms being *individual enterprises.* Four farms belonged to a *company of people* and eight farms were registered to a *person not engaged in business activity.* Of the last three farms, one was owned by a *joint stock company*, one by a *cooperative society excluding social cooperative* and one by being a *public institution*.

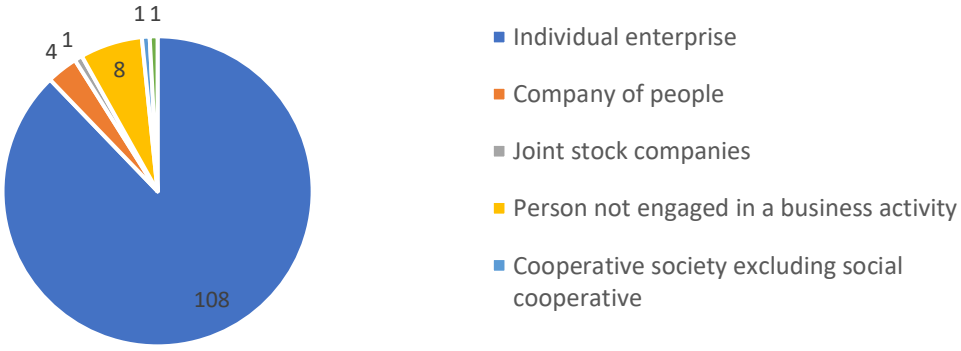


Figure 45. Legal form of farms of the seven archetypal municipalities

5.2.2 Farm Types and Farmers within the Archetypal Municipalities

To give an overview of the farm types and farmers present in the seven archetypal municipalities and answer RQ3, the following section gives a description per municipality. This information is best understood when accompanied by the profiles in Annexe 4 and was created based on census data.

Cabella Ligure

Eight farms were present in the municipality with approximately 702 ha *in total surface* and around 485 ha of *SAU*, and six of them having 252 animals in livestock. Two farms with *SAU* and two farms with livestock produced organically. These farms were mostly *individual enterprises*, with one being a *company of people*, and comprised of four female and four male farmers registered as owners. Three female farmers were between 25 and 40, while one was in the category of 55–64. Of the male farmers, one was under 25, one was 25–40 and two were 41–54. Most livestock were *cattle and buffaloes*, with 222 animals divided among five farms. The other categories were smaller, with 25 *goats*, two *equines* and three *other livestock* animals.

Carrega Ligure

The municipality had eight farms with around 309 ha of *SAU*, and *SAT* of over 2,731 ha, and seven farms owned 128 livestock in total. Two farms with *SAU*, as well as two farms with livestock, had organic production. Seven were *individual enterprises*, while the other was a *public institution*. One female farmer was between 55 and 64 years old, while the two others were 65 or over. The age of the male farm owners was under 25 to 64, with one being under 25, two 25–40, one 41–54 and the last two 55–64. Most livestock were *cattle and buffaloes* with 113 animals, followed by six *equines* and only two *goats*.

Casasco

The municipality had ten farms with a *total surface* of 272.64 ha and *SAU* of around 183 ha. One livestock farm was present with two animals. Two farms with land were organic, as was the livestock farm. The legal form of most farms was an *individual enterprise*, with just one of the farms being classified as a *person not engaged in business activity.* Two registered farms were owned by females, one 41–54 and the other 55–64. One male farmer was under the age of 25, two were between 41 and 54, two were 55–64 and four were 65 and over. The only registered livestock farm was owned by a female 55–64 years old, with two equines.

Costa Vescovato

The municipality had 25 farms with a *SAU* of 397.77 ha. These 25 farms had a *total surface* of 482.32 ha, and there were three farms with livestock that owned 498 animals. Eight farms with land were organic, as were the three livestock farms. One of the farms falls into the *cooperative society excluding social cooperative* category, two were a *person not engaged in a business activity*, and the rest were *individual enterprises*. Seven farms were owned by females, none younger than 41. Two were between 41 and 54 years old, two more were 55–64, and three were 65 or over. No male owner was under 25, with two between 25 and 40 years old. Nine of the male owners were 41 to 54 years old; three were 55-64, while seven were 65 or over. The biggest livestock category was *other livestock,* with 407 animals, followed by 50 *swine* and 33 registered *cattle and buffaloes*.

Dernice

Twenty-four farms with a *SAU* of 212.33 ha and a *total surface* of 345.15 ha, and seven livestock farms with 174 animals were present in the municipality. One of the livestock and two of the farms with SAU produced organically. Seventeen were registered as *individual enterprises*, one was a *company of people*, and the other was a *joint stock company*. Five businesses were on record as *person not engaged in business activity*. Seven farms were owned by females: one was 41–54, two were 55 –64 years old, and four were over 65 years old. Eighteen male farmers were registered: one 25–40, four 45–54, six 55–64 and seven over 65 years old. The municipality had different livestock types: 63 *sheep*, 44 *goats* and 39 *cattle*. The other categories were smaller, with 16 *pigs*, seven *equines* and five *other livestock* animals.

Gremiasco

Twenty-one farms with 226.76 ha *SAU,* 428.29 ha *total surface*, and seven farms with 740 livestock animals were present. Two farms with *SAU* and two farms with livestock were labelled organic. All 21 farms were registered as *individual enterprises*. Nine belonged to female farmers, with three between 25 and 40 years old, three 41–54 and three over the age of 65. Twelve farms were registered to male owners, with one between 25 and 40 years old, two 41–54, three between 55 and 64 years old and six over the age of 65. The biggest livestock categories were *birds* and *other livestock,* with 550 and 375 animals, respectively, followed by 41 *cattle* and *buffaloes* and five registered *equines*.

Pozzol Groppo

The records showed that 27 farms with 297.64 ha *SAU*, 391,90 ha of total surface and eight farms with livestock of 227 animals were registered to the municipality. Two farms with *SAU* and one livestock farm were organic. Besides two farms owned by a *company of people*, the rest were *individual*

enterprises. Eight agricultural enterprises were owned by females between 41 and over 65 years old. Three were between 41 and 54, two were 55–64 and three were over 65 years old. Twenty businesses were registered to male farmers, with five between 25 and 40 years old, two 41–54, three between 55 and 64 years old and ten over the age of 65. The biggest livestock category was *other livestock*, with 101 animals, followed by 84 *cattle and buffaloes*, 47 *equines*, 35 *sheep*, 20 *goats* and 11 *birds*.

5.2.3 Farm Types and Farmers Based on Interviews

To create a more detailed picture and give a more in-depth analysis of the farm types and farmers, the following sections illustrates the data acquired from the interviews conducted with farmers. Some of the collected data during the interviews in this section were grouped using age categories that were copied and taken from the census data of the *censimenti* (see Section 4.2.2).

5.2.3.1 Farm Types

Table 8 shows the interview partners' legal form of farms. Additionally, it shows whether the business was viewed as a family business by the farmer.

Table 8. List of legal forms of farmers

		Individual enterprise	Company of people	Cooperative society		Family business
Female	25–40	3				3
	41–54	1		1		1
	55–64	1				1
	Over 65	1				1
Male	Under 25	1				1
	25–40	1				1
	41–54	3				3
	55–64	3	1			3
Total		14	1	1	**= 16**	14

The farms' legal form for most interview partners was an *individual enterprise* registered to a sole owner. The two exceptions were an agricultural *cooperative society*, where multiple partners/associates owned the enterprise and one agricultural *company of people*, where multiple family members were the owners. The fourteen *individual farms* were reported to be *family businesses*. Often, the business was handed over or passed down to younger generations, such as children and grandchildren, while the older people still helped around the farm. Several times, interview partners reported that one person as sole owner established the farm or enterprise but that family members actively participated in the business.

The following diagrams provide a summary of the information collected on the size of the farms and the agricultural activities of the interview partner-. Figure 46 shows the farm size divided into surface categories. Figure 47 shows the number of employees hired permanently. Figures 48 and 49 demonstrate the agricultural and non-agricultural activities of the farms, respectively.

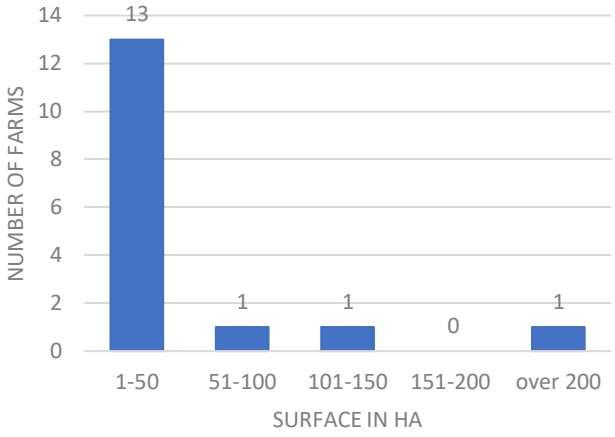


Figure 46. Farm size in hectares

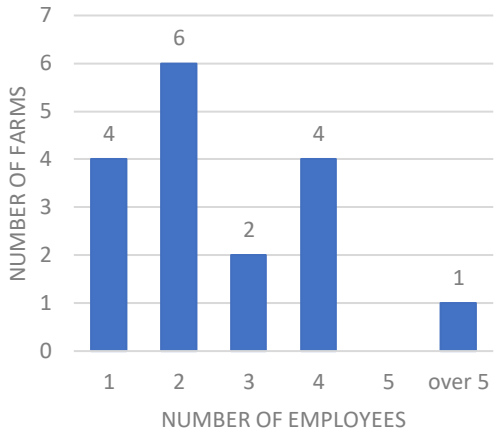


Figure 47. Number of employees

As seen in Figure 46, most farms were smaller, with 13 between 1 to 50 ha in surface. Two interview partners owned approximately 86 ha and 150 ha, respectively, while only one farm had over 200 ha. Four of 16 farms had not hired additional employees, with the owner working alone. Six farmers reported having one more person working on the business, often a family member such as a partner or a sibling (see Figure 47). Six farms had three or four workers on the farm. The only business with over five employees was the agricultural cooperative with 15. Most farmers reported more employees during busier periods, such as holidays and harvest season.

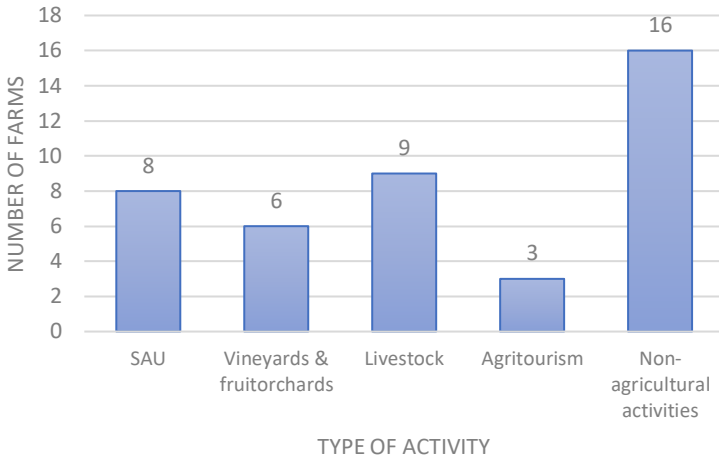


Figure 48. Farm activities

Figure 49. Non-agricultural activities

Figure 48 shows that eight farmers reported *SAU*. Within those eight, while six cultivated *arable land*, two of them highlighted only possessing *grassland* and *pastures*. Six had *vineyards* and *fruit orchards,* with four being wineries. Nine owned *livestock,* ranging from 10 to 50 animals. While most raised *cattle*, two specifically raised *goats*. Some farmers reported slaughtering their *pigs* due to the African Swine Fever, leaving only one farmer still producing pig meat. Three of the interview partners own an *agritourism* as agricultural businesses with hospitality accommodations to tourists and visitors, two of which primarily used agricultural activities and products for agritourism with just a small amount sold. All interview partners also reported *non-agricultural productions* such as wood production, beekeeping and wine-tasting events (see Figure 49). Most had smaller plots of *woodland* to collect wood for personal use or to sell. Four farmers practised beekeeping to produce and sell honey and wax products. Two of the winemakers conducted wine-tasting events.

5.2.3.2 Living and Working History of Farmers

The farmers were also asked about their living and working history to determine how long they had been active in the area, including if they were new and why they moved there. Table 9 shows a summary of the answers per age category. Additional remarks and information were collected in the last column of the table.

Table 9. Overview of interview partners' living and working situations

		Always worked/ lived in area	Moved back	New to the area	Remarks: Family relation/attachment to the area
Female	25–40	1			• Moved villages
				1	• No relation
				1	• Husband is from the area
	41–54			1	• Been here for a long time
		1			
	55–64	1			• Lives in a close-by village
	Over 65			1	• From the city
Male	Under 25		1		• Parents are from the area • Moved back for business
	25–40		1		• Went away for a few years
	41–54	1			
		1			
			1		• Left a short time to study
	55–64		1		• Wife grew up in the vicinity
			1		• Took over parents' abandoned farm
				1	• Moved specifically to this area to start their business
				1	• His wife is from the area
Total		**5**	**5**	**6**	

Five of the 16 farmers had always *lived and worked in the area*. Some moved at some point between villages or lived in a different place than their business, but all of it happened within the area. Two of them were able to take over their parents' or grandparents' farms, keeping the family business going. Five were born or grew up in the area, moved away for specific reasons and then later *moved back*. For example, one male farmer grew up in the area, left to study, and then returned. The reasons mentioned were mainly that the parents chose to leave at some point to raise their kids closer to the city. A certain bond with the area made them want to move back and start a business. Six farmers were *new to the area*, having never lived or worked within or close to the study area. Two were originally from outside of Italy, with one however living in one of the municipalities for over 20 years already. For two of those farmers, the reason for settling in the area was that their partners had grown up or lived there.

5.3 Abandonment, Perceptions and Challenges

5.3.1 Perceptions and Activities Concerning Abandonment

Figures 50 and 51 below provide an overview of the answers given by the farmers regarding the abandonment process in the research area. Firstly, they were asked to rate their perceptions of the general state of abandonment of their living area from 1 to 5 (1 = not abandoned, 5 = very abandoned). Then, they were asked to name activities they conducted to mitigate the abandonment process on their own farm. Finally, they were invited to openly talk about the challenges that abandonment proposes to the landscape, to them and their agricultural activity on a farm level.

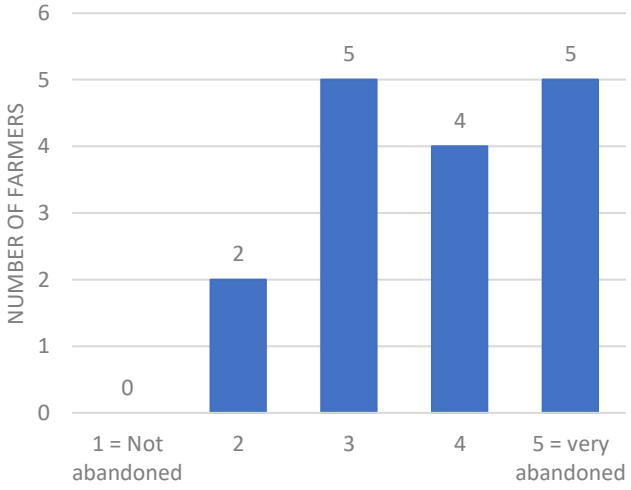


Figure 50. Rating the perception of abandonment

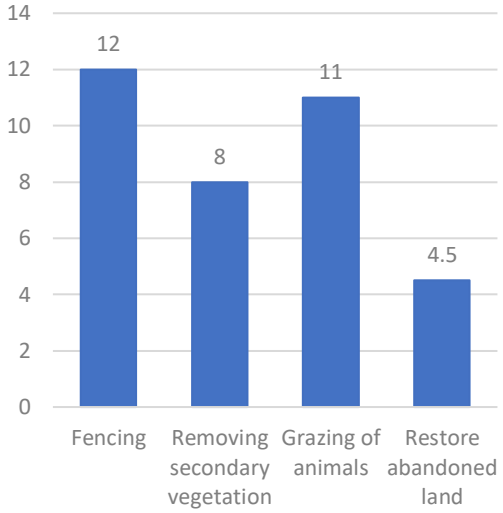


Figure 51. Farm activities to mitigate abandonment

Figure 50 shows that the overall *perception of abandonment* ranged between 2 and 5. Differences were especially observed based on the municipality in which the farmer is located. Especially (but not only) farmers in Carrega Ligure and Cabella Ligure reported a high abandonment rate, discussing the themes of depopulation, migration and abandonment of fields and woodlands. They repeatedly recounted that the number of farmers has significantly decreased, leaving just a few people still cultivating and conducting agricultural activities there.

A farmer from Cabella Ligure recollected how the landscape used to be when he was young:

> *"Quando è stato l'esodo degli anni… parliamo del dopo Guerra. L'area era praticamente tutta, parlando di terrazzamenti, erano tutti coltivati. C'è stato l'esito, l'abbandono, il bosco ha preso sopravento. Oggi a distanza di 40-60 anni parliamo di quasi foresta non più bosco. Piante di*

alto fusto, aceri, faggete quindi ormai non si può più parlare di ramaglia, di arbusti, ormai si parla di piante di alto fusto. Il territorio si è perso praticamente, non abbiamo più terrazzamenti coltivati." (Intervista agricoltore con allevamento, 63)

"When the exodus happened … we are talking post-World War II. The area was practically completely… Talking about terraces, they were all cultivated. Then there was the exodus, the abandonment; the forest took over. Today, 40–60 years later, we are talking about almost forest no longer woodland. Tall trees, maples, beech forests, so now we can no longer talk about brush and shrubs; now we talk about tall trees. The land has been lost practically. We no longer have cultivated terraces." (Interview livestock farmer, 63)

The *farm activities done to prevent or mitigate abandonment* appear in Figure 51 and are similar overall, the most prevalent being *fencing*, keeping fields and surroundings clean, and *removing secondary/invasive vegetation*. The fencing was targeted at wildlife, such as boar and deer, in order to protect the farmers' production and animals. A required repeated activity was reported as *removing unwanted and invasive vegetation* to keep the cultivated fields clean. Farmers with livestock used their animals to clean their fields by *grazing*. Some farmers had abandoned fields or were interested in acquiring abandoned land, with the intent to *recover and restore* it or install new cultivations.

Table 10. Overview of challenges of abandonment

Challenges of abandonment	
• Wildlife • Disease and infestation • Secondary/invasive vegetation • Overgrowth • Hydrological and geomorphological risks • Climatological changes • Fire risk	• Bureaucracy • General infrastructure: Health system, educational system

The overall mentioned *challenges of abandonment* (Table 10) were overgrowth and invasion of (secondary) vegetation, wildlife and associated disease and infestation issues and infrastructural matters (such as roads). Hydrological, geomorphological and climatological events and changes were also indicated as challenging. Due to neglect of waterways, water catchments and other structural elements, the *risk of floods* and landslides, which were already happening, had increased. Overgrowth by *secondary/successive vegetation*, especially in less supervised areas such as *woodlands*, could also

lead to fire hazards, with farmers reporting to have already experienced dangerous *wildfires***.** One of the farmers explains:

> *"Le problematiche sono la non gestione del territorio. Che quindi questo proporre soprattutto in collina una non-gestione delle acque meteoriche e quindi problemi a valle successivi. (…) Poi l'abbandono può portare una sorte di inselvaticamento del terreno, che però non ti porta alla formazione di un bosco. (…) Si forma un incolto che è fonte di rischio d'incendio." (Intervista con viticoltore, 45)*
>
> *"The problems are the non-management of the land. This then results, especially in the hills, in a non-management of rainwater and therefore subsequent problems downstream (...) Then the abandonment can lead to a kind of rewilding of the land, which, however, does not lead to the formation of a forest. (...) A fallow land is formed, which is a source of fire risk." (Interview with wine maker, 45)*

Another farmer mentioned the same challenges saying:

> *"Attorno sono dissesti idrogeologici. Perché praticamente, l'abbandono dei terreni… Una volta quando pioveva e c'era tutto pulito e tutto lavorato, riuscivi a fare andare via l'acqua, e comunque a controllare le frane, invece adesso purtroppo no. E comunque anche la pulizia delle strade o dei rili... Insomma non c'è più questo." (Intervista con agricoltore, 47)*
>
> *"All around, there are hydrogeological disruptions. Because practically, with the abandonment of the land… Before, when it used to rain and everything was clean and everything was cultivated, you were able to make the water go away, and therefore control the landslides, but now unfortunately not anymore. And anyway, also the cleaning of the roads or waterways.... In short, it is no longer done." (Interview with farmer, 47)*

Secondary/successive and invasive vegetation are often shrubs and other thorny bushes that do not serve any purpose but spread easily and are difficult to remove. Such shrubs invaded the farmers' fields and harmed their cultivations and crops. Since the shrubby plants do not offer any food to the wildlife, they lead the animals to the fruitful cultivations. As two winemakers reported:

> *"Allora, dei terreni che sono abbandonati quindi ci crescono degli arbusti spontanei per noi se sono molto vicini alle produzioni, alle vigne creano un danno. Perché all'interno di quei terreni vanno a vivere animali che poi ci mangiano una grande parte dell'uva."* (Intervista con viticoltore, 31).

"So, some fields are abandoned, so there grow wild shrubs. For us, if they are very close to our productions, they create damage to the vineyards. Because inside of those lands, animals go to live that then eat a big part of our grapes." (Interview with winemaker, 31)

"L'abbandono dei terreni, fa sì che quelli coltivati vengono presi più di mira dei animali, perché se sono tutti coltivati i danni si distribuiscono." (Intervista con viticoltore, 45)

"The abandonment of land makes the cultivated parts get targeted more by the animals because if they are all cultivated, the damage is distributed." (Interview with winemaker, 45)

The abandonment processes and their consequences do not only happen on an agricultural level but also affect *public and infrastructural services*. As reported by several farmers, many schools and healthcare facilities have been closed due to a lack of personnel**.** *Insufficient road quality and public transport* were also mentioned to be an issue. A wine maker explained:

"Poi c'è da dire che, la politica sia locale che regionale deve dare due indicazioni: Una a livello produttivo con queste misure e quindi ci sono queste (politiche) che abbiamo detto che sono abbastanza validi. L'altra però è a livello sociale: e quindi dei servizi erogati per le persone che abitano qui. Se non ci sono scuole, e non ci sono strade e non c'è la sanità, nessuno abita qui e quindi nessuno lavora." (Intervista con viticoltore, 45)

"Then it needs to be said that both local and regional politics must give two indications: One at the productive level with those measures, and there are these (policies) that we have said are quite valid. The other, however, is at the social level and therefore the services provided for the people who live here. If there are no schools, and there are no roads, and there is no healthcare, nobody lives here and therefore nobody works." (Interview with winemaker, 45)

According to the interview partners, the abandoned fields often belong to older people who could not cultivate and manage their land due to age and health. Therefore, a challenge related to this ageing of the farming population mentioned by multiple farmers was that many (older) owners of fields and land *did not want to sell or rent*. Therefore, the land lay uncultivated and unused, so consequently over time is in a complete state of abandonment. The interviewed farmers observed the same behaviour with housing and buildings. Many lay vacant, and the buildings even threatened to collapse after some time. When approached by people or farmers who wanted to settle in the area and therefore needed housing, many owners did not want to sell or rent their buildings to new residents they did not know:

"Quelli che hanno i terreni abbandonati (in condizioni pessime) non li vendono. Non so perché." (Intervista con viticoltore, 45)

"Those who have abandoned lands (in bad condition) do not sell them. I don't know why." (Interview with winemaker, 45)

Especially one of the newcomer farmers reports having encountered many difficulties in settling and implementing an agricultural business in the area. Finding housing was the biggest challenge:

"Secondo me la sfida sulla questione dell'abbandono sono due: Uno è le persone che non vogliono lasciare andare i terreni che loro non usano e le case vecchie che sono crollate. Quella è stata la nostra più grande sfida. Cioè è pieno di case e strutture abbandonate, nessuno voleva venderci niente perché non ci conoscevano. Cioè abbiamo preso la casa all'asta." (Intervista con agricoltore, 37)

"In my opinion the challenge on the issue of abandonment are twofold: One is the people who do not want to let go of the land they do not use and the old houses that have collapsed. That has been our biggest challenge. I mean it's full of abandoned houses and structures, nobody wanted to sell us anything because they didn't know us. So we took the house at auction." (Interview with farmer, 37)

5.3.2 Investments and Financial Assistance

The farmers were further asked whether they had made some bigger investments and if they had asked for financial help from a bank or with policy measures. Figure 52 shows the type of investments that the farmers reported. Figure 53 demonstrates whether their financial help was from the bank, policies, or other ways.

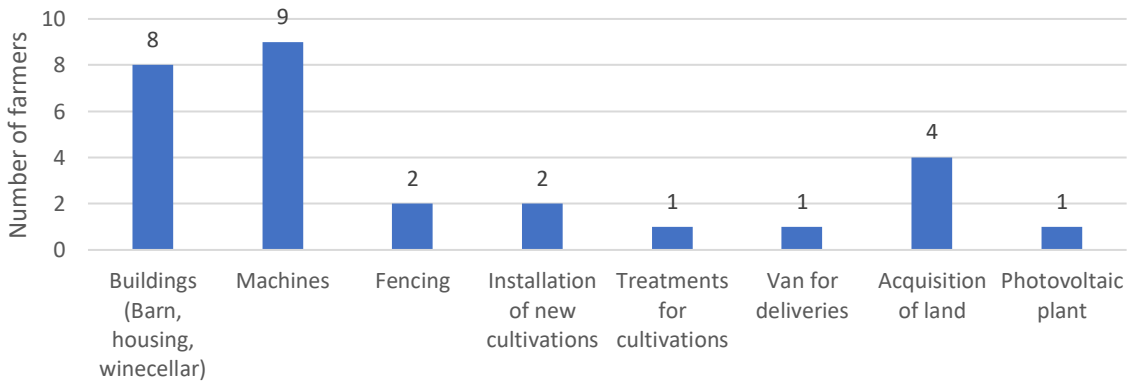


Figure 52. Overview of investment types

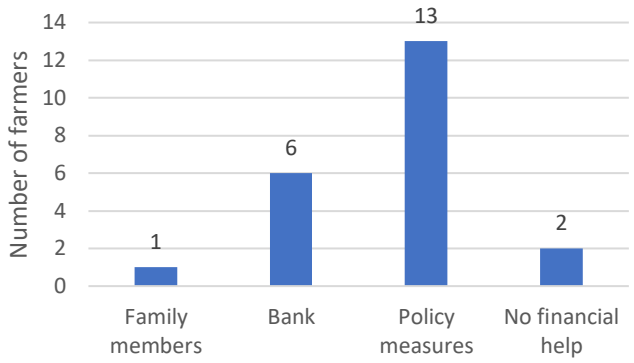


Figure 53. Overview of types of financial help

All the interviewed farmers reported that investments were constantly made to maintain the business. Bigger investments were often made at the time of first starting their business or when trying to expand the enterprise in the form of *land acquisitions, building infrastructure* such as *housing, barns, fencing* and *wine cellars,* and installing *new cultivations* such as vineyards. Other investments were *necessary equipment,* such as tractors and other agricultural machines, and their constant maintenance. Two farmers reported not requesting financial help, paying so far for everything by themselves. The other 14 farmers all requested financial help either by family, banks or policy measures.

One farmer received financial help from family members. Six of the 16 farmers mentioned requesting financial help from banks through leasing or advance payment. This form of financial help is not directly connected to agricultural policies and is an agreement between the individual and the bank. These farmers reported that this form of financial help was quite easy to obtain but is also associated with a much paperwork. A farmer explained that the bureaucracy has been the reason to not ask for financial help anymore:

> *"In questo momento storico, andare in banca è sempre un assassinamento, quindi se si può non si chiedono finanziamenti." (Intervista con viticoltore, 22)*
>
> *"At this moment in history, going to the bank is always suicide, so if you can, you don't ask for financing." (Interview with winemaker, 22)*

Thirteen discussed receiving subsidies, incentives or other financial support through policies. This is further discussed in the next section on policy measures below.

5.4 Policies and Policy Measures Influencing Farmers

5.4.1 Types and Accessibility of Policy Measures

This section discusses the policy measures in the research area that may influence the farmers' decision-making. During the interviews, the farmers were asked about what type of measures, including the financial aspects, they took advantage of, how easy they were to obtain, whether they influenced their activities on the farm and their decisions and if they felt supported by policymakers through these measures. Three out of the 16 interviewed farmers reported not taking any financial support through policy measures such as subsidies and incentives. The reason for this is often to avoid complex bureaucratic efforts or expenses.

Figure 54 shows the three main policy measures, while Table 11 provides a short explanation of those policy measures. Seven farmers reported using the *politica agricola comune* (PAC). However, it is said to be minimal monetary support that is therefore unsubstantial, especially for bigger businesses. Smaller farms reported it helping to a certain extent with material expenses. The *gruppo di azione locale* (GAL) fundings have been used by seven respondents. It was especially used for bigger investments at the beginning of the businesses to build housing and barns. Nine interview partners reported using the rural development programs (PSR/RDP). One farmer reported to using it specifically to buy land and the old farming house, which they renovated. One of the mentioned PSR was the funding given for young farmers. The two interview partners from Carrega Ligure were part of the *Parco Naturale Alta Val Borbera* (Regional Parc of the Upper Borbera Valley). Both described that being situated within the regional parc did so far not have a negative or positive influence on their business.

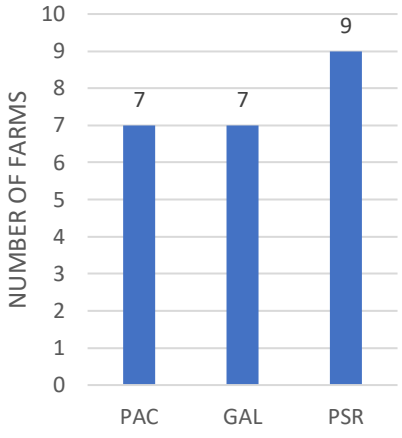


Figure 54. Types of policy measures

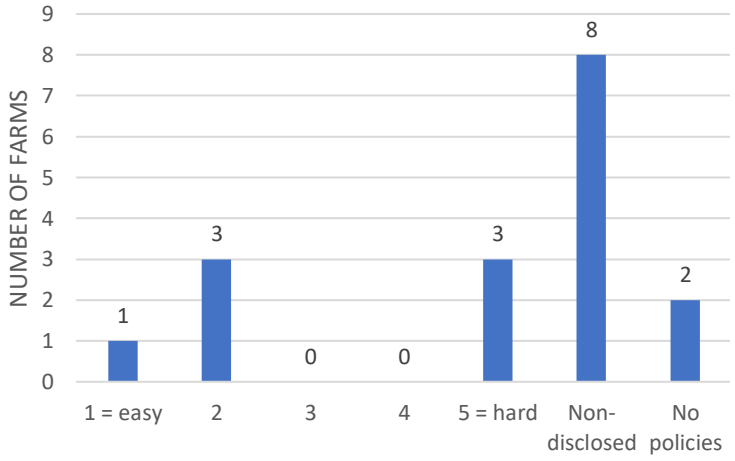


Figure 55. Accessibility of policy measures

Table 11. Explanation of the main three policy measures

Policy	Explanation
PAC *(CAP in English)*	The Common Agricultural Policy (CAP) encompasses a set of rules and guidelines that the European Union set to promote the agricultural sector. It is a common policy for all EU countries, managed and financed with resources from the EU budget. *(Commisione italiana, https://agriculture.ec.europa.eu)*
GAL *(LAG in English)*	Local Action Groups (LAGs) are part of the LEADER Programme and an instrument provided by EU rules to promote social and economic growth of more specifically disadvantaged areas. They work to enhance local potential and promote the establishment of networks. The financial help is given through open calls for funding opportunities. There are 14 GALs in the region of Piedmont. *(https://www.regione.piemonte.it/)*
PSR *(RDP in English)*	Rural development programmes (RDP). The CAP contributes to the EU rural development goals by financially supporting PSR. While the European Commission approves and oversees RDPs, decisions on project selection and the granting of payments are made by managing authorities at the national or regional level. *(https://agriculture.ec.europa.eu/common-agricultural-policy)*

Financial help from banks was reported as easier to obtain than through policy measures. Figure 55 shows that the opinions on the accessibility and availability of policy measures varied, with some farmers finding it relatively easy to obtain while others struggled. Notably, some of the respondents who rated it easy had administrative help through the council association, which took over the administrative workload. Many farmers did not disclose their answers since the accessibility varied strongly between the different types of policy measures. For example, smaller farm owners mentioned that some funding was inaccessible to them because it required paying or investing a certain amount of money upfront, which they were not able to do. As one small farmer explained:

> *"Piu è grande l'azienda e più fondi a disposizione hai, più riesci ad accedere ai finanziamenti. Quindi più è grosso l'investimento, più è facile accedere ai fondi. Piu è piccolo, come nel nostro caso, e più vengono i problemi. Perché ci sono una serie di normative che bisogna seguire." (Intervista con agricoltore, 59)*
>
> *"The bigger the company and the more funds you have, the more successful you are in accessing funding. Hence the bigger the investment, the easier it is to access funds. The smaller it is, as in our case, the more problems come. Because there are a series of regulations that you have to follow." (Interview with farmer, 59)*

Although some farmers reported that certain funding was very important, most responded that it did not significantly influence their decision-making. Since some of the fundings were not always available but do come as so called "*bandi*", which basically are (public) calls for tender, some of the farmers tried to timely match their investments with those financial support opportunities. However, if something is urgently needed, the investment will be done independent of it.

5.4.2 Perceived Support through Policy Measures

Since some farmers renounced applying for certain policies on purpose, they did not feel supported by policymakers in this aspect. The reason mentioned was mostly the bureaucratic burdens of applying for policy measures. All farmers reported bureaucracy as a major factor contributing to not feeling supported. Conducting agricultural activities in disadvantaged and rural areas already has various challenges, which they did not feel supported to overcome. A farmer was of the opinion that not more financial help is necessarily needed but more so making the so far available fundings and generally the conduction of an agricultural business easier:

> *"Se vorrebbero davvero sostenerci, una realtà come la nostra, non ha bisogno di fare tante carte, basta che vengono qui in azienda a vedere cosa facciamo. (…) Se effettivamente ci fosse l'interesse di ripopolare, cercare di aiutare queste zone che stanno piano piano diventando abbandonati, se vorrebbero lo potessero fare con delle scelte più riflessivi. Non è che per forza si deve portare più soldi o più finanziamenti, basterebbe proprio facilitare il nostro lavoro." (Intervista con agricoltore, 55)*
>
> *"If they really want to support us, a reality like ours, they don't need to do a lot of paperwork. They just have to come here to the farm and see what we do. (...) If there really was an interest to repopulate, to try to help these areas that are slowly becoming abandoned, if they would like to, they could do it with more thoughtful choices. It's not that you necessarily have to bring in more money or more funding. It would just be enough to make our work easier." (Interview with a farmer, 55).*

The bureaucratic expenses were explained as an additional challenge that is not facilitated in any way. This is even more highlighted by owners of smaller farms, which don't have the resources and economic means to handle the high amount of complex paperwork. Hiring administrative assistance can be very expensive. The opinion of many farmers was that not enough support was given to people willing to tackle strenuous agricultural activities. As one of the farmers explained:

"Il problema è che non abbiamo avuto un aiuto da parte delle istituzioni, della parte della politica. Questa è il problema che è stato creato, non soltanto nella mia zona, diciamo per tutto l'appennino ligure e piemontese… questa è la realtà. Tante belle parole, tanti bei discorsi, però alla fine concretamente non fanno nulla e non continuano a fare nulla. Questo è il problema fondamentale." (Intervista con agricoltore, 63)

"The problem is that we haven't had help from the institutions, from the political side. This is the problem that has been created not only in my area but, let's say, for the whole of the Ligurian and Piedmontese Apennines… this is the reality. Many nice words, many nice speeches. But in the end, concretely, they do nothing and continue to do nothing. This is the fundamental problem." (Interview with farmer, 63)

An owner of a small farm stressed the need to especially support small-scale farmers and simplify the bureaucratic processes. He also mentioned that hiring workers can be very difficult and is associated with a lot of administrative work:

"Ma una cosa che io trovo che sarebbe molto importante per le aziende agricole piccole, sarebbe proprio di trovare uno strumento, per poter fare sì che le persone vogliono venire a lavorare qua in azienda, non abbiano grosse difficoltà burocratiche (...) In queste zone rurali, così limitate, dovrebbero cercare di trovare delle semplificazioni per le piccole aziende." (Intervista con agricoltore, 59)

"But one thing that I find that would be very important for small farms would be to find a tool, so that people who want to come and work here on the farm do not have great bureaucratic difficulties. In these rural areas, which are so limited, they should try to find simplifications for small businesses" (Interview with farmer, 59)

Also contributing to the feeling of not being particularly supported or helped by institutions and policymakers was one farmer's bad experience with the surface cover categorisation system. Due to heavy invasion of secondary vegetation as a result of abandonment and low capacity to clean his fields, this farmer was taken away his subsidies since the vegetation cover led to his land being categorised as woodland. Some discontent was also expressed regarding the measures taken regarding the African Swine Fever outbreak in the area. Farmers argued that the rules implemented by the government might not be necessarily adequate, often negatively impacting their agricultural activities, and that the issue could have been handled in a different manner. One of the farmers expressed his opinion that different approaches could be taken by saying:

"Un grosso problema di questo periodo qua soprattutto è che con la peste suina, con i problemi che ha avuto la caccia, con meno cacciatori o comunque le regole più restrittive sulla caccia gli animali di solito stanno nei incolti e gli incolti quindi portano animali selvatici. Se io ho confinante un incolto ovviamente poi l'animale sarà spinto a venire a mangiare dove c'è la frutta e verdura. Questo è un aspetto molto negativo. Però li, secondo me prima di tutto si dovrebbe consapevolizzare i proprietari di questi terreni che lasciano incolti. Nel dire "va bene, fatelo lavorare", perché qualcuno si può trovare." (Intervista con viticoltore, 22)

"A big problem of this period especially is that with the swine plague, with the problems that hunting has had, with fewer hunters or the more restrictive rules on hunting, animals usually stay in the fallow lands and the fallow lands then attract wild animals. If I have land bordering a fallow, obviously then the animal will be driven to come to eat where fruits and vegetables are. This is a very negative aspect. But in this case, in my opinion first of all you should make the owners aware of these lands that they leave uncultivated. In saying 'all right, have it (the land) be worked,' because someone can be found to do that." (Interview with winemaker, 22)

One of the situations in which an interviewed farmer felt supported by the government was regarding the vine disease called *Flavescence dorée* back in the 1990s. The financial support given to the affected farmers to combat the disease or even plant new vines was crucial. The business would have experienced a detrimental economic impact without the help. The farmer explains:

"Per la malattia della vite. Se non ci fossero stati gli investimenti (aiuti finanziari del governo) avremmo perso metà delle vigne. In quel momento abbiamo anche … come dire, siamo andati fino in Francia. Eravamo molto attivi per capire da dove veniva questa malattia e cosa potevamo fare per ottenere degli aiuti dello stato." (Intervista con agricoltore, 54)

"Because of the vine disease, if there had been no investment (government financial aid), we would have lost half the vines. At that time, we also ... how to say, we went all the way to France. We were very active to understand where this disease was coming from and what we could do to get some state aid." (Interview with a farmer, 54)

An additional event which a few of the interviewed winemakers reported to have felt encouraged and supported by different actors, including the policymakers, was a commercial relaunch of an old grapevine and wine called Timorasso. The farmers report that the re-branding and the introduced special label for this specific local product (called Timorasso Derthona) lead to a higher valorisation of the wine. Many farmers were able to profit from the generated demand.

6 Discussion

6.1 Development Trajectory of Agricultural Activities in the Study Area

6.1.1 Abandonment and Diversity in Trajectories

The results showed some agricultural land use surface changes that indicated a still-ongoing process of agricultural abandonment. The *utilised agricultural surface (SAU)* for the entire research area and the archetypal municipalities showed an overall predominant, sometimes drastic decrease in size over the considered timeline which is summarised in Section 5.1.3 as one of the main trends seen for the seven archetypal municipalities. Especially *arable land* and *permanent crops* are no longer cultivated, which has been observed as the overall trend for mountainous Areas of the European Mediterranean (Filho et al., 2015; Lasanta et al., 2015) as well as specifically for the study region (Dossche, 2022; Dossche et al., 2016).

As supported by literature, the abandonment of the former agriculturally used surface leads to the spreading of secondary and successive vegetation, which concurring with information from the interviews and also as mentioned in research (e.g. Filho et al., 2017; Lasanta et al., 2015) are often shrubs, thorny bushes and undesired plants, that do not serve any purpose to the farmer. This type of vegetation has also been found to not be biodiverse but more so heightened the risk of fire and soil erosion (Filho et al., 2017). This was also discussed by Fontefrancesco et al. (2022) specifically for the area of the Borbera Valley which is part of this thesis' study region.

The secondary vegetation often mixes in with woodlands. The only archetypal municipalities that showed a slight increase in agricultural surface were Cabella Ligure and Casasco. But this increase was due to a stark increase in *woodland*, indicating that formerly cultivated land was abandoned and consequently invaded by *successive/secondary vegetation*. This is a great example of why conducting a more small-scaled and detailed analysis is so crucial. If not further investigated, on a superficial level the increase in agricultural surface might seem as an increase in agricultural activities practiced in the area. This aligns with some core concepts of Bürgi et al. (2017) and Diogo et al. (2022) highlighting the importance of system knowledge and looking at smaller scales such as the farm-level or regional-level. This also concurs with Antrop (2005) emphasising that looking at the history is crucial to understand the development and current landscapes of today. This knowledge is very important and needed for planning and future management.

6.1.2 Elevation and Marginality

Concordant with many studies on the abandonment of mountainous Mediterranean areas (e.g. Antrop, 2005; Cocca et al., 2012; Dossche, 2022; Pinto-Correia, 1993), this research was able to show that the municipalities with less favourable characteristics such as higher elevations and consequently steeper slopes, remoteness, low accessibility and reduced connection to other areas, tend to have more extensive abandonment.

The results indeed showed significant abandonment indicators especially in more steep and less accessible areas. For instance, the municipalities of Cabella Ligure and Carrega Ligure, as can be visible in the profiles in Annexe 4, are characterised by higher elevation, with Cabella Ligure having an average altitude of 510 masl with the highest peak of 1686 masl and Carrega Ligure reaching an average altitude of 958 masl with the highest points on Mt. Legna and Mt. Carmo at 1650 masl. Both had a very drastic decrease in their *SAT* and an increase in *woodland* over the considered timeline. Field observations and interviews with farmers confirmed these advanced abandonment processes. This also concurs with Fontefrancesco et al. (2016) explaining in their research about the upper Borbera Valley that the "those steep and unforgiving areas were the first to be completely abandoned" (p. 15).

Concerning accessibility, similar abandonment characteristics can be also observed for the municipality of Dernice. The municipality was the third-biggest archetypal municipality with 18.28 km^2, an average altitude of 600 masl and a maximum of 805 masl, showing quite steep slopes in various parts. During a field observation, the road quality in certain places was observed to be very low, making the municipality less accessible. The area also experienced, similar to Cabella Ligure and Carrega Ligure, a very significant decrease in the total agricultural surface.

6.2 Current Agricultural Activities, Farm Types and Farmers

6.2.1 Wildlife and Invasive Vegetation Shaping Farming Activities

As a consequence of the invasion and spreading of secondary vegetation and woodland, farmers of more abandoned areas, such as Carrega Ligure and Cabella Ligure, have struggled with wildlife, especially wild boar and deer, eating their cultivations and destroying their fields. As mentioned in the results in Chapter 5.3, farmers reported that grains, fruits and vegetables attractive to those animals could not be planted anymore. The installation of fences has been not very successful. The issues with wildlife were also thematised by Dossche (2022) and Dossche et al. (2016), who also conducted

interviews with farmers. Similar to this thesis, the interview partners reported to have had many struggles with wild boars and deer, remembering that just a few decades ago there were fewer problems with these animals. This issue therefore strongly shaped their farming activities, shifting to a farming type of almost exclusively animal husbandry with permanent grassland and pastures. Economic profit is gained by livestock trade and meat and dairy products. This shift was clearly visible in the landscape during field observations with the presence of abandoned terraces.

The abandoned fields are not only vulnerable to invasive species of vegetation as mentioned in literature (Munroe et al., 2013), but also bring issues of disease, due to wildlife coming closer to populated areas. As mentioned, a very current additional challenge for farmers has been the African Swine Fever, which is carried by wild boar and can be transmitted to other livestock. Due to the measures taken by the government, livestock farmers had to slaughter their pigs without being able to sell the meat afterwards. This had a significant negative economic impact on some farmers. They reported that so far no policy measures had been implemented or followed through to help them financially. Since being a more current issue, this topic has been thematised very little in previous literature. Notable is also the observation of a decrease in animal numbers of pigs in the census data of 2022 in several municipalities. This dynamic was visible for the municipalities of Cabella Ligure, Pozzol Groppo, Costa Vescovato and Gremiasco (described in Chapter 5.1.2 and 5.2.2). Further data and information would be necessary to establish a definitive relation between the census data and the information provided in the interviews. It does however lead to the assumption that the decline in pig numbers is due to the slaughtering of pigs as a consequence of measures implemented regarding the African Swine Fever. This issue is evidently especially challenging for farmers that have focused on agricultural activities around pig meat production.

6.2.2 Ageing, Newcomers and Small-Scale Family Farms

The age of the farmers present in the archetypal municipalities, as discussed in the results and shown in Figure 44, was predominantly older, with the biggest age category in both the female and the male categories being *over 65*. Indeed, more than half the female and male farmers were over the age of 55. These findings were consistent with the literature discussing the ageing of population of these abandoned areas, consequently also famers being predominantly older in age. Subsequently, aligning with research (see Carrosio, 2013; Dossche, 2022; Dossche et al., 2016; Filho et al., 2017) and supported by the interviewees' opinions, one of the many various promoters of agricultural land abandonment is the retirement and ageing of farmers that consequently are not able to or not interested in cultivating and maintaining their land anymore. However, contrary to the assumption

that new and/or younger people would not move to these remote areas, several researchers including Dossche et al. (2016), Dossche (2022) and Varotto and Lodatti (2014) discussed a new demographic dynamic of so-called “newcomers” who settle in rural mountain villages. Carrosio (2013) concurred, dating this dynamic already back to the 1990s with new habitants of younger age moving from the city or even from other countries to these rural areas.

This observation was supported by the information collected through the interviews of this thesis, as some of the interviewed individuals were younger in age or moved to the area with their family. Consistent with Dossche et al. (2016), some newcomers had taken up rural activities in the area, such as meat and dairy production, sometimes combining it with an agritourism business. During the interviews, it became apparent that they purposefully moved to this specific area, seeking a quieter life with a closer connection to nature and agriculture. However, they reported experiencing some difficulties from the very beginning, with a major issue being unable to find housing, agricultural infrastructure (e.g. barns) and land to buy, which was also discussed by Dossche et al. (2022). It is explained that many older owners would not let go of their land or houses, even though they themselves abandoned them. A young farmer clearly stated:

> *“Quindi questa è stata la più grande sfida. Che non vogliono lasciare andare. Più tosto fanno crollare. Anche se li vuoi pagare, non gli interessa.” (Intervista con agricoltore, 37)*
>
> *“So that was the biggest challenge. That they don't want to let go. They prefer for it to collapse. Even if you want to pay them, they are not interested.” (Interview with farmer, 37)*

In his research on the social networks in rural marginal areas, Carrosio (2013) came to the same conclusion regarding the challenges encountered as a newcomer. He argues that the integration of new people and the implementation of new ideas within the well-ingrained networks of the local habitants are very difficult and sometimes encountered with resistance. This can be problematic, since these newcomers represent an opportunity for not only the repopulation through younger people but also for new development and (innovative) actions. Many new younger habitants have taken it upon themselves to recuperate abandoned agricultural land, vineyards and other agricultural practices, contributing significantly to the areas’ development and dynamics. Therefore, creating opportunities and facilitating living in this area for people willing to move here is even more imperative. The importance of policies is further discussed in Section 6.4.

Very notable is also the fact that all the individual enterprises which were reported by the majority of interviewed farmers have been described as family businesses. Multiple respondents shared that family involvement was due to the challenges and economic difficulties proposed by farming in such

a rural area since a family member's work could be compensated differently and not always necessarily in form of physical money. Some farmers reported that the help of family members was crucial and running a farm alone in such rural and challenging areas would be impossible. Some even argued that finding qualified employees was difficult or could not be afforded. Consequently, most of the farmers do not have the capacities, economic profit or human resources to expand their business. Working in a small agricultural business under such conditions also means that all different tasks must be done by only a small number of employees. This discourse of working in rural mountainous areas being associated with strenuous work has been mentioned in various literature (Dossche et al., 2016; Dossche, 2022), sometimes even as a contributor to emigration processes.

6.3 Challenges of Farmers in Rural Marginal Areas

As clearly demonstrated, the farmers were exposed to challenges from socio-economic changes and the consequences of abandonment in these rural and marginal areas. As often mentioned by the interview partners, these challenges heavily shaped the farmers' activities. As stated before (see Sections 6.1 and 6.2), successive/invasive vegetation, wildlife and diseases are the most significant abandonment challenges. These issues influence, sometimes even decide, which cultivations and crops can be grown, whether livestock can be held and what measures should be taken to protect these activities. Moreover, the overgrowth and invasion of secondary/successive vegetation can lead to increased fire hazards (Filho et al., 2016; Lasanta et al., 2015; MacDonald et al., 2000) which farmers also reported to have experienced in the vicinity.

As also mentioned before, these abandonment processes do not only have consequences on the agricultural level, but also on a more infrastructural basis and public services, which then again influence agricultural actors. These issues were already discussed by Fontefrancesco et al. (2022). The interviews in this thesis stressed that educational and healthcare systems have been affected by marginalisation. Many schools have been closed due to a lack of teachers and pupils. This means that children have to travel long distances to reach their schools. Public transport, such as school buses, is not always available, so parents must accompany their children, which can be time-consuming and impractical for working parents.

Further mentioned was the lack of healthcare services, with many hospitals shutting down or medical offices closing due to a lack of personnel. Some doctors also retired without finding anyone to take over the business. As reported by multiple interviewed farmers, these issues were not specific to agricultural activities but heavily shaped their decision-making and could be crucial in deciding whether to move, stay or leave this area. The quote on page 60 in Chapter 5.3 shows the concern of

farmers explaining that not only the help through policies for the agricultural practices and production is crucial but also the more general living and working conditions. He further stated:

> *“Se noi vogliamo aumentare le persone che vengono a vivere qui e quindi poi lavorare, devono avere la possibilità di vivere (parlando della infrastruttura).” (Intervista con viticoltore, 45)*
>
> *“If we want to increase the number of people who come to live here and then work, they must be given the opportunity to live (speaking of the infrastructure).” (Interview with wine maker, 45)*

This quote leads to the next discussion point regarding infrastructure, in specific road quality and safety, traffic mobility and public transport. As mentioned in the interviews and seen during field observation, the road quality and accessibility of certain places can be low, while public transport is almost non-existent. Some farmers specifically also expressed concerns regarding their safety.

> *“Poi un’altra cosa che ha portato questo abbandono è la viabilità. Non abbiamo la viabilità, che ti consente di… non ci sono le strade che ti permettono di poterti muovere tranquillamente.” (Intervista con agricoltore, 63)*
>
> *"Then another thing that has led to this abandonment is trafficability. We don't have the trafficability, which allows you to... we don't have the roads that allow you to be able to move around safely." (Interview with farmer, 63)*

These infrastructural issues are critical to overcome, especially for a region like the research area that benefits heavily from tourism. In particular, the owner of the agritourism business reported that these issues could impact their activities by not shedding a good light on the area. Safer roads and parking possibilities for campers and vans should be available for visitors and promoted. This concurred with the issues voiced by Fontefrancesco et al. (2022) or Carrosio (2013) who said: “The ability to move around the area, but especially to reach cities and major centres outside the area is crucial. (…) Public mobility, as it has been conceived to date, will not be able to be the answer” (p. 207).

An additional consequence of abandonment that farmers often mentioned was the heightened risk of flooding and landslides after heavy rains due to the degradation of aqueducts and waterlines. According to them, a decrease in public services led to those waterlines not being cleaned anymore, which means that the water often does not run how it should, overflowing in unsuitable areas. It results in farmers either not having enough water supply or flooding occurring. The thus created instability of terraces can provoke landslides, as were observed within the research area.

One example of natural risks heavily impacting these abandoned areas is the landslide in the municipality of Carrega Ligure, which cut off the main street leading to the villages of Connio and Carrega Ligure. This catastrophe led to the decreased accessibility of the area, with the inhabitants almost being shut off from the neighbouring villages, resulting in the majority of them being forced to move away. This contributed to the area now being even more marginalised and remote.

One of the most mentioned issues overall was bureaucracy. All of the interviewed farmers reported struggling with heavy paperwork and bureaucratic expenditures. These rules and regulations are often very complex and time-consuming, so many businesses needed to hire representatives from agricultural organisations to help them with those matters. Consequently, more financial expenses arose, which could not always be carried by smaller farms with limited resources. The farmers perceived this as an additional challenge, making owning and profiting from an agricultural business in such an already disadvantaged area even more difficult. An interviewed winemaker explained how paperwork, administrative costs and regulations left very little actual financial help:

> *"Uno ci rinuncia in pieno. Uno per una questione burocratica. Due però anche per una questione economica. Perché comunque qui siamo in zona montana." (Intervista con viticultore, 45).*
>
> *"One gives up completely. First because of bureaucratic issues. Second, also because of an economic issue. Because we are in the mountainous area here anyway." (Interview with a winemaker, 45)*

Therefore, the results and this discussion strongly highlighted the need for farmers to have more simplified processes to manage a farm, especially regarding policies. According to most interview partners, policymakers are a key driver and element in enabling change and transformation, especially by supporting people and farmers willing to invest in this area, whether out of love for the territory or other reasons. This idea leads to the next section of this discussion on the importance and influence of policies.

6.4 The Influence and Importance of Policies

The results showed that the majority of the interviewed farmers requested financial help in the form of policy measures or from banks, since smaller or even bigger investments occurred regularly, as discussed in Chapter 5.3 and 5.4. Only a few farmers reported intentionally not asking for financial help through public institutions, either financing their investments through their own capital or help from family members. The reasons for not requesting any support through official and public channels were either a lack of capital, the scale of investment, and/or avoiding bureaucracy to not depend on such institutions (regional and state).

Smaller farms reported that financial help through policies is often only given starting from a certain amount of investment, which many of them were not able to make due to their size. Therefore, they did not fulfil the criteria for the subsidies. This though does not mean that carrying the full investment, although being small, for the individual small-scale farmer was feasible. In some instances, a certain amount of the investment to obtain financing had to be paid upfront, which many smaller farmers also could not do.

Another issue with policy measures occurring to an interview partner was the misclassification of land use due to successive vegetation. The farmer who reported this problem is located in a municipality with more advanced abandonment processes. Due to some invasion of shrubs and thorn bushes on still-used agricultural land, the satellite system used by the government did not attribute this surface to his farming activity, therefore taking away his subsidies, specifically the CAP/PAC. According to the farmer, the rectification process had been very long and complex due to bureaucracy and administrative inefficiency. For small-scale farmer though this financial help could be crucial and its lack could have negative consequences. A farmer argued:

> *"Il tentativo delle politiche agricole anche a livello europeo è sicuramente nella direzione di aiutare a sostenere. Perché si conosce il valore di questa cosa (parlando dell'agricoltura). Ma il problema è che poi si perdono in troppi passaggi amministrativi burocratici" (Intervista con agricoltore, 43).*
>
> *"The attempt* of *agricultural policies, even at the European level, is definitely in the direction of helping to support, because the value of this is known (talking about agriculture). But the problem is that then they get lost in too many bureaucratic administrative steps." (Interview with* a *farmer, 43)*

The importance of financial help from the government was also pointed out by a farmer recounting the outbreak of a vine disease in the 80-ies called *Flavescence dorée* that destroyed extensive

vineyards. In this case, she referenced a situation and a great example of how the government's and institutions' (financial) support can enable people to take action and overcome difficulties.

As already mentioned, the recent events regarding the outbreak of African Swine Fever have added to the discontent with the procedures and actions taken by the government. Farmers of the municipalities classified as high-risk areas reported that because of the regulations passed by the government, they experienced a loss in profit by not being able to sell the pig meat. However, the farmers did not receive any financial support for those losses so far. For some farmers who specialised in pig meat production or had a significant income through meat sales, this circumstance could have a major impact on their livelihood. Moreover, the perceived lack of support was problematic because many farmers had shifted their focus to animal husbandry due to the consequences of abandonment, especially wildlife issues. The results and further discussion showed that most farmers did not feel supported enough by the government, institutions and policymakers.

As mentioned, the farmers see the government and policymakers as a key drivers for transformation, which is also supported by plenty of literature discussing the importance of adequate policy measures supporting farmers and the role of policy-makers (e.g. Carrosio, 2013; Cortignani and Dono, 2018; Dossche, 2022; Filho et al., 2016; Gottero and Cassatella, 2017; Lasanta et al., 2015; Lasanta et al., 2017).

The above-discussed issues that farmers had with the policy measures showed first of all a dissatisfaction with implementing these policies but second also the need for more action and support to enable actors such as the farmers, habitants and newcomers to actively shape the landscape towards desirable outcomes. Financial support through policy measures should be more accessible, particularly for smaller farms with insufficient resources and capacities. The process of starting an agricultural business for newcomers and other people should be facilitated and encouraged, which according to some interview partners on the contrary has been very difficult and strenuous. As one farmer responds to the question whether policies are needed to promote the area:

> *"Certo. Qui secondo me la situazione andrebbe che… ci fosse modo per far si che le persone in questi paesi, potessero trovare servizi per rimanere in questi paesi. Purtroppo c'è una politica che lavora tutto al contrario. Quindi a dirittura si stanno chiudendo scuole. Di conseguenza non si può sperare che delle famiglie decidono di vivere in un territorio dove non ci sono scuole, dove non ci sono servizi dove non ci sono autotrasporti. Si diventa un po' borderline, un po' selvaggi. Cioè sono scelte molto difficili per chi deve mettere una famiglia."* (Intervista con agricoltore, 59).

"Sure. Here, in my opinion, the situation would evolve so that… there was a way for people in these areas to find services to stay in these areas. Unfortunately, there is politics that works all backwards. Schools are being closed. As a result, you cannot hope that families decide to live in an area where there are no schools, where there are no services, where there are no transports. You become a little bit borderline, a little bit wild. These are very difficult choices for people who have to start a family." (Interview with a farmer, 59)

Another farmer expressed his view on how to move forward in this area:

"Proprio in queste zone montane abbandonate, dovrebbero proprio esserci una scrematura di tutte queste cose qua (parlando della burocrazia). Dovrebbero esserci delle cose semplice che danno l'opportunità ai giovani per ripopolare queste zoni e di non avere tutto questi cavilli." (Intervista con agricoltore, 59)

"Especially in these abandoned mountainous areas, there should really be a skimming of all these things here (talking about the bureaucracy). They should be simple things that give the opportunity for young people to repopulate these areas and not to have all these loopholes." (Interview with a farmer, 59)

One of the main points emerging from this research is the fact that farmers do not necessarily express a need for more policy measures such as incentives and subsidies, but more so highlight the importance of simply facilitating their activities. Therefore, to create a better understanding of farmers' needs and concerns, participatory and transdisciplinary approaches are needed. Including local actors' knowledge can help in formulating and creating more comprehensive and effective forms of support.

6.5 Post-Abandonment and Future Possibilities

6.5.1 Post-Abandonment Trajectories

Fayet et al. (2022a, 2022b) described in their paper how abandoned land could offer opportunities for new developments and practices to contribute to achieve certain (inter-)national environmental goals (see Chapter 3). They described drivers and characteristics of outcomes by identifying and categorising seven post-abandonment trajectories. Although the results of this thesis showed that the abandonment process is mostly still ongoing, some smaller indicators of possibly new dynamics and trajectories were present, as allocated in certain post-abandonment trajectories of Fayet et al (2022b). The creation of the regional park including parts of the municipality of Cabella Ligure and Carrega Ligure could, according to Fayet et al.'s (2022b) theory, be indicative of an institutional regulation of protection of the area that could lead to the landscape outcomes categorised as *semi-natural landscapes* or *restored landscapes*. Also consistent with Fayet et al.'s (2022b) multi-functional landscapes would be the promotion of recreational activities, such as hiking and biking trails, and the relaunch of traditional local products, which could contribute to increasing interest from the population and tourists. Many farmers also reported being interested in or having acquired abandoned land to recover and restore not only as an economical strategy to generate more profit but also as an active form to fight against the abandonment processes and consequences.

According to Fayet et al. (2022a, 2022b) and Bock et al. (2020), creating supportive policies and opportunities enabling farmers to adapt and build resilience, change and transform is crucial. As stated, "financial and institutional support are key to driving post-abandonment trajectories other than natural succession" (Fayet et al., 2022b, p. 7). This would allow farmers to not only create a sufficient livelihood and well-being, but also to contribute to desirable environmental outcomes.

In 2014, Varotto and Lodatti published a paper on recultivation programmes of abandoned terraced lands in the Italian Alps. Similar to Fayet et al. (2022a, 2022b), their conclusion was that to allow new transforming processes, the collaboration of institutions, policymakers and the local community is needed. Varotto and Lodattis' (2014) research serves here as an example of new initiatives for rural mountainous areas, to reflect on the need for new forms of governance that are crucial to manage these marginal landscapes.

Here it is important to add that there is no clear starting point or ending for such agricultural land use dynamics. The transitional and shifting character of such processes means that no clear point zero can be defined. Thus, more research must be conducted by also including different actors' opinions and

explanations. This represents a limitation of this thesis since it did not involve key actors of different disciplines and did not necessarily analyse the drivers of post-abandonment as Fayet et al. (2022b) did. It is also possible and most likely that tendencies, dynamics and shifts towards post-abandonment landscapes may not be visible yet but will be in the census data of the coming years or decades.

6.5.2 Rediscovering Old Traditions

Some municipalities with more suitable terrain and climatic characteristics have historically been known for vineyards and wine production. The archetypal municipalities in the lower valleys, such as Casasco, Costa Vescovato and Pozzol Groppo, showed very high numbers of vine surfaces in 1970, with Costa Vescovato almost reaching 250 ha. Although the surface has significantly decreased since then, concordant with the identified abandonment processes, these areas still have bigger vineyard cultivations than the other municipalities.

Nevertheless, through an effort between different actors and wine lovers, the world of wine has recently experienced a sort of reviving jolt through the relaunch of a highly regarded vine species: the Timorasso. The Timorasso used to be the region's most cultivated and important vine but was lost during the discussed exodus after World War II. In 1990, it was rediscovered and relaunched by knowledgeable winemakers. Since then, Timorasso wine production has increased with rising popularity and demand. Many farmers who re-introduced this type of vine in their cultivations have been able to profit from this relaunch in different ways (Bergamini, 2019; Dossche, 2022; Vinhood Editors, 2023; Quiligotti, 2015). Talking about how he was able to grow his income through the production of Timorasso wine, a winemaker explained:

> *"C'è un cambiamento di reddito con il cambiamento del ruolo vitivinicole di questa zona: negli ultimi anni il Timorasso sta portando un maggior interesse in queste zone, quindi con una maggiore facilità di vendita." (Intervista con viticoltore, 45)*
>
> *"There is a change in income with the change in the viticultural role of this area: in recent years, Timorasso is bringing more interest to these areas, which comes with greater ease of sales." (Interview with a winemaker, 45)*

The relaunch of this old traditional grapevine and wine is an extraordinary example of how the effort of many different institutions and actors can lead to the outstanding promotion of a rural area rich in traditional practices and qualitative productions. It particularly also shows the local farmer's ability and willingness to invest.

7 Conclusion and Outlook

This thesis aimed to identify agricultural trajectories for the chosen research area, overview the current farm activities, farm types and farmers and analyse the influence of policy measures on these farmers. The chosen timeline for this analysis was 1970 to 2022.

The central questions for this research were as follows:

- What has been the **development trajectory of agricultural activities** in the study area?
- What types of **agricultural activities** are currently practised?
- What types of local **farms and farmers** are currently present?
- How are local **farmers' agricultural activities influenced** by international, national and regional policies?

The results of this thesis indicated that the study area showed clear land use trajectories of agricultural abandonment over the considered timeline. The analysis of census data and information from the field survey and interviews however also revealed newer tendencies and trends indicating a possible transition to a post-abandonment landscape. However, this possible shift and transitions may only be better visible in future census data. This thesis was also able to illustrate that although overall clear tendencies and indicators of abandonment are visible, there is a large diversity in trajectories, developments and trends within the study region. This was shown through the more in-depth analysis of the seven archetypal municipalities and therefore highlights the importance of a more nuanced and small-scale analysis. This diversity in dynamics and trajectories might get lost when only looking at a larger and broader scale. With landscape dynamics being constantly changing systems influenced by socio-economic changes and institutional drivers, more long-term studies and research could provide more insightful information and data.

Furthermore, this research generally identified the challenges that farmers experience in such marginalised and rural areas. As reported by the interview partners, such aspects can be pivotal for deciding whether people stay or leave the area. The consequences of the abandonment process heavily shape the agricultural land use and landscape. The current landscapes are therefore a representation of past land use changes and more recent dynamics, which is why looking at the landscapes' history is so important. The results show that due to the strenuous work and economic challenges associated with farming in such marginalised areas, mostly smaller family farms are present. Many farmers in more abandoned areas have shifted to livestock farming and pastureland. The farmers overall do not feel supported by government and policymakers.

There are two major limitations in this study that should be addressed in future research. First, the study focused on census data provided through different channels (i.e. archived and digitalised) by various providers. The data were often found to be incongruent within and between providers. The reasons for the discrepancy between numbers could often not be fully investigated, especially considering time limitations. Therefore, the census data results should be interpreted with caution. Second, this thesis focused on a case study methodology, providing information and data specific and restricted to the research area, creating an issue with generalisation. However, this research can contribute to vaster research subjects, such as the abandonment of Mediterranean rural mountain areas with insights into the wider issue. However, the generalisation of the findings with a small sample size and interviews with farmers was limited. Additionally, by conducting qualitative analysis, certain biases could occur.

Nevertheless, this thesis was able to contribute to a better understanding of farmers realities, challenges and needs in conducting agricultural activities in these rural areas. Policymakers and policy measurements are crucial to creating conditions and possibilities to generate more desired land use changes. It has though been made clear that these decisions and measures taken and implemented by people higher up do not always necessarily effectively benefit the actors on farm-level. For the future it is therefore important to implement a more transdisciplinary approach by including farmer's needs, opinions and ideas.

8 References

Antrop, M. (2005). Why landscapes of the past are important for the future. *Landscape and Urban Planning*, *70*(1–2), 21–34. https://doi.org/10.1016/j.landurbplan.2003.10.002

Antrop, M., & van Eetvelde, V. (2019). *Landscape perspectives: The holistic nature of Landscape (Landscape Series, Band 23)* (Softcover reprint of the original 1st ed., 2017). Springer.

Bassey, M. (1999). Case study research in educational settings. Open University Press.

Baur, N. & Blasius, J. (2014). *Handbuch Methoden der empirischen Sozialforschung.* Springer Fachmedien Verlag.

Benjamin, K., Bouchard, A., & Domon, G. (2008). Managing abandoned farmland: The need to link biological and sociological aspects. *Environmental Management*, *42*(4), 603–619. https://doi.org/10.1007/s00267-008-9176-5.

Bergamini, V. (2019, August 29). *Il miracolo del Timorasso: Walter Massa e l'antropo-vinizzazione. La vinium*. https://www.lavinium.it/il-miracolo-del-timorasso-walter-massa-e-lantropovinizzazione/.

Blondel, J. (2006). The "design" of Mediterranean landscapes: a millennial story of humans and ecological systems during the historic period. *Human Ecology*, *34*(5), 713–729. https:// doi.org/10.1007/s10745-006-9030-4.

Bock, A. K., Krzysztofowicz, M., Rudkin, J., & Winthagen, V. (2020). *Farmers of the future*. https://doi.org/10.2760/680650

Bürgi, M., Ali, P., Chowdhury, A., Heinimann, A., Hett, C., Kienast, F., Mondal, M. K., Upreti, B. R., & Verburg, P. H. (2017). Integrated landscape approach: Closing the gap between theory and application. *Sustainability*, *9*(8), 1371. https://doi.org/10.3390/su9081371.

Carrosio, G. (2013). Reti sociali e nuovi abitanti nelle aree rurali marginali. *Scienze del Territorio*, *1*, 201–210. https://doi.org/10.13128/scienze_territorio-14275

Cevasco, R., Moreno, D., & Hearn, R. (2015). Biodiversification as an historical process: An appeal for the application of historical ecology to bio-cultural diversity research. *Biodiversity and Conservation*, *24*(13), 3167–3183.

Clifford, N., Cope, M., Gillespie, T. & French, S. (2016). *Key methods in Geography*. SAGE.

Cocca, G., Sturaro, E., Gallo, L., & Ramanzin, M. (2012). Is the abandonment of traditional livestock farming systems the main driver of mountain landscape change in Alpine areas? *Land Use Policy*, *29*(4), 878–886. https://doi.org/10.1016/j.landusepol.2012.01.005

Cortignani, R., & Dono, G. (2018). Agricultural policy and climate change: An integrated assessment of the impacts on an agricultural area of Southern Italy. *Environmental Science & Policy*, *81*, 26–35. https://doi.org/10.1016/j.envsci.2017.12.003.

Council of Europe (2000). European Landscape Convention, Florence 20. 10. 2000. European Treaty Series, No. 176.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed-methods approaches* (3rd ed.). SAGE Publications Inc.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed-methods research*. Sage.

Dax, T., Schroll, K., Machold, I., Derszniak-Noirjean, M., Schuh, B., & Gaupp-Berghausen, M. (2021). Land abandonment in mountain areas of the EU: An inevitable side effect of farming Modernization and neglected threat to sustainable land use. *Land*, *10*(6), 591. https://doi.org/10.3390/land10060591

Diogo, V., Helfenstein, J., Mohr, F., Varghese, V., Debonne, N., Levers, C., Swart, R., Sonderegger, G., Nemecek, T., Schader, C., Walter, A., Ziv, G., Herzog, F., Verburg, P. H., & Bürgi, M. (2022). Developing context-specific frameworks for integrated sustainability assessment of agricultural intensity change: An application for Europe. *Environmental Science & Policy*, *137*, 128–142.

Dossche, R. (2022). Towards a sustainable rural mountain landscape. Exploring the (hi)stories of Val Borbera (Northern Apennines, Italy) [PhD thesis, University of Genoa].

https://www.semanticscholar.org/paper/Towards-a-sustainable-rural-mountain-landscape-%3A-of-Dossche/ee680283e1fc04f92677b4bfdc4833c622046104

Dossche, R. & Primi, A. (2022). Le montagne nel basso Alessandrino: Quadro socio-demographico dell'area rurale. Università di Genova.

Dossche, R., Rogge, E., & Van Eetvelde, V. (2016). Detecting people's and landscape's identity in a changing mountain landscape. An example from the northern Apennines. *Landscape Research*, *41*(8), 934–949. https://doi.org/10.1080/01426397.2016.1187266.

Dossche, R. (2023). Is shrinking really a bad thing? A socio-demographic photograph of inner areas. In L. Rocca, B. Castiglioni B., & L. Lo Presti (Eds.), *Soggetti, gruppi, persone. Pratiche, spazi e dinamiche delle mobilità umane*, XXXIII Congresso Geografico Italiano (pp. 370–379), Geografie in Movimento.

Farina, A. (1991). Recent changes of the mosaic patterns in montane landscape (North Italy) and consequences on vertebrate fauna. *Option Méediterranéennes, 15,* 121–134.

Fayet, C. M., Reilly, K. H., Van Ham, C., & Verburg, P. H. (2022a). The potential of European abandoned agricultural lands to contribute to the Green Deal objectives: Policy perspectives. *Environmental Science & Policy*, *133*, 44–53.

Fayet, C. M. J., Reilly, K. H., Van Ham, C., & Verburg, P.H. (2022b). What is the future of abandoned agricultural lands? A systematic review of alternative trajectories in Europe. *Land Use Policy*, 112.

Filho, W. L., Mandel, M., Al-Amin, A. Q., Feher, A. & Jabbour, C. J. C. (2017). An assessment of the causes and consequences of agricultural land abandonment in Europe. *International Journal of Sustainable Development and World Ecology*, *24*(6), 554–560. https://doi.org/10.1080/13504509.2016.1240113.

Flick, U. (2011). *Triangulation: Eine Einführung (Qualitative Sozialforschung, 12) (German Edition)* (3., aktualisierte Aufl. 2011). VS Verlag für Sozialwissenschaften.

Fontefrancesco, M. F., Zocchi, D. M., Cevasco, R., Dossche, R., Abidullah, S., & Pieroni, A. (2022). Crumbotti and rose petals in a ghost mountain valley: Foraging, landscape, and their transformations in the upper Borbera Valley, NW Italy. *Journal of Ethnobiology and Ethnomedicine*, *18*(1). https://doi.org/10.1186/s13002-022-00535-7

Freeman, O. E., Duguma, L. & Minang, P. A. (2015). Operationalizing the Integrated landscape approach in practice. *Ecology and Society*, *20*(1). https://doi.org/10.5751/es-07175-200124

Galluzzo, N. (2017). The impact of the common agricultural policy on the agritourism growth in Italy. *Bulgarian Journal of Agricultural Science, 23*(5), 698–703.

García-Ruiz, J. M., Lasanta, T., Nadal-Romero, E., Lana-Renault, N. & Álvarez-Farizo, B. (2020). Rewilding and restoring cultural landscapes in Mediterranean mountains: Opportunities and challenges. *Land Use Policy*, *99*, 104850. https://doi.org/10.1016/j.landusepol.2020.104850.

Gottero, E., & Cassatella, C. (2017). Landscape indicators for rural development policies. Application of a core set in the case study of Piedmont Region. *Environmental Impact Assessment Review*, *65*, 75–85. https://doi.org/10.1016/j.eiar.2017.04.002.

Haddaway, N. R., Styles, D. & Pullin, A. S. (2013). Environmental impacts of farmland abandonment in high altitude/mountain regions: A systematic map of the evidence. *Environmental Evidence*, *2*(1). https://doi.org/10.1186/2047-2382-2-18

Hartig, T., Korpela, K., Evans, G. W. & Gärling, T. (1997). A measure of restorative quality in environments. *Scandinavian Housing and Planning Research*, *14*(4), 175–194. https://doi.org/10.1080/02815739708730435

Istituto nazionale di Statistica (ISTAT). (2022). L'istituto: Organizzazione e attività. https://www.istat.it/it/organizzazione-e-attività.

Kuckartz, U. (2014). *Mixed methods: Methodologie, Forschungsdesigns und Analyseverfahren* (2014. Aufl.). Springer VS.

Lasanta, T., Nadal-Romero, E. & Arnáez, J. (2015). Managing abandoned farmland to control the impact of re-vegetation on the environment. The state of the art in Europe. *Environmental Science & Policy*, *52*, 99–109. https://doi.org/10.1016/j.envsci.2015.05.012.

Lasanta, T., Arnáez, J., Pascual, N., Ruiz-Flaño, P., Errea, M., & Lana-Renault, N. (2017). Space-time process and drivers of land abandonment in Europe. *CATENA*, *149*, 810–823. **Fehler! Linkreferenz ungültig.**https://doi.org/10.1016/j.catena.2016.02.024.

MacDonald, D. W., Crabtree, J., Wiesinger, G., Dax, T., Stamou, N., Fleury, P., Lazpita, J. G. & Gibon, A. (2000). Agricultural abandonment in mountain areas of Europe: Environmental consequences and policy response. *Journal of Environmental Management*, *59*(1), 47–69. https://doi.org/10.1006/jema.1999.0335

Malandra, F., Vitali, A., Urbinati, C. & Garbarino, M. (2018). 70 years of land use/land cover changes in the Apennines (Italy): A meta-analysis. *Forests*, *9*(9), 551. https://doi.org/10.3390/f9090551.

Mayring, P. (2000). Qualitative content analysis. *Forum Qualitative Social Research*, *1*(2). https://doi.org/10.17169/fqs-1.2.1089

Mazzoleni, S., Di Pasquale, G., Mulligan, M., Di Martino, P. & Rego, F. (2004). *Recent dynamics of the Mediterranean vegetation and landscape*. John Wiley & Sons.

Navarro, L. M. & Pereira, H. M. (2012). Rewilding abandoned landscapes in Europe. *Ecosystems*, *15*(6), 900–912. https://doi.org/10.1007/s10021-012-9558-7

Pasquale, G. D., Martino, P. D., & Mazzoleni, S. (2004). Forest history in the Mediterranean region. *Recent Dynamics of the Mediterranean Vegetation and Landscape*, 13–20.

Pelorosso, R., Della Chiesa, S., Tappeiner, U., Leone, A., & Rocchini, D. (2011). Stability analysis for defining management strategies in abandoned mountain landscapes of the Mediterranean basin. *Landscape and Urban Planning*, *103*(3–4), 335–346. https://doi.org/10.1016/j.landurbplan.2011.08.007

Pinto-Correia, T. (1993). Land abandonment: Changes in the land use patterns around the Mediterranean basin. *Cahiers Options Méditerranéennes*, *1*(2), 97–112.

Plieninger, T., Draux, H., Fagerholm, N., Bieling, C., Bürgi, M., Kizos, T., Kuemmerle, T., Primdahl, J. & Verburg, P. H. (2016). The driving forces of landscape change in Europe: A systematic review of the evidence. *Land Use Policy*, *57*, 204–214. https://doi.org/10.1016/j.landusepol.2016.04.040

Pointereau, P., Coulon, F., Girard, P., Lambotte, M., Stuczynski, T., Sánchez Ortega, V. & Del Rio, A. (2008). *Analysis of the driving forces behind farmland abandonment and the extent and location of agricultural areas that are actually abandoned or are in risk to be abandoned*. Ispra: Joint Research Centre.

Prévosto, B., Kuiters, L., Bernhardt-Römermann, M., Dölle, M., Schmidt, W., Hoffmann, M., Van Uytvanck, J., Bohner, A., Kreiner, D., Stadler, J., Klotz, S. & Brandl, R. (2011). Impacts of land abandonment on vegetation: Successional pathways in European habitats. *Folia Geobotanica*, *46*(4), 303–325. https://doi.org/10.1007/s12224-010-9096-z

Quiligotti, G. (2015). Il Timorasso e la luna. In Poggio, P.P. (ed.) *Le 3 agricolture: contadina, industriale, ecologica* (pp. 279–288). Editoriale Jaca Book SpA.

Quintas-Soriano, C., Buerkert, A. & Plieninger, T. (2022). Effects of land abandonment on nature contributions to people and good quality of life components in the Mediterranean region: A review. *Land Use Policy*, *116*, 106053. https://doi.org/10.1016/j.landusepol.2022.106053

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J., Sheil, D., Meijaard, E., Venter, M., Boedhihartono, A. K., Day, M. J., Garcia, C., Van Oosten, C. & Buck, L. E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(21), 8349–8356. https://doi.org/10.1073/pnas.1210595110.

Terres, J. M., Scacchiafichi, L. N., Wania, A., Ambar, M., Anguiano, E., Buckwell, A., Coppola, A., Gocht, A., Källström, H. N., Pointereau, P., Strijker, D., Visek, L., Vranken, L. & Zobena, A.

(2015). Farmland abandonment in Europe: Identification of drivers and indicators, and development of a composite indicator of risk. *Land Use Policy*, *49*, 20–34. https://doi.org/10.1016/j.landusepol.2015.06.009

Ustaoglu, E. & Collier, M. (2018). Farmland abandonment in Europe: An overview of drivers, consequences, and assessment of the sustainability implications. *Environmental Reviews*, *26*(4), 396–416. https://doi.org/10.1139/er-2018-0001.

Van Eetvelde, V. (2007). *Van geografische strekenkaart tot landschapsdatabank. Gebruik van GIS, informatietheorie en landschapsmetrieken voor het karakteriseren van landschappen, toegepast op België*. https://biblio.ugent.be/publication/468593/file/1879128.pdf

Varotto, M. & Lodatti, L. (2014). New family farmers for abandoned lands. *Mountain Research and Development*, *34*(4), 315–325. https://doi.org/10.1659/mrd-journal-d-14-00012.1

Vinhood Editors. (2023). *Luca Canevaro: The rebirth of Timorasso, the jewel of Tortona*. https://www.vinhood.com/en/magazine-en/luca-canevaro-cosi-rinasce-il-timorasso-perla-del-tortonese/.

Vink, A. P. A. (1980). *Landschapsecologie en landgebruik*. Scheltema & Holkema.

Yin, R. (2014). *Case study research: Design and methods* (5th ed.). Sage.

9 Annexe

- Annexe 1: Census data tables
- Annexe 2: Field survey form
- Annexe 3: Interview guideline
- Annexe 4: Municipality profiles

Annexe 1: Census Data Tables

SAT components (ha)	1970				
	SAU	altra superficie	arboricoltura da legna	bosco	*SAT*
ALBERA LIGURE	1188.7	80.17	n.d.	683.17	*1952.04*
AVOLASCA	613.48	58.8	n.d.	203.85	*876.13*
BERZANO DI TORTONA	306.51	18.83	n.d.	26.92	*352.26*
BORGHETTO DI BORBERA	1264.77	490.49	n.d.	1784.7	*3539.96*
BRIGNANO-FRASCATA	1132.2	106.98	n.d.	351.72	*1590.90*
CABELLA LIGURE	2601.79	382.51	n.d.	1069.56	*4053.86*
CANTALUPO LIGURE	1357.61	83.86	n.d.	752.08	*2193.55*
CARREGA LIGURE	921.64	0	n.d.	2037.58	*2959.22*
CASASCO	551.59	50.8	n.d.	168.9	*771.29*
CASTELLANIA	305.79	62.95	n.d.	194.87	*563.61*
CERRETO GRUE	521.75	11.2	n.d.	14.4	*547.35*
COSTA VESCOVATO	691.77	48.56	n.d.	98.18	*838.51*
DERNICE	1129.9	89.9	n.d.	479.6	*1699.40*
FABBRICA CURONE	1957.47	319.37	n.d.	1072.73	*3349.57*
GARBAGNA	650.63	214.27	n.d.	796.39	*1661.29*
GREMIASCO	491.36	219.81	n.d.	717.39	*1428.56*
GRONDONA	572.99	828.45	n.d.	978.51	*2379.95*
MOMPERONE	595.65	87.86	n.d.	162.78	*846.29*
MONGIARDINO LIGURE	1047.7	219.99	n.d.	750.04	*2017.73*
MONLEALE	715.16	44.61	n.d.	81.01	*840.78*
MONTACUTO	1052.28	203.58	n.d.	588.44	*1844.30*
MONTEGIOCO	306.72	49.78	n.d.	58.05	*414.55*
MONTEMARZINO	850.46	57.43	n.d.	222.36	*1130.25*
POZZOL GROPPO	911.89	42.93	n.d.	242.61	*1197.43*
ROCCAFORTE LIGURE	472.51	96.48	n.d.	790.48	*1359.47*
ROCCHETTA LIGURE	474.15	1.81	n.d.	582.18	*1058.14*
SAN SEBASTIANO CURONE	262.72	57.89	n.d.	94.3	*414.91*
STAZZANO	792.66	175.88	n.d.	525.54	*1494.08*
VIGNOLE BORBERA	386.79	87.87	n.d.	185.65	*660.31*
VOLPEGLINO	248.96	5.97	n.d.	17.98	*272.91*

SAT components (ha)	1980				
	SAU	altra superficie	arbicoltura da legna	bosco	*SAT*
ALBERA LIGURE	1146.8	284.67	n.d.	572.67	*2004.14*
AVOLASCA	609.61	146.85	n.d.	207.32	*963.78*
BERZANO DI TORTONA	285.43	13.26	n.d.	21.1	*319.79*
BORGHETTO DI BORBERA	849.44	150.5	n.d.	2'187.33	*3187.27*
BRIGNANO-FRASCATA	686.76	234.02	n.d.	380.63	*1301.41*
CABELLA LIGURE	2265.02	152.74	n.d.	1'300.93	*3718.69*
CANTALUPO LIGURE	1183.85	351.96	n.d.	802.71	*2338.52*
CARREGA LIGURE	1705.15	26.62	n.d.	472.56	*2204.33*
CASASCO	560.23	93.01	n.d.	161.53	*814.77*
CASTELLANIA	211.79	38.84	n.d.	171.27	*421.9*
CERRETO GRUE	505.85	17.62	n.d.	17.53	*541*
COSTA VESCOVATO	812.12	77.21	n.d.	82.72	*972.05*
DERNICE	969.97	56.51	n.d.	698.4	*1724.88*
FABBRICA CURONE	1282.54	254.47	n.d.	846.34	*2383.35*
GARBAGNA	716.09	221.8	n.d.	690.25	*1628.14*
GREMIASCO	573.31	185.72	n.d.	701.16	*1460.19*
GRONDONA	632.41	213.48	n.d.	1'161.99	*2007.88*
MOMPERONE	671.73	99.1	n.d.	127.88	*898.71*
MONGIARDINO LIGURE	547.79	237.86	n.d.	873.13	*1658.78*
MONLEALE	718.28	76.96	n.d.	87.53	*882.77*
MONTACUTO	1016.39	134.42	n.d.	619.14	*1769.95*
MONTEGIOCO	272.91	118.12	n.d.	81.81	*472.84*
MONTEMARZINO	718.82	107.75	n.d.	210.08	*1036.65*
POZZOL GROPPO	912.41	119.96	n.d.	256.66	*1289.03*
ROCCAFORTE LIGURE	607.77	156.36	n.d.	398.58	*1162.71*
ROCCHETTA LIGURE	387.11	77.68	n.d.	551.01	*1015.8*
SAN SEBASTIANO CURONE	310.17	63.22	n.d.	147.09	*520.48*
STAZZANO	696.86	192.12	n.d.	594.65	*1483.63*
VIGNOLE BORBERA	296.54	38.77	n.d.	297.93	*633.24*
VOLPEGLINO	207.73	10.14	n.d.	21.32	*238.69*

SAT components (ha)	1990				
	SAU	altra superficie	arboricultura da legna	bosco	*SAT*
ALBERA LIGURE	382.42	109.51	0.5	331.18	*823.61*
AVOLASCA	423.37	157.73	2.83	187.45	*771.38*
BERZANO DI TORTONA	229.87	39.4	3.99	28.59	*301.85*
BORGHETTO DI BORBERA	641.19	342.06	24.89	1296.34	*2304.48*
BRIGNANO-FRASCATA	693.99	188.79	1.39	339.07	*1223.24*
CABELLA LIGURE	400.95	374.37	0	519.5	*1294.82*
CANTALUPO LIGURE	580.43	191.79	0	447.63	*1219.85*
CARREGA LIGURE	511.45	4.75	0	217.8	*734*
CASASCO	386.8	80.27	1.4	114.44	*582.91*
CASTELLANIA	189.68	44.64	2.09	107.42	*343.83*
CERRETO GRUE	502.71	17.06	2.86	7.49	*530.12*
COSTA VESCOVATO	616.24	34.24	0.20	94.62	*745.3*
DERNICE	584.04	153.13	2	481.52	*1220.69*
FABBRICA CURONE	1'280.53	175.9	0	541.54	*1997.97*
GARBAGNA	621.14	122.38	0	643.58	*1387.1*
GREMIASCO	311.55	172.16	0.34	587.47	*1071.52*
GRONDONA	430.62	190.5	1.75	1'041.90	*1664.77*
MOMPERONE	516.85	108.89	5.43	98.38	*729.55*
MONGIARDINO LIGURE	365.41	39.94	0	239.25	*644.6*
MONLEALE	564.63	116.45	2.09	93.73	*776.9*
MONTACUTO	728.97	210.9	0	559.78	*1499.65*
MONTEGIOCO	276.16	68.66	9.79	97.49	*452.1*
MONTEMARZINO	664.7	129.11	3.15	120.69	*917.65*
POZZOL GROPPO	798.39	138.84	2.05	323.53	*1262.81*
ROCCAFORTE LIGURE	406.91	70.61	0	489.31	*966.83*
ROCCHETTA LIGURE	309.35	61.25	0	272.17	*642.77*
SAN SEBASTIANO CURONE	227.07	77.41	2.85	98.81	*406.14*
STAZZANO	699.96	25.93	2.2	602.87	*1330.96*
VIGNOLE BORBERA	301.42	15.85	1	275.96	*594.23*
VOLPEGLINO	184.66	6.29	0	18.08	*209.03*

SAT components (ha)	2000				
	SAU	altra superficie	arboricultura da legna	bosco	*SAT*
ALBERA LIGURE	256.63	23.83	0	150.29	*430.75*
AVOLASCA	436.6	61.71	6.32	80.13	*584.76*
BERZANO DI TORTONA	216.19	45.7	1.36	24.55	*287.80*
BORGHETTO DI BORBERA	472.2	46.15	4.46	283.66	*806.47*
BRIGNANO-FRASCATA	543.11	176.35	0	235.14	*954.60*
CABELLA LIGURE	652.99	23.61	0	346.46	*1023.06*
CANTALUPO LIGURE	579.82	13.74	0	236.79	*830.35*
CARREGA LIGURE	266.45	8.57	0	233.67	*508.69*
CASASCO	263.29	42.17	11.07	64.27	*380.8*
CASTELLANIA	200.24	55.63	7.37	99.71	*362.95*
CERRETO GRUE	401.65	6.74	9.29	9.29	*426.97*
COSTA VESCOVATO	524.49	100.41	11.82	78.37	*715.09*
DERNICE	287.37	52.75	22.9	236.26	*599.28*
FABBRICA CURONE	610.81	16.74	0.14	146.93	*774.62*
GARBAGNA	450.5	127.47	2.49	352.4	*932.86*
GREMIASCO	433.66	157.57	0.06	455.37	*1046.66*
GRONDONA	192.17	97.76	4.76	395.8	*690.49*
MOMPERONE	486.64	68.5	24.09	151.63	*730.86*
MONGIARDINO LIGURE	169.37	7.79	0	141.67	*318.83*
MONLEALE	501.45	97.32	7.19	57.59	*663.55*
MONTACUTO	366.56	277.61	15.62	567.38	*1227.17*
MONTEGIOCO	292.52	45.75	2.51	61.32	*402.1*
MONTEMARZINO	579.01	133.38	17.75	102.65	*832.79*
POZZOL GROPPO	635.47	115.44	2.85	167.18	*920.94*
ROCCAFORTE LIGURE	158.07	31.18	0	183.07	*372.32*
ROCCHETTA LIGURE	214.57	38.21	0	214.46	*467.24*
SAN SEBASTIANO CURONE	224.32	76.41	2.85	97.81	*401.39*
STAZZANO	416.86	230.48	3.34	542.07	*1192.75*
VIGNOLE BORBERA	238.21	20.65	0.82	193.17	*452.85*
VOLPEGLINO	136.75	7.44	8.73	15.26	*168.18*

SAT components (ha)	2010				
	SAU	altra superficie	arboricultura da legna	bosco	*SAT*
ALBERA LIGURE	516.01	14.17	0	136.92	*667.1*
AVOLASCA	387.73	12.79	6.96	82.75	*490.23*
BERZANO DI TORTONA	163.67	10.92	8.65	15.44	*198.68*
BORGHETTO DI BORBERA	526.1	98.58	4.75	828.68	*1458.11*
BRIGNANO-FRASCATA	432.89	44.94	22.39	143.09	*643.31*
CABELLA LIGURE	462.75	12.86	0	122.74	*598.35*
CANTALUPO LIGURE	336.62	11.14	0	138.04	*485.8*
CARREGA LIGURE	1098.27	41.54	0	319.88	*1459.69*
CASASCO	278.44	16.6	15.27	59.93	*370.24*
CASTELLANIA	149.59	8.34	6.05	89.79	*253.77*
CERRETO GRUE	354.32	11.16	0.74	13.58	*379.8*
COSTA VESCOVATO	490.69	27.09	35	47.73	*600.51*
DERNICE	303.33	16.62	9.69	225.37	*555.01*
FABBRICA CURONE	1291.29	13.95	1.5	347.85	*1654.59*
GARBAGNA	400.18	93.17	14.03	315.62	*823*
GREMIASCO	214.94	48.46	7.9	231.09	*502.39*
GRONDONA	454.3	79.46	0	1400.86	*1934.62*
MOMPERONE	345.23	30.57	8.83	60.23	*444.86*
MONGIARDINO LIGURE	216.51	6.04	0	189.9	*412.45*
MONLEALE	476.73	82.07	14.89	61.95	*635.64*
MONTACUTO	505.93	24.49	6.69	245.47	*782.58*
MONTEGIOCO	298.14	21.57	12.43	53.7	*385.84*
MONTEMARZINO	319.28	46.09	10.3	87.7	*463.37*
POZZOL GROPPO	523.48	33.21	8.46	118.24	*683.39*
ROCCAFORTE LIGURE	236.88	2.29	0	132.38	*371.55*
ROCCHETTA LIGURE	149.34	5.98	0	92.17	*247.49*
SAN SEBASTIANO CURONE	80.16	13.08	0	32.24	*125.48*
STAZZANO	314.34	12.16	10.78	180.31	*517.59*
VIGNOLE BORBERA	195.95	6.54	3	53.15	*258.64*
VOLPEGLINO	191.48	10.85	9.66	15.41	*227.4*

SAT components (ha)	2022				
	SAU	altra superficie	arbicoltura da legna	bosco	*SAT*
ALBERA LIGURE	351.82	20.45	1.39	366.76	*740.42*
AVOLASCA	378.94	25.84	4.4	59.34	*468.52*
BERZANO DI TORTONA	152.82	17.82	10	16.85	*197.49*
BORGHETTO DI BORBERA	333.78	35.83	1.03	285.25	*655.89*
BRIGNANO-FRASCATA	469.11	42.49	19.73	106.57	*637.9*
CABELLA LIGURE	425.27	16.57	0.05	166.21	*608.1*
CANTALUPO LIGURE	292.19	48.2	1.45	180.3	*522.14*
CARREGA LIGURE	502.88	39.64	0.05	2’591.01	*3133.58*
CASASCO	286.5	21.08	22.09	76.25	*405.92*
CASTELLANIA	139.87	9.47	2.23	63.29	*214.86*
CERRETO GRUE	337.31	11.33	11.02	5.47	*365.13*
COSTA VESCOVATO	414.05	32.14	5.86	36.99	*489.04*
DERNICE	282.8	22.69	14.61	102.78	*422.88*
FABBRICA CURONE	454.16	40.28	3.18	475.83	*973.45*
GARBAGNA	231.78	26.6	7.77	162.65	*428.8*
GREMIASCO	159.31	27.2	5.81	148.67	*340.99*
GRONDONA	111.87	19.9	1.2	181.72	*314.69*
MOMPERONE	288.46	24.59	8.16	97.13	*418.34*
MONGIARDINO LIGURE	174.79	15.14	0.06	148.2	*338.19*
MONLEALE	385.36	37.76	26.82	66.72	*516.66*
MONTACUTO	276.14	28.16	17.98	230.48	*552.76*
MONTEGIOCO	221.54	17.2	5.17	39.04	*282.95*
MONTEMARZINO	287.22	26.3	9.43	71.85	*394.8*
POZZOL GROPPO	402.42	37.39	15.49	165.61	*620.91*
ROCCAFORTE LIGURE	151.77	29	0	137.03	*317.8*
ROCCHETTA LIGURE	128.04	30.73	0.15	126.39	*285.31*
SAN SEBASTIANO CURONE	54.06	7.2	0.25	23.54	*85.05*
STAZZANO	187.45	20.39	12	165.09	*384.93*
VIGNOLE BORBERA	132.49	13.02	1.66	60.39	*207.56*
VOLPEGLINO	170.35	12.78	13.76	15.63	*212.52*

SAU components (ha)	1970			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	513.45	84.18	591.07	*1188.70*
AVOLASCA	485.35	127.90	0.23	*613.48*
BERZANO DI TORTONA	159.55	142.35	4.61	*306.51*
BORGHETTO DI BORBERA	846.74	84.66	333.37	*1264.77*
BRIGNANO-FRASCATA	832.94	149.24	150.02	*1132.20*
CABELLA LIGURE	657.46	169.34	1774.99	*2601.79*
CANTALUPO LIGURE	1271.01	78.10	8.50	*1357.61*
CARREGA LIGURE	0.00	0.00	921.64	*921.64*
CASASCO	451.20	99.39	1.00	*551.59*
CASTELLANIA	219.51	59.03	27.25	*305.79*
CERRETO GRUE	268.70	247.35	5.70	*521.75*
COSTA VESCOVATO	443.39	248.38	0.00	*691.77*
DERNICE	759.65	132.80	237.45	*1129.90*
FABBRICA CURONE	760.34	36.37	1160.76	*1957.47*
GARBAGNA	566.98	79.91	3.74	*650.63*
GREMIASCO	462.78	28.58	0.00	*491.36*
GRONDONA	306.02	29.72	237.25	*572.99*
MOMPERONE	502.41	85.44	7.80	*595.65*
MONGIARDINO LIGURE	331.97	226.60	489.13	*1047.70*
MONLEALE	277.97	434.83	2.36	*715.16*
MONTACUTO	830.14	36.14	186.00	*1052.28*
MONTEGIOCO	203.87	102.85	0.00	*306.72*
MONTEMARZINO	606.92	243.54	0.00	*850.46*
POZZOL GROPPO	712.11	195.78	4.00	*911.89*
ROCCAFORTE LIGURE	407.13	8.68	56.70	*472.51*
ROCCHETTA LIGURE	471.25	2.90	0.00	*474.15*
SAN SEBASTIANO CURONE	206.40	45.30	11.02	*262.72*
STAZZANO	530.15	113.17	149.34	*792.66*
VIGNOLE BORBERA	301.76	83.35	1.68	*386.79*
VOLPEGLINO	137.48	111.48	0.00	*248.96*

SAU components (ha)	1980			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	483.12	178.25	485.43	*1146.80*
AVOLASCA	490.79	118.82	0.00	*609.61*
BERZANO DI TORTONA	128.10	157.33	0.00	*285.43*
BORGHETTO DI BORBERA	662.56	54.23	132.65	*849.44*
BRIGNANO-FRASCATA	518.86	140.90	27.00	*686.76*
CABELLA LIGURE	192.09	441.09	1631.84	*2265.02*
CANTALUPO LIGURE	827.34	113.53	242.98	*1183.85*
CARREGA LIGURE	28.45	214.00	1462.70	*1705.15*
CASASCO	465.16	95.07	0.00	*560.23*
CASTELLANIA	175.46	33.04	3.29	*211.79*
CERRETO GRUE	298.33	205.60	1.92	*505.85*
COSTA VESCOVATO	429.95	223.82	158.35	*812.12*
DERNICE	826.67	101.74	41.56	*969.97*
FABBRICA CURONE	926.89	58.95	296.70	*1282.54*
GARBAGNA	567.74	137.14	11.21	*716.09*
GREMIASCO	447.22	38.09	88.00	*573.31*
GRONDONA	277.86	85.57	268.98	*632.41*
MOMPERONE	480.22	144.63	46.88	*671.73*
MONGIARDINO LIGURE	217.16	4.46	326.17	*547.79*
MONLEALE	271.37	446.91	0.00	*718.28*
MONTACUTO	816.99	67.30	132.10	*1016.39*
MONTEGIOCO	157.01	115.87	0.03	*272.91*
MONTEMARZINO	468.07	248.32	2.43	*718.82*
POZZOL GROPPO	658.73	253.39	0.29	*912.41*
ROCCAFORTE LIGURE	290.31	217.29	100.17	*607.77*
ROCCHETTA LIGURE	326.94	13.20	46.97	*387.11*
SAN SEBASTIANO CURONE	225.47	27.19	57.51	*310.17*
STAZZANO	456.85	113.67	126.34	*696.86*
VIGNOLE BORBERA	240.54	21.73	34.27	*296.54*
VOLPEGLINO	101.49	105.74	0.00	*207.73*

SAU components (ha)	1990			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	187.14	6.21	189.07	*382.42*
AVOLASCA	318.40	104.92	0.05	*423.37*
BERZANO DI TORTONA	104.28	125.59	0.00	*229.87*
BORGHETTO DI BORBERA	538.18	26.71	76.30	*641.19*
BRIGNANO-FRASCATA	523.26	104.57	66.16	*693.99*
CABELLA LIGURE	42.19	3.38	355.38	*400.95*
CANTALUPO LIGURE	569.29	6.21	4.93	*580.43*
CARREGA LIGURE	8.00	4.10	499.35	*511.45*
CASASCO	311.36	75.44	0.00	*386.80*
CASTELLANIA	166.70	20.31	2.67	*189.68*
CERRETO GRUE	327.81	173.16	1.74	*502.71*
COSTA VESCOVATO	401.77	182.86	31.61	*616.24*
DERNICE	500.21	59.62	24.21	*584.04*
FABBRICA CURONE	540.79	10.49	729.25	*1280.53*
GARBAGNA	462.98	156.18	1.98	*621.14*
GREMIASCO	291.90	19.65	0.00	*311.55*
GRONDONA	189.21	9.77	231.64	*430.62*
MOMPERONE	336.80	104.42	75.63	*516.85*
MONGIARDINO LIGURE	248.56	3.50	113.35	*365.41*
MONLEALE	225.53	339.10	0.00	*564.63*
MONTACUTO	437.43	13.06	278.48	*728.97*
MONTEGIOCO	164.49	111.67	0.00	*276.16*
MONTEMARZINO	406.93	250.97	6.80	*664.70*
POZZOL GROPPO	593.74	204.65	0.00	*798.39*
ROCCAFORTE LIGURE	354.91	52.00	0.00	*406.91*
ROCCHETTA LIGURE	291.40	3.50	14.45	*309.35*
SAN SEBASTIANO CURONE	206.05	17.62	3.40	*227.07*
STAZZANO	539.56	74.35	86.05	*699.96*
VIGNOLE BORBERA	240.02	7.02	54.38	*301.42*
VOLPEGLINO	187.14	6.21	189.07	*382.42*

SAU components (ha)	2000			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	164.70	22.15	69.78	*256.63*
AVOLASCA	358.36	66.00	12.24	*436.60*
BERZANO DI TORTONA	101.13	114.39	0.67	*216.19*
BORGHETTO DI BORBERA	398.84	1.99	71.37	*472.20*
BRIGNANO-FRASCATA	404.53	98.79	39.79	*543.11*
CABELLA LIGURE	141.19	16.24	495.56	*652.99*
CANTALUPO LIGURE	468.76	0.24	110.82	*579.82*
CARREGA LIGURE	10.96	0	255.49	*266.45*
CASASCO	214.57	41.46	7.26	*263.29*
CASTELLANIA	173.80	17.72	8.72	*200.24*
CERRETO GRUE	304.35	96.67	0.63	*401.65*
COSTA VESCOVATO	365.15	157.95	1.39	*524.49*
DERNICE	232.36	7.50	47.51	*287.37*
FABBRICA CURONE	407.99	20.23	182.59	*610.81*
GARBAGNA	332.73	96.72	21.05	*450.50*
GREMIASCO	395.38	20.58	17.70	*433.66*
GRONDONA	67.26	4.63	120.28	*192.17*
MOMPERONE	378.25	69.93	38.46	*486.64*
MONGIARDINO LIGURE	143.80	1.14	24.43	*169.37*
MONLEALE	169.17	320.81	11.47	*501.45*
MONTACUTO	304.00	0.94	61.62	*366.56*
MONTEGIOCO	207.50	81.01	4.01	*292.52*
MONTEMARZINO	345.50	221.11	12.40	*579.01*
POZZOL GROPPO	497.44	135.87	2.16	*635.47*
ROCCAFORTE LIGURE	90.32	0.00	67.75	*158.07*
ROCCHETTA LIGURE	148.66	3.49	62.42	*214.57*
SAN SEBASTIANO CURONE	204.05	16.87	3.40	*224.32*
STAZZANO	304.41	38.29	74.16	*416.86*
VIGNOLE BORBERA	126.41	4.15	107.65	*238.21*
VOLPEGLINO	74.53	62.22	0.00	*136.75*

SAU components (ha)	2010			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	158.11	3.71	353.21	*516.01*
AVOLASCA	243.22	58.82	85.01	*332.02*
BERZANO DI TORTONA	58.81	85.51	19.25	*82.01*
BORGHETTO DI BORBERA	381.89	3.11	139.55	*528.67*
BRIGNANO-FRASCATA	215.76	64.01	152.60	*371.25*
CABELLA LIGURE	68.51	3.85	390.17	*468.56*
CANTALUPO LIGURE	295.72	5.68	34.71	*341.00*
CARREGA LIGURE	12.80	2.37	1082.65	*1098.95*
CASASCO	245.67	22.69	9.81	*256.88*
CASTELLANIA	129.80	17.41	2.28	*140.43*
CERRETO GRUE	296.89	53.83	3.23	*304.12*
COSTA VESCOVATO	355.08	110.83	23.71	*438.68*
DERNICE	251.39	4.03	47.13	*384.81*
FABBRICA CURONE	335.69	8.14	945.50	*1347.16*
GARBAGNA	291.53	53.62	54.25	*369.25*
GREMIASCO	164.22	17.71	30.93	*214.64*
GRONDONA	65.35	9.66	378.53	*498.47*
MOMPERONE	221.71	62.05	60.56	*394.01*
MONGIARDINO LIGURE	127.32	10.06	78.47	*210.48*
MONLEALE	188.44	266.97	19.38	*217.90*
MONTACUTO	271.30	5.76	225.62	*553.79*
MONTEGIOCO	224.68	61.61	10.48	*254.24*
MONTEMARZINO	148.36	157.68	12.16	*223.65*
POZZOL GROPPO	380.06	112.32	28.54	*678.13*
ROCCAFORTE LIGURE	21.79	3.05	211.83	*239.59*
ROCCHETTA LIGURE	95.94	1.13	51.81	*209.82*
SAN SEBASTIANO CURONE	55.32	9.46	14.28	*228.38*
STAZZANO	178.17	8.25	126.86	*418.41*
VIGNOLE BORBERA	151.73	3.63	40.09	*201.78*
VOLPEGLINO	112.72	77.40	1.00	*191.48*

SAU components (ha)	2022			
	Seminativi	Coltivazioni permanenti	Prati permanenti e pascoli	*Totale*
ALBERA LIGURE	101.09	5.18	245.55	*351.82*
AVOLASCA	299.48	37.86	41.61	*378.94*
BERZANO DI TORTONA	76.46	64.55	11.37	*152.82*
BORGHETTO DI BORBERA	307.75	1.48	23.66	*333.78*
BRIGNANO-FRASCATA	396.26	45.91	26.92	*469.11*
CABELLA LIGURE	35.43	0.00	389.84	*425.27*
CANTALUPO LIGURE	200.80	7.96	83.09	*292.19*
CARREGA LIGURE	20.79	0.00	482.09	*502.88*
CASASCO	241.19	17.41	27.48	*286.50*
CASTELLANIA	98.99	21.11	19.61	*139.87*
CERRETO GRUE	278.64	40.08	18.44	*337.31*
COSTA VESCOVATO	291.29	97.76	23.29	*414.05*
DERNICE	217.66	8.82	55.77	*282.80*
FABBRICA CURONE	153.52	3.96	296.51	*454.16*
GARBAGNA	200.22	14.02	17.47	*231.78*
GREMIASCO	135.08	3.44	20.72	*159.31*
GRONDONA	53.02	22.45	36.40	*111.87*
MOMPERONE	213.99	42.21	32.23	*288.46*
MONGIARDINO LIGURE	90.95	1.31	82.53	*174.79*
MONLEALE	177.16	188.16	19.47	*385.36*
MONTACUTO	236.26	4.97	34.36	*276.14*
MONTEGIOCO	167.04	52.55	1.91	*221.54*
MONTEMARZINO	141.14	124.27	20.10	*287.22*
POZZOL GROPPO	329.37	44.52	27.77	*402.42*
ROCCAFORTE LIGURE	92.77	0.27	58.71	*151.77*
ROCCHETTA LIGURE	101.81	8.94	17.29	*128.04*
SAN SEBASTIANO CURONE	46.45	5.07	2.55	*54.06*
STAZZANO	143.80	12.53	30.96	*187.45*
VIGNOLE BORBERA	120.52	0.34	11.63	*132.49*
VOLPEGLINO	119.99	47.10	3.26	*170.35*

Livestock	1970									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	85	85	324	142	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
AVOLASCA	58	58	361	32	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
BERZANO DI TORTONA	20	20	95	8	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
BORGHETTO DI BORBERA	223	223	685	177	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
BRIGNANO-FRASCATA	83	83	426	68	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CABELLA LIGURE	143	143	486	239	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CANTALUPO LIGURE	108	108	690	263	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CARREGA LIGURE	60	60	260	145	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CASASCO	32	32	230	23	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CASTELLANIA	16	16	60	5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CERRETO GRUE	41	41	211	7	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
COSTA VESCOVATO	45	45	193	13	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
DERNICE	91	91	616	209	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
FABBRICA CURONE	255	255	1107	696	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
GARBAGNA	95	95	494	57	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
GREMIASCO	77	77	481	127	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
GRONDONA	75	75	222	45	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MOMPERONE	54	54	404	46	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONGIARDINO LIGURE	104	104	480	225	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONLEALE	45	45	202	21	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONTACUTO	123	123	1013	353	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONTEGIOCO	34	34	228	5	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONTEMARZINO	86	86	562	39	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
POZZOL GROPPO	89	89	566	129	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ROCCAFORTE LIGURE	54	54	270	110	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ROCCHETTA LIGURE	40	40	169	60	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
SAN SEBASTIANO CURONE	32	32	156	55	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
STAZZANO	68	68	356	67	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
VIGNOLE BORBERA	24	24	135	20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
VOLPEGLINO	9	9	50	2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Livestock	1980									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	97	39	248	107	4	189	4	5	n.d.	n.d.
AVOLASCA	65	15	498	113	2	6	14	20	n.d.	n.d.
BERZANO DI TORTONA	13	3	54	4	0	0	2	7	n.d.	n.d.
BORGHETTO DI BORBERA	159	75	464	125	4	19	15	153	n.d.	n.d.
BRIGNANO-FRASCATA	66	30	217	72	2	265	6	14	n.d.	n.d.
CABELLA LIGURE	138	40	189	47	2	7	4	6	n.d.	n.d.
CANTALUPO LIGURE	120	59	475	203	11	275	7	29	n.d.	n.d.
CARREGA LIGURE	44	27	315	120	1	6	5	9	n.d.	n.d.
CASASCO	54	7	103	14	2	16	0	0	n.d.	n.d.
CASTELLANIA	24	1	6	1	0	0	2	4	n.d.	n.d.
CERRETO GRUE	65	4	36	3	0	0	5	8	n.d.	n.d.
COSTA VESCOVATO	77	9	222	3	0	0	15	200	n.d.	n.d.
DERNICE	92	49	360	136	6	28	21	33	n.d.	n.d.
FABBRICA CURONE	225	120	588	380	1	1	5	521	n.d.	n.d.
GARBAGNA	104	45	504	84	9	102	38	81	n.d.	n.d.
GREMIASCO	104	29	290	73	1	5	5	23	n.d.	n.d.
GRONDONA	120	29	345	79	11	194	8	24	n.d.	n.d.
MOMPERONE	64	20	410	99	0	0	7	17	n.d.	n.d.
MONGIARDINO LIGURE	70	54	249	140	1	3	1	5	n.d.	n.d.
MONLEALE	94	11	101	17	0	0	17	34	n.d.	n.d.
MONTACUTO	110	61	526	259	3	4	8	16	n.d.	n.d.
MONTEGIOCO	52	6	48	12	2	2	17	39	n.d.	n.d.
MONTEMARZINO	106	24	206	33	0	0	22	53	n.d.	n.d.
POZZOL GROPPO	118	51	553	111	1	6	29	37	n.d.	n.d.
ROCCAFORTE LIGURE	50	21	239	114	0	0	5	11	n.d.	n.d.
ROCCHETTA LIGURE	58	12	65	23	1	6	4	7	n.d.	n.d.
SAN SEBASTIANO CURONE	18	14	101	31	0	0	1	2	n.d.	n.d.
STAZZANO	144	27	187	36	6	39	11	30	n.d.	n.d.
VIGNOLE BORBERA	64	11	75	20	4	17	2	7	n.d.	n.d.
VOLPEGLINO	17	4	25	8	0	0	2	3	n.d.	n.d.

Livestock	1990									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	52	22	192	72	4	54	4	6	0	0
AVOLASCA	67	6	113	6	0	0	7	12	0	0
BERZANO DI TORTONA	3	0	0	0	0	0	0	0	0	0
BORGHETTO DI BORBERA	207	31	408	116	11	51	11	170	9	23
BRIGNANO-FRASCATA	31	11	76	36	0	0	0	0	0	0
CABELLA LIGURE	52	15	154	64	0	0	3	11	4	26
CANTALUPO LIGURE	76	18	179	59	3	19	3	16	10	472
CARREGA LIGURE	19	17	160	72	0	0	2	2	2	26
CASASCO	17	6	129	0	0	0	0	0	0	0
CASTELLANIA	11	2	18	0	0	0	0	0	0	0
CERRETO GRUE	44	4	120	36	0	0	6	17	4	15
COSTA VESCOVATO	61	3	65	0	0	0	4	150	2	4
DERNICE	73	19	146	70	3	23	8	10	8	34
FABBRICA CURONE	128	57	314	216	0	0	14	121	0	0
GARBAGNA	91	28	394	36	5	73	19	41	7	13
GREMIASCO	61	15	345	58	0	0	2	19	0	0
GRONDONA	77	14	204	71	4	98	0	0	2	325
MOMPERONE	49	10	373	142	0	0	3	109	2	10
MONGIARDINO LIGURE	36	27	162	79	0	0	2	13	0	0
MONLEALE	73		25	11	0	0	11	18	3	8
MONTACUTO	83	29	243	84	0	0	0	0	3	26
MONTEGIOCO	46	3	42	1	0	0	4	14	2	5
MONTEMARZINO	70	8	54	14	0	0	10	26	4	46
POZZOL GROPPO	105	28	363	82	0	0	12	23	2	30
ROCCAFORTE LIGURE	45	10	122	55	2	13	5	21	2	7
ROCCHETTA LIGURE	31	4	53	24	0	0	0	0	0	0
SAN SEBASTIANO CURONE	5	5	21	8	0	0	0	0	0	0
STAZZANO	132	17	86	18	8	76	6	29	11	52
VIGNOLE BORBERA	48	6	74	12	3	31		0	2	3
VOLPEGLINO	0	0	0	0	0	0	0	0	0	0

Livestock	2000									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	25	11	105	35	3	27	0	0	0	0
AVOLASCA	28	4	9	0	0	0	5	10	1	3
BERZANO DI TORTONA	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
BORGHETTO DI BORBERA	38	15	373	115	2	11	3	307	1	21
BRIGNANO-FRASCATA	2	1	8	4	1	200	0	0	0	0
CABELLA LIGURE	27	10	272	133	1	15	0	0	2	8
CANTALUPO LIGURE	59	4	77	11	0	0	0	0	1	500
CARREGA LIGURE	17	13	86	50	0	0	1	2	3	35
CASASCO	11	4	86	9	0	0	1	1	1	4
CASTELLANIA	2	2	3	0	0	0	1	25	1	14
CERRETO GRUE	5	3	74	0	0	0	0	0	1	2
COSTA VESCOVATO	3	3	54	0	n.d.	n.d.	2	75	n.d.	n.d.
DERNICE	20	8	55	6	2	27	4	7	0	0
FABBRICA CURONE	23	11	215	62	1	15	5	37	1	2
GARBAGNA	50	11	230	50	1	36	8	16	2	17
GREMIASCO	47	6	37	14	3	18	2	85	1	1
GRONDONA	45	5	23	4	4	172	1	3	4	310
MOMPERONE	20	5	367	52	0	0	0	0	0	0
MONGIARDINO LIGURE	13	11	65	29	2	14	0	0	1	2
MONLEALE	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MONTACUTO	45	10	116	2	0	0	1	19	0	0
MONTEGIOCO	8	3	77	11	0	0	3	285	2	29
MONTEMARZINO	10	4	26	0	1	2	6	29	1	1
POZZOL GROPPO	35	8	207	66	1	3	8	39	2	27
ROCCAFORTE LIGURE	20	3	52	7	2	7	0	0	1	320
ROCCHETTA LIGURE	18	2	40	18	0	0	0	0	1	1
SAN SEBASTIANO CURONE	25	7	132	16	0	0	4	4	0	0
STAZZANO	54	5	147	62	2	23	2	5	3	10
VIGNOLE BORBERA	27	3	27	4	3	34	1	100	1	25
VOLPEGLINO	12	1	18	13	0	0	0	0	0	0

Livestock	2010									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	5	3	64	n.d.	1	4	2	17	0	0
AVOLASCA	3	2	4	n.d.	0	0	0	0	1	3
BERZANO DI TORTONA	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
BORGHETTO DI BORBERA	20	15	313	n.d.	1	5	2	205	0	0
BRIGNANO-FRASCATA	2	0	0	n.d.	0	0	1	30	1	24
CABELLA LIGURE	9	8	237	n.d.	1	1	1	75	1	3
CANTALUPO LIGURE	5	4	24	n.d.	0	0	0	0	1	13
CARREGA LIGURE	10	7	143	n.d.	0	0	0	0	1	20
CASASCO	3	3	76	n.d.	0	0	0	0	0	0
CASTELLANIA	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CERRETO GRUE	4	4	114	n.d.	1	2	3	58	1	2
COSTA VESCOVATO	2	1	56	n.d.	0	0	2	81	0	0
DERNICE	8	7	87	n.d.	2	70	1	5	2	50
FABBRICA CURONE	8	5	97	n.d.	2	35	0	0	1	50
GARBAGNA	10	8	308	n.d.	1	20	4	158	0	0
GREMIASCO	5	2	29	n.d.	0	0	2	26	0	0
GRONDONA	4	3	14	n.d.	1	150	0	0	2	112
MOMPERONE	5	4	21	n.d.	0	0	2	20	0	0
MONGIARDINO LIGURE	8	6	104	n.d.	2	196	2	21	1	6
MONLEALE	3	0	0	n.d.	0	0	1	1	0	0
MONTACUTO	6	3	87	n.d.	0	0	1	2	0	0
MONTEGIOCO	6	4	126	n.d.	1	8	1	197	1	7
MONTEMARZINO	2	1	2	n.d.	0	0	1	39	0	0
POZZOL GROPPO	17	5	90	n.d.	1	10	2	33	2	12
ROCCAFORTE LIGURE	3	2	98	n.d.	0	0	0	0	1	500
ROCCHETTA LIGURE	1	1	54	n.d.	0	0	0	0	0	0
SAN SEBASTIANO CURONE	4	2	33	n.d.	0	0	0	0	0	0
STAZZANO	4	2	54	n.d.	1	103	0	0	2	128
VIGNOLE BORBERA	7	2	30	n.d.	0	0	0	0	1	3
VOLPEGLINO	2	1	9	n.d.	0	0	1	14	0	0

Livestock	2022									
	Totale aziende con allevamenti	BOVINI			OVINI		SUINI		CAPRINI	
		Aziende	Capi		Aziende	Capi	Aziende	Capi	Aziende	Capi
			Totale	Di cui vacche						
ALBERA LIGURE	3	2	71	n.d.	0	n.d.	0	0	0	0
AVOLASCA	2	3	306	n.d.	1	20	0	0	1	40
BERZANO DI TORTONA	1	0	0	n.d.	0	0	0	0	0	0
BORGHETTO DI BORBERA	14	11	258	n.d.	0	0	2	51	1	10
BRIGNANO-FRASCATA	5	2	3	n.d.	0	0	0	0	0	0
CABELLA LIGURE	6	5	222	n.d.	0	0	0	0	1	25
CANTALUPO LIGURE	3	0	0	n.d.	1	160	0	0	2	301
CARREGA LIGURE	7	5	113	n.d.	0	0	0	0	1	2
CASASCO	1	0	0	n.d.	0	0	0	0	0	0
CASTELLANIA	0	0	0	n.d.	0	0	0	0	0	0
CERRETO GRUE	2	2	58	n.d.	0	0	0	0	1	2
COSTA VESCOVATO	3	1	33	n.d.	0	0	1	50	0	0
DERNICE	7	4	39	n.d.	3	63	1	16	3	44
FABBRICA CURONE	6	3	58	n.d.	1	16	0	0	1	11
GARBAGNA	9	7	146	n.d.	1	20	0	0	1	0
GREMIASCO	7	3	41	n.d.	0	0	1	0	0	0
GRONDONA	7	3	16	n.d.	1	50	0	0	4	47
MOMPERONE	3	0	0	n.d.	0	0	0	0	1	3
MONGIARDINO LIGURE	2	2	52	n.d.	0	0	0	0	0	0
MONLEALE	2	0	0	n.d.	0	0	0	0	0	0
MONTACUTO	2	1	0	n.d.	0	0	0	0	0	0
MONTEGIOCO	4	2	41	n.d.	1	1	1	140	1	4
MONTEMARZINO	2	0	0	n.d.	0	0	0	0	0	0
POZZOL GROPPO	8	5	84	n.d.	1	35	0	0	4	29
ROCCAFORTE LIGURE	5	2	79	n.d.	0	0	0	0	0	0
ROCCHETTA LIGURE	3	1	118	n.d.	1	33	0	0	1	6
SAN SEBASTIANO CURONE	5	2	24	n.d.	0	0	0	0	1	21
STAZZANO	3	3	8	n.d.	1	0	0	0	2	38
VIGNOLE BORBERA	3	1	25	n.d.	1	11	0	0	1	0
VOLPEGLINO	1	0	0	n.d.	0	0	0	0	0	0

Agricultural woody crops	1970							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	5	1.11	0	0	0	0	2	0.75
CARREGA LIGURE	0	0	0	0	0	0	0	0
CASASCO	85	87.79	0	0	0	0	7	11.6
COSTA VESCOVATO	137	243.33	0	0	0	0	2	1.5
DERNICE	108	29.6	0	0	0	0	0	0
GREMIASCO	122	24.17	0	0	0	0	20	4.41
POZZOL GROPPO	152	155.73	0	0	0	0	36	37.95

Agricultural woody crops	1980							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	0	0	0	0	0	0	197	49.39
CARREGA LIGURE	0	0	0	0	0	0	0	0
CASASCO	81	73.2	0	0	0	0	30	21.87
COSTA VESCOVATO	115	221.57	0	0	0	0	9	2.25
DERNICE	86	19.22	0	0	0	0	17	18.45
GREMIASCO	84	18.34	0	0	0	0	42	14.66
POZZOL GROPPO	154	183.47	0	0	0	0	55	69.92

Agricultural woody crops	1990							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	0	0	0	0	0	0	17	2.22
CARREGA LIGURE	0	0	0	0	0	0	0	0
CASASCO	54	58.16	0	0	0	0	14	17.28
COSTA VESCOVATO	96	177.95	0	0	0	0	9	2.11
DERNICE	32	5.02	0	0	0	0	19	12.49
GREMIASCO	54	7.82	0	0	0	0	39	6.73
POZZOL GROPPO	132	128.5	0	0	0	0	69	76.15

Agricultural woody crops	2000							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	2	1	0	0	0	0	19	15.24
CARREGA LIGURE	0	0	0	0	0	0	0	0
CASASCO	30	27.85	0	0	0	0	8	8.61
COSTA VESCOVATO	74	156.81	0	0	0	0	5	1.14
DERNICE	3	0.8	0	0	0	0	8	6.7
GREMIASCO	37	6.37	0	0	0	0	26	14.21
POZZOL GROPPO	75	80.06	0	0	0	0	37	55.81

Agricultural woody crops	2010							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	1	0.3	1	0.21	0	0	1	0.03
CARREGA LIGURE	0	0	0	0	0	0	1	1.49
CASASCO	13	17.44	0	0	0	0	6	2.57
COSTA VESCOVATO	39	100.37	0	0	0	0	5	0.25
DERNICE	6	18.02	0	0	0	0	7	1.85
GREMIASCO	14	3.64	0	0	0	0	19	12.54
POZZOL GROPPO	49	72.75	1	0.65	0	0	34	44.39

Agricultural woody crops	2022							
	VITE		OLIVE		AGRUMI		FRUTTIFERI	
	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)	Aziende	Superficie (ha)
CABELLA LIGURE	0	0	0	0	0	0	0	0
CARREGA LIGURE	0	0	0	0	0	0	0	0
CASASCO	6	6.25	0	0	0	0	3	2.61
COSTA VESCOVATO	9	14.4	0	0	0	0	4	0.69
DERNICE	3	1.18	0	0	0	0	5	2.4
GREMIASCO	1	0.16	0	0	0	0	7	3.28
POZZOL GROPPO	19	35.64	0	0	0	0	14	11.71

Annexe 2: Field Survey Form

SIPATH Spinoff Abandoned Landscapes	Field survey
Name:	Date:
Municipality/ hamlet:	Pictures:
Observation point:	Coordinates

Short description of the landscape (topography, open/closed landscape, geomorphology)

Description observation point (situation within the landscape)

Accessibility of the observation point

1. Indicators of abandonment

Biophysical	**Y/N**	**Description**
Steep slopes		
Degraded/poor soils		
Land/ mud slides		
Forest proximity		
Secondary/ successive vegetation		
Other:		
Management		
Presence of agricultural activities		
Presence of non-agricultural activities (wood production, craftmanship)		
Degradation of terraces		
Mechanization/ Technology access		
Small landscape elements (trees, treelines, hedgerows, stone walls, …)		
Clearly visible passages		
Absence or abandoned structures of natural risk prevention		
Other:		

Infrastructure		
Abandoned housing		
Abandoned agricultural/ rural infrastructure (fences, barns, …)		
Degradation of road structure		
Other:		

2. Indicators of post-abandonment

Return to agricultural uses → Revival of the rural landscape		
	Y/N	
Landscape preservation: Restoration or maintenance of traditional landscape features (hedgerows, terraces, …)		
Diversification of land uses with low-impact management activities: presence of various functions beyond agricultural and forest-based commodity production		
Re-farming: Agricultural lands are cultivated (cropland) or managed (grassland) in a monofunctional way		
Re-farming: Organic farming: Low-intensive farming or sustainable practices		

Revegetation → managed or spontaneous		
(Re-)afforestation: Trees planted for commercial purposes (timber, industry, wood biomass) Trees planted to address soil erosion or improve water quality		
Restoration: Restoration of natural vegetation by assisting vegetation recovery (site preparation, seedling, pruning, removal of invasive)		
Succession: Absence of human management leading to spontaneous revegetation (secondary succession, old-field succession or forest regrowth)		

Annexe 3: Interview Guideline

Prima di iniziare l'intervista: Ringraziare la persona, accennare rapidamente al tema dell'intervista, informare su durata del intervista, informarla/assicurarla che non è obbligata a rispondere a domande che non desidera, chiedere il permesso di registrare l'intervista, chiedere come desidera che le informazioni personali siano gestite (anonime, ecc.). Informare sull'inizio della registrazione.

Data:_____ Orario:_____ Municipalità:_____

DOMANDE SULLA PERSONA	
1. Come si chiama?	
2. Quanti anni ha?	
3. Sesso:	**O Uomo O Donna**
FARMER	
4. Da quanto tempo vive/lavora in questo territorio?	
a. Nuovi arrivati: di dove siete originari?	
5. Qual è il nome della sua azienda agricola?	
6. Da quanto tempo lavora in agricoltura?	
a. Sempre nella stessa azienda agricola?	
b. Se no, che cosa faceva prima?	
CONDUZIONE LEGALE/AMMINISTRATIVA DELL'AZIENDA AGRICOLA	
7. Qual è il sistema di conduzione della vostra azienda agricola?	
a. Siete proprietario della vostra azienda agricola o siete in affitto? b. Siete il proprietario unico?	O Si O No O Si O No
c. E un azienda di famiglia? Ha dei soci?	O Si O No Partners:
8. Qual è la forma giuridica della sua azienda agricola? o Azienda individuale? o Comunanza/ Communita? o Società cooperativa? o Associazione di produttori?	Altro:
9. Quante persone lavorano nell'azienda agricola?	

○ Sono membri della famiglia? ○ Sono dipendenti?	O Si O No O Si O No

PRODUZIONE AGRICOLA	
10. Qual è la quantità totale di terreno (in superficie - ettari) che utilizza per le sue attività agricole?	
○ Quanto (%) è di sua proprietà?	
11. C'è stato un aumento o diminuzione delle dimensioni dell'azienda agricola? *(da quando lei lavora qua? negli ultimi 5, 10, 20 anni)*	
12. C'è stato un aumento o diminuzione delle dimensioni del suo terreno agricolo? *(da quando lei lavora qua? negli ultimi 5, 10, 20 anni)*	
13. Che tipo di attività agricole svolge? Cosa produce in azienda?	
Allevamento:	
○ Quante mucche/ pecore/capre ha?	
○ Sono in stalla o "allo stato brado"?	
○ Nascono anche in azienda? Se sì, quanti in un anno?	
○ Qual è il suo prodotto finale? (Formaggio, carne, bestiame, ...?)	
○ Vende i suoi prodotti o sono per il vostro sostentamento?	
• Vende i prodotti in azienda?	
Come si è sviluppata la sua produzione nel corso degli anni *(ultimi 5, 10, 20 anni, ecc.)?*	
Seminativi:	

○ Che tipo di coltivazioni? (grano, patate, ortaggi, mais, frumento...)	
○ Quanti ettari?	
○ Qual è il suo prodotto finale?	
• Vende i prodotti in azienda?	
Come si è sviluppata la sua produzione nel corso degli anni *(ultimi 5, 10, 20 anni, ecc.)?*	
Vigneti/frutteti:	
○ Che tipo di coltivazioni?	
○ Quanti ettari?	
○ Qual è il suo prodotto finale? (vino/uva...)	
• Vende i prodotti in azienda?	
Come si è sviluppata la sua produzione nel corso degli anni *(ultimi 5, 10, 20 anni, ecc.)?*	
Altre attività/prodotti (apicoltura, ...):	
○ Quantità? ○ Qual è il suo prodotto finale?	
Come si è sviluppata la sua produzione nel corso degli anni *(ultimi 5, 10, 20 anni, ecc.)?*	
14. Le vostre coltivazioni/prodotti sono biologici o a bassa intensità? ○ I vostri prodotti sono certificati?	O Si O No

○ Se sì, quali? ○ Ha altri tipi di certificazioni?	
15. Le attività agricole creano un reddito sufficiente a sostenere il sostentamento dell'individuo/della famiglia?? ○ È cambiato nel corso del tempo?	O Si O No

PRODUZIONE NON AGRICOLA	
16. Che tipo di attività extra-agricole svolge? (produzione di legname, agriturismo, negozio di prodotti agricoli...) ○ Produzione di legno ○ Agriturismo ○ Negozio in azienda ○ Lavoro extra-agricolo ○ Altro:	
17. Su una scala da 1 a 5, quanto è importante per il suo sostentamento?	**O 1 O 2 O 3 O 4 O 5** Non importante molto importante

(POST) ABANDONMENT	
18. Su una scala da 1 a 5, quanto considera abbandonato il paesaggio in cui si trova la sua azienda agricola? ○ La vostra azienda comprende terreni non più coltivati e che mostrano segni di abbandono?	**O 1 O 2 O 3 O 4 O 5** Poco molto
19. Quali sono, secondo lei, le maggiori sfide dell'abbandono?	
a. Per il paesaggio?	
b. Per l'azienda Agricola?	

20. Che tipo di attività fa a livello aziendale per affrontare le conseguenze dell'abbandono?		
21. Vi occupate attivamente del ripristino della vegetazione naturale assistendo il recupero della vegetazione (come la rimozione della vegetazione invasiva, la preparazione del sito, la semina e la potatura)?		
22. Ha fatto qualche investimento importante nell`azienda?		**O Si O No**
o Negli ultimi 10 anni?	o Macchinari Altro/Note: o Tecnologia o Terreno o Manutenzione o Animali	
o Negli ultimi 20 anni?	o Macchinari Altro/Note: o Tecnologia o Terreno o Manutenzione o Animali	
o Altro periodo di tempo?		
23. Ha richiesto un finanziamento per questo investimento?		**O Si O No**
a. Su una scala da 1 a 5, quanto è stato facile ottenere un finanziamento per questo investimento?		O 1 O 2 O 3 O 4 O 5 Facile difficile

STRUMENTI DI POLITICA Con misure politiche intendiamo decisioni presi dal alto o dal basso che portano a la valorizzazione di un certo settore (agricolo, ambientale, culturale …). Queste misure possono essere tradotte attraverso dei leggi, regolamenti, strumenti come finanziamenti e sussidi, are di tutela/conservazione ecc.	
24. Ci sono delle misure politiche o di gestione nel area dove lei svolge le sue attività?	

	O Si O No
25. Che tipo di misure politiche? Esempio: CAP, GAL, PSR, parco naturale)	
26. Hanno avuto un impatto sulle vostre decisioni a livello di azienda agricola?	
27. Esistono finanziamenti (sussidi, incentivi) per il vostro tipo di azienda agricola/commerciale?	O Si O No
a. Avete fato uso di questi sussidi/incentivi?	O Si O No
b. Li ha ricevuti?	O Si O No
c. Se sì, quali?	
d. Su una scala da 1 a 5, quanto sono stati importanti per la sua azienda agricola?	O 1 O 2 O 3 O 4 O 5 Non importante importante
28. I cambiamenti nelle sue attività agricole e nell'uso del suolo sono stati influenzati (in modo positivo o negativo) o sono stati causati da politiche/modifiche politiche?	
29. Si sente sostenuto dal governo (locale, regionale, nazionale...) nelle sue decisioni di agricoltore?	
30. Si sente supportato dai sindacati degli agricoltori nella comunicazione/richiesta di incentivi/sussidi?	

ULTERIORI
31. Siete soddisfatto delle infrastrutture esistenti o vi ostacolano in qualche modo? (strade, energia, acqua, ecc.)
32. Quali tipi di difficoltà incontra nella sua vita lavorativa e/o nella gestione della sua azienda agricola?

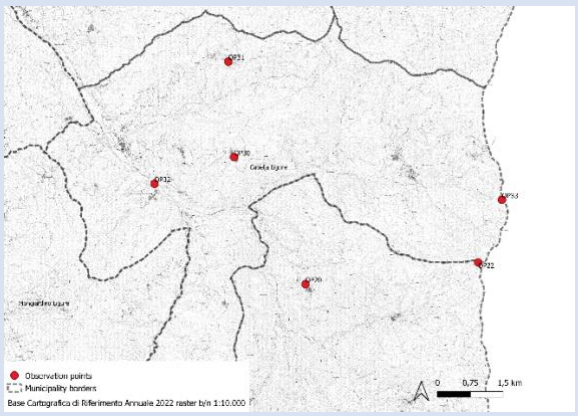
Annex 4: Profiles of the Seven Archetypal Municipalities

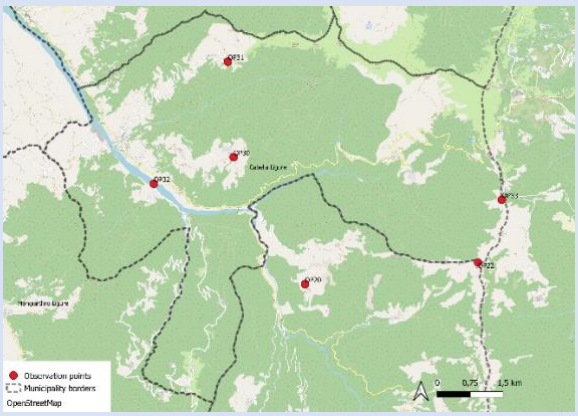
CABELLA LIGURE

Population	468 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	10.04 inhabitants/km^2
Surface	46.63 km^2
Average altitude	510 masl.
ISTAT & SNAI classification	Inner mountain; Intermediate

Territorial area		Val Borbera-Spinti
Hamlets		Aie Cosola, *Cabella Ligure,* Dova I.& S., Dovanelli, Montaldo Cosola, *Piuzzo*, *Pobbio I.* & S., Rosano, Selvagnassi, Teo *(cursive contain OP)*
Geomorphological features	**Mountains**	Mt. Saia, Mt. Roncasso, Mt. Coserone, Mt. Ebro, Mt. Prenardo, Mt. Chiappo, Mt.Caval-murone, Mt. Legna, Mt. Porreio, Mt. Bossola
	Bodies of water	Torrente Borbera, Rio Lubbia, Rio Gorreio, Rio Carpi, Rio Robe
	Other	Strette di Pertuso, conglomerate fills
Number of farms		8

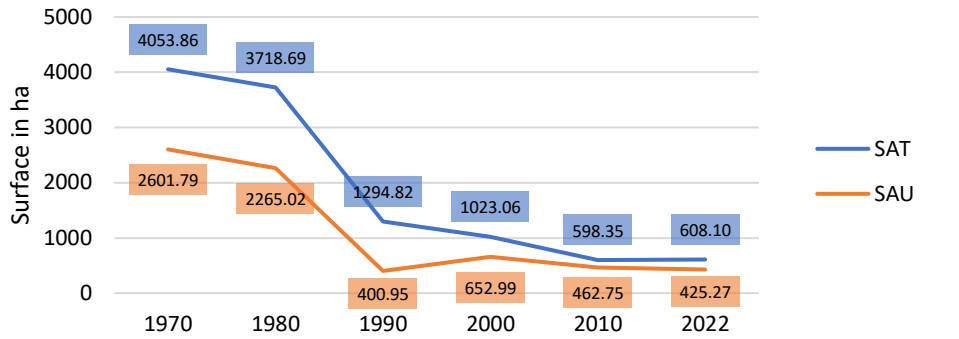
Field survey observation points	OP30 – OP33
Interviews	Livestock farmer Farmer





HISTORICAL CENSUS DATA 1970-2022

SAT / SAU

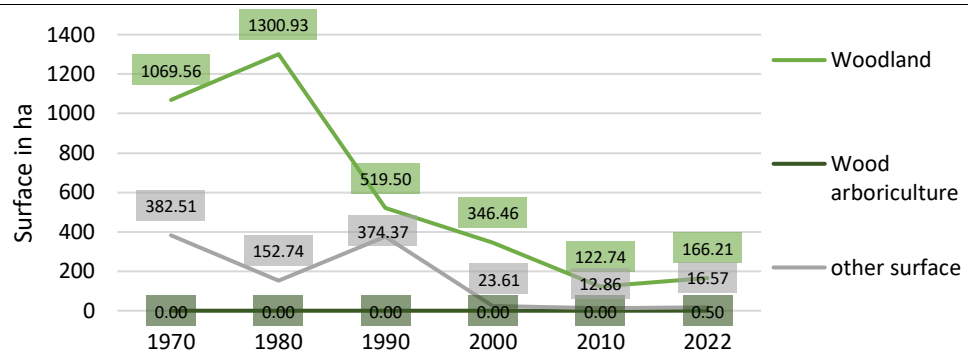


This graph shows the relation between the SAT and the SAU in hectares. The relation is shown from 1970 to the most current data of 2022.

Woodland

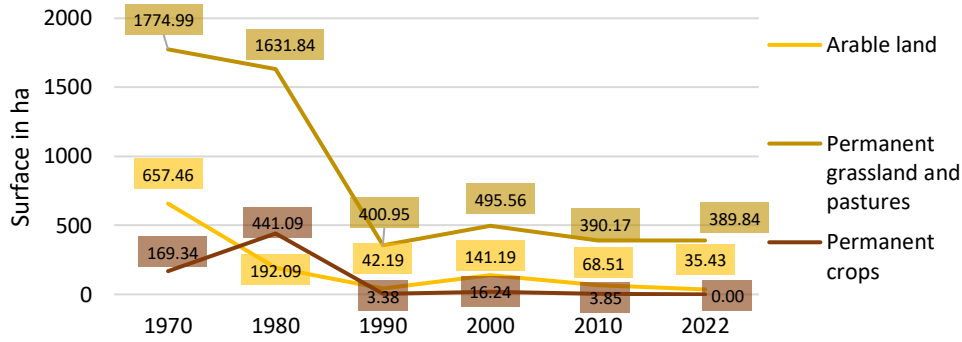
Wood arbori-culture

Other surface

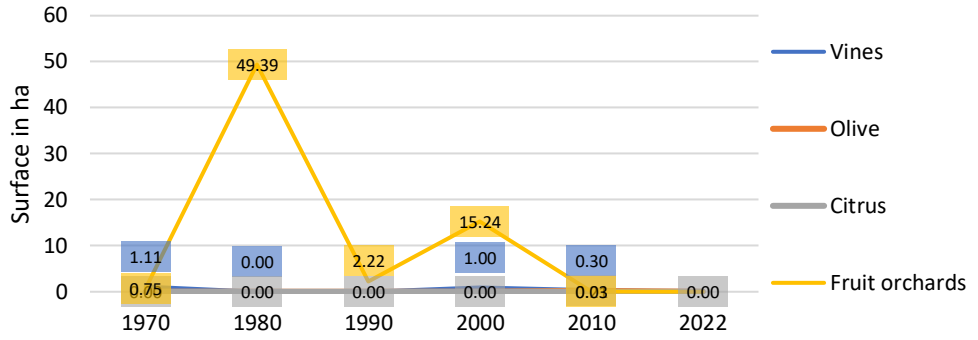
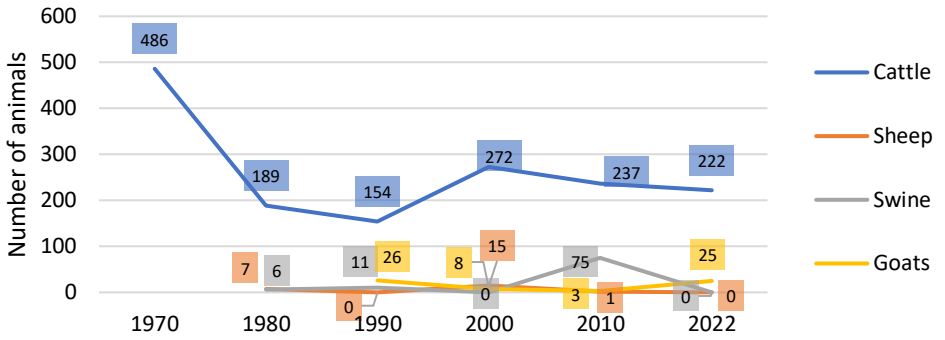


The diagram shows the different categories of the SAT such as woodland, wood arboriculture and other surface, excluding the SAU over the last six decades.

SAU land type

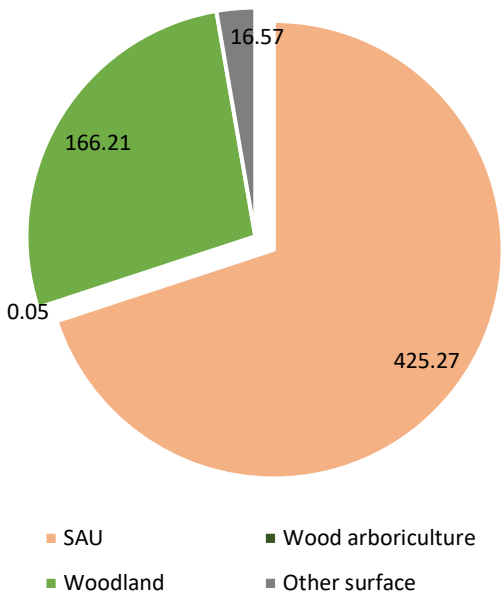


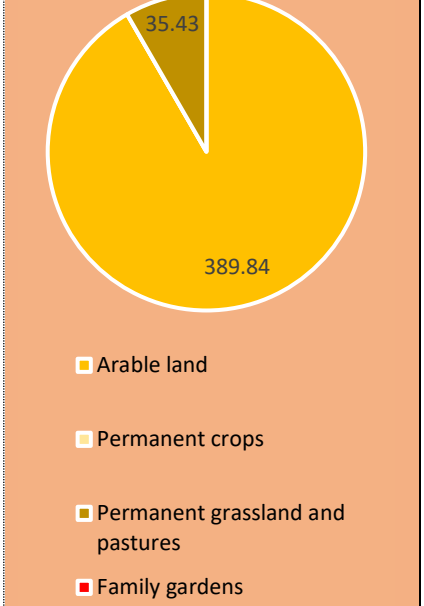
This graph shows the surface development of the different components of the SAU category such as arable land, permanent crops, permanent grassland and pastures.

Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

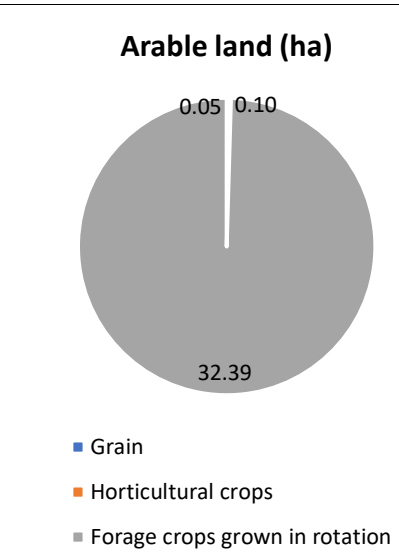
CURRENT SITUATION

SAT / SAU



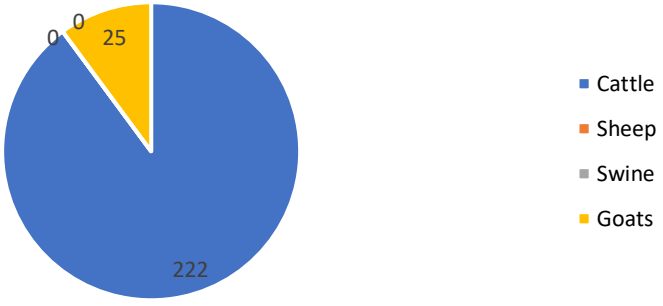


Arable land and wood arboriculture



- no vineyards
- no other agricultural woody crops

Livestock

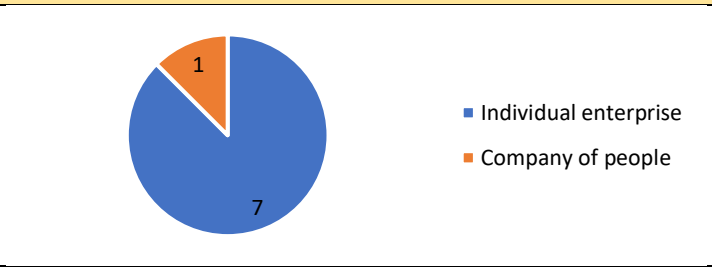


TYPE OF FARMS AND FARMERS

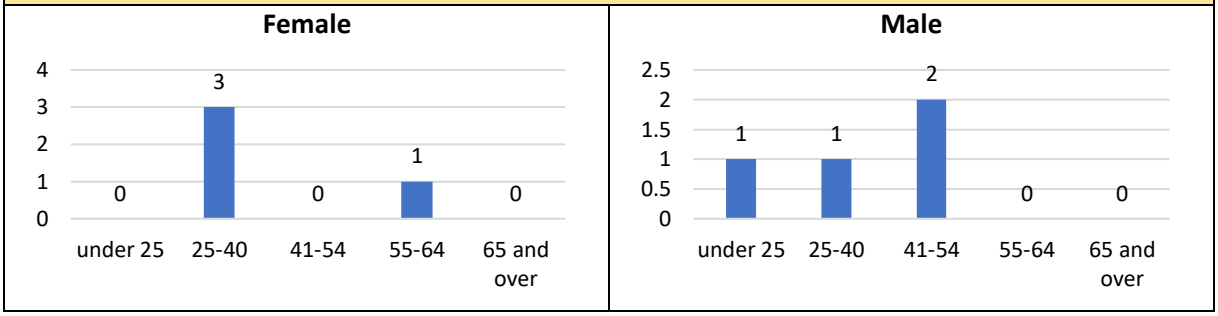
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
8	485.07	8	702.01	6	252

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	2	6	6	4

LEGAL FORM OF FARMS



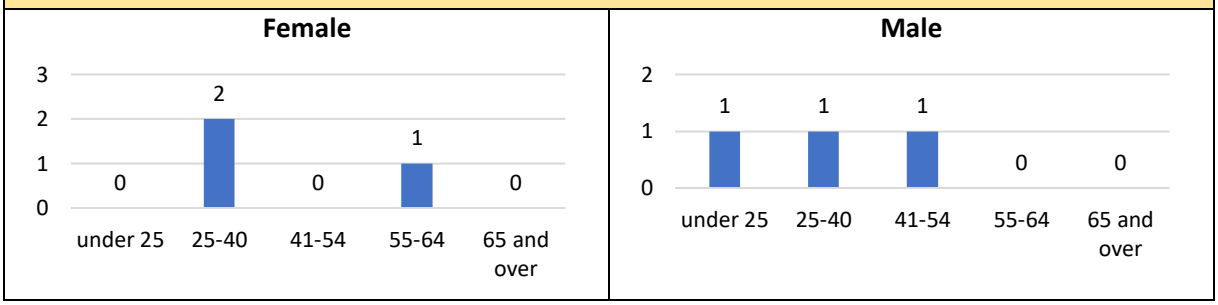
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Cattle and buffaloes	Goats	Equines	Other livestock
Number of farms	5	1	2	2
Number of animals	222	25	2	3

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

This municipality lays at a higher elevation with the lowest parts in the valley at around 440 masl. and the highest point at 1600 masl. It is situated in the Val Borbera with the Torrente Borbera running from SE to the NW through the municipality.

Geomorphological:

NW: The north-western part shows a very hilly mountain landscape with medium to steep slopes. The lower valley where the Borbera river flows through is characterized by a large alluvial plane/riverbed with sedimentary terraces.

NE: The north-eastern part is characterized by hilly slopes of a mountainous landscape. Geomorphological elements are the Mt. Roncasso, Mt. Coserone, Mt. Ebro, M. Prenardo, Mt. Chiappo. This is where the Val Borbera begins with the Rio Carpi and Rio Gorreio flowing down the valley and running into the Borbera river more down the valley.

SE: Due to the shape of the municipality the south-eastern part is very small. The area is very hilly and mountainous with steep slopes. Geomorphological elements are the Mt. Porreio, Mt. Legna and Mt. Cavalmurone.

SW: This area is at higher elevation and shows therefore very steep slopes. Mt. Saia lays between the boarder of Cabella Ligure and the municipality of Carrega Ligure.

Agricultural land use:

NW: This area has some patches with different land uses. In the steeper slopes more uphill some grassland, some fruit orchards and smaller vegetable gardens are present. Few smaller patches of arable land can be seen. Some larger pinewoods patches can be observed, especially in more steeper areas. In the valley of the municipality where the village of Cabella Ligure is situated mostly nonagricultural activities can be observed, such as recreational areas, play and sports grounds, as well as a swimming pool area. Few agricultural activities can be observed, such as small fruit orchards, smaller patches of grassland and the presence of possible agricultural infrastructure like barns and stable.

NE: The area shows signs of grazing activities such as fencing and older cow manure. At the time of the two observation points no actual livestock was present on the grassland. Larger plots of grassland are present. Some farmers with livestock and cheese production are situated in the surrounding vicinity.

SE: Some few plots with grassland are visible.

SW: Some plots in vicinity to the villages show signs of agricultural activities. Steeper and less accessible plots are abandoned and overgrown by secondary vegetation.

Indicators of abandonment:

NW: The steeper slopes show clear signs of abandonment. Secondary vegetation is largely spread and often invading and therefore mixed in with grassland and woodland. Forest mixed with successive vegetation is widely spread, especially in the steeper slopes. Signs of former agricultural land use are present in from of abandoned and in the meanwhile degraded terraces, abandoned fences and agricultural infrastructure. On the steeper slopes abandoned housing can be observed. The road condition is of medium to low quality with some major potholes.

NE: The area has large patches of secondary and successive vegetation. It is clearly visible that some former terraces and especially tree lines have expanded and mixed in with woodland. Few smaller plots seem to be used as grassland for livestock grazing. Due to its steep slopes the area is not easily accessible, sometimes only by foot.

SE: The area is characterized by steep slopes with secondary and successive vegetation mixed in with woodlands. Some former grazing plots are abandoned and overgrown by secondary vegetation. The present grassland seems to be reduced in size and reduced to the less steep areas.

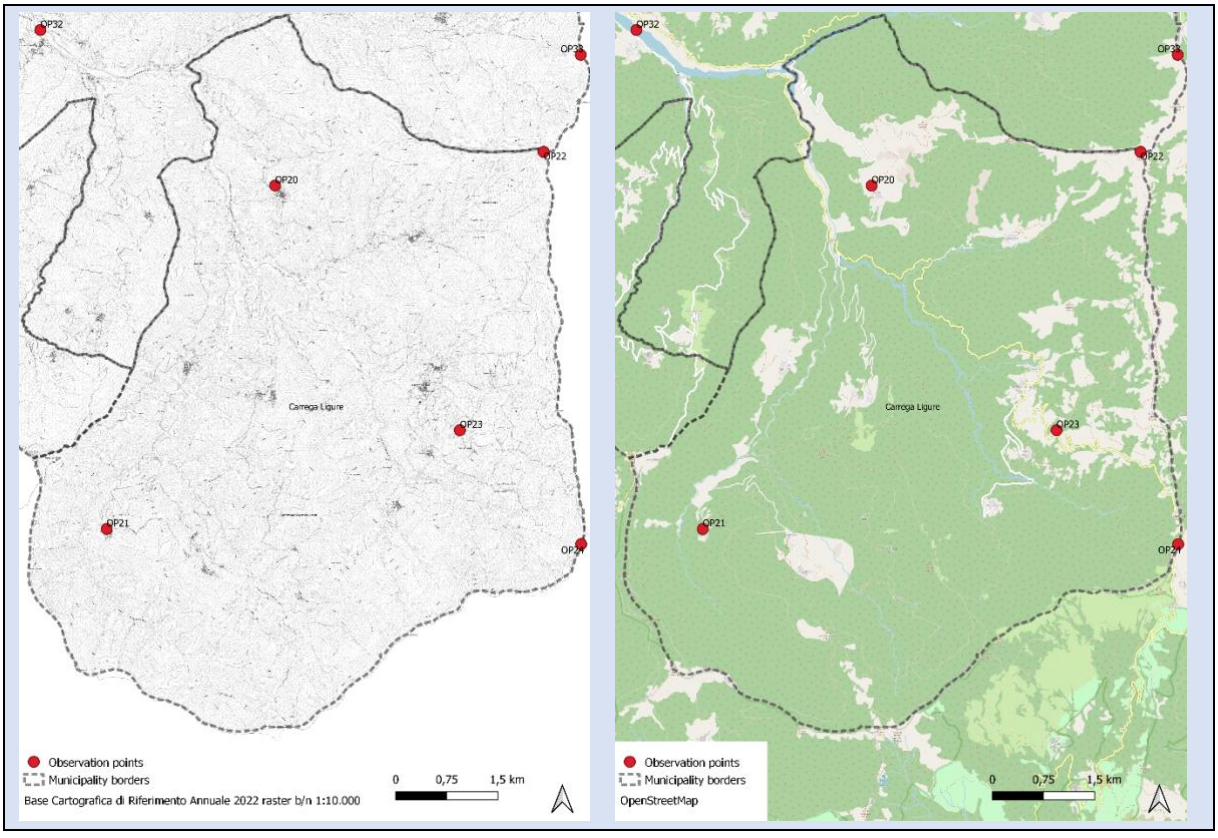
SW: The southern-western area shows strong signs of agricultural abandonment. Former terraces and plots are overgrown by successive and secondary vegetation mixed in with woodland. Only Singular terraces and plots around the villages of Dova Inferiore and Dova Superiore seem to be cultivated and used.

CARREGA LIGURE

Population	86 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	1.56 inhabitants/km^2
Surface	55.26 km^2
Average altitude	958 masl.
ISTAT & SNAI classification	Inner mountain; Peripheral

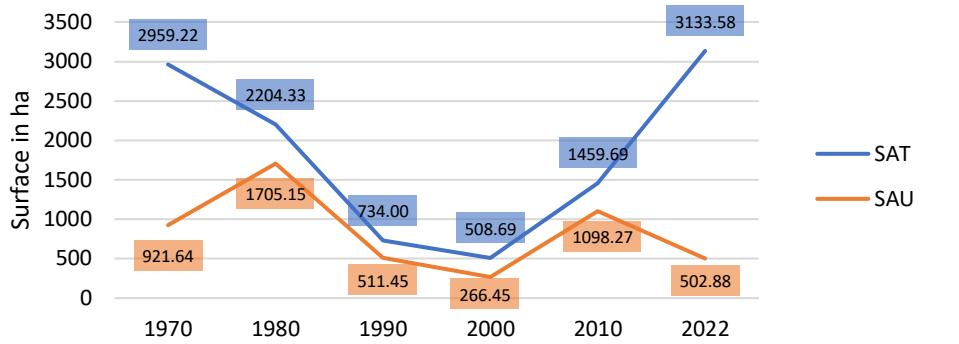
Territorial area		Val Borbera- Spinti
Hamlets		Agneto, *Berga*, Carrega Ligure, Cartasegna, Connio, *Daglio*, Vegni , *(cursive contain OP)*
Geomorphological features	**Mountains**	Mt. Legna, Mt. delle tre croci, Mt. Buio, Mt. Carmo, Mt. Saia, Mt. Porreio, Mt. Colletto, Mt. Antola, Mt. Propiano, Mt. Berga, Mt. Sopra Costa
	Bodies of water	Careghino, Torrente Agnellasca, Rio Berga, Rio Borbera, Rio dei Campassi, Rio Robe
Number of farms		8
Extra information		Landslide, Parco naturale dell' Alta Val Borbera

Field survey observation points	OP20 – OP24
Interviews	Farmer Livestock farmer



HISTORICAL CENSUS DATA 1970-2022

SAT / SAU

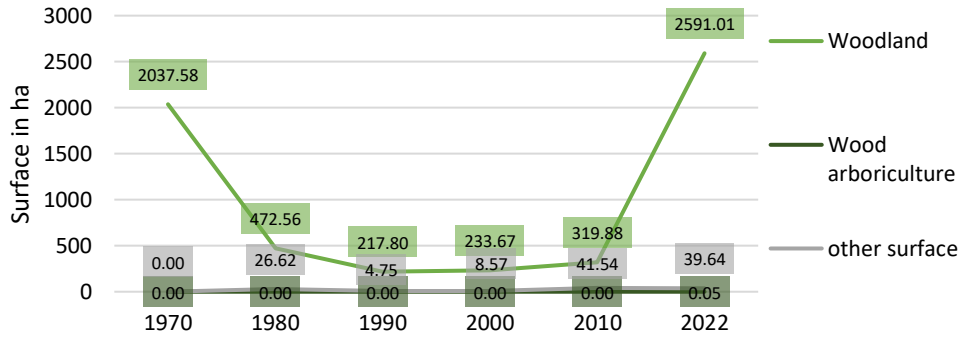


This graph shows the relation between the SAT and the SAU in hectares. The relation is shown from 1970 to the most current data of 2022.

Woodland

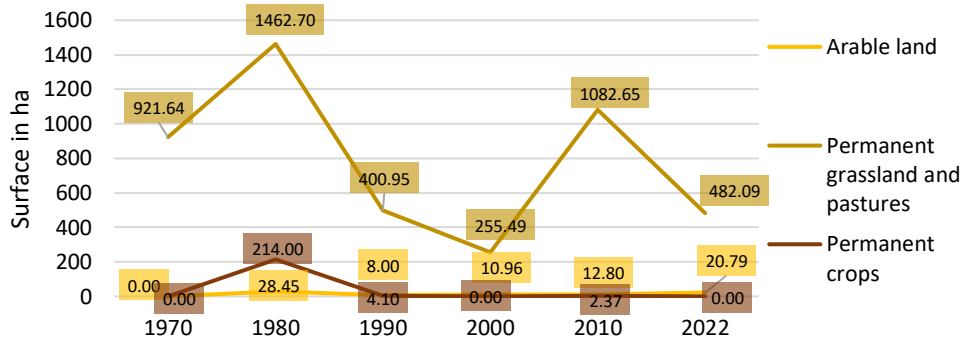
Wood arbori-culture

Other surface

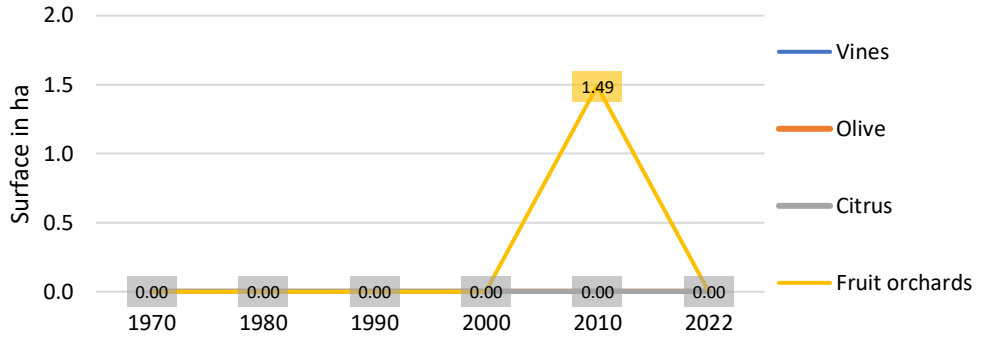
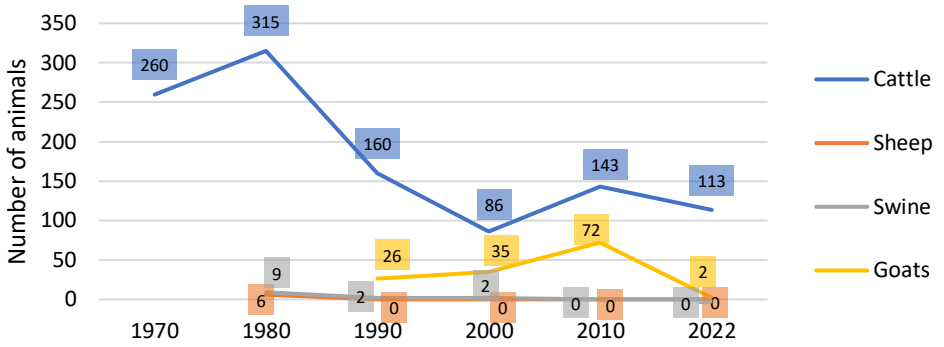


The diagram shows the different categories of the SAT such as woodland, wood arboriculture and other surface, excluding the SAU over the last six decades.

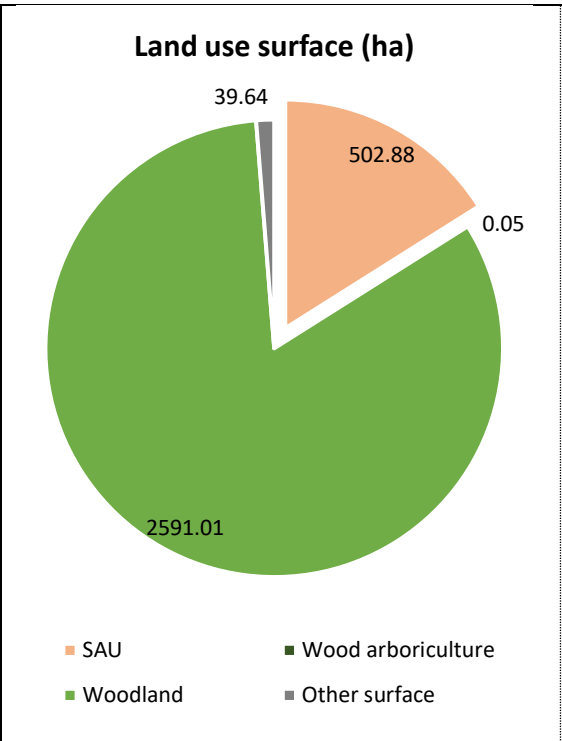
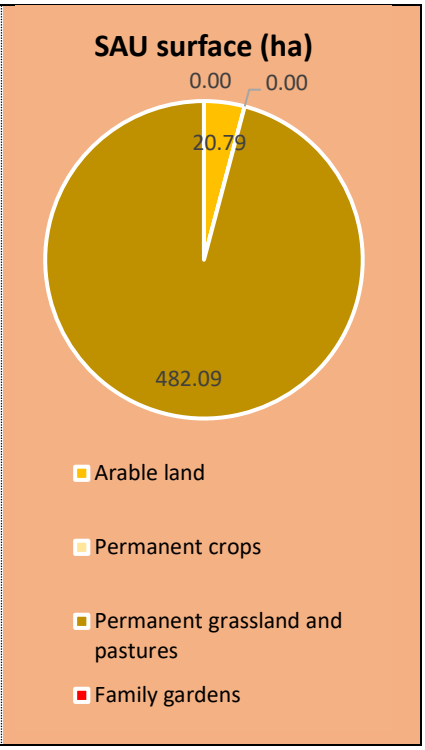
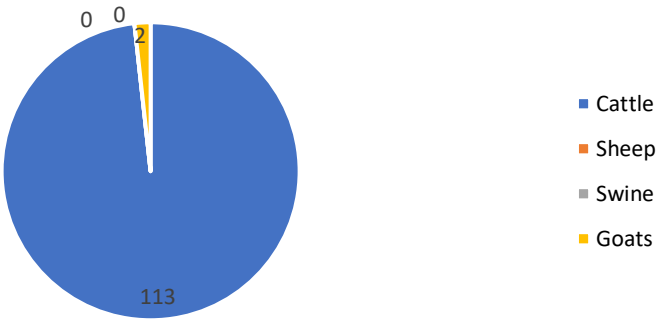
SAU land type



This graph shows the surface development of the different components of the SAU category such as arable land, permanent crops, permanent grassland and pastures.

Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

CURRENT SITUATION

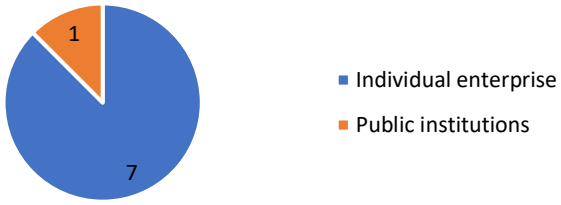
SAT / SAU		
Arable land and wood arboriculture	- no significant arable land	- no wood arboriculture
Livestock		

TYPE OF FARMS AND FARMERS

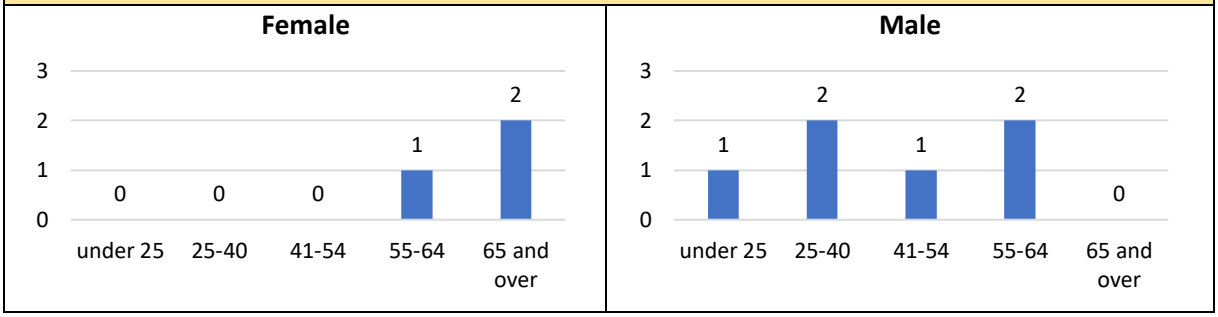
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
8	309.94	8	2732.38	7	128

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	2	7	6	5

LEGAL FORM OF FARMS



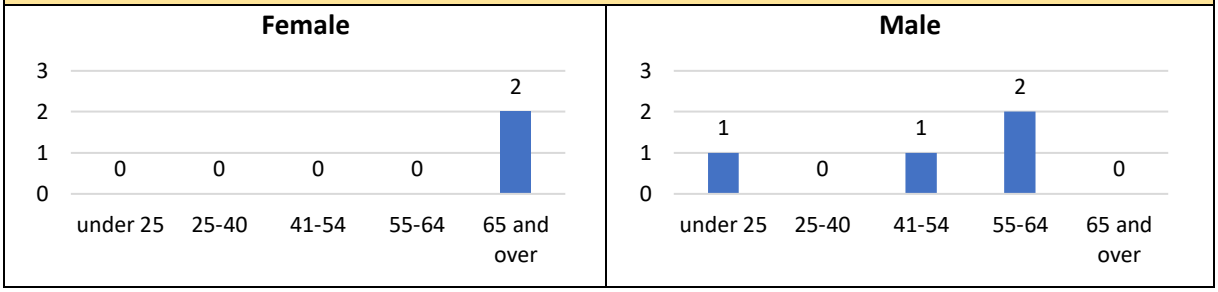
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Cattle and buffaloes	Goats	Equines
Number of farms	5	1	1
Number of animals	113	2	6

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

The municipality has a high average elevation of 958 masl. with a minimum of 562 masl. in the lowest valley and a maximum of 1650 masl.

Geomorphological:

NW: A mountainous landscape with steep hills can be observed. The area reaches higher elevations with Mt. Saia situated at the border between the two municipalities Cabella Ligure and Carrega Ligure. Multiple slopes show degradation of soil due to their steepness. The Agnelasca stream runs towards the South-East down the valley where eventually it will run into the Borbera river.

NE: The area is characterized by very steep slopes with higher altitudes. Some geomorphological elements are the Mt. Porreio and Mt. Legna that lay on the border between Carrega Ligure and the neighboring municipality of Cabella Ligure. Degraded soil and signs of possible landslides can be observed on steeper slopes.

SE: This area is a mountainous landscape with steep to very steep slopes. Some of those show some degraded or poor soils and signs of possible land/mud slides. The area is of higher elevation and some of the geomorphological elements are the Mt. delle tre Croci, Mt. Propiano, Mt. Carmo, some of them being situated at the border of the municipality also representing the border between Piemonte and Liguria.

SW: High elevated mountainous landscape with very steep slopes. Some of the geomorphological elements are the Mt. Sopra Costa, Mt. Bulo, Mt. Antola, Mt.Berga and Mt. Carmetto. The steeper slopes show some degradation of the soil. The area is where the National Parc “dell’Alta Val Borbera” is situated and the Rio Berga and Rio dei Campassi originate in these mountains. Further down the valley they merge into the Torrente Agnellasca.

Agricultural land use:

NW: Some smaller vegetable gardens can be observed in proximity to the village. Fruit orchards and grassland is present. The area is difficult to access, especially for larger agricultural machines. Non-agricultural activities such as smaller wood production with wood piles are seen. Some larger pinewood plots can be seen. Different steeper slopes are not cultivated due to their steepness and degraded soils structure.

NE: Signs of some grazing activities are present such as old cow manure and fencing. No terraces are visible. Other nonagricultural land use are the hiking trails.

SE: Agricultural activities observed are pastures for livestock and some hay production. Non-agricultural activities include some smaller wood production as

well as recreational hiking trails. The access to the fields with machinery is difficult.

SW: Small traces of grazing activities can be seen as well as a few smaller vegetable gardens. Especially the steeper slopes are difficult to access with heavy and bigger machines.

Indicators of abandonment:

NW: Secondary and successive vegetation is largely spread as an indicator of abandonment. Former grassland plots and arable land are strongly overgrown. The vegetation often mixes in with woodland. Most former agriculturally used fields are difficult to access especially with bigger and heavy machines due to their steepness.

NE: This area shows large indicators of abandonment. Secondary and successive vegetation has taken over large plots often mixed in with woodlands. Former agricultural terraces and grassland are overgrown and clearly not cultivated anymore. Some abandoned fencing can be observed. The more abandoned plots seem to be the more difficult to cultivate area because of their steep slopes and degraded soils. Some softer and easier accessible plots are still used for grazing activities.

SE: The area is largely invaded by secondary and successive vegetation. Former arable is seen to be overgrown and the secondary vegetation mixes in with the woodland. Terraces are also overgrown and degraded through lacking land use management. Small landscape elements such as tree lines and hedgerows are overgrown, expanded and mixed in with other vegetation. In the village some abandoned housing as well as abandoned agricultural infrastructures such as barns, sheds and fences can be observed.

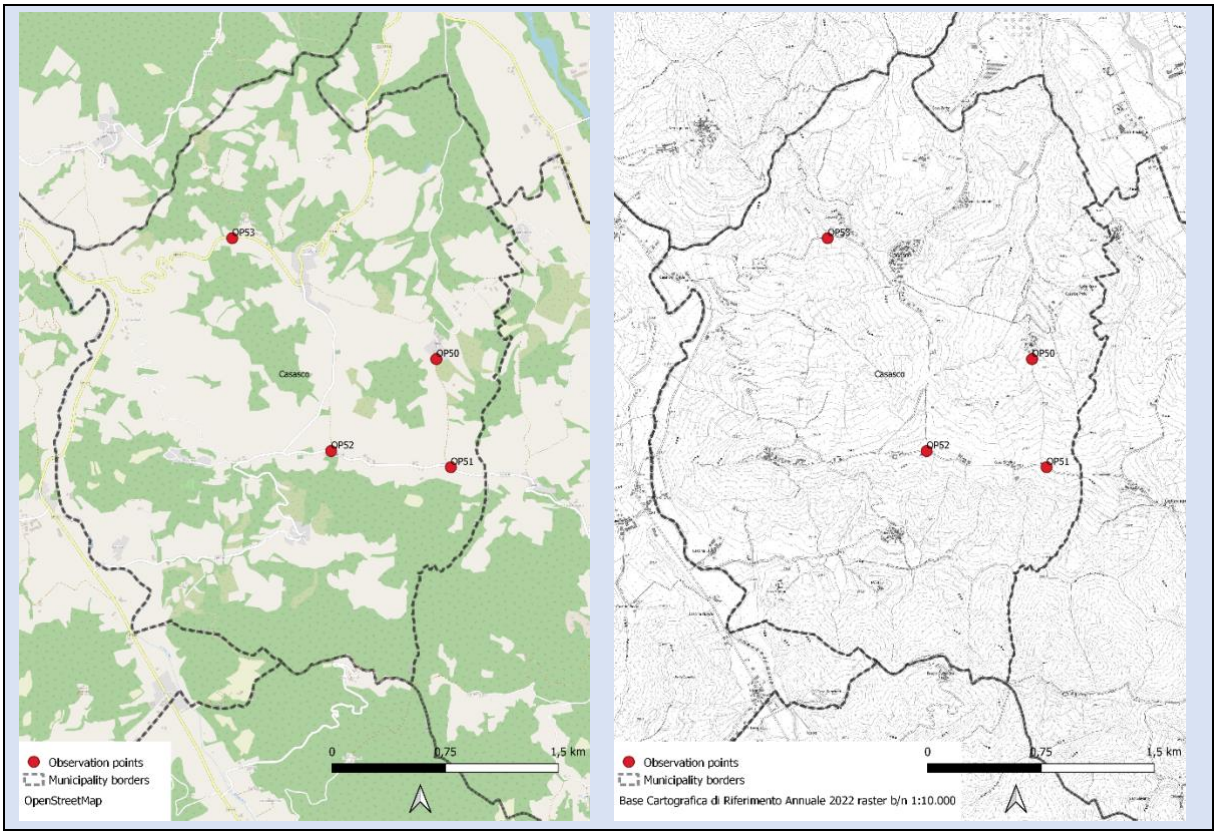
SW: The are shows many signs of abandonment. Secondary and successive vegetation is largely spread mixing in with woodland but also invading and overgrowing former pastureland. Terraces are abandoned and also invaded by vegetation. Tree lines and other smaller landscape elements are overgrown and spread into large patches. The road structure is of bad quality.

CASASCO

Population	114 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	12.61 inhabitants/km^2
Surface	9.04 km^2
Average altitude	398 masl.
ISTAT & SNAI classification	Interior hill; Intermediate

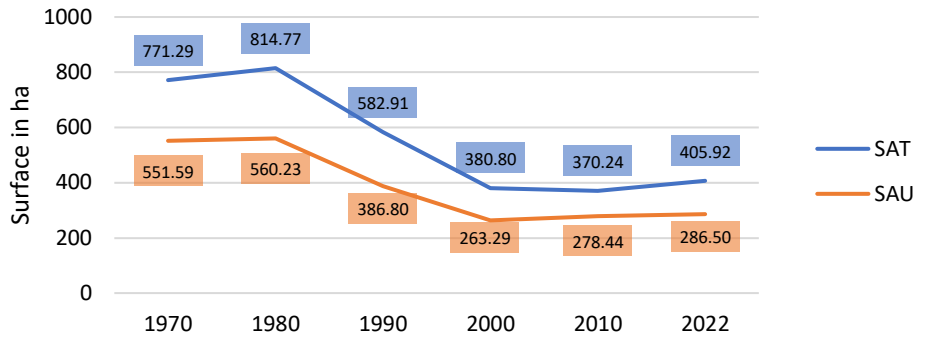
Territorial area		Val Curone, Val Grue, Val Ossona
Hamlets		Casasco, *Casaschino*, Magrassi, *Poggio*, Polverola *(cursive contain OP)*
Geomorphological features	**Bodies of water**	Torrente Grue, Rio Polverola, Rio di Carignano
Number of farms		10
Extra information		Big Bench n°129, Naturalistic Astronomical Observatory

Field survey observation points	OP50 – OP53
Interviews	Winemaker Winemaker



HISTORICAL CENSUS DATA 1970-2022

SAT / SAU



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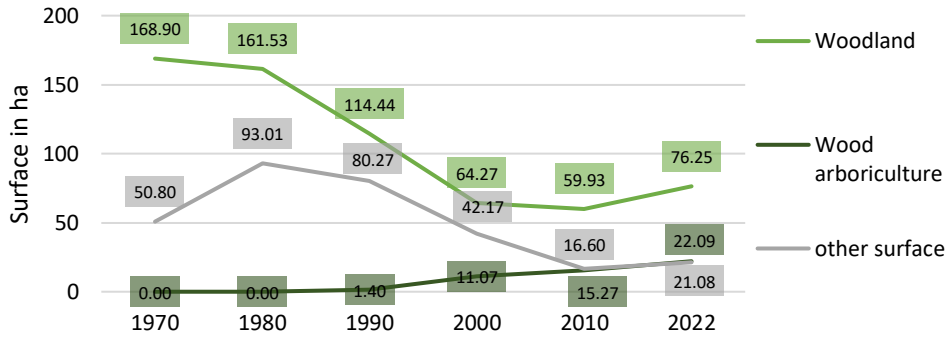
Woodland

Wood arbori-culture

Other surface



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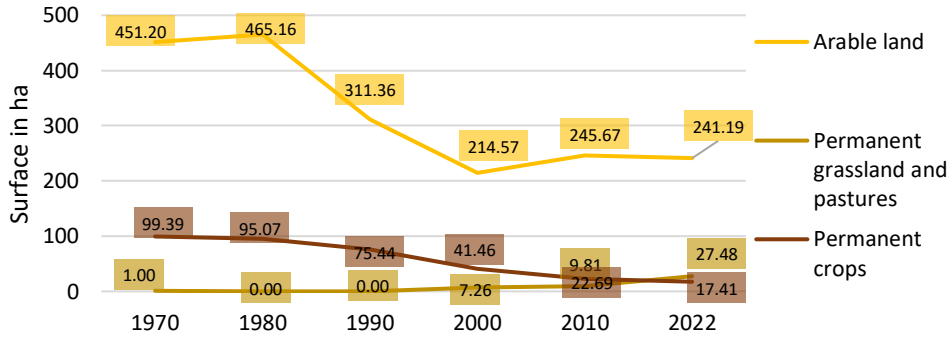
SAU land type



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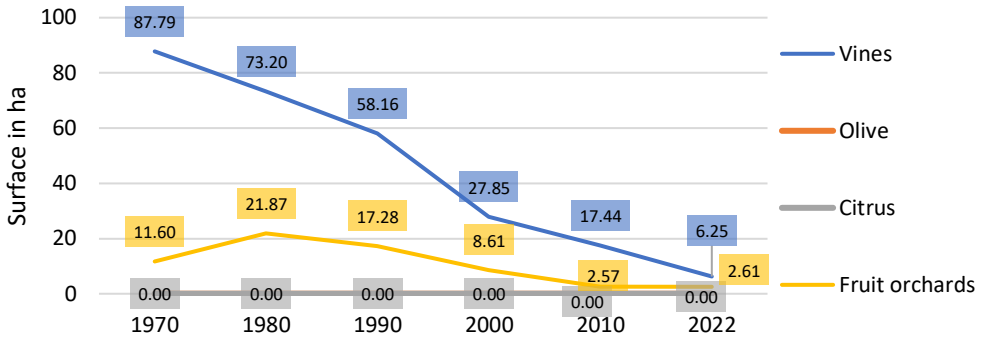
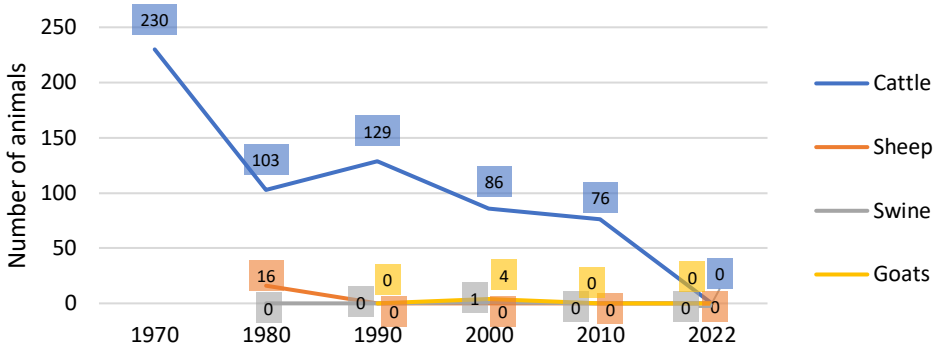
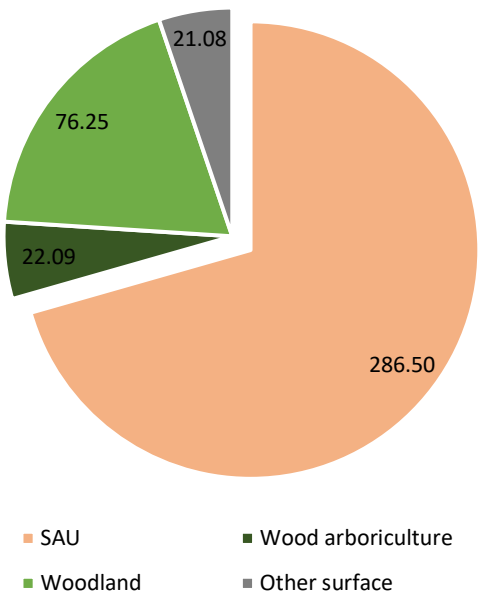
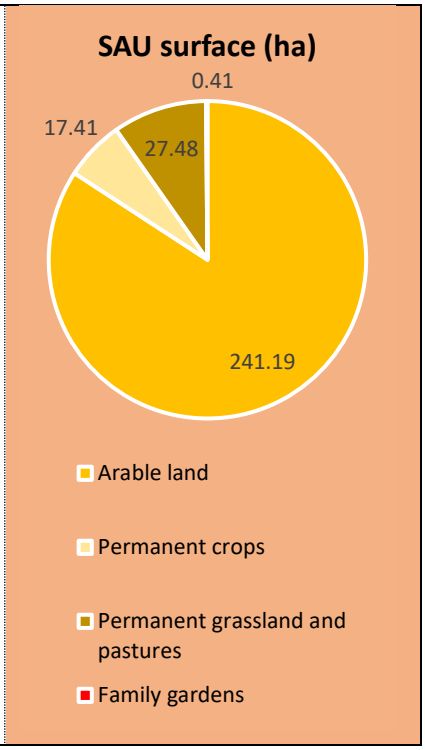
Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

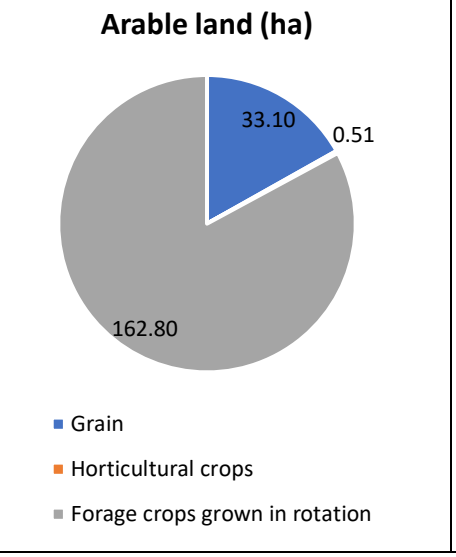
CURRENT SITUATION

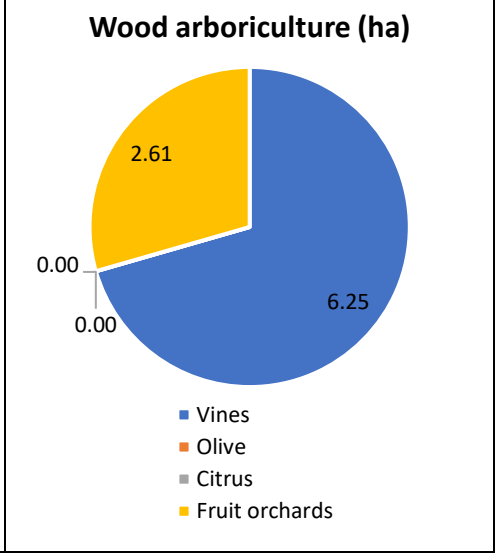
SAT / SAU





Arable land and wood arboriculture





Livestock

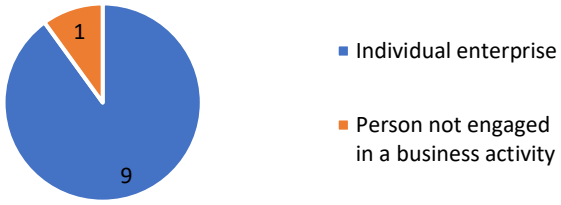
- no livestock

TYPE OF FARMS AND FARMERS

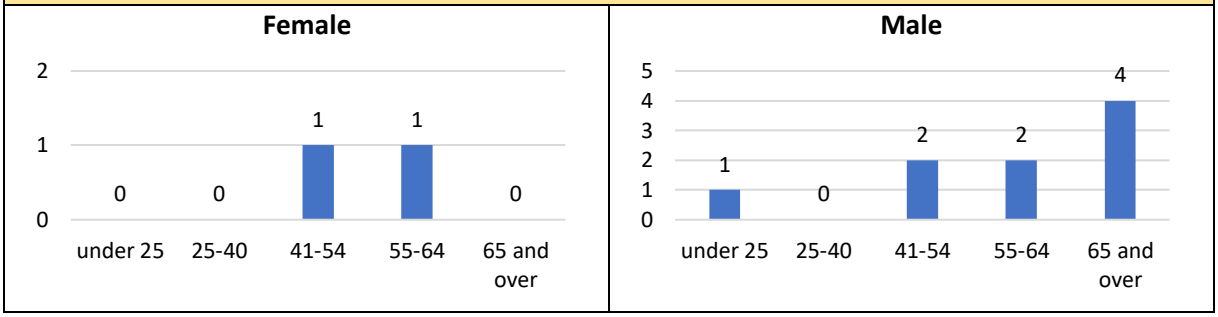
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
10	183.62	10	272.64	1	2

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	1	9	9	0

LEGAL FORM OF FARMS



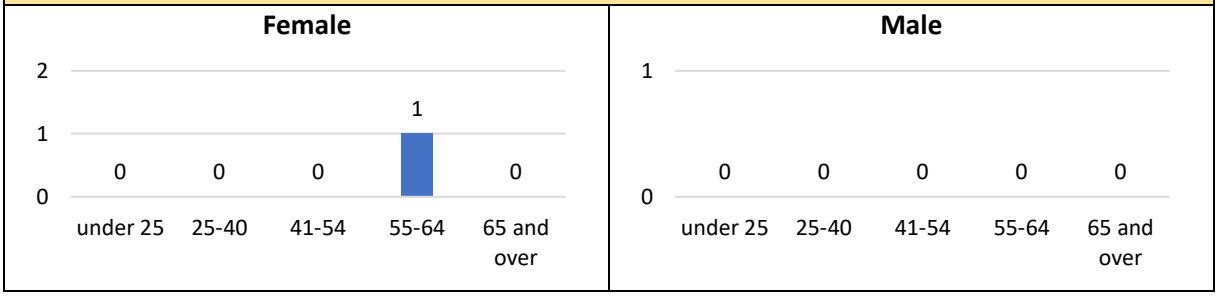
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Equines
Number of farms	1
Number of animals	2

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

The elevation ranges between 208 masl. and 455 masl. The Torrente Grue runs along the south-west border of the municipality.

Geomorphological:

NW: Hilly open landscape with soft slopes. Some steeper slopes towards the river valley. The Rio Carignano runs through this part of the municipality and flows into the Torrente Grue.

NE: The area is characterized by a hilly open landscape with larger areas of woodland and few steeper slopes. The area is quite leveled with elevation only ranging between 250 m.a.s.l. and 370 m.a.s.l.

SE: The area can be described as a open hilly landscape with some steeper slopes to the south along the riverplain. Many smaller stream originate in this steeper slopes flowing into the Rio Polverola that more down the valley in the south-western part of the municipality runs into the Torrente Grue.

SW: The south-wester part has some leveled softer slopes to the north but also some steeper slopes especially to the south. The Rio Polverone flows south-west into the Torrente Curone.

Agricultural land use:

NW: The various present agricultural land uses are: Arable land, large vineyards, fruit orchards, grassland and vegetable gardens. Observed nonagricultural activities is wood production. There are larger patches of woodland especially on the slightly steeper slopes.

NE: Agricultural activities are observed such as arable land, fruit orchards and vegetable gardens. Some non-agricultural activities in the area is the agritourism “il poggio del nonno”. This part of the municipality has some very large plots of vineyards with wineries.

SE: The more northern part of this area shows more agricultural activities such as vineyards, grassland, arable land, fruit orchards and some vegetable gardens. Non-agricultural are the Big Bench as touristic attraction and the observatory. The more southern steeper slopes show little activities such as just smaller plots of arable land, possible farms and dog shelter.

SW: The less steep slopes show various agricultural activities such as vineyards, arable land and fruit orchards. The steeper areas are mostly vegetated with woodland.

Indicators of abandonment:

NW: Secondary or successive vegetation can be seen in-between different fields, mixed in with the woodland and on some arable land. Some former terraces are overgrown or degraded due to abandonment. The general access to the plots with mechanization is granted, but some steeper slopes are hard to reach and have been abandoned. Singular abandoned housing and barns can be observed. The quality of the main roads is of good quality.

NE: The area shows some signs of abandonment. Secondary and successive vegetation can be observed mixed in with the woodland, on certain grassland plots and mostly on some steeper slopes. Some terraces seem to be degraded with signs of landslide/mudslide. There are though some well-maintained structures of natural risk prevention. No abandoned housing or agricultural infrastructure is visible.

SE: The northern part shows few signs of abandonment. Some secondary and successive vegetation can be observed mixed in with woodland and on some abandoned arable land. Most terraces seem to be well maintained though some smaller degradation (one land slide) is present. The more southern area is difficult to access for agricultural activities due to its steepness, therefore various signs of abandonment are visible. The soils does also show degradation and signs of possible land/mud slides. Secondary and successive vegetation is largely spread mixed in with woodland and on former agricultural plots. Terraces are degraded and overgrown, smaller landscape elements such as singular trees, tree lines and hedgerows are not visible anymore due to being overgrown. Overall no abandoned housing or agricultural infrastructure is visible and road structure is of good quality.

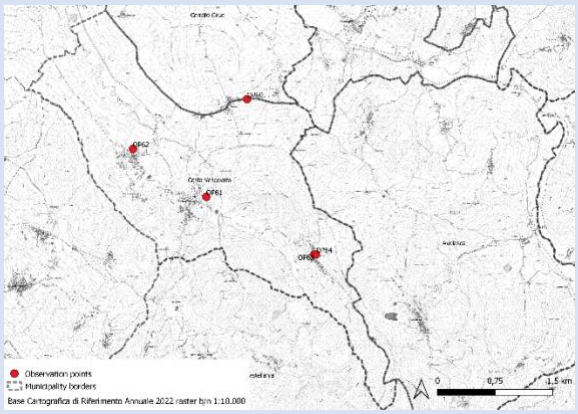
SW: Steeper areas show signs of abandonment. Secondary and successive vegetation is visible and often mixed in with woodland.

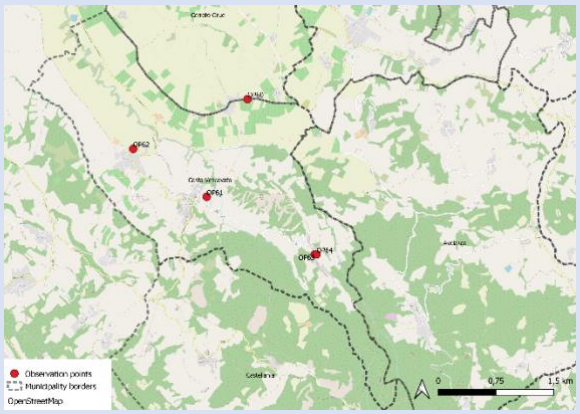
COSTA VESCOVATO

Population	316 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	40 inhabitants/km^2
Surface	7.90 km^2
Average altitude	305 masl.
ISTAT & SNAI classification	Inner hill; Belt

Territorial area		Val Curone, Val Grue, Val Ossona
Hamlets		*Arpicella*, *Costa Vescovato*, *Montale Celli*, *Sarizzola (cursive contain OP)*
Geomorphological features	**Mountains**	Mt. Lisone
	Bodies of water	Torrente Ossona, Rio Granalone, Rio Gambarasco
Number of farms		25
Extra information		Forest pre-school

Field survey observation points	OP60 – OP64
Interviews	Winemaker Farmer





HISTORICAL CENSUS DATA 1970-2022

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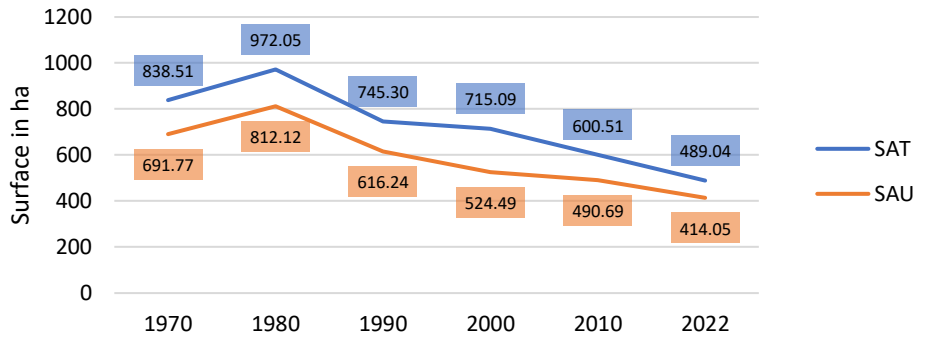

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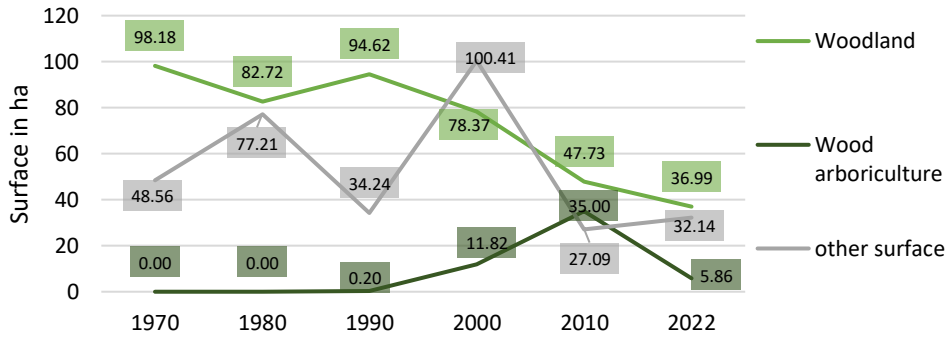
Woodland

Wood arbori-culture

Other surface



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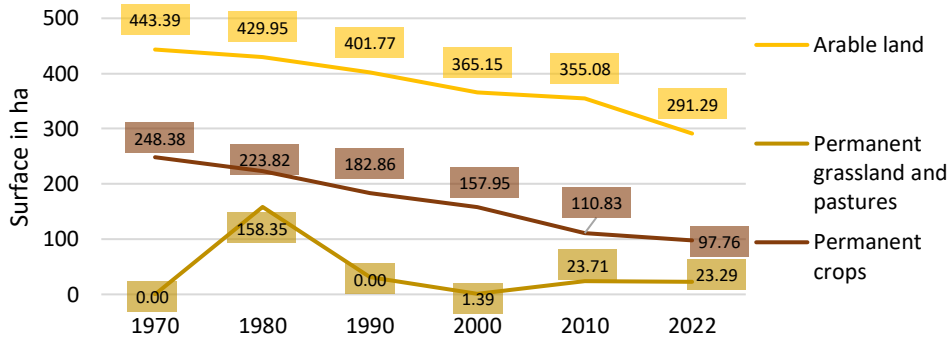

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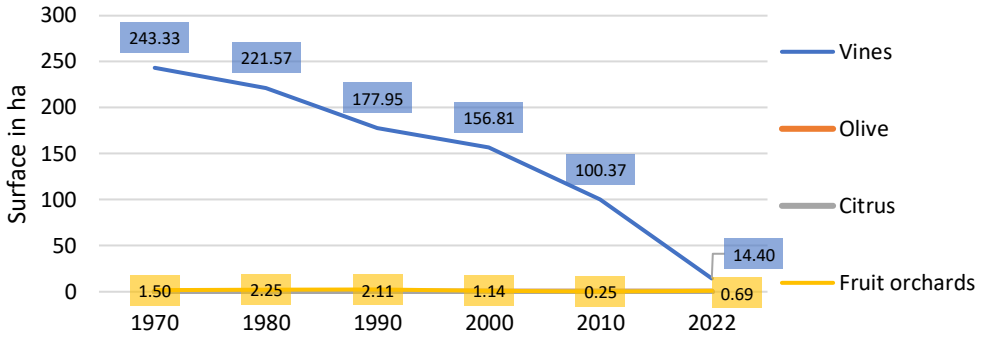
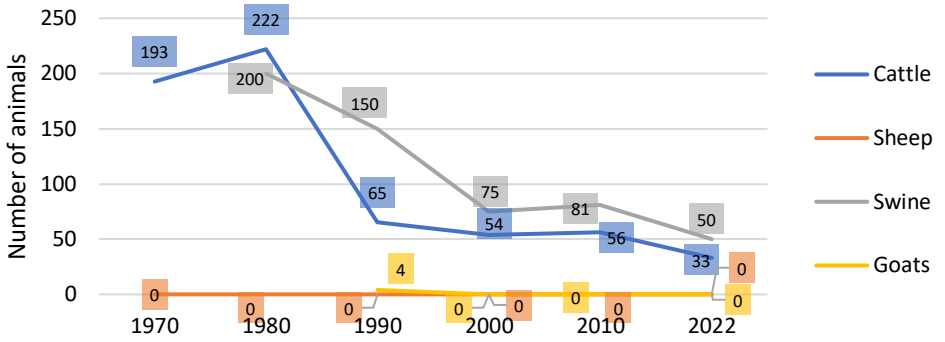
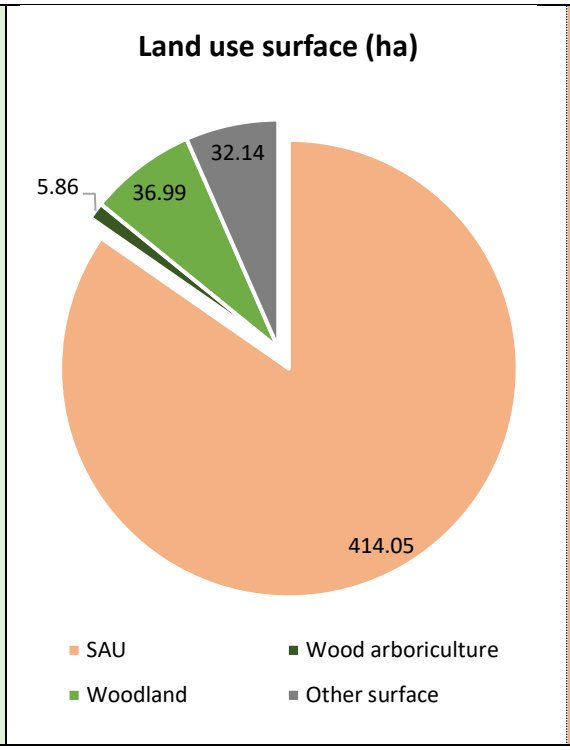
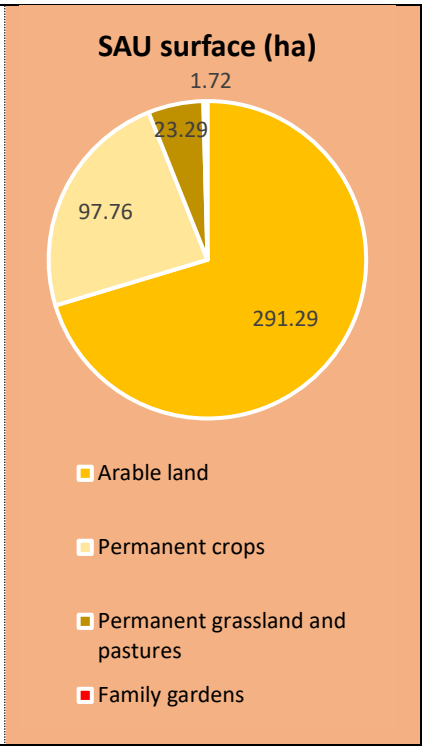
Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

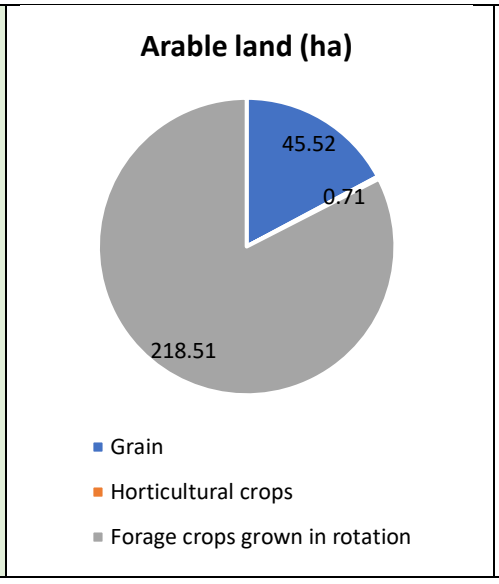
CURRENT SITUATION

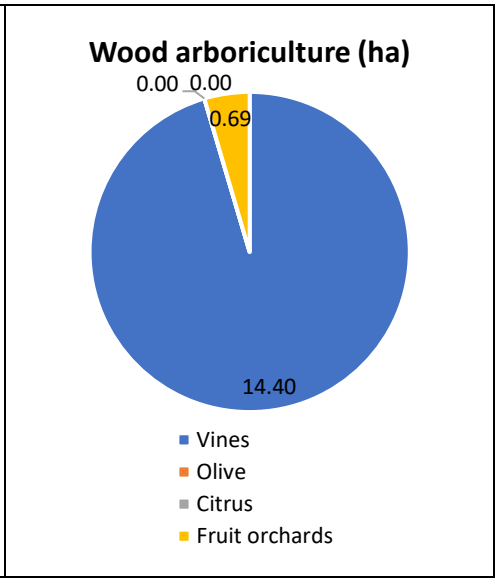
SAT / SAU



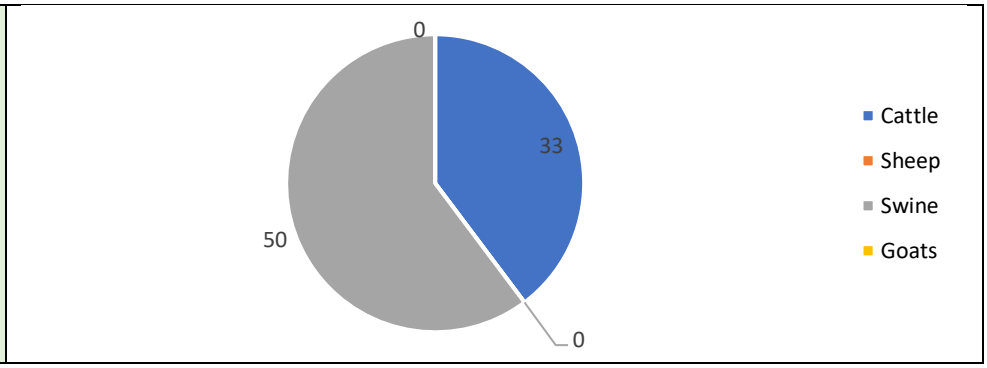


Arable land and wood arboriculture





Livestock

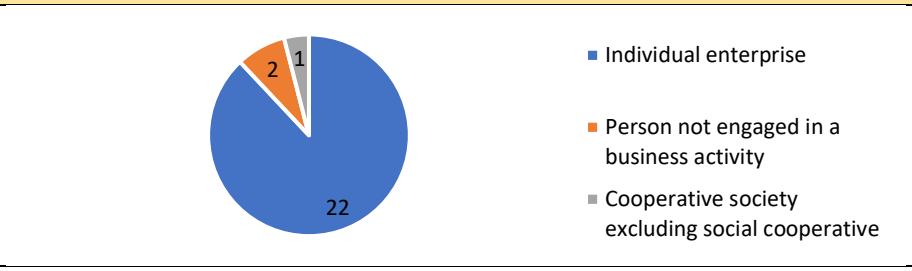


TYPE OF FARMS AND FARMERS

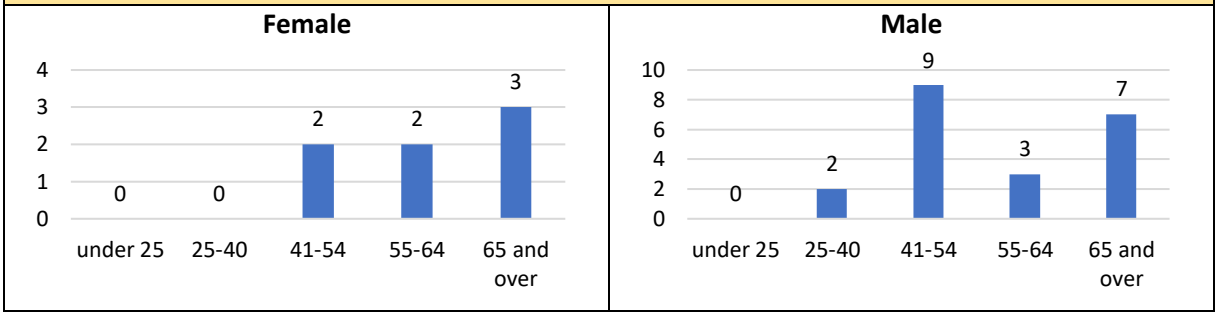
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
25	397.77	25	482.32	3	498

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
8	6	3	20	19	0

LEGAL FORM OF FARMS



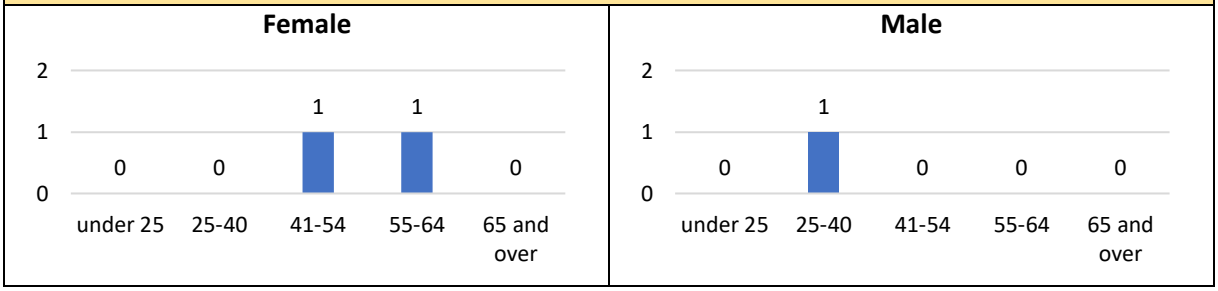
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Cattle and buffaloes	Swine / Pigs	Equines	Other livestock
Number of farms	1	1	1	2
Number of animals	33	50	8	407

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

The municipality is located in the Val Ossona wih the river Ossona running south-east to the north-east part. The municipality has a minimum elevation of 173 masl. and a maximum of 476 masl.

Geomorphological:

NW: The north-western area shows softer hills with less steep slopes. The steepness of the slopes increases going towards the Mt.Lisone to the more eastern part of the municipality. This part shows leveled terrain and plots with elevation only ranging from 180 masl. and 300 masl. The Ossona river runs X→Y through this area.

NE: This part of the municipality is lower in altitude and does also have softer hillslopes. An important geomorphological element is the Mt. Lisone with very steep slopes and degraded soils, that show some signs of possible landslides.

SE: To the south-east the Ossona river has its source in the steeper slopes and this area is on higher altitude. The area is generally characterize through steep slopes with quite degraded soils. These more degraded and steeper slopes show some signs of landslides.

SW: Hilly landscape with some steeper slopes.

Agricultural land use:

NW: The north-western part shows signs of being more cultivated due to being more suitable for agricultural activities due to its less steep slopes. The area shows different land use patches such as fruit orchards, arable land, some smaller vegetable gardens, grassland and larger plots of vineyards.

NE: In the more northern part bigger patches of cultivated land can be seen that are easily accessible with machines. The observed cultivations are fruit orchards, grassland, arable land and mostly vineyards. Going more south towards the Mt. Lisone the slopes become quite steep and therefore smaller and less cultivated plots appear.

SE: Due to its steep slopes this part does have some larger areas of degraded and non-cultivated land. Some smaller plots are cultivated with vineyards, fruit orchards, some arable land and smaller vegetable gardens.

Indicators of abandonment:

NW: This area shows little signs of abandonment due to being largely cultivated. Secondary and successive vegetation can be seen mostly mixed in with wooded areas, along the riverbank and on the plot boarders.

NE: This area shows some smaller signs of abandonment. There is a strong presence of agricultural and non-agricultural activities and terraces are used and well maintained. The plots seem to be easily accessible for mechanization. Some successive and secondary vegetation can be observed in abandoned grassland and mixed with woodlands.

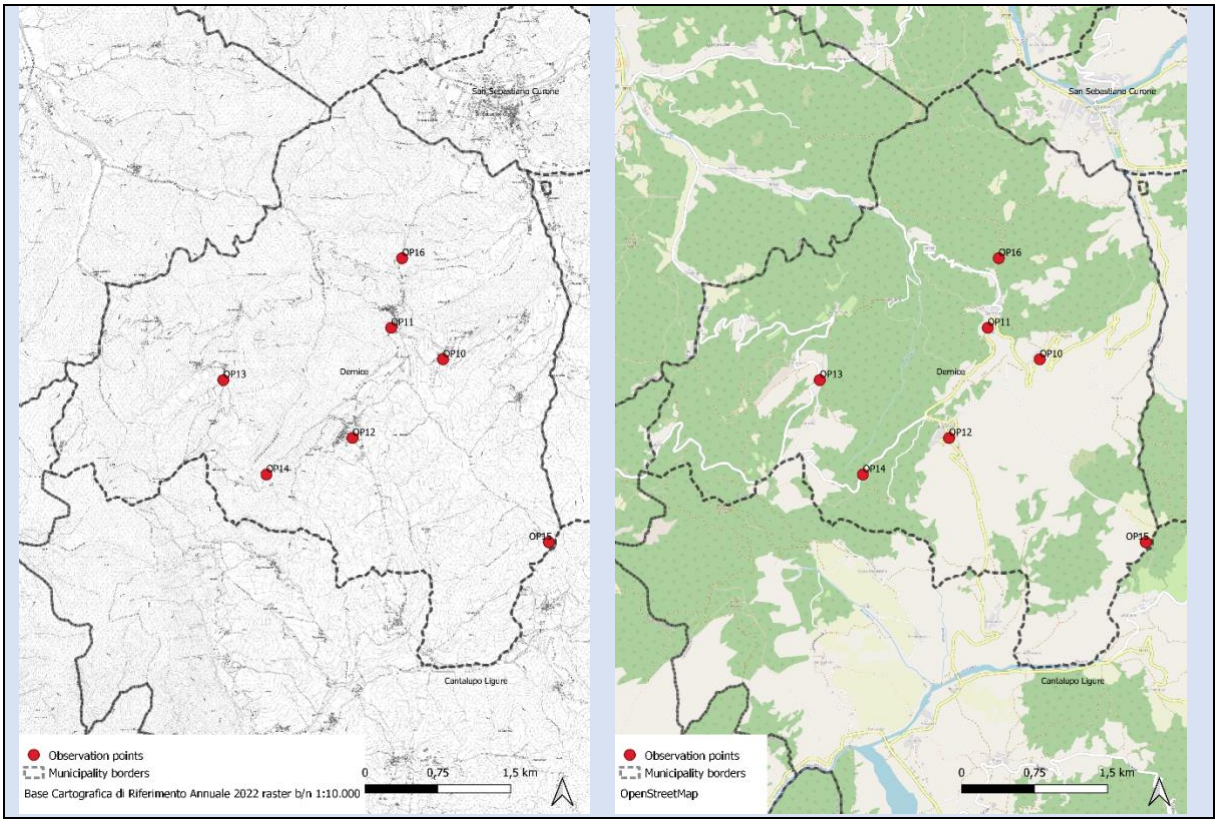
SE: Due to its steep slopes which make the cultivation and tillage of the land more difficult, this area shows some bigger plots that seem to be abandoned and overgrown with secondary vegetation. Some abandoned and overgrown terraces are visible. Secondary/successive vegetation is strongly present and mixed in with the woodland. The mechanical access to these stepper fields might be difficult or not possible at all. Only smaller plots in less steep areas are cultivated, probably done by hand. Abandoned housing is present and the road quality is low.

DERNICE

Population	178 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	9.74 inhabitants/km^2
Surface	18.28 km^2
Average altitude	600 masl.
ISTAT & SNAI classification	Interior hill; Intermediate

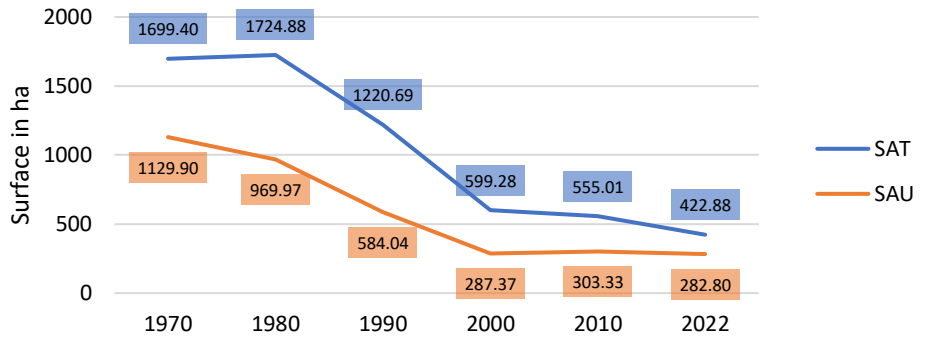
Territorial area		Val Curone, Val Grue, Val Ossona
Hamlets		Aia Del Gallo, Bregni, Ca' Bella, Ca' Di Marco, Campioli, Cascina Bellaria, Cascina Terranera, Casuzza, Caviggino, *Costa di Montebore*, *Dernice*, *Fontanelle,* Grattaie, Gropparo I. & S., Groppo, Montebore, Nicrosia, *Vigana, Vigoponzo,* Zerbe *(cursive contain OP)*
Geomorphological features	**Mountains**	Mt. di Calvadi, Mt. Barillaro, Mt. Croce dell'Alpe, Mt. della Cappelletta, Mt. della Croce, Mt. Moglazza, Mt. Scabella
	Bodies of water	Torrente Grue, Rio della Praghe, Rio Robbia
Number of farms		24

Field survey observation points	OP10 – OP16
Interviews	Farmer Farmer



HISTORICAL CENSUS DATA 1970-2022

SAT / SAU

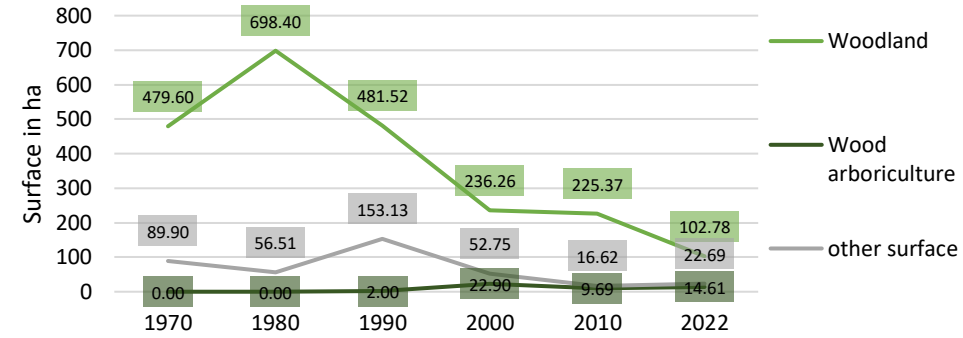


This graph shows the relation between the SAT and the SAU in hectares. The relation is shown from 1970 to the most current data of 2022.

Woodland

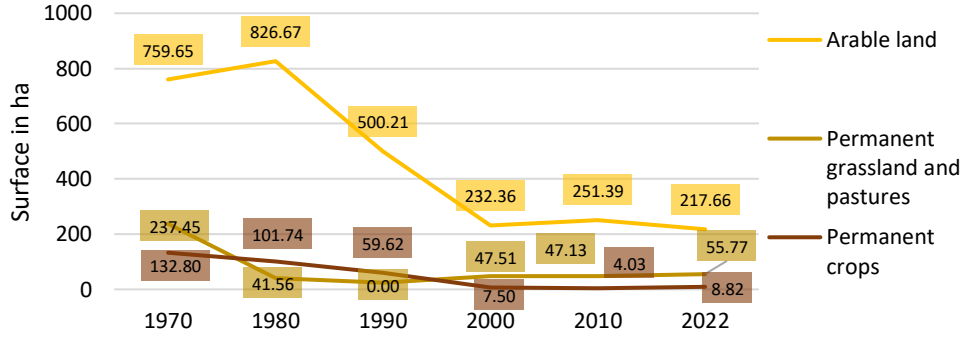
Wood arbori-culture

Other surface

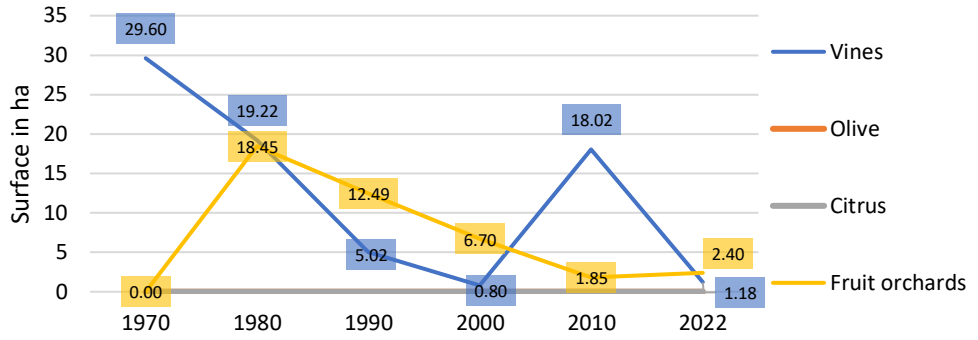
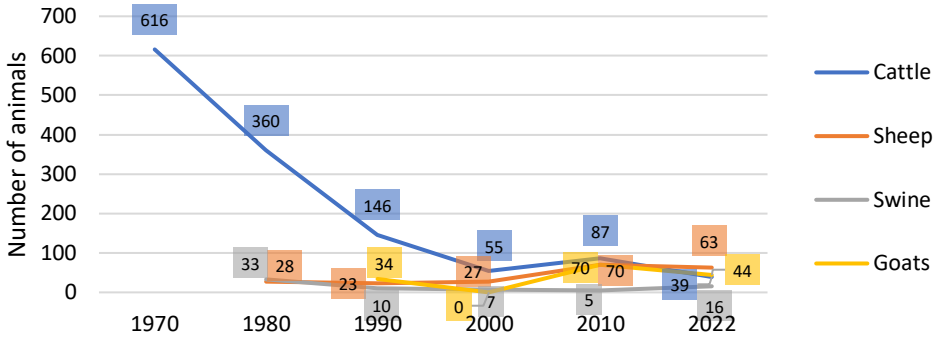


The diagram shows the different categories of the SAT such as woodland, wood arboriculture and other surface, excluding the SAU over the last six decades.

SAU land type

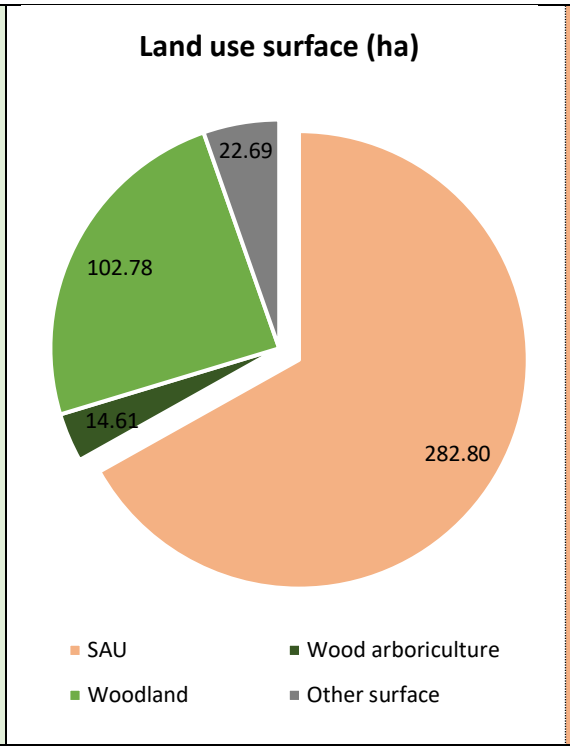


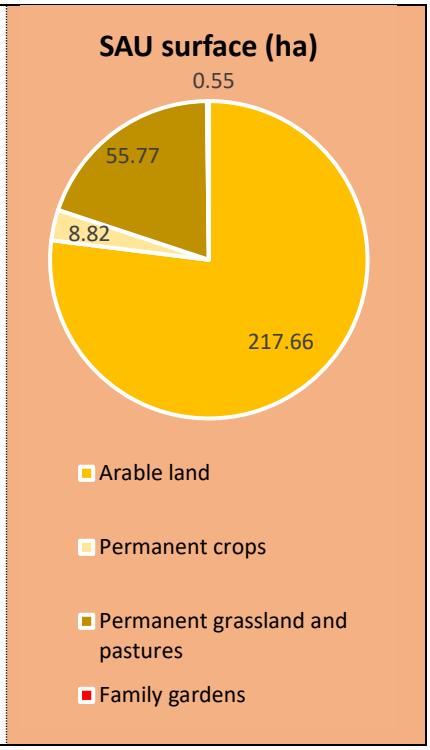
This graph shows the surface development of the different components of the SAU category such as arable land, permanent crops, permanent grassland and pastures.

Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

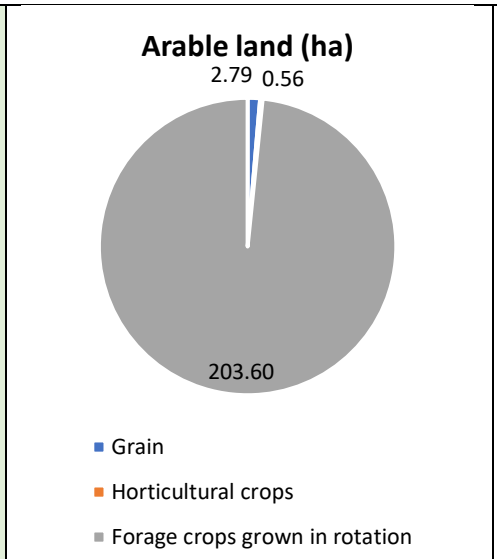
CURRENT SITUATION

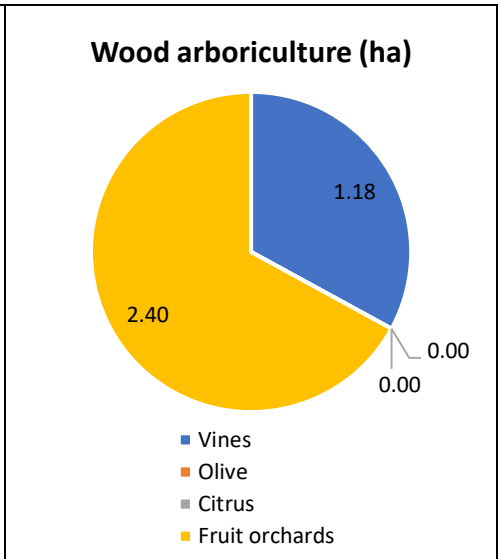
SAT / SAU



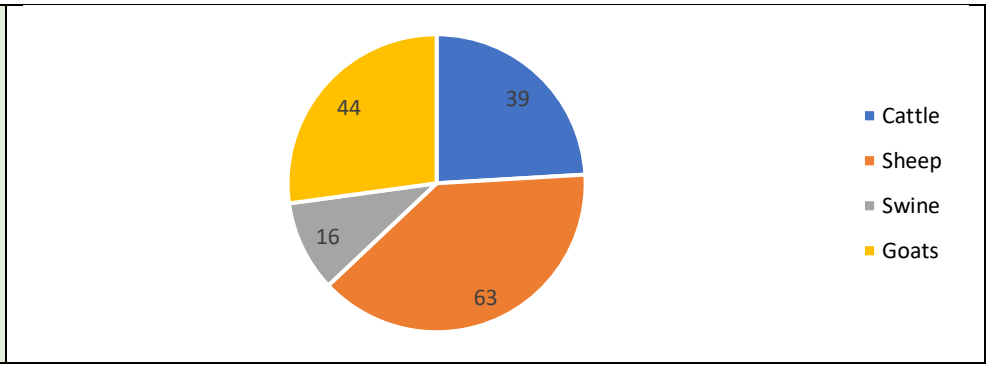


Arable land and wood arboriculture





Livestock

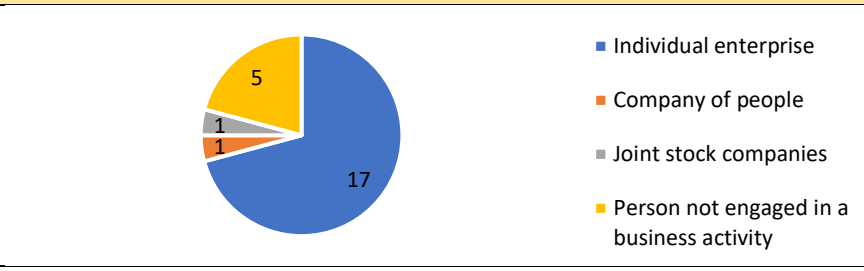


TYPE OF FARMS AND FARMERS

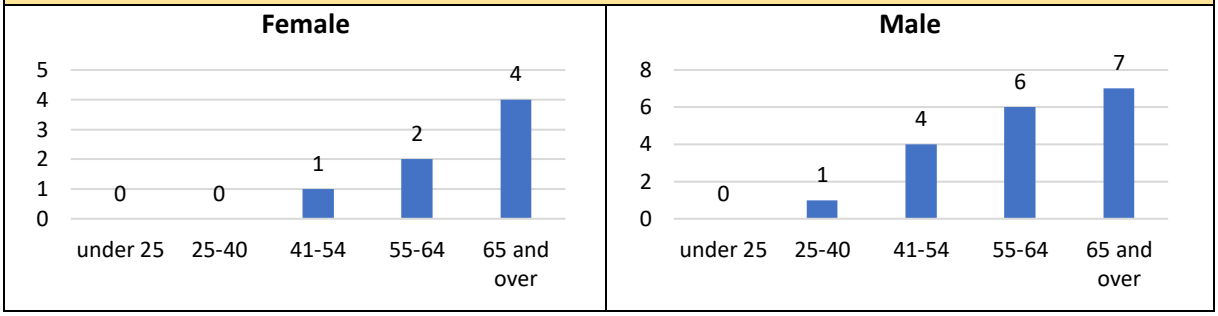
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
24	212.33	24	345.15	7	174

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	1	23	22	6

LEGAL FORM OF FARMS



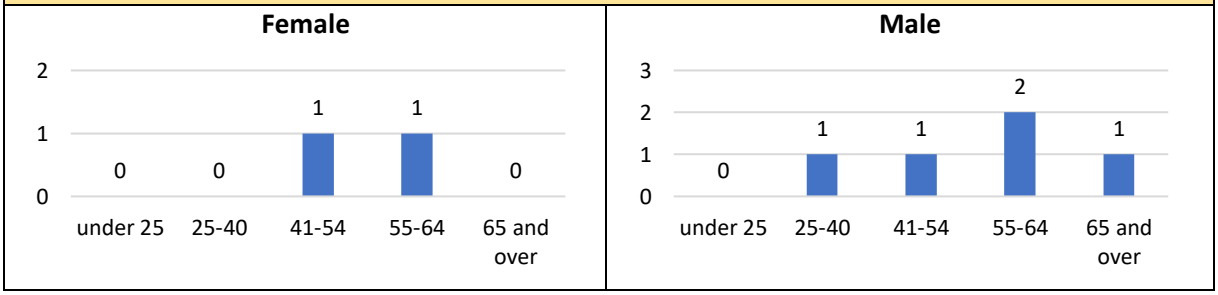
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Cattle and buffaloes	Swine / Pigs	Sheep	Goats	Equines	Other livestock
Number of farms	4	1	3	3	4	1
Number of animals	39	16	63	44	7	5

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

The municipality ranges in elevation between approximately 350 and 780 masl. The Torrente Grue runs through the western part of the municipality.

Geomorphological:

NW: Hilly open landscape with some very steep slopes. To the north-east the Torrente Grue flows through. Some geomorphological elements are the Mt. Rivelta, Mt. Irassa and to the north is the Mt. Croce dell Alpe. The elevation ranges from 350 masl. and 650 masl. To the west some rock formations are visible.

NE: This area shows a hilly landscape with some soft to steeper slopes. Some geomorphological elements are the Mt. Mogiazza, Mt. Scabesa Some streams originated here in the steeper slopes flowing down into the Torrente Arzola.

SE: Hilly landscape with mostly softer hills and few steeper slopes.

SW: Hilly mountainous landscape with some smaller plots with softer hils and some steeper slopes.

Agricultural land use:

NW: The area does not show many signs of agricultural activities. Some arable land is visible. Some non-agricultural activities are the panoramic point “Costa die Montebore”, wood structure for hunting activities and some bigger plots of pine woods for possible wood production.

NE: Agricultural land use observed is grassland for grazing activities or animal feed. Most of the area though is woodland mixed in with secondary and successive vegetation. Not many terraces for agricultural activities are visible. Some farms with livestock/animals, such as horses are present. Some non-agricultural activities are the hiking trails.

SE: Different plots of agricultural activities are visible such as: Arable land, grassland (probably for hay production), some vineyards and vegetable gardens around the settlement of Vigoponzo. Some agricultural farms with agritourism are situated in this area. Some bigger patches of pine and aspen wood and woodpiles can be observed. Hiking trails are present in the area.

SW: Some smaller signs of agricultural activities can be observed: Fences for livestock, sheeps, some arable land and an agricultural farm with an agritourism. Some non-agricultural activities that can be seen are hunting structures and some woodpiles close to the houses.

Indicators of abandonment:

NW: The area shows various signs of abandonment. Secondary or successive vegetation is widely spread especially mixed in with woodland, on former and now abandoned arable land and on steeper slopes. Many former terraces are degraded and also overgrown with vegetation. Small landscape elements such as singular trees, tree lines and hedgerows are enlarged and overgrown. Road structure is of very bad quality. Some abandoned housing and abandoned agricultural infrastructures are visible in the small settlement.

NE: Many former grasslands and terraces seem to be abandoned and overgrown. Secondary and successive vegetation is largely spread with lots of shrubs and bramble. No abandoned housing or agricultural infrastructure is visible. Road structure is often of bad quality, some of them no being asphalted at all. Some plots have difficult access and seem to be abandoned.

SE: Bigger patches of secondary and successive vegetation are visible, especially on steeper slopes and mixed in with woodland. While on steeper slopes agricultural terraces are abandoned and degraded, terraces on more leveled areas are well kept. Some successive vegetation can be seen at the boarders of plots and with some larger hedgerows. Some abandoned housing and barns are present, and road structure is in some parts of very bad quality.

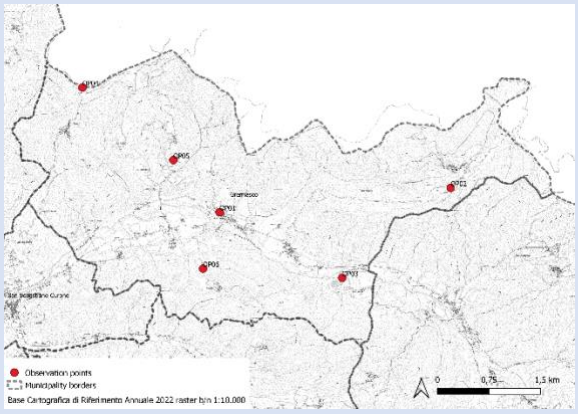
SW: No abandoned housing or agricultural structures can be seen. Secondary and successive vegetation is mixed in with arable land, grassland, in between terraces. And in the lower part of the Grue Valley, abandoned terraces are visible.

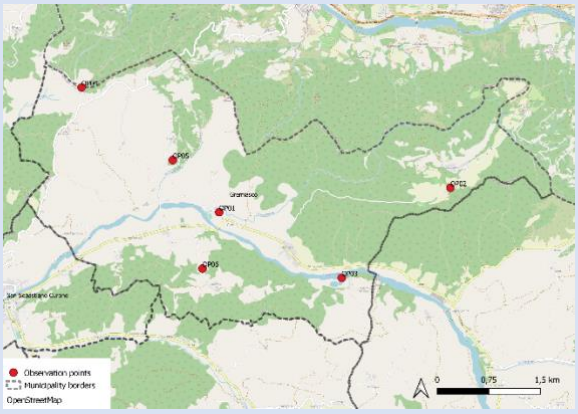
GREMIASCO

Population	280 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	16.11 inhabitants/km^2
Surface	17.38 km^2
Average altitude	400 masl.
ISTAT & SNAI classification	Inner mountain; Intermediate

Territorial area		Val Curone, Val Grue, Val Ossona
Hamlets		Casotto, *Castagnola*, *Codevico*, Colombassi *Gremiasco*, *Musigliano*, Principessa, Ronco *(cursive contain OP)*
Geomorphological features	**Mountains**	Mt. dei Cogni, Mt. Casso, Mt. Pisello, Mt. Pianasso, Mt. Sigretta, Mt. Boscogrande, Bric del Busone, Bric Dorsa, Mt. Latino, Mt. Curlo, Mt. Vaccarezza, Mt. Bruni, Mt. D'Imbroga
	Bodies of water	Torrente Curone, Torrente Dorbida, Rio di Codevico
Number of farms		21
Extra information		Laghi della malvista, Planetario e Osservatorio Astronomico Cà del Monte

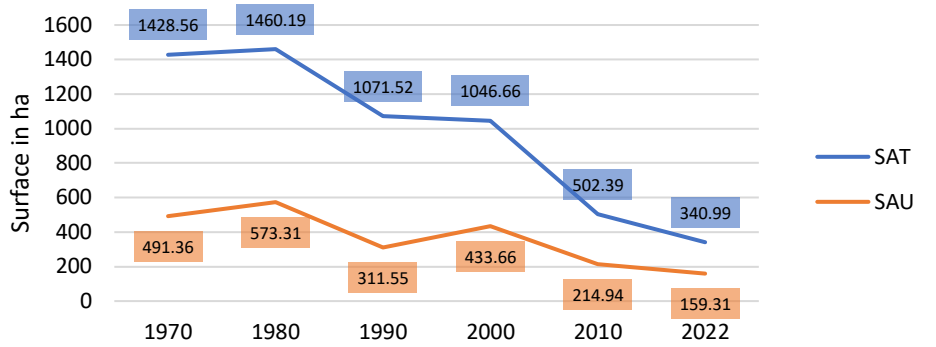
Field survey observation points	OP01 – OP06
Interviews	Livestock farmer Livestock farmer





HISTORICAL CENSUS DATA 1970-2022

SAT / SAU

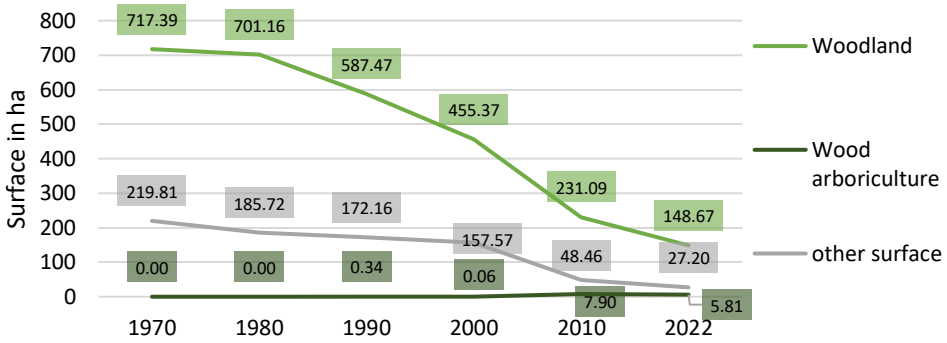


This graph shows the relation between the SAT and the SAU in hectares. The relation is shown from 1970 to the most current data of 2022.

Woodland

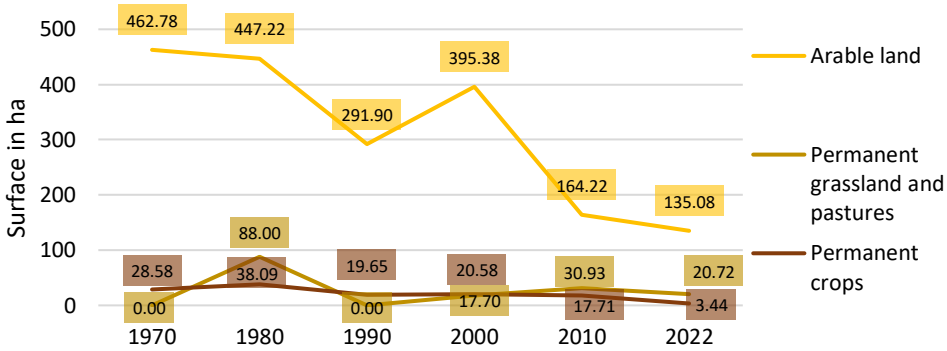
Wood arbori-culture

Other surface

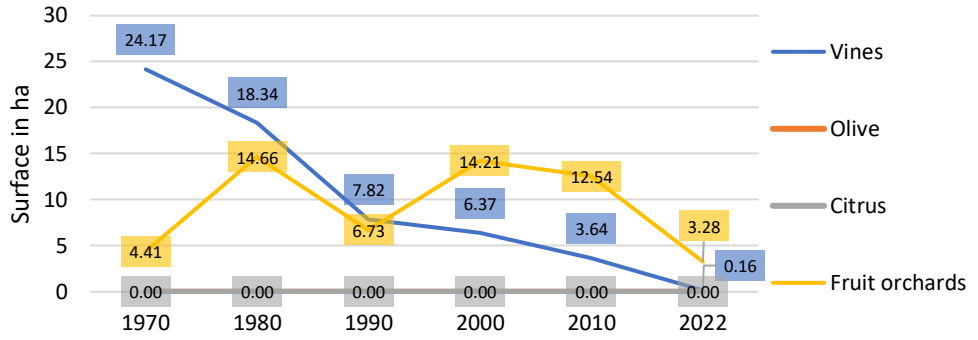
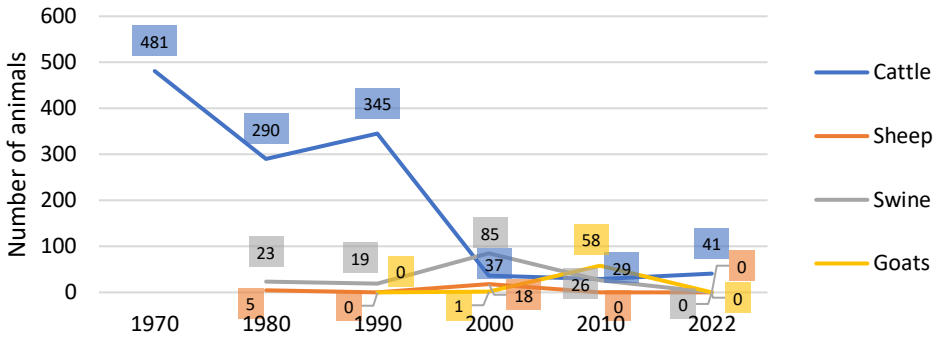


The diagram shows the different categories of the SAT such as woodland, wood arboriculture and other surface, excluding the SAU over the last six decades.

SAU land type

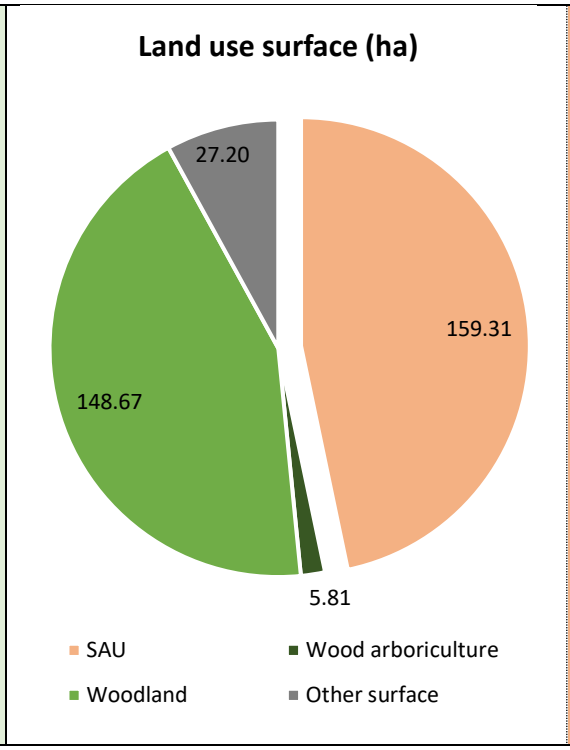


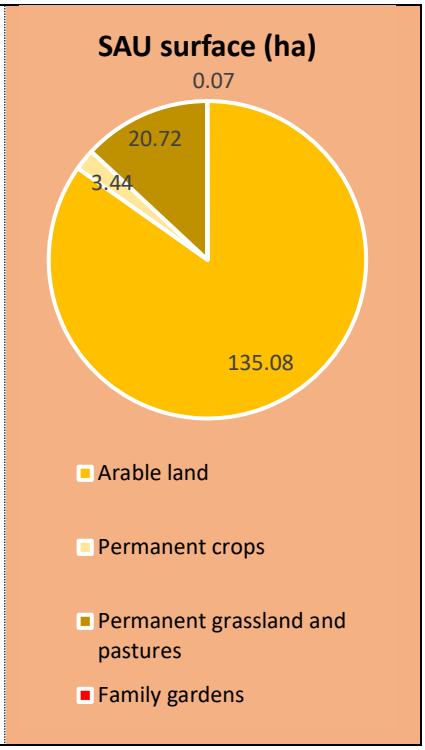
This graph shows the surface development of the different components of the SAU category such as arable land, permanent crops, permanent grassland and pastures.

Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

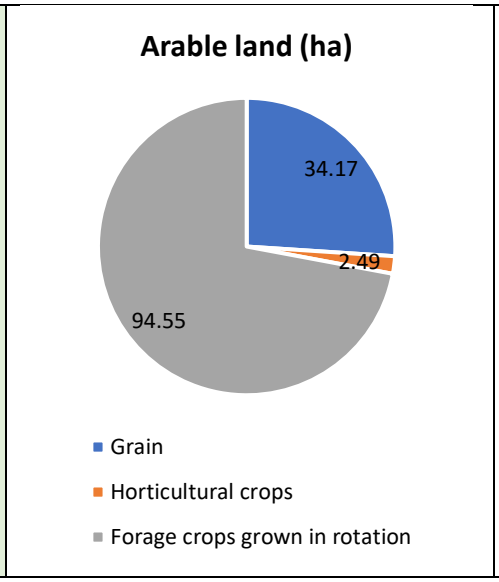
CURRENT SITUATION

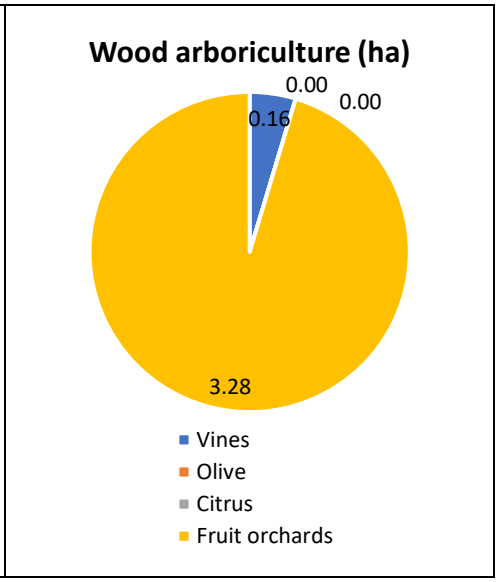
SAT / SAU



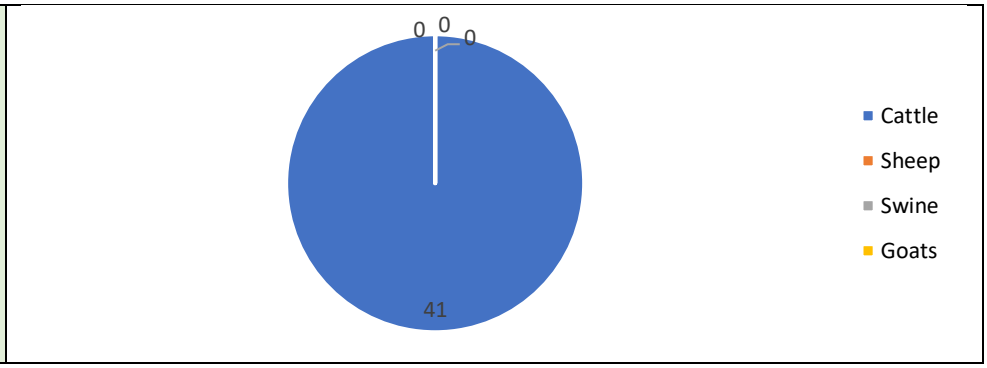


Arable land and wood arboriculture





Livestock

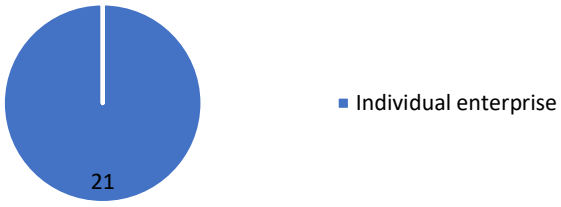


TYPE OF FARMS AND FARMERS

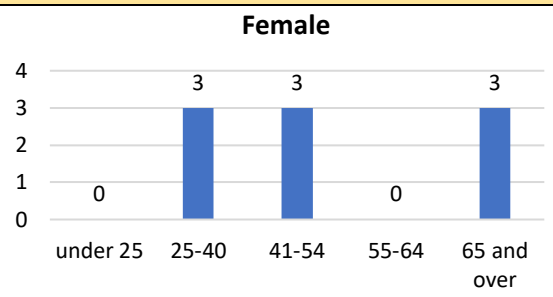
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
21	226.76	21	428.29	7	740

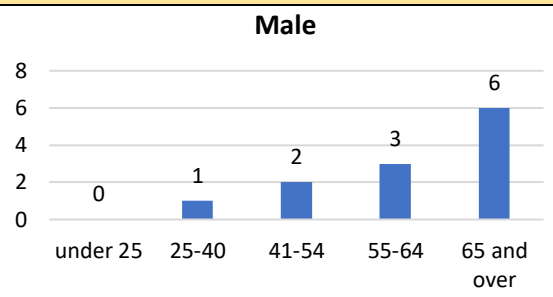
Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	2	19	19	5

LEGAL FORM OF FARMS



AGE OF FARMERS

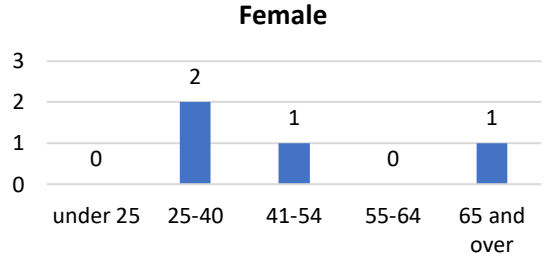


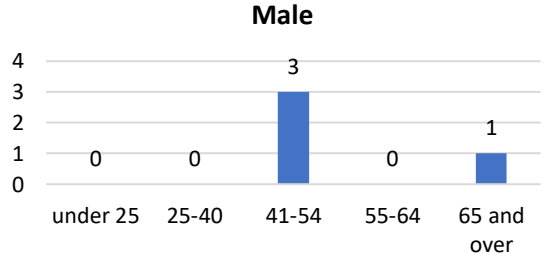


FARMS WITH LIVESTOCK

	Cattle and buffaloes	Swine / Pigs	Birds	Equines	Other livestock
Number of farms	3	1	1	3	2
Number of animals	41	0	550	5	375

AGE OF FARMERS WITH LIVESTOCK





FIELD SURVEY

This municipality is situated in the Val Curone. The river Curone runs from the south-east to the south-west of the valley. The elevation varies between 400 and 700 masl.

Geomorphological:

NW: This area is characterized by a just slightly hilly open landscape. This municipality is situated at lower elevation with more steeper areas only reaching between 600 to 700 masl. such as the Mt. Vaccarezza and Piso di Caiella.

NE: This part has some less steep plains that are very cultivated as well as some steep slopes in the more northern part with geomorphological elements like the Mt. Curlo, Mt.Bruni. The Torrente Dorbida originates in this part and lower down the valley flows into the Torrente Curone.

SE: In this area the River Curone runs SE to SW through the Curone valley creating an large riverbed on the alluvial plane. To the north and south steeper slopes lead to the various mountains such as the Mt. Pisello, Bric del Pusone to the north and the Mt. Sigretta in the south. The valley floor and therefore more suitable area for agricultural purposes is more narrow in this part of the municipality compared to the more western part.

SW: The valley plain in the western part of the municipality is larger and offers therefore more possibilities for agricultural land uses. Some leveled bigger plots of land appear along the slopes. At the same time some very steep slopes are present belonging and leading up to the Mt. de Cogni, Mt. Pianasso and Mt. Casso. The Torrente Curone runs in western direction along the Curone Valley.

Agricultural land use:

NW: Different types of agricultural land use can be observed. Mostly arable land and grassland are present. On steeper areas woodland is largely spread often mixed in with secondary vegetation.

NE: On the flatter parts some different types of agricultural activities are practiced. Grassland on the terraced slopes, vegetable gardens around the settlement of Castagnola, arable land and patches of fruit orchards and even vineyards can be observed. The more steeper slopes though have been abandoned and woodland mixed with secondary vegetation has taken over.

SE: The area shows mostly signs of recreational and non-agricultural activities. Few smaller grassland plots are observed. A big and new recreational park called “laghi della malvista” with artificial lakes, playgrounds and grilling area is situated close to the Curone River between the villages of Colombassi and Castello. The steeper slopes are mostly covered by woodland with some pinewood patches in-

between. The alluvial stone accumulation seems to be used for some construction or industrial purposes.

SW: Different land use plots can be observed. Grassland, smaller vineyards and prominently arable land is visible. Most plots on the riverplain and on the more leveled areas on the side of the slope are well maintained and terraces are in good conditions. The steeper slopes are covered with secondary and successive vegetation mostly mixed in with woodland. Some larger plots of pine wood trees can be seen.

Indicators of abandonment:

NW: The area shows some signs of abandonment. Secondary and successive vegetation is largely spread especially on steeper slopes. Some of those slopes though show some poor quality and degradation of the soil with some signs of possible land and mud slides. The secondary vegetation is mixed in with woodlands and on the boarder of field plots by also enlarging former small landscape elements such as tree lines and hedgerows into big patches of mixed vegetation. Terraces are mostly well kept but overgrown and degraded in places of abandonment where secondary vegetation has taken over.

NE: Secondary and successive vegetation is largely present on the steeper slopes. On those higher steeper slopes some abandoned, degraded and overgrown terraces can be observed. Small landscape elements such as tree lines and hedgerows are enlarged by successive vegetation. The mixed woodland with pine, chestnut and oak trees is in a high state of abandonment. Some abandoned housing is present in the settlement.

SE: The valley plain seems to be well kept through new installations such as the recreational park a new bridge and the river management with new stone walls. Signs of abandonment are very small and no abandoned infrastructure is observed. The steeper slopes on the other hand have widespread secondary and successive vegetation mixed in with the woodland. No major agricultural activities or terraces are visible. The steeper slopes have some degraded soils with signs of possible land or mud slides.

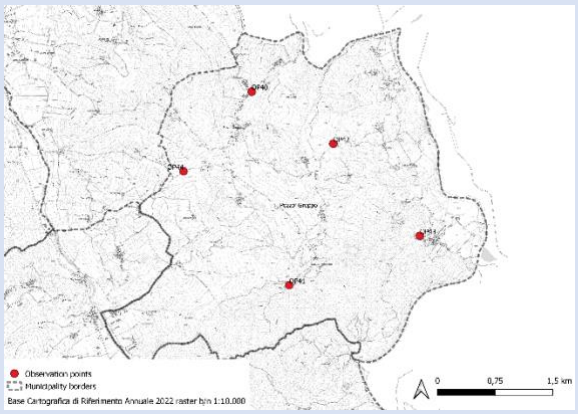
SW: The steeper slopes show abandonment. Access with mechanization and agricultural activities are also due to the poor quality of the soils are difficult. The asphalted roads leading up are of very poor quality. Therefore vast areas, including some existing terraces are overgrown with secondary and successive vegetation. On the steeper slopes as well as in the more leveled valley overgrown tree lines and hedgerows can be observed.

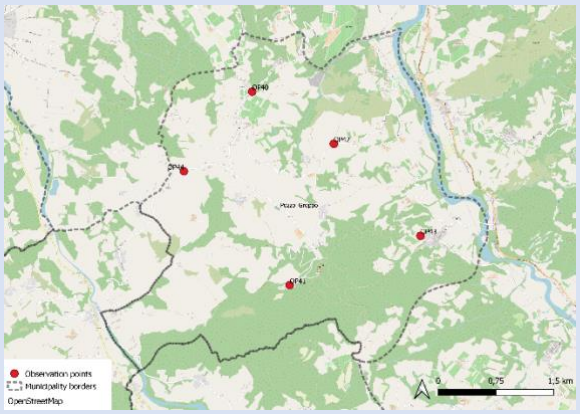
POZZOL GROPPO

Population	295 inhabitants (from tuttiitalia.it, as of 01.01.23)
Population density	20.49 inhabitants/km^2
Surface	14.09 km^2
Average altitude	369 masl.
ISTAT & SNAI classification	Interior hill; Belt

Territorial area		Val Curone, Val Grue, Val Ossona
Hamlets		*Biagasco,* Casa d'Andrino, Casa Franchini, *Casa Lucchi,* Monastero, Montemeriano, *Monticelli,* Osteria Nuova, *Pozzol Groppo*, San Lorenzo *(cursive contain OP)*
Geomorphological features	**Mountains**	M. Brienzone
	Bodies of water	Torrente Curone, Torrente Stàffora, Rio Serena
Number of farms		27
Extra information		Castello di Pozzol Groppo, Big Bench n°172

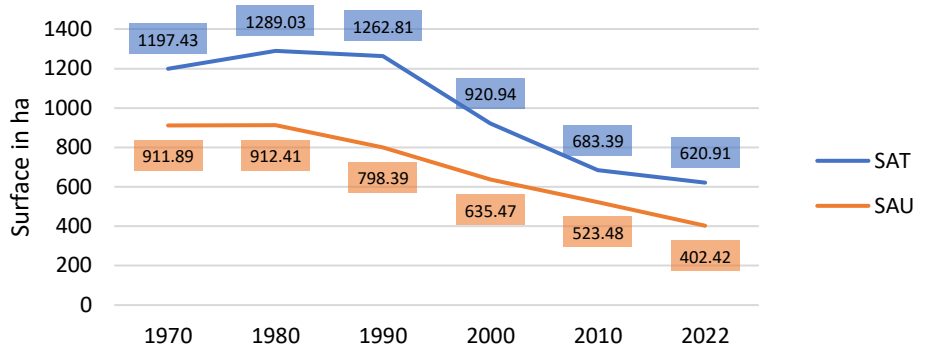
Field survey observation points	OP40 – OP44
Interviews	Winemaker Farmer





HISTORICAL CENSUS DATA 1970-2022

SAT / SAU

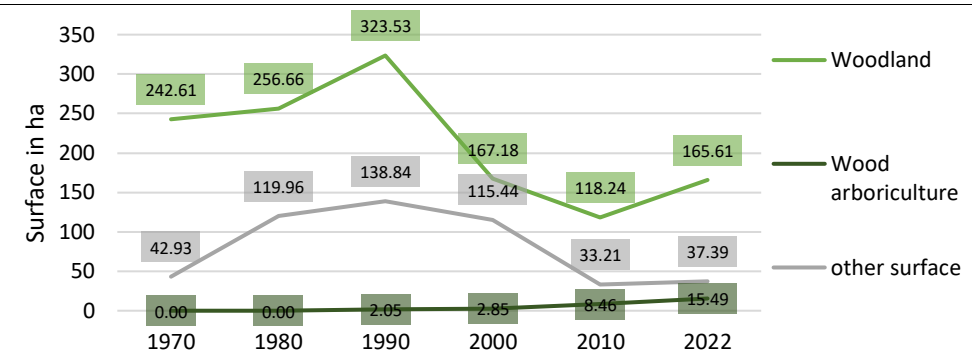


This graph shows the relation between the SAT and the SAU in hectares. The relation is shown from 1970 to the most current data of 2022.

Woodland

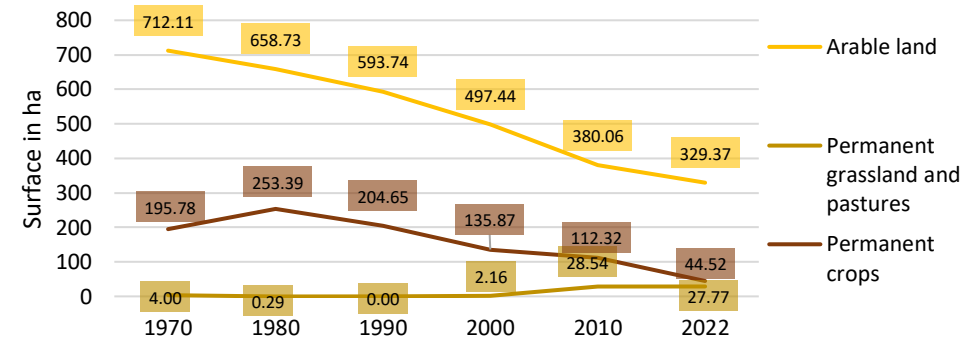
Wood arbori-culture

Other surface

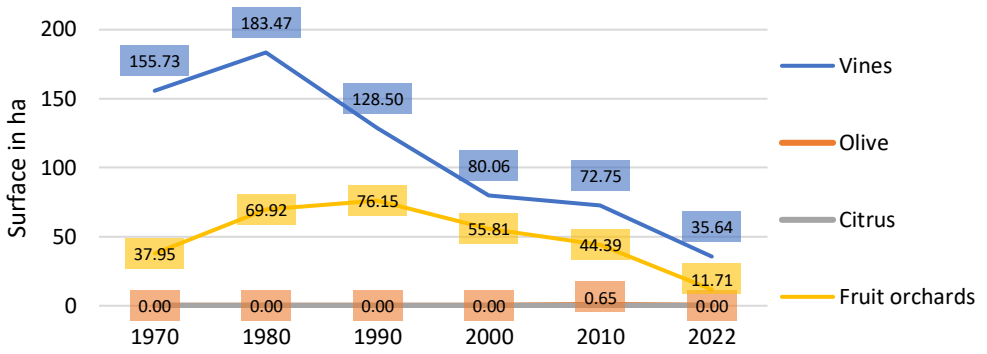
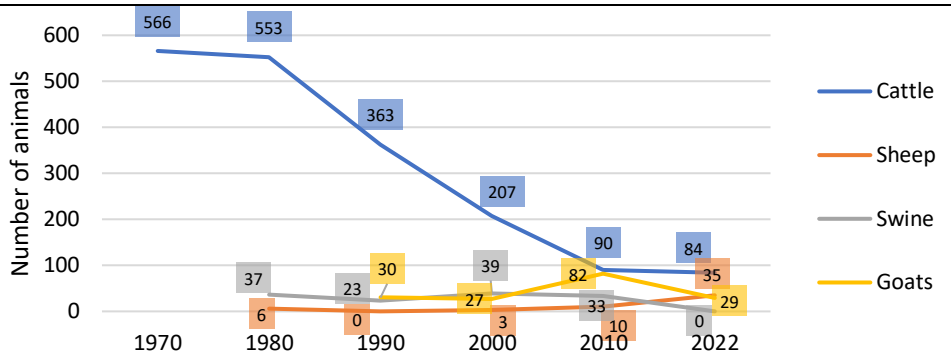


The diagram shows the different categories of the SAT such as woodland, wood arboriculture and other surface, excluding the SAU over the last six decades.

SAU land type

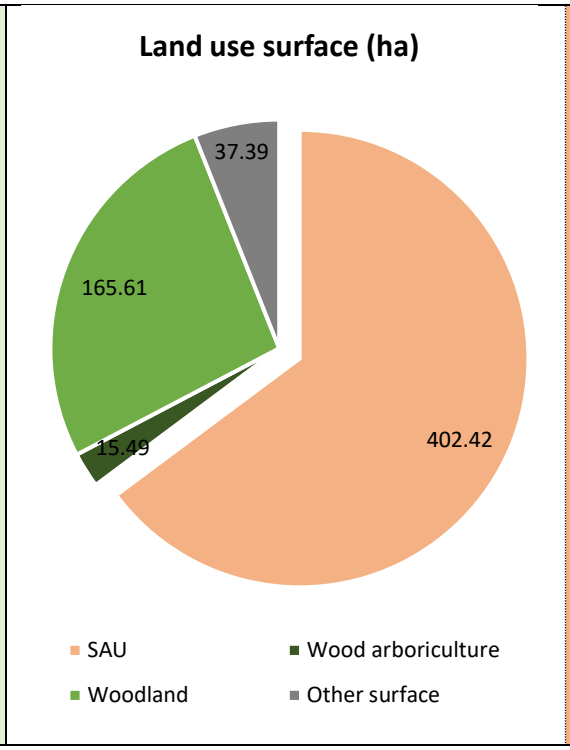


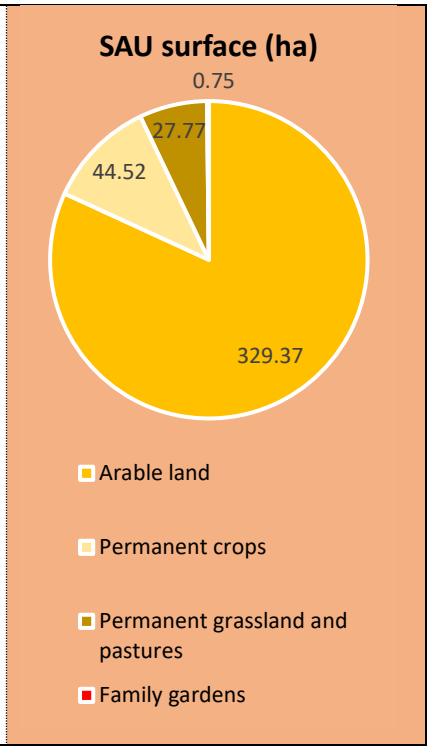
This graph shows the surface development of the different components of the SAU category such as arable land, permanent crops, permanent grassland and pastures.

Agri-cultural woody crops	 The diagram shows the change in surface of sub-categories of the agricultural woody crops such as vines, olive, citrus and fruit orchards from 1970 to 2022.
Livestock	 This diagram shows the development trajectory of livestock farming, specifically the main categories of cattle, sheep, swine and goats.

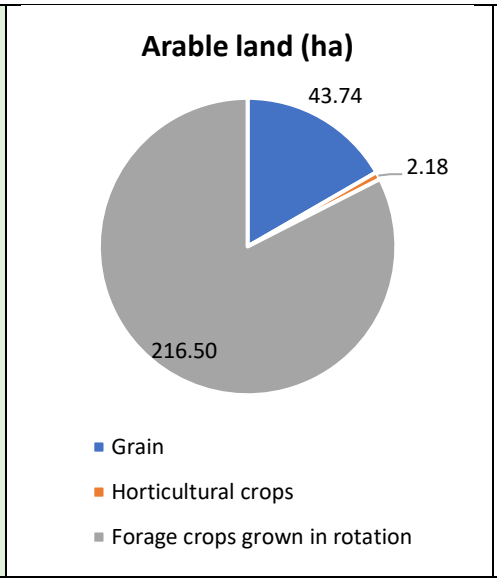
CURRENT SITUATION

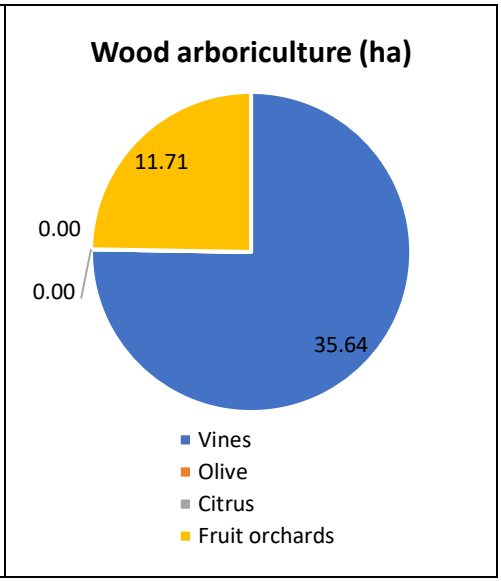
SAT / SAU



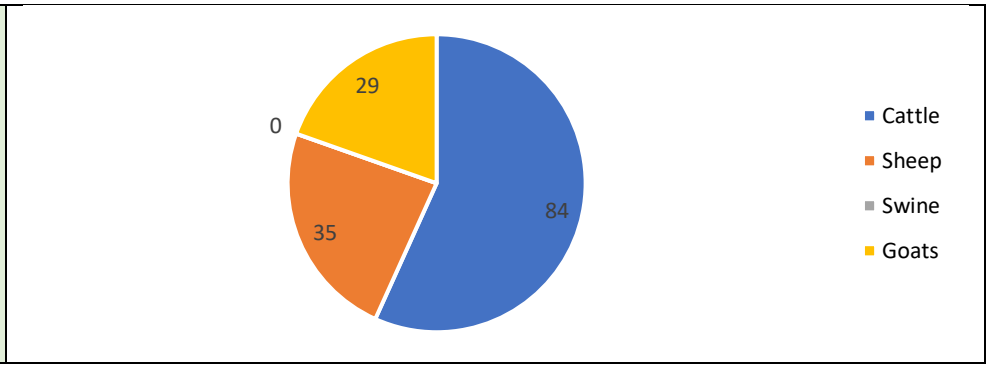


Arable land and wood arboriculture





Livestock

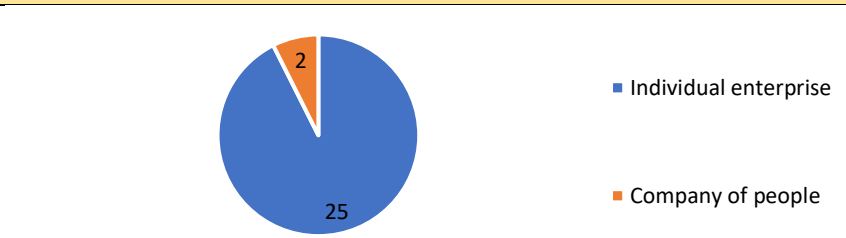


TYPE OF FARMS AND FARMERS

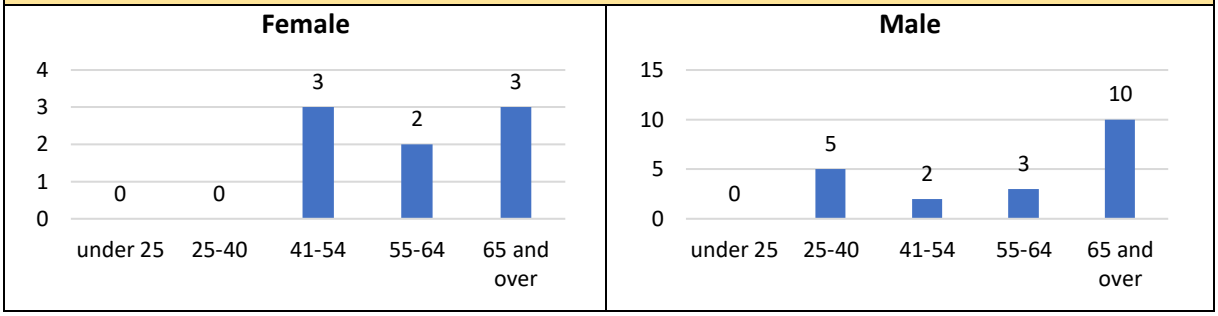
Farms with SAU (n.)	SAU (ha)	Farms with land (n.)	Total surface (ha)	Farms with livestock (n.)	Animals (n.)
27	297.64	27	391.90	8	227

Organic farms total	Organic farms with SAU	Organic farms with livestock	Non-organic farms total	Non-organic farms with SAU	Non-organic farms with livestock
2	2	1	26	25	7

LEGAL FORM OF FARMS



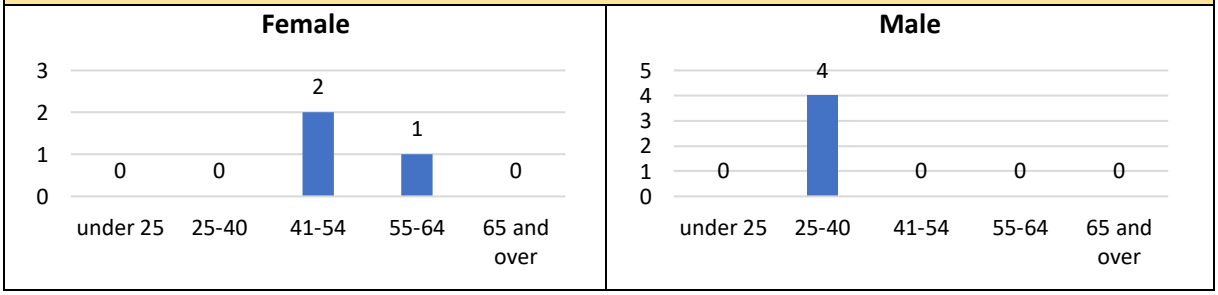
AGE OF FARMERS



FARMS WITH LIVESTOCK

	Cattle and buffaloes	Sheep	Goats	Birds	Equines	Other livestock
Number of farms	5	1	4	1	6	1
Number of animals	84	35	29	11	47	101

AGE OF FARMERS WITH LIVESTOCK



FIELD SURVEY

This municipalities' altitude ranges from 200 masl. to 500 masl. The Torrente Curone flows through the south-western part.

Geomorphological:

NW: Slightly hilly landscape with soft slopes.

NE: Hilly open landscape with soft slopes. On the north-eastern part the Torrente Stàffora runs X-Y also representing the end of the municipality and the border between piedmont and neighboring region Lombardy. The area is quite leveled with no significant higher altitudes or hills/mountains.

SE: Hilly landscape with some steeper slopes in the wooded area and in the valley. This part of the municipality is has a very large wooded areas without any access roads.

SW: Hilly open landscape with very soft slopes. In the most south-western part the Torrente Curone flows through the municipality. Some slightly steeper slopes can be found to the south where the area is mostly woodland.

Agricultural land use:

NW: Different plots of agricultural land use can be observed: Vineyards, fruit orchards, grassland, arable land and some stables with livestock such as cows. The majority of terraces are well maintained. There are clearly visible passages with dirt roads giving access to the fields. Some non-agricultural activities are horse riding structures and the "Big Bench", which is the installation of a outsized Bench on a panoramic outlook to support local communities but mostly attract tourism.

NE: Different agricultural land use activities are present in the area. Vineyards, arable land and fruit orchards are visible.

SE: Some plots with agricultural land use are present, mostly in vicinity of the settlements of Biagasco and Pozzol Groppo such as grassland and some cows and possible recreational activity with horses. The few visible terraces are well maintained. A really large part of those area is covered with woodland.

SW: The is presence of various agricultural activities such as vineyards, vast plots of arable land, fruit orchards and some nut trees. Small woodpiles/wood productions can be seen. The largely wooded area is compromised by oak trees, some poplar trees and mixed woodland merged with secondary and successive vegetation. Clear passages between the agricultural plots are visible. Not many terraces are present but all of them well maintained.

Indicators of abandonment:

NW: Secondary and successive vegetation is present in few places such as some arable land plots, mixed in with some wooded areas, on some more steeper slopes and along the river/stream. No abandoned housing or agricultural infrastructure can be observed. The few visible terraces seem to be well maintained. Road structure is of good quality and there is access for mechanization to the different plots.

NE: The area shows only minor signs of abandonment. Some secondary and successive vegetation can be seen sparsely on some slightly steeper areas and mixed in with woodland. Some degraded soils can be observed. The road structure is of good quality and no abandoned housing or agricultural infrastructure is present.

SE: Secondary vegetation can be observed mixed in with the woodland where also some patches of degraded or poor soils are present. Abandoned housing or agricultural infrastructures cannot be seen. The road structure is of good quality.

SW: Secondary and successive vegetation is observed only mixed in with the woodland and on steeper slopes. No abandoned housing or agricultural infrastructure are present. Road structure is of good quality.