

Extensive grazing as a tool for building
socio-ecological resilience in fire-prone
territories:
Insights from The Valencian Region, Spain

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Abstract

Wildfires are part of the socio-ecological history of fire-prone territories such as Mediterranean Europe. However, during the last decades, the increasing severity of wildfires due to socio-environmental factors have revealed the vulnerability of these socio-ecological systems (SESs) in the face of global environmental change, revealing the need to increase resilience in the face of wildfires. In contrast to the well established wildfire suppression policies, which in the long term have resulted in fuel build-up and larger wildfires, increasing literature suggest focussing on wildfire prevention. Among the potential measures, fostering extensive grazing is on strategy that is gaining visibility in fire-prone territories such as Spain, where the activity has been traditionally carried out but currently is showing an abandonment tendency. Widespread research has been done on the ecological function that extensive grazing has in preventing wildfires by regulating the structure and composition of the vegetation. However, little is known about how, from a socio-politically perspective, this activity contributes to build socio-ecological resilience (SER). Therefore, this study aims to contribute to shorten this knowledge gap by exploring the highly fire-prone region of Valencia (Spain), examining the socio-ecological aspects of extensive grazing using the SES framework as a starting point, analysing the interactions between its coupled social and ecological dimensions, and exploring how extensive grazing contributes to the construction of SER in the face of wildfires by applying a socio-politically sensitive framework. To do so, a qualitative approach was followed, and the information was gathered through both literature review and interviews. The findings of this investigation evidence that extensive grazing contributes in several aspects to socio-ecological resilience in the face of wildfires in the study area. Due to its territorial importance, the development of a governance system that foster extensive grazing to contribute to wildfire prevention has been promoted. However, an inclusive governance structure for the involvement and participation of rural actors, such as extensive herders is still lacking. Nevertheless, local initiatives have managed to position themselves in the territory to demonstrate the work of extensive grazing and its importance for the SES, building SER through its intervention, taking advantage of the windows of opportunity wildfires have provided to recover the local socio-ecological knowledge, to revalue the role of extensive grazing and to foster collaboration with the governmental authorities.

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1. Introduction

1.1. Problem Statement

Wildfires, despite being an important component in many ecosystems around the world, constitute a growing social, economic, and environmental threat (Lucas-Borja et al., 2021; Wunder et al., 2021). During the last decades, the intensity of wildfires has increased, which not only has an impact on the ecosystem structure and in the ecosystem services that forests provide but significantly affects the local population and their livelihoods (L. Hernández et al., 2022; Varela et al., 2018). Considering that wildfires cannot be avoided, identifying strategies to build resilience in fire-prone territories is key (Higuera et al., 2019; McWethy et al., 2019). To this end, the literature has highlighted how wildfires should be recognized as a socio-ecological issue (Higuera et al., 2019; Wunder et al., 2021); and fire-prone territories as complex socio-ecological systems (SESs), in order to fully understand the processes and dynamics involved to build-up resilience (Spies et al., 2014; Tedim et al., 2016).

SESs, in which social and ecological systems interact, are integrated systems (Ostrom, 2009). Despite the fact that extensive research has been done regarding how humans and nature interact, the complexity of these interlinked systems has not been fully understood (Berkes et al., 2009; Liu et al., 2007). The wildfire literature has not been the exception, and traditionally the tendency has been to work in silos, concentrating primarily on the specific physical, biological, or social components of wildfires (Smith et al., 2016). Considering that resilience refers to the ability of a SES to cope with and adapt to disturbances (Folke et al., 2009), it has been noted that in order to build resilience, a focus on the interdependent relationships between the social and ecological systems is needed (Cinner & Barnes, 2019; Cote & Nightingale, 2012).

In Mediterranean Europe, evidence indicates that both, socio-economic and environmental change are responsible for increasing wildfires intensity (Jia et al., 2019; Wunder et al., 2021). Climate change is bringing about extreme weather conditions, which are affecting the wildfire regime. The combination of temperature increase and precipitation decline enhances vegetation flammability, thus increasing the risk of extreme wildfires to occur (Brotons et al., 2013; Jia et al., 2019; Silvestro et al., 2021). Moreover, changing socio-economic and political dynamics, such as rural exodus and the abandonment of traditional rural activities, are contributing to increase the available biomass in rural fire-prone territories, and thus wildfire risk (Varela et al., 2017; Wunder et al., 2021).

Mediterranean Europe suffers around 85% of the annual burnt area in the continent, being the most vulnerable region to fire in Europe (Lucas-Borja et al., 2021; Wunder et al., 2021). Therefore, the wildfire issue in this region is very high in the political agenda and is considered one of the main threats to the ecosystem, population and infrastructure (Uyttewaal et al., 2023; Varela et al., 2018). Against this backdrop, countries have increased their investment in fire suppression (Xanthopoulos et al., 2019), in detriment of wildfire prevention measures.

A study of WWF (2019) estimated that five European Mediterranean countries - Spain, Greece, Portugal, Turkey and France - invest all together more than two thousand millions of euros yearly, which has been mainly used for wildfire suppression (80%), compared to wildfire prevention (20%), on average.

However, the increasing wildfire severity during the last decade has made clear that wildfire suppression is not a long-term solution (L. Hernández et al., 2022; WWF, 2019; Xanthopoulos et al., 2019). If anything, intense wildfire suppression has resulted in an increase in the available biomass in the fire-prone territories and in an alteration of the fire regime. Given the focus on wildfire suppression, the management of the forested land to prevent wildfires has been progressively left behind, resulting in fuel build-up and larger wildfires (Fernandes, 2008; Pyne, 2007; Tymstra et al., 2020). This phenomenon is known as the fire paradox, as wildfire suppression policies has proven to be effective in the short-term, but ineffective in the long term if complementary measures are not considered (Brotons et al., 2013; Castellnou et al., 2019; Xanthopoulos et al., 2019). This has led to a wide sector of the international wildfire community to strengthen the focus on wildfire prevention instead of suppression (Brotons et al., 2013; FAO, 2011; Lucas-Borja et al., 2021; McWethy et al., 2019). Among the different measures included under wildfire prevention, different studies have shown that a mosaic landscape¹ can reduce the size and intensity of wildfires, and that it could be achieved by recovering traditional rural economic activities (Bertomeu et al., 2022; Lasanta et al., 2022; Wunder et al., 2021). Extensive grazing is one strategy that is gaining visibility in Mediterranean Europe in recent years (Dopazo, 2011; C. García & Cordero, 2019; Varela et al., 2017, 2018; Wunder et al., 2021).

Extensive grazing consists in the use of the natural resources available in the territory for livestock production. It is characterised by the breeding of native species, mainly through the sustainable use of pastures for livestock feeding, considering its spatial and temporal availability (C. García & Cordero, 2019; Ruiz et al., 2017). The activity generates environmental and social services, such as landscape conservation, wildfire prevention, territorial identity, etc. (Herrera et al., 2018; Urivelarrea & Linares, 2020). However, even though the benefits of extensive grazing are well-known, current rural abandonment trends are threatening the activity, that is progressively being abandoned due to its harsh labour conditions, the heavy bureaucracy herders have to face and low economic profitability, among other socio-economic factors (Castillo & Álvarez, 2021).

Considering the importance of increasing efforts in building socio-ecological resilience in the face of wildfires, extensive grazing as a wildfire prevention measure to reduce the wildfire risk at a landscape level is gaining popularity among policymakers. This has been reflected in the increasing policy instruments put in place to promote and regulate it in the study area of this

¹ Mosaic landscape refers to a heterogeneous landscape where diverse land uses, such as pastures, agricultural land and forested land, are intermixed with each other.

research, the Valencian Community, Spain (Amat-Montesinos et al., 2019). However, policies have mainly focused on the ecological dimension of extensive grazing, not fully addressing its important social aspects.

1.2. Research Objective & Questions

This master thesis aims to analyse how extensive grazing contributes to build socio-ecological resilience in Mediterranean, fire-prone territories, such as the Valencian Community in Spain. To this aim, the following research questions guide the research:

- *How can the Valencian extensive grazing socio-ecological system be characterized?*

Answering this question will allow to set the scene and describe the SES of the extensive grazing in the Valencian Community at the biophysical and socio-economic level. In doing so, this thesis will also identify and critically analyse the different barriers and opportunities at the socio-political, economic and ecological levels, that extensive grazing faces in the Valencian Community.

- How does extensive grazing contribute to build socio-ecological resilience in the face of wildfires in the Valencian Community?

This question seeks to discuss the dynamics of extensive grazing, as well as its outcomes against the background of resilience theory. Specifically, it will explore the relationship between extensive grazing and the process of building socio-ecological resilience in the Valencian Community.

1.3. Academic Relevance

This thesis is relevant in several ways. Theoretically, it adds to the literature framing wildfires as a socio-economic and environmental issue, which is still limited within Mediterranean Europe. Also, and building upon resilience scholarship, it operationalizes the concept of socio-ecological resilience from a critical social science perspective, and it uses it for the analysis of the extensive grazing system. Empirically, it explores the highly fire-prone region of Valencia, which has been so far understudied within qualitative wildfire research. This thesis also brings to the spotlight extensive grazing, which is (re)gaining visibility in the public eye as an example of a traditional activity which can contribute to reduce wildfire risk while being able to produce marketable products. Whereas several studies have explored the contribution of extensive grazing to wildfire prevention from an ecological perspectives contributions to socio-ecological resilience from a qualitative perspective remain limited. This research also aims at contributing to fill this gap, by adding to the growing literature on extensive grazing by framing it as a socio-ecological system and by offering a socio-politically sensitive perspective on the subject.

1.4. Thesis structure

This master thesis consists of seven chapters. After setting the scene in the introductory first chapter, the second chapter develops the theoretical framework that guides this research. Chapter three presents the methodological approach, describing the research design, as well as the methods of data collection and analysis. Chapter four comprises background information about the study area, while chapter five focus on the current situation of extensive grazing and wildfires in the study area following a socio-ecological system's approach. In chapter six how extensive grazing contributes to build socio-ecological resilience is discussed, by taking into consideration the theoretical framework and the insights from the other chapters. Finally, chapter seven presents the main conclusions of this research.

2. Theoretical Framework

The following chapter develops the theoretical framework of this master thesis. First, the socio-ecological system (SES) framework is introduced, which will guide the research. Then, the concept of socio-ecological resilience (SER) is described, as well as the principles that must be considered for building it and how can we address it from a socially sensitive perspective. Finally, the meaning of the SER concept in the face of wildfires is operationalized.

2.1. Socio-ecological systems (SESs)

Since the appearance of humans on Earth, ecosystems have been used by societies to fulfil their material and non-material needs. However, during the last decades, ecosystems have suffered unprecedented alterations, which are now reflected in urgent problems, such as biodiversity loss and climate change, which are not only affecting the equilibrium of ecosystems, but also are having negative effects on human well-being (Collins et al., 2011; Folke et al., 2021). This has led to an increasing realization that the ecological and social systems are deeply interconnected in contrast to the traditional division of the natural and social sciences, which for a long time analysed in isolation either ecological or social variables (Liu et al., 2007).

SESs are defined as dynamic, interdependent and linked complex systems in which the social and ecological dimensions are coupled and interact with each other in a sustained manner, co-evolving across space and time (Berkes et al., 2009; Fischer et al., 2015; Ostrom, 2009; Petrosillo et al., 2018; Redman et al., 2004). Meaning that anthropogenic activities shape the biophysical environment while this, in turn, also modifies the socio-economic and political spheres (Folke et al., 2009; Petrosillo et al., 2018). Traditionally, the natural and the social sciences have been mutually exclusive. However, in the twentieth century, systems thinking became popular, putting at the centre the link between the social and ecological spheres (Mooney et al., 2013). Nowadays, the idea that human-wellbeing and ecosystem integrity are mutually interdependent is widely accepted (Davidson-Hunt & Berkes, 2009). Yet, finding sustainable ways to achieve a balance between human well-being and ecosystem integrity remains a challenge (Fischer et al., 2015).

Notwithstanding the importance of pure social and ecological sciences, a system's perspective is needed to acquire a deep understanding of the dynamics of a SES (Collins et al., 2011). The SES approach assumes that any delineation between the social and biophysical spheres is artificial (Biggs et al., 2021) and specifically offers an integrated research platform for combining the social and natural sciences. This makes the SES's approach a strong analytical frame to understand the dynamics occurring in the territory and to find solutions to the current environmental challenges (Fischer et al., 2015), being useful when investigating patterns and processes that might not appear when analysing them from a single disciplinary viewpoint (Collins et al., 2011; Liu et al., 2007).

According to the SESs framework, developed by Ostrom (2009), each SES is composed by multiple subsystems which interact and produce outcomes at the SES level and feedback loops. Those interlinked subsystems are the resource system (RS), understood as the ecosystem under analysis (i.e. the woodlands); the resource units (RU), referring to the natural resources - such vegetation - available in the resource system; the actors of that system (A), and the governance system (GS), which includes formal and informal rules, norms and principles under which the actors operate (Leslie et al., 2015; McGinnis & Ostrom, 2014). Each of these subsystems has its own socio-political, economical, and environmental internal variables. However, SESs are also influenced by external variables operating at higher scalar levels, such as environmental, social, economic, and political conditions and processes (i.e. climate change and international policies) (Ostrom, 2009; Redman et al., 2004; Virapongse et al., 2016).

Extensive grazing systems have been recognised as a SES in the literature, as it involves ecological and social aspects that are interlinked, such as the anthropogenic use of natural pastures for livestock production, regulated by a governance system, that has influence on the structure and composition of the woodland (Dean et al., 2021; Postigo, 2021). However, the identification of a common set of variables to analyse them is still lacking. In order to contribute to fill this gap, Figure 1. depicts an adaptation of the SESs framework (McGinnis & Ostrom 2014), tailoring it to variables focusing on extensive grazing systems, which serves as the foundation for presenting the results of this research.

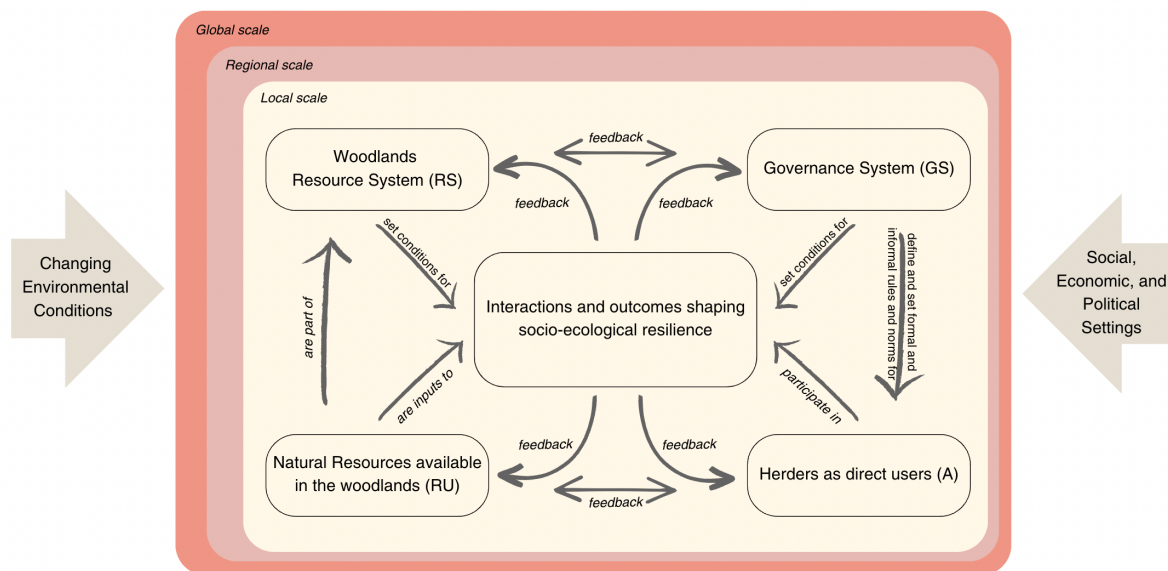


Figure 1. Conceptual framework for analysing extensive grazing SES. Elaborated by the author, based on McGinnis & Ostrom (2014).

Following this conceptual framework, in the case at hand the RS is the woodland ecosystem where the livestock grazes, including pastures. These will show specific yet dynamic characteristics, linked to natural factors such as soil, vegetation and climate etc., as well as to socio-economic dynamics, both past and present. The RS is ecologically composed by

different natural resources, which are the RU. For the purpose of this research, the RU under analysis are the vegetation and the herbivores. Socio-ecological relations within the SES are mediated by the GS, which in this case refers to the policies and norms regulating how herders must use the RU available in the RS. The proposed conceptual framework focuses on how the interactions between the GS, A, RS and RU shape the socio-ecological resilience of the SES in the face of wildfires, considering that there are feedback loops between the subsystems, under the premise that the ecological and social systems are interconnected and influence each other dynamics.

Furthermore, the Figure 1 also depicts the changing environmental conditions and the social, economic and political settings that influence the interactions in the extensive grazing SES. For example, at the environmental level, climate change has important ecological and socio-economic consequences, as the modification of weather conditions modify the vegetation structure and distribution and alter the wildfire regime, resulting in more severe wildfires with significant socio-economic impacts. Likewise, at the socio-economic and political level, demographic trends and economic development trends at higher scalar levels also affect the extensive grazing SES.

2.2. Socio-ecological resilience

SES are subject to multiple anthropogenic and environmental disturbances, both internal and external. Socio-ecological resilience (SER) is defined as the capacity of SESs to cope with those disturbances, particularly unexpected, throughout continuous adaptive cycles that include disruption, reorganization and renewal, maintaining its fundamental characteristics and interlinked dynamics (Berkes et al., 2009; Cote & Nightingale, 2012; Folke et al., 2016; Virapongse et al., 2016). The literature describes four principles that must be considered for building SER: (i) learning to live with change and uncertainty, (ii) nurturing diversity for reorganization and renewal, (iii) combining different types of knowledge for learning, and (iv) creating opportunity for self-organization toward socio-ecological sustainability (Folke et al., 2009).

Critical resilience scholars have pointed out that, even though the social aspects of the SES are present in the SER framework, it falls short when it comes to consider the role of power relations, collective action and culture in adapting and coping with disturbance (Cinner & Barnes, 2019; Cote & Nightingale, 2012; Cretney, 2014). One of the main criticisms is the insufficient analysis of governance and its socio-political character, with a limited consideration of power hierarchies as it presumes equality across different actors (Hornborg, 2013; MacKinnon & Derickson, 2013). Moreover, the vision of community as a spatial unit with common interest and shared views has also been criticised, as communities are hardly ever homogeneous and thus, preferences between different actors may vary. As a result, the desirability of governance arrangements cannot be taken for granted, and special sensitivity is required for understanding the trade-offs of different development trajectories. Therefore, questions of equity and justice should be explicitly considered, as what is desirable by

some may be undesirable for others (Cote & Nightingale, 2012; Miller et al., 2012). Thereby, when working towards a more resilient SES it is important to reflect on fundamental questions such as resilience to what, for whom and, also, by whom, which is highly important in fire-prone contexts. Asking these questions is key to identify from which perspective socio-ecological resilience is being built, who is responsible of it, who is benefited and who is being left out (Cretney, 2014).

With the aim to address the criticism to the framework of SER, social scientists have revisited the meaning of SER, including socio-political aspects in their analysis, and incorporating them into their studies of SER. This thesis builds on the work done by Rodríguez et al. (2022), in which the authors build a socially sensitive framework for assessing SER by drawing upon both resilience and social innovation (SI) bodies of literature. In particular, three outputs of the work of Rodríguez et al. (2002) will be incorporated into the analysis of this research to assess how extensive grazing contributes to the construction of SER: (i) the importance of collective spaces for dialogue and action, where the *status quo* is questioned, (ii) the role of bottom-linked governance formulas that contribute to the transformation process of the SES; and (iii) the collective engagement and active participation of the different actors involved to unveil vulnerabilities and mitigate risks (Rodríguez et al., 2022).

Considering that the topic of this master thesis involves the analysis of a strategy to building SER in the face of wildfires, the next section delves into what have been identified in the literature as being useful for building SER in fire-prone territories.

2.3. Socio-ecological resilience in the face of wildfires

When identifying and implementing strategies to build SER, it is important to first understand the socio-ecological context of the target area and identify which approach is more suitable, in the understanding that each SES is, to some extent, unique (Ostrom & Cox, 2010). Consequently, the specific actions needed to bring about SER are context dependent. In the case of fire-prone for building SER in the face of wildfires, McWethy et al. (2019, p. 798) describes three main variables: human exposure and vulnerability to wildfire; wildfire severity and human impacts; and changes in wildfire regimes.

Communities located in fire-prone territories have developed many strategies to deal with the wildfire impacts and reduce its effects (Colding et al., 2009). These strategies can be classified in preventive (i.e. biomass reduction through extensive livestock grazing) and suppressive (i.e. zero-fire policies) measures. Suppressive measure are the ones that have had the greatest financing in recent decades, despite the fact that it has been shown that these are not the most effective measures to build SER in the long-term, resulting into the fire-paradox (Brotans et al., 2013; L. Hernández et al., 2022; Xanthopoulos et al., 2019).

Traditionally, practitioners and policymakers have worked in isolation from each other, generating different responses to the wildfire problem (Wunder et al., 2021). However, evidence suggest that there are learning opportunities if these different actors work together

(Charnley et al., 2017). According to Lambrechts et al. (2023), in order to mainstream wildfire prevention, fire management needs multistakeholder participation, sharing responsibility and knowledge. Moreover, the engagement of the people at risk is critical as including their knowledge and perspectives could result in finding better-fit solutions to the wildfire problem (Moritz et al., 2014). Studies have shown that building SER is strongly related with the collaboration of multiple actors at multiple levels, from individual landowners to governmental decision-makers (Castellnou et al., 2019; McWethy et al., 2019), working together to find diverse and learning-oriented solutions (Wunder et al., 2021).

This master thesis builds on the literature of SER in the face of wildfire and aims to analyse how extensive grazing contributes to build SER in fire-prone territories, through the analysis of the situation of the activity in the Valencian Community. The developed conceptual framework for analysing extensive grazing SES has been useful to identify a set of variables to analyse and better understand the problematic around the extensive grazing in the study area. The principles to build-up SER, as well as the outputs of the cross-fertilization between SI and SER, have guided the analysis to assess the viewpoints of the different key actors involved about how extensive grazing contributes to build SER (Table 1).

Table 1. Socio-politically sensitive SER framework. Elaborated by the author, based on Folke et al. (2009) and Rodríguez et al. (2022).

Principles to build-up SER	Description
Learning to live with change and uncertainty	Related with the capacity of the SES to coexist with expected and unexpected change. Importance of collective spaces for dialogue and action to avoid the accumulation of disturbance and the role of bottom-linked governance that question the <i>status quo</i> .
Nurturing diversity for reorganization and renewal	Diversity of species, institutions, actors and sources of knowledge with different and overlapping roles, and interacting, contribute to mitigate risk and to cope with disturbances. Socio-ecological memory of past experiences related with disturbances is significant (risk awareness). Inclusive engagement and active participation of the different actors involved is needed.
Combining different types of knowledge for learning	Conventional scientific knowledge is complemented with the traditional ecological knowledge of local users. Importance of bottom-link governance formulas with collective spaces for dialogue where the local knowledge is considered and contributes to tackle power imbalances in the SES.
Creating opportunity for self-organization	It is linked with the momentum that disturbances create, where needs are revealed, and local initiatives appear and/or reinforce in the SES aiming to respond and shape change using its memory, knowledge, and learnings.

3. Methodology

The following chapter presents the methodology followed to develop this master thesis. It consists of two parts. In the first part, the research design is explained. In the second part, the methods of data collection and data analysis are presented.

3.1. Research Design

The objective of this master thesis is two-folded: (i) to characterize the Valencian extensive grazing socio-ecological system and (ii) to analyse how extensive grazing contributes to socio-ecological resilience in a fire-prone territory such the Valencian Community. Consequently, this research applies a qualitative approach, as it has an interpretative character (R. Hernández et al., 2014).

Qualitative research is based on an inductive logic, going from the particular to the general with the aim to explore, describe, understand, and explain situations through the perceptions of a group of people (R. Hernández et al., 2014; Kumar, 2019). The focus of qualitative research is on discovering the perspectives and points of view of the participants, deepening into their points of view and interpretations (R. Hernández et al., 2014).

This master thesis follows a case study design (Yin, 2009), which is based on the deep exploration and understanding of a specific case, in order to analyse the phenomenon of interest (Kumar, 2019). For this research, the phenomenon of interest is the extensive grazing as a strategy to build-up resilience in fire-prone territories, and the case study selected is the Valencian Community, as an example of a typical Mediterranean fire-prone territory where extensive grazing has traditionally occurred and is nowadays being promoted. It is important to note that one of the main limitations of a case study is that the results cannot be generalized, as the evidence presented is limited to the study area (Bryman, 2012). However, the purpose of this kind of research design is not to generalize, but to examine intensively one case using a theoretical analysis to gain detail insights about the phenomenon of interest (Bryman, 2012; Kumar, 2019).

3.2. Methods of data collection and analysis

Qualitative research often relies on methods of data collection that are neither standardized nor completely predetermined (R. Hernández et al., 2014). Moreover, the use of multiple methods to collect data is recommended to have a holistic perspective of the case study (Kumar, 2019). For the development of this master thesis, two data collection methods were used: literature review and interviews. Data collection for this thesis was conducted between October 2022 and March 2023.

3.2.1. Literature review

Firstly, an extensive desk-based literature review was carried-out. The documents that have been analysed include academic publications, grey literature, local press, and policy instruments related to the extensive grazing activity and wildfires, such as the Forest Territorial Action Plan of the Valencian Community (2013) and the Special Plan Against the Risk of Wildfires (2021). As a whole, the literature review has been useful for the research conceptualization as well as to identify key stakeholders. Additionally, it served the purpose of gaining preliminary insights about the extensive grazing activity and its relationship with land and wildfire management in the study area. At a final stage, the information collected in written form also served to contrast and triangulate the information collected in the interviews.

3.2.2. Primary data collection and analysis

For the collection of primary data, semi-structured interviews based on open-ended questions were used (Appendix 1). Open-ended questions allow for the conversation to be fluent, as these are flexible and allow the introduction of follow-up questions, being useful for the jointly construction of knowledge and to obtain information that otherwise would not be available (R. Hernández et al., 2014). Interviewees were selected through purposeful sampling, and through the snowball technique. Thus, the number of interviewees did not depend on a representative sample but sought to include a diversity of actors. In selecting them, the goal was to gain deeper understanding on the current situation of extensive livestock grazing in the study area; reflect on the problems, challenges and opportunities that the activity is facing; and to identify how extensive livestock grazing could be contributing to the construction of SER in the face of wildfires.

The selection of the interviewees was made based on their relevance to the case study. Initially, through the literature review, 10 potential interviewees were identified, who have worked on issues related to extensive livestock grazing from different fronts, either from academia, project implementation, policy implementation or carrying out the activity itself, as herders. During the first week of December 2022, the identified actors were asked, via email, for an interview to contribute to this research. Seven of the 10 identified actors responded positively, while two of the actors who did not agree to the interview referred to a colleague claiming that it would be more beneficial for the research to have their participation instead. In addition, during the interviews, five of the interviewees referred to other actors who could contribute to the research, three of whom agreed to be interviewed. It is important to mention that the two referenced actors with whom the interview did not take place were herders, who did not have the means to hold a virtual interview (i.e. stable internet connection).

In total, 12 interviews were carried out, until data saturation was reached, meaning no new or relevant data was emerging (Bryman, 2012). Table 2 provides a summary of the interviewees' profiles.

Table 2. Summary of the interviewees' profiles. Elaborated by the author.

ID	Type of actor	Interviewee profiles
A01	Academia	University Professor in Human Geography
A02	Academia	University Professor in Agronomic and Rural Environment Engineering
A03	Firefighters	Forest Technician
A04	Local Associations	Forest Technician and Local Development Agent
A05	Local Government	Specialist of Forest Fire Prevention
A06	Local Government	Specialist on Rural Development
A07	Local initiatives around extensive grazing	Project coordinator of local initiative
A08	Local initiatives around extensive grazing	Head of local initiative
A09	Local initiatives around extensive grazing	Local herder and head of local initiative
A10	National Associations	Technical secretary in extensive livestock systems and pastoralism
A11	ONGs	Technical adviser in extensive livestock
A12	ONGs	Coordinator of extensive livestock related projects

The interviews were held in Spanish and online through Microsoft Teams between December 2022 and February 2023. Depending on the preferences of each interviewee², stated in the informed consent (Appendix 2) signed by them, interviews were recorded and transcribed using the tools available in Microsoft Teams. The recordings were used to ensure the accuracy of the transcriptions. Then, the interviews were coded using NVIVO to facilitate the analysis. Coding is a method to organize extensive data into themes, reducing its volume to facilitate the interpretation and analysis (R. Hernández et al., 2014). The themes used were developed and identified during the coding process, taking into consideration the theoretical framework and the information collected. This exercise allowed in-depth exploration and interpretation of how extensive grazing contributes to build-up SER in the Valencian Community. Moreover, direct statements from the interviews, reported in italics and with the corresponding alphanumeric ID of the interviewee, were used to support the findings.

² Specifically, two interviewees - A02 and A11 – gave their consent to transcript the interview with the tool available on Microsoft Teams, but preferred not to be recorded.

4. Context of the study area

Spain is administratively divided in 17 autonomous communities, which are territorial entities with its own institutions, representatives and with legislative, executive and administrative competences. The Valencian Autonomous Community (referred to in this thesis as the Valencian Community, or simply the Valencian Territory) is located on the south-east coast of the Iberian Peninsula, bordering the Mediterranean Sea. The area of the Valencian territory is 23,255 km² and it is administrative divided into three provinces – Castellon, Valencia and Alicante – and 542 municipalities. Likewise, according to the Territorial Strategy of the Region of Valencia (Generalitat Valenciana, 2011), the territory could be geographically divided in three zones: the coastal strip, the intermediate strip and the rural strip (Figure 2).



Figure 2. Geographical division of the Valencian Community. Elaborated by the author, using free spatial data from the © *Institut Cartogràfic Valencià, Generalitat*

Table 3 shows a summary of the general information of each geographical division of the Valencian Territory. The coastal strip is characterized by its low terrain slope, with a mean altitude of 100 above sea level. It is densely populated, sustaining more than 81% of the population and concentrating 85% of the GDP of the autonomous community, even though it only represents 25% of the total area (Gielen et al., 2018). Moreover, the coastal strip is considered the urban area and it concentrates most of the economic resources. The main

cities of the Valencian Community - the capitals of each province - are located in this geographical region, which have important implications in the governance system of the Valencian Community as a whole, such as a dominant urban perspective in the policymaking, as pointed out by one of the herders interviewed. The main economic activities developed within the coastal strip include tourism and irrigated agriculture, mainly of citrus (Ministerio de Agricultura Pesca y Alimentación, 2003).

“...everything comes from a concept of centrist urban thinking, people in cities drag everything in their way, with a very specific vision of how to eat, how to proceed, how to feel and even how to consume; and in the face of this, there is little that can be done” (A09)

The intermediate strip represents the transition from the coastal area to the rural area. Mid-sized cities (between 10,000 and 100,000 inhabitants) are located in this zone. It has a lower population density than the coastal strip, holding 17% of the population in 37% of the Valencian territory’s surface, and concentrating 13% of the GDP (Gielen et al., 2018). Contrary to the coastal strip, in the intermediate strip there is a predominance of rain-fed agriculture (fruits such as kaki) and industry (Ministerio de Agricultura Pesca y Alimentación, 2003).

Table 3. General information of each geographical divisions of the Valencian Territory. Elaborated by the author, based on Gielen et al. (2018)

Geographical divison	Surface (%)	Population (%)	GDP (%)
Coastal strip	25%	81%	85%
Intermediate strip	37%	17%	37%
Rural strip	38%	2%	2%

On the other side, the rural strip is characterized by being largely forested. Although it represents 38% of the Valencian territory, it only sustains 2% of the population of the region and 2% of the GDP (Gielen et al., 2018). Due to its rugged terrain, the agriculture is very limited and situated in flat enclaves in mosaic, consisting of mainly olive and almond. Meanwhile, the territory is used by extensive livestock of autochthonous breeds of sheep and goats, such as *Guirra* sheep and the *Blanca Celtibérica goat*, which are well adapted to the environment (Ministerio de Agricultura Pesca y Alimentación, 2003). However, current rural abandonment trends are threatening the activity. According to the demographic indicators of depopulation of the Valencian Community updated to 2021, 56 municipalities are at very high risk of depopulation, while 73 are at high risk and 42 are at medium risk (Generalitat Valenciana, 2022a). Figure 3a shows the location of the 171 municipalities at depopulation risk. As it can be observed, most of these municipalities are located in the rural strip (72%), while 24% are in the intermediate strip and only 4% are in the coastal strip. Moreover, the mentioned demographic statistics shows that 121 of the 144 municipalities located in the rural area have had a negative population growth since 2001.

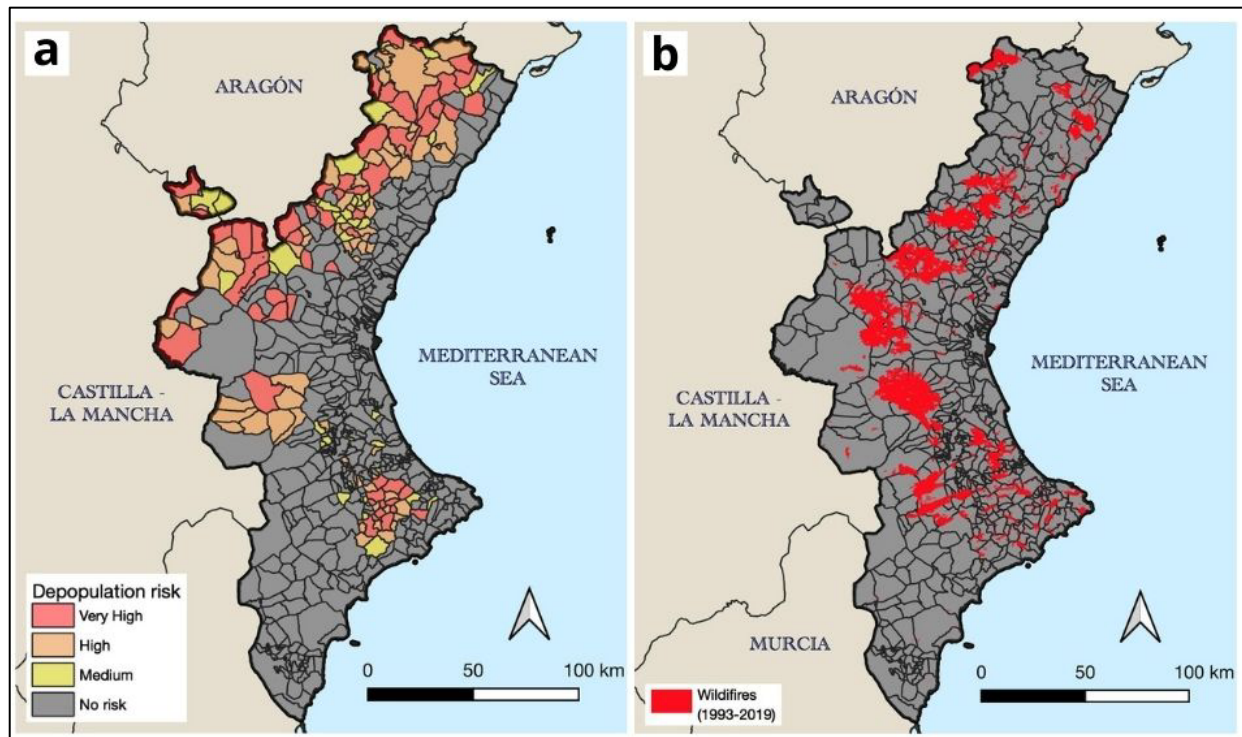


Figure 3. Comparison between Municipalities of the Valencian Community at depopulation risk and wildfires registered in the territory between 1993-2019. Elaborated by the author, using free spatial data from the © *Institut Cartogràfic Valencià, Generalitat*

Depopulation of rural areas is linked with the expansion of the vegetation and the increment of the wildfire risk (Colonico et al., 2022; Salis et al., 2022). The community as a whole is at wildfire risk due to its complex topography, its meteorological conditions and its vegetation structure and composition (Generalitat Valenciana, 2021a). However, the rural and intermediate areas present higher risk, which means that the fire behaviour could get worse easily. Figure 3b shows the areas that has been burned between 1993 and 2019. As it can be observed, most of the wildfire events have occurred in a municipality at depopulation risk.

4.1. Wildfires in the Valencian Territory

Wildfires are a natural element of ecosystems within the Valencian Community, and every year there are wildfires in the area. However most of them have a small extension due to effective wildfire suppression (Dopazo et al., 2009; Radín et al., 2019). Statistically, the number of ignitions has decreased over the last decade. However, the severity of wildfires has been increasing, originating more frequent big wildfires (over 500 ha burnt) (Generalitat Valenciana, 2021a), which are generally wildfires that for its characteristics cannot be controlled by the firefighting force and burn a large area of territory.

In the Valencian territory, 3,463 wildfires were registered between 2012 and 2021, of which 17 were big wildfires, responsible for 90% of the burned area in the aforementioned period (Generalitat Valenciana, 2021b). It is important to note that in wildfire management, the principle of social interest prevails, which states that the population safety comes first,

followed by the control of the emergency and, finally, the protection of property and of the natural environment (Ministerio para la Transición Ecológica y el Reto Demográfico, 2022). As mentioned by one of the interviewees, given the increasing intensity of wildfires, often firefighters forces do not have enough resources to keep the population safe and to protect the woodlands, so the population safety is prioritized.

“In our case, there was nobody... the firefighters were advanced in their work, only saving people, going to the towns that were burning. It was a big wildfire. In these cases, the operating capacity of the firefighting services is exceeded. In other words, the firefighters were located at the entrance of the town and if the fire reached the entrance of the town, as it did here in Pego, they acted there... but if not, no” (A08, about the big wildfire in Vall d’Ebo municipality on august 2022)

According to the literature, wildfire suppression capacity is overcome when the fireline intensity limit is higher than 10,000 kw/m, the (Gomar et al., 2022; Xanthopoulos et al., 2019). This means that the rate of heat output per length of fireline and the size of the flames make it impossible to reduce these wildfires, regardless of the size of the fire suppression resources (Martínez & Montero, 2019). Moreover, it has been pointed out that even at 4,000 kw./m it is difficult to control wildfires, which means that the firefighting forces cannot suppress these few but harmful big wildfires (Xanthopoulos et al., 2019). The fire intensity is directly proportional to the amount of biomass susceptible to be burned and the wind intensity, which influences the fire spread (Alexander & Cruz, 2019). This information is known by the Specialist of Forest Fire Prevention interviewed, who recognises that biomass accumulation is a problem in the territory.

“[...] year after year the biomass increases, which means that when there is a wildfire, it happened what happened to us this summer: there are wildfires with great virulence and intensity, and with the suppression resources that we currently have, you cannot put them out” (A05)

One of the last big wildfires in the Valencian Territory occurred in the municipality of Bejis (Castellon) on august 2022, reaching a fireline intensity of 93.456 kw/m and burning more than 9.900 hectares, affecting the forest ecosystem and more that 1,500 inhabitants that had to be evacuated (Andres & Navarro, 2022; Gomar et al., 2022). Therefore, big wildfires have important harmful consequences to the socio-ecological system as a whole.

“The damages of big wildfires can be relevant, there can be loss of human life, property, housing, infrastructure... and then everything that is the burning of the landscape, of the forest environment and of the agriculture can also cause very significant damage, direct economic damages in terms of products; and also important social damages... it affects the different activities... it affects the culture of the place and the activities of the place... also important environmental damages, for example, apart from the direct damage to the vegetation, the [big] wildfires can generate negative processes at the soil level and at the level of fauna and flora populations” (A02)

As mentioned before, wildfires are strongly related with the vegetation structure and composition, which is also influenced by the depopulation trend observed in the rural territory, due to the abandonment of land and its subsequent scrubbing.

4.2. Extensive grazing in the Valencian Territory

Agriculture and livestock activities in Valencia are strongly shaped by the smallholding structure of land tenure (Cámara Valencia, 2011). Transhumance - seasonal movement of herders and their livestock over long distances - is a historical activity in Spain (Trujillo, 2016). Despite the decline of transhumant shepherds, still today the livestock trails are recognised as assets with environmental and historical-cultural value at the country level, reason why they are protected by law (L. Hernández et al., 2022). In the Valencian territory specifically, this activity fostered socio-economic relations between the woodland areas and the lowlands (Piqueras & Sanchis, 1991). Currently, the Law 3/2014 establish that the livestock trails located in the jurisdiction of the Valencian Community should be restored, conserved and protected (Edo, 2015).

Historically, extensive grazing of sheep and goats have been an important activity in the territory, both economically and culturally (Piqueras & Sanchis, 1991; Sánchez Carpio et al., 2021). Currently, the extensive grazing in the study area is mainly conformed by autochthonous breeds, such as *Guirra* sheep and the *Blanca Celtibérica* goat, better adapted to the territory (L. Hernández et al., 2022). Its territorial distribution is determined by the environmental conditions and the availability of grazing resources, being found mainly in rural and woodlands areas with little inhabitation and where there is less competition for land use³ (Amat-Montesinos et al., 2019; L. Hernández et al., 2022). However, the fragmentation of the ecosystem, the lack of pastoral infrastructure, the cost of adapting to the new regulations in terms of food safety and animal welfare, the low income it generates, the difficulties for generational renewal in the sector and the lack of training programs adapted to the needs of the profession, among other reasons, have caused the progressive abandonment of extensive grazing activity, and consequently, of pasture lands (Amat-Montesinos et al., 2019).

During the last decades, the Valencian Community has introduced a variety of policies, programs and strategies to incentivize the recovery of the extensive grazing activity, such as the Strategic Plan for Valencian Livestock (2006), the Forest Territorial Action Plan of the Valencian Community (2013) and the ORDER 1/2015 for the management of traditional extensive livestock use in the natural parks of the Valencian Community (2015). Nevertheless, information from livestock censuses indicates that there are fewer and fewer people dedicated to the aforementioned economic activity, evidencing that the efforts made by the Valencian Community have not been enough to overcome the problems that extensive grazing is facing (Amat-Montesinos et al., 2019).

³ This does not mean that grazing only occur where agriculture is not possible, as both are rural activities that have co-existed in the territory.

5. Understanding the extensive grazing SES in the face of wildfires

This chapter seeks to deepen the understanding of the extensive grazing SES. To this end, each subchapter will address a subsystem identified in section 2.1 (resource system, resource units, actors, and governance system), based on McGinnis & Ostrom (2014). Furthermore, considering that this research aims to assess how extensive grazing contributes to building SER in the face of wildfires, the analysis of each subsystem includes the interaction of each of them with wildfires.

5.1. The Valencian Woodlands

The Valencian Territory is mainly composed by woodlands (approx. 50%), which are located a short distance from the coastline (less than 50 km). The region is dominated by a Mediterranean climate. On average, the temperatures range between 8 and 20°C, with significant north-south variations influenced by altitude and the distance from the sea. Moreover, the maximum temperatures can reach 40°C in summer, while the minimum temperatures oscillate between -10°C, on high-altitude rural areas, and 3°C, on the coast. Regarding precipitation, the yearly total amount ranges between 275 and 800 mm, characterized by strong seasonality and dry summers (Colomé et al., 2013). In general, the Mediterranean climate fosters biomass growth. The vegetation is of the European Mediterranean Forest type, which is characterized by the domination of conifers, mainly *Pinus halepensis* (Colomé et al., 2013).

Currently, the forest land occupies 57% of the Valencian territory, with a current tendency to increase at a rate of about 3,300 ha/year, mainly due to the abandonment of agricultural fields and the subsequent colonization by shrubs and forest species (Generalitat Valenciana, 2021a). Moreover, the rural exodus has played an important role in the increment of vegetation. As pointed out by some of the interviewees and the literature, as the forestry and traditional agriculture are abandoned, the vegetation growth has been fostered causing and homogenization of the landscape and an increment of the wildfire risk (G. García et al., 2019).

“Of course, if they are essentially forest areas, if there are no people there, there will be no forestry use, and if there is no forestry use, the vegetation grows, which is what is happening now in many places. As there is no economic profitability of biomass, then this produces that year after year it increases” (A05)

Figure 4 shows the increment of forested land in the territory between the year 2000 and 2018, which is more prominent in rural areas. Forested land is divided into two categories, depending on the presence of trees in the area: woodlands with trees and woodlands without trees. Woodland with trees occupy 53% of the forest land, while woodlands without trees cover 47% (Generalitat Valenciana, 2021a). However, the area of woodlands with trees is expected to grow 10,500 ha/year, while the area of woodlands without tree is expected to decrease 7,200 ha/year due to the proliferation of wooded species such as the *Pinus halepensis* (Quílez, 2015).

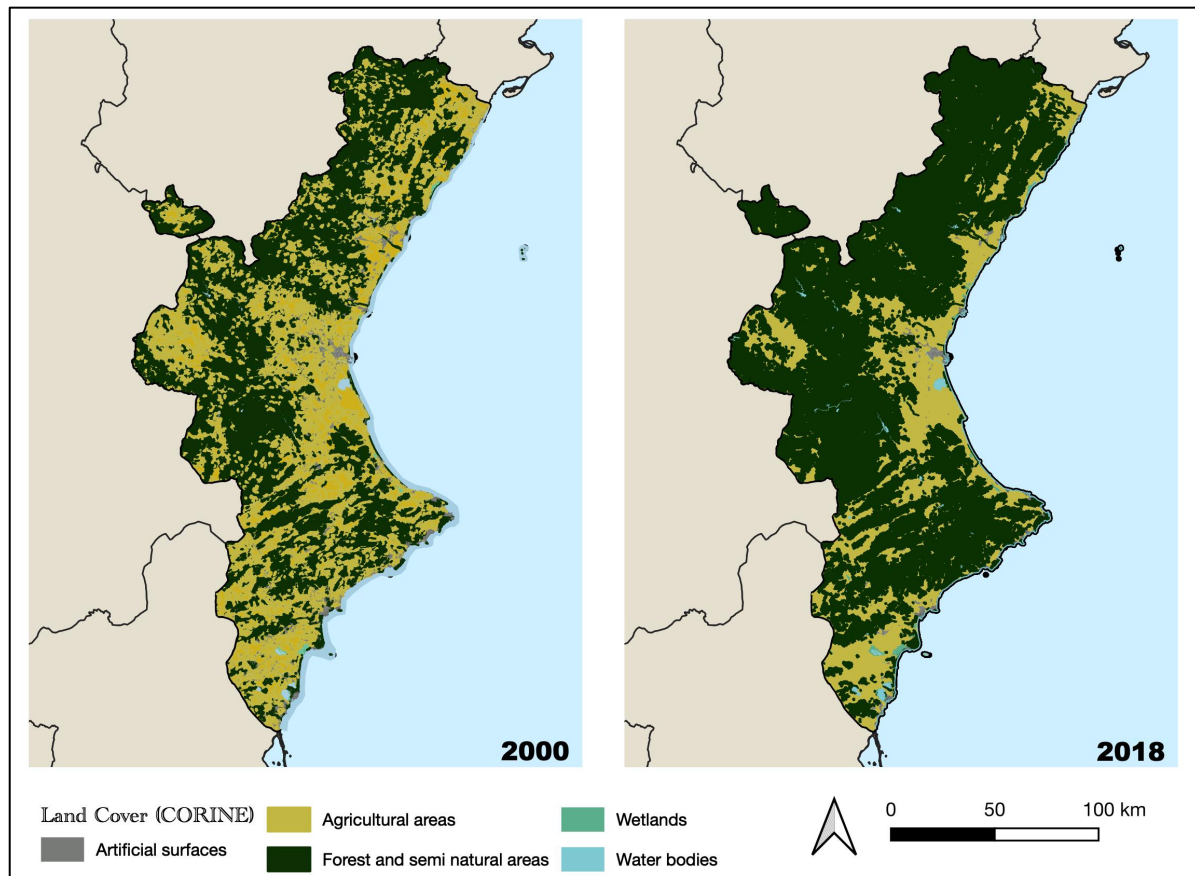


Figure 4. Land Cover Map of the Valencian Community, years 2000 and 2018. Elaborated by the author, using free spatial data from the © *Institut Cartogràfic Valencià, Generalitat*

During the processes of encroachment and densification of the main forest, shrublands are formed, mainly integrated by species with high pyrophyte potential due to their very dry biomass (such thyme, rosemary, and esparto grass), contributing to a fast spread of wildfires (Gomar et al., 2022; Pla et al., 2012). Moreover, endemic aromatic herb species, such as savoury and sage, are displaced by more competitive species, such as thyme and pines, limiting their presence to the firebreaks and roadsides (Gomar et al., 2022). The next section will go into more detail on this regard.

5.2. Vegetation and herbivores as resource units

The vegetation structure and distribution in the Valencian territory is strongly related to climatic conditions, such as temperature and precipitation; influenced by geomorphological characteristics, such as altitude and slope. The typical vegetation of the Valencian Community is the Mediterranean forest, characterized by evergreen and xerophytic vegetation, adapted to drought. The most abundant species are the *Pinus halepensis* and the *Quercus ilex* (Generalitat Valenciana, 2021a), occupying 72% and 14% of the forested area, respectively. Other species that can be found are *Pinus nigra*, *Pinus pinaster*, *Quercus faginea* and *Quercus suber*. The dominant understory is made up of thorny and aromatic woody species, such as rosemary, thyme and kermes oak (Colomé et al., 2013).

Pastures are one of the main resources available in the woodlands, being the source of food for wildlife and livestock (Ferrer et al., 2001). In the Valencian Community, pastures are mainly woody, with presence of bushes and trees species such as *Quercus sp* (Figure 5). According to the Territorial Action Plan of the Valencian Community, 31.6% of the pastures are non-wooded areas, of which only 8.7% are of high quality for grazing, while more than 50% present trees, which could be used by livestock through proper management techniques (Generalitat Valenciana, 2013).



Figure 5. Extensive livestock grazing in the woody pastures of Alcublas, a municipality located in the Valencia Province. Source: Garrido & Transversal Cooperativa (2019)

The structure and composition of pastures is affected by herbivores, as they play an important role in shaping the vegetation structure and in the landscape configuration. In the Valencian Community, several ungulates can be found between the rural and intermediate strips, such as the red deer, the European fallow deer, the European mouflon, and the Iberian ibex (also known as the Spanish wild goat). However, most of them are threatened due to hunting and are, therefore, not abundant in the area (Jiménez, 2012). On the other side, extensive grazing is an activity still present in the territory and that have traditionally been used to manage the Spanish Mediterranean ecosystems (Herrera, 2015). In the Valencian territory, sheep, goats and cows are the herbivores used as livestock, being sheep and goats the most representative groups (Ministerio de Agricultura Pesca y Alimentación, 2003). According to the Agrarian Census carried out every 10 years by the National Institute of Statistics (Table 4), between 1999 and 2020, the number of heads of sheep have decreased in 40%, while the number of sheep farms have decreased in 57%. In the case of goats, the number of heads has not changed significantly between 1999 and 2020, however, the number of goats farms have decreased in 47%.

Table 4. Evolution of the sheep and goats farms in the Valencian region (1999-2000).
Elaborated by the author, based on Instituto Nacional de Estadística (n.d.)

	Sheep		Goats	
	1999	2020	1999	2020
Livestock heads	457,152.00	275,034.00	79,448.00	79,455.00
Farms	2,129.00	907.00	1,472.00	777.00

This inconsistency between the changes in the number of livestock heads and farms suggests that the livestock sector has been industrializing, concentrating the livestock in fewer intensive farms, to the detriment of extensive, family-based farming (Gil, 2022; Ojeda & Ley, 2022). To date, there is no differentiated information on intensive and extensive livestock farms. One of the main problems is that there is no official characterization of extensive livestock at the country level (Ruiz et al., 2017), which makes it difficult to differentiate and collect information.

“[...] the first thing that is needed is to characterize extensive grazing, and there are many sectors that are against it because the livestock grazing activity as a whole benefit from the image of extensive grazing, but 90% of the livestock that people buy in the supermarket is not extensive, but rather intensive or even industrial. So, let's say that there is a lobby that appropriates the image of extensive grazing to sell its non-extensive products” (A11).

Extensive livestock farms vary in many different ways. The main ones are the type of grazing (continuous, rotational, intensive, etc.) and feeding, the use of breeds and varieties adapted to the conditions of the territory, and the (limited) use of external inputs (such as fodder) and the sustainability of the activity (Herrera et al., 2018; Ruiz et al., 2017). This means that having an official binary definition between extensive and intensive is virtually not feasible, so experts suggest classifying livestock farms based on an extensiveness gradient (Ruiz et al., 2017).

With regard to the role of livestock in shaping the vegetation structure, the main difference between extensive and intensive grazing is that the former takes advantage of natural pastures to feed livestock, while the latter does not, basing the feeding and fattening of livestock on external inputs (Herrera et al., 2018). In this sense, the lack of a differentiation between extensive and intensive grazing in statistic information, such as the Agricultural Census, affects the possibility of estimating the impact that sheep and goats may have on the structure of the vegetation in the Valencian territory. However, the role that extensive herders play in the landscape configuration towards a more resilient territory in the face of wildfires should not be overlooked.

5.3. Herders in the Valencian Territory

For the purpose of this thesis, we consider herders as the direct users of the resources available in the resource system. Thus, this section focusses on their characterization as a social group and the barriers and opportunities they face to understand their position in the SES and their contribution to the SER. It is important to acknowledge that the extensive

grazing activity is influenced by market factors, such as consumers preferences and market prices. Despite the fact that the results of the investigation include an overview in this regard, these aspects are not developed in depth in this section, as an economical characterization of the activity falls out of the scope of the research.

The presence of herders in the Iberian Peninsula dates back to Early Neolithic times, around 10,000 B.C (Gamba et al., 2012). In Spain, the livestock grazing activity associated with transhumance has an important socioeconomic and cultural connotation (Ministerio de Agricultura Alimentación y Medio Ambiente, 2012), and the Valencian territory is not an exception. According to Piqueras & Sanchis (1991), extensive grazing fostered socio-economic relations between the woodlands areas and the lowlands in the Valencian Community. However, due to urbanization processes and the loss of extensive grazing infrastructure, such as watering troughs and sheepfolds, the livestock activity has been decreasing over the years (Amat-Montesinos et al., 2019). As a consequence, the environmental services that it provided have also reduced, such as the control of vegetation growth.

“There are areas in the Valencian Community that were the destination areas of some royal cattle tracks, which came from both Aragon and Castilla, and there was a permanent passage of livestock of all kinds heading to the most inhabited areas or even for export. That transhumance has been lost, here it is practically lost and, well, those were livestock loads that also favoured the control of vegetation a bit” (A03)

Although extensive grazing is currently not a fundamental economic activity in the Valencian territory, it is not marginal either (Ruiz et al., 2017). According to statistics, livestock activity is concentrated in the province of Castellon, but it is also present in the interior of the provinces of Valencia and Alicante (Instituto Nacional de Estadística, n.d.). Its distribution responds to environmental conditions and the existence of grazing resources. As previously mentioned, the basis of extensive livestock activity is the direct use of pastures for livestock feeding. Therefore, its distribution in the woodlands responds to the fact that, in these zones, which are sparsely populated, there are large areas of pasture, in addition to having limited land use competition (Amat-Montesinos et al., 2019).

“It is present but there is less and less [...] in general, it has declined and continues to decline, especially certain types of livestock... it is a limited activity” (A02)

As mentioned in the previous section, to date there is no differentiation between extensive and intensive livestock in terms of statistical information. However, according to the information collected during the interviews, it can be affirmed that extensive grazing in the Valencian territory is atomized, showing a scatter distribution. The sector is characterized by being farms with a reduced number of livestock heads, compared to what is observed in other parts of Spain.

“...the figures, not the activity, the figures are small, but because the shape of the sector is also small, that is, they are small censuses and very distributed... it is not as if you go to Extremadura and look at the people who do extensive grazing,

because they all have 2,000, 4,000 or 5,000 sheep... everyone here has 300, 200, 80 [...] there are many herders, but they are small” (A09)

Moreover, during an interview it was pointed out that promoting a political agenda or developing joint projects for their benefit is complex due to the particular location of herders and the small size of their farms. Added to this is the fact that there are fewer and fewer herders in the Valencian territory, aligned with the abandon tendency of the extensive grazing activity, as pointed out by one of the interviewees who is working on this regard.

“It is a quite isolated and quite complicated sector... there are fewer and fewer herders left, more isolated from each other, and it is difficult for them to do this joint work of joining forces” (A07)

Likewise, the disappearance of the herders has brought implications in the development of the extensive livestock activity in the territory. Due to the abandoning process, the livestock infrastructure has also been abandoned, which makes it difficult for extensive herders to proliferate in the territory.

“...since the herders have disappeared for too long, the buildings have also disappeared, the corrals have been demolished, there are almost no corrals left in the towns of Pego or neighbouring ones. Nowadays, you can no longer lock up an animal anywhere, you need to comply with a series of rules, and it is very difficult to find a place for 300 or 500 livestock heads. It is very difficult. Then the cattle trails have also been lost... we have not only lost the herders, but we have also lost all of that culture” (A08)

It is important to mention that this abandon tendency is not exclusive to the Valencian Community, but in Spain in general. According to one of the interviewees, the abandonment of extensive grazing responds to socio-political settings at higher levels, such as political regulations and changing consumer behaviours, resulting in the intensification of the livestock activity, the impoverishment of the herders and their dependency on subsidies.

“...these last decades of the 20th century have been a total loss of heads of small livestock. There have been two trends since Spain entered the European Union, which was in 1986. One has been the intensification of livestock farming, and the other is the abandonment [of extensive grazing activities], those have been the two major trends that somehow follow” (A12)

As mentioned previously, small livestock predominate in the Valencian Community, that is, sheep and goats. Of special interest is the case of goats, as farms have gone through an intensification process associated with the production of goat milk and cheese, which are products in high demand on the market.

“... the decline of goats and sheep has plummeted, [...] goat farming has intensified, with which goat grazing has been lost and what it has done is become intensive goat farms to produce goat cheese, which is popular, has a market. That is what has happened. In general, it has been in decline, especially for small ruminants” (A12)

From the perspective of one of the herders interviewed, the decline of the extensive livestock activity in the Valencian territory is associated with socioeconomic factors, since it is a very demanding activity with very low economic retribution. Thus, the harsh labour conditions

added to the low profitability causes a problem of generational replacement, as young people are not interested in the profession. Faced with this situation, some herders seek to diversify their sources of income with other activities, such as agriculture. However, the low economic profitability of extensive grazing continues to be a key piece to understand the problems of the activity today.

“...extensive grazing is in decline, there is no generational replacement, there are no people willing to consolidate an economic and personal life plan based on the livestock grazing activity, because it gives very little and a lot of work is done, but that is a historical [...] I do not dedicate myself 100% to livestock, I also dedicate myself to agriculture, and I am also a technician, and in those 3 things I go there looking for a living to have my economy more or less solvent and working a lot and a little more” (A09)

The lack of generational replacement, however, is not only due to the low economic remuneration. During the interviews issues such as the need to revalue the profession and dignify it has been repeatedly pointed out. According to those interviewed, herders are seen as people from a low social stratum and with limited capacities, which is why young people do not usually show interest in being herders.

“... it is about dignifying the profession of the herders, because at least here in Spain, for a long time, herders were people with few resources, little access to schooling... all too complicated for them in general. So it's not about that image of the old herders, it's about it being an economic activity that a person chooses to have it because he likes it and that he can also combine it with his family” (A04)

The abandonment of the activity, in addition to having social and economic consequences, also has an environmental impact, which is reflected in the territory. Extensive livestock, especially of goats, helps to control vegetation structure, reducing scrub biomass and maintaining firebreaks (Dopazo et al., 2009). Moreover, all the interviewees agreed to identify extensive grazing as an activity that helps to prevent big wildfires. Important for this thesis is how extensive grazing is repeatedly mentioned as an additional activity that serves to complement wildfire prevention efforts.

“It is a tool that is not going to save the forests, it is not going to save the woodlands, but it is going to help our ecosystems, which are not wild natural ecosystems, but rather humanized ecosystems [...], reducing environmental risks such as wildfires” (A01)

Although herders play an important role in wildfire prevention, several of the interviewees emphasized the fact that the environmental services provided by extensive grazing go beyond wildfire prevention, contributing to the maintenance of biodiversity and the conservation of ecosystems.

“Our action is broader, because extensive grazing and wildfires are linked to other things, another series of services [...] our perspective is broader, it covers more things than wildfires, but in the end, everything is linked, since nature works holistically... So one thing does not go without the other” (A12)

Throughout the previous paragraphs, the main characteristics of extensive grazing in the Valencian Community have been outlined, as well as the challenges herders are going

through. In order to address the main problems of extensive grazing and to generate evidence of the positive impact that it can have on the territory, several initiatives and projects have been launched on a local scale. The following subsection presents a non-exhaustive compilation of pioneering initiatives and projects in the field of extensive livestock grazing, with influence in the Valencian territory.

5.3.1. Local initiatives and projects linked with extensive grazing in the Valencian Territory

One example is Pego Viu, a grassroot initiative created in response to the Vall d'Ebo big wildfire (2015) with the aim of contributing to the management of woodlands and their biodiversity. Among its different actions, Pego Viu has been running a pilot project with sheep to evaluate the effect they can have on strategic areas for wildfire prevention. For the moment, Pego Viu has served as a base platform for local action, involving the local population in territorial management and testing various alternatives for the prevention of wildfires, as they consider that the focus on wildfire suppression is not enough to reduce the impacts that wildfires have on the SES of which they are a part.

“...we have managed to get people quite involved in Pego Viu, people are quite involved in this project of breeding and maintaining the sheep, there are different partners, we take turns every week” (A08)

Another example is the pilot project "Promotion of extensive livestock in our woodlands for prevention of wildfires and environmental conservation" developed in Bicorp by the Association of Forest Municipalities of the Valencian Community (AMUFOR, by its acronyms in Spanish), which has demonstrated that by carrying out certain actions of sustainable woodland management, extensive grazing can be promoted in some way. The project has not only managed to receive support from the Valencian Council, achieving the recovery of livestock infrastructure, but has also included within its activities the analysis of the economic and labour viability of an extensive livestock farm, under reasonable labour conditions for the herders, with positive results.

As with the project developed by AMUFOR, there are other projects that focus on the socio-economic sustainability of extensive grazing, where, although their main goal is not the prevention of wildfires, their implementation has allowed the territory to be managed in a way that is compatible with wildfire prevention. For example, *A Paso Lento*, a local initiative promoted by three extensive herders from the Alcublas municipality, was born with the aim of returning the control of the market to extensive herders and consumers, promoting new short-market channels that connect rural producers with urban consumers. Their purpose has been to demonstrate how a fair price for the extensive products could be reached by reducing the market-intermediaries, leading to an increase in herders' profits. Moreover, its main activity has been the maintenance of the public forests of the Alcublas municipality, throughout the expansion of the grazing area – where no alternative use to grazing is feasible – and the improvement of livestock infrastructures.

As mentioned, one of the main challenges of extensive grazing is linked to the low economic remuneration that herders receive for their livestock products, which makes their economy dependent on the subsidies they could receive. In this way, this type of projects seek to demonstrate that it is possible to consolidate a life plan around extensive grazing, which in turn helps to fix population in the territory, which uses the resources of the woodland. Although not all of these initiatives were conceived with the aim of preventing wildfires, wildfire prevention is an argument that is frequently used for the dissemination of their activities and the capitalization of resources, since it is a matter of community interest and one that is among the political agenda priorities. Moreover, these initiatives and projects have made it possible to demonstrate the role that extensive grazing plays in reducing the wildfire risk. It is also important to mention that efforts are being made to divulge these projects by creating spaces for dialogue to disseminate them as success cases, with the aim of encouraging other actors to replicate them throughout the territory and to include extensive grazing as an effective wildfire prevention tool in decision-making.

“Why do we hold this type of event? So that they can be replicated, so that other people who are at these events can take the voice of these experiences back to their territories, and so that not only regional administrations, which are the ones that really have the competence in forest management, but also small municipalities can also have their own initiatives in this area” (A10)

The projects and initiatives presented seek to address the main challenges faced by extensive livestock herders such as the low profitability of the activity and the loss of infrastructure. However, there are many other barriers that also hinder the extensive livestock activity, and that cannot be tackled from a purely bottom-up action, such as the sector's dependence on subsidies for its subsistence.

“Nowadays, a farmer cannot live without these subsidies, without these aids, unfortunately, but that does not happen only in livestock, it happens in general, in the entire agricultural sector and not only in Valencia, but also in Spain and Europe. Here, if there are no subsidies, agriculture does not work, it would be a real ruin. This happens in the livestock sector, [...] without that subsidy a farmer, well, he should sell this herd and dedicate himself to something else” (A01)

The issue of subsidies is key for the sector, and it is heavily linked to the governance system. Thus, one of the topics that will be explored in more depth in the next section is how the governance system understands and implements subsidies and how they influence extensive grazing today.

5.4. The governance system mediating the extensive grazing activity in the Valencia Community

According to the SES framework, the governance system is defined as been the rules and norms under which actors interact with the resource units (Ostrom & Cox, 2010). However, it is important to emphasise that it is not only about legal regulations, as it also includes the decision-making processes, as well as the principles and values that influence the cultural norms of each society (Whittingham, 2010). In the case of extensive grazing in the Valencian

Community, the governance system is complex, as the activity is regulated not only at local but also at the international level, influenced by two different but complementary views of the territory: the urban and the rural.

While extensive grazing is not the main socioeconomic activity in the Valencian territory, the autonomous community is recognised as a pioneer in the construction of a system of governance that makes the activity visible and regulates it with the aim of promoting it (Amat-Montesinos et al., 2019). However, as mentioned in the previous sections, this has not been sufficient to reverse the trend towards the abandonment of extensive grazing activity, nor has it successfully addressed the socio-economic problems faced by extensive herders.

Since 1980, policies, laws and programmes such as the Extensive grazing Programme of the Valencian Community and the Territorial Strategy of the Valencian Community, have been implemented to foster extensive grazing in the territory. The understanding of extensive grazing in such governance instruments have been extensive grazing in terms of the environmental services it provides and/or extensive grazing as a socio-economic activity that fixes population in the territory and fosters rural development (Amat-Montesinos et al., 2019; Herrera, 2015). However, according to the information gathered during the research, these governance instruments have not been successful in promoting extensive grazing in the territory do to a heavy bureaucratization, which is often difficult to navigate. Thus, it is important to assess how these policies are being formulated, what social principles and values they respond to, and what are the power relations behind them.

“There are many legal determinations, but in the end, they are just patches... there is not really something that makes the life of a traditional extensive herder easy, so there is still, let's say, much, much to be done, or much to be undone, because I think the easiest thing would be to return to less bureaucratized systems and with more common sense” (A01)

More and more public policies related to land management in rural areas recognise extensive grazing as an activity with important roles in the territory, in terms of landscape configuration and resource management. However, as pointed out by one interviewee, this recognition has not been materialized in tangible actions to improve the extensive grazing sector.

“Nowadays, when public policies are introduced, they all recognise, or almost all of them recognise, all the benefits that extensive grazing brings and how necessary it is to promote it, but then when it comes to structuring the lines of support, they come to nothing because there is no follow-up from the sector” (A11)

This situation, according to the interviewees, is due to the low representation of extensive herders in political and decision-making spheres. Considering the characteristics of the extensive herders in the Valencian Community such as the atomised distribution of herders in the territory and their limited technical and economic resources, they are unable to promote a political agenda that looks after their interests.

“The problem is not the grassroots, the number of people, but that they don't have resources, that is, they are not a lobbying sector, they don't move a lot of money. So, since they don't move a lot of money, it's a question of capital” (A11)

As a consequence, policy instruments regulating the extensive livestock activity are often designed with a top-down approach, from administrative offices located in the main cities, and with very little input from the main stakeholders. From the perspective of several interviewees, this way of operating and governing extensive grazing activities is problematic, as it does not reflect the reality of the rural world and regulate a rural activity following principles and values of the urban world. Interviewees argue that the current governance system does not consider the point of view of the rural population either because there is a centrist urban thinking and/or because, strategically speaking, the rural population is less, it has less political power from a purely electioneering perspective. As explained by one interviewee:

“The policies that are coming out today are made with the stomach and from the cities, they are not made with the heart and from the countryside. So, urbanites understand what they are taught in schools or wherever, and they have a series of values that are very different from the people of the countryside... the people of the countryside are becoming fewer and fewer, their point of view and their opinion is less and less taken into account because in the end there are fewer votes that count in some elections and in the end, new political lines appear that try to impose their opinion in the face of the reality of things” (A03)

There are several policy instruments regulating the activity of extensive herders, but this thesis does not carry out an exhaustive review of the regulations that apply to the Valencian territory, as it is an exercise that has already been carried out by other authors (Amat-Montesinos et al., 2019). Instead, the policies of greatest relevance to the sector and to this study, which have also been mentioned by the interviewees, will be presented (Table 5).

Table 5. Policy instruments related with extensive grazing and/or wildfire prevention analysed. Elaborated by the author.

Policy instrument	Scope	Main Goal
Common Agricultural Policy (CAP)	European Union (EU)	Regulate and support the agriculture and livestock activities in the EU
Forest Law of the Valencian Community (Law 3/1993)	Valencian Community	To regulate the use of forest resources in the Valencian Community.
Order which approves the regulatory bases for the granting of subsidies for the control of natural vegetation through extensive grazing in strategic areas linked to wildfire prevention in the Valencian Community (Order 9/2022)	Valencian Community	To establish the conditions to grant subsidies to herders that contribute to wildfire prevention in the Valencian Community.
Local Forest Wildfire Prevention Plan	Municipalities	Define, design and manage the measures, actions and infrastructures necessary to reduce the number of wildfires and the area affected by them in each municipality.

First of all, it is essential to take a closer look at the Common Agricultural Policy (CAP), due to its international importance and its influence on the activities of extensive livestock

herders. The CAP is the agricultural policy of the European Union and was created to regulate and support the agriculture and livestock activities. In addition, the CAP aims to ensure a stable food supply, to protect the environment and the countryside, and to keep the rural economy alive (European Commission, n.d.). The CAP is of particular interest to extensive livestock herders, as it counts with a financial instrument that subsidizes their activities. In order for extensive livestock herders to be eligible for financial support, they have to meet a number of requirements related to the management of their livestock farm, the size of the grazing area and the animal welfare (Santaella, n.d.). Our data shows how extensive livestock herders in the Valencian Community feel that the CAP does not help them enough, as it has several rigid requirements and, in the case of the livestock sector, it is focused on bovine cattle.

“...what I have heard from farmers about the EU's agricultural policy are indeed complaints [...] the fact that they are required to comply with certain standards in the field and with certain types of exploitation places them in an unfavourable situation” (A02)

“...they are very much forgotten by the Community Agricultural Policy because they have very little support, very little, well, very little sheep, and even less goat [...] although they say they do, and although the theory is recognised, in practice it is not, the support is very minimal” (A12)

The support level received by extensive livestock herders in the Valencian Community, and in general in Spain, is closely linked to the structure of the vegetation. The CAP grants a subsidy to livestock herders known as direct payments, which are aimed to improve the economy of extensive livestock herders, considering that the income they earn from the sale of their products is often insufficient to cover their expenses. The logic of these payments is grounded on the idea that extensive grazing activities should be continued due to its socio-economic benefits, but also because it provides important environmental services for which extensive livestock herders are not remunerated.

In the past, extensive livestock herders were paid directly according to the number of livestock they had; however, since 2005 the regulation has changed and now, they are paid according to the number of hectares grazed (Ruiz et al., 2015). This change has been detrimental for extensive livestock farmers in the Valencian Community because the regulation indicates that pastures grazed must be herbaceous, as the presence of trees and shrubs is not considered to be compatible with a productive management. However, as mentioned in section 5.2, pastures in the Valencian Community, and in much of Spain, are woody and shrubby pastures.

Woody and shrubby pastures are valuable for extensive grazing. This type of vegetation provides important benefits for livestock production, such as the production of milk with high casein content and cheeses rich in oligoelements. In addition, the foliage of trees and shrubs, especially when evergreen species are present, allows livestock, mainly goats, to feed at times of the year when grass is not abundant (Beaufoy et al., 2015). In short, these pastures

are indeed used for productive purposes. However, there are many technically unsupported obstacles to counting them as grazed hectares eligible for direct payment.

Currently, there are several administrative and bureaucratic mechanisms by which a hectare of woody/shrubby pasture can be eligible for CAP direct payments. One example is the figure of “Established Local Practices”, which entails an additional administrative burden, as each Member State must describe and communicate it to the European Commission, as well as include it in its Geographical Information System for Agricultural Parcels (Beaufoy et al., 2015; Ruiz et al., 2015). Considering that livestock plays an important role in the maintenance of firebreaks, and that these are often woody pastures, the application of the figure of “Established Local Practice” is potentially an option to include those pastures as part of the pastures eligible for CAP direct payments. Although the regulations are rather rigid and bureaucratic, this mechanism represents an opportunity to emphasise the importance of extensive grazing on shrub or woody pastures for wildfire prevention, with the opportunity to generate income for extensive livestock herders through direct payments from the CAP. However, it is important to note that the CAP does not contemplate a direct payment for wildfire prevention, as it is not its main focus.

“What is not being done yet is, at a general policy level, to admit and support extensive grazing as a major wildfire prevention measure. This is not being done at a general level and that is what is missing [...] there is no direct wildfire prevention measure in the CAP, why? Because, for example, in the case of Spain, it has another policy, another wildfire prevention regulation, more of a fire suppression policy...” (A12)

According to some of the interviewees, although the CAP is not intended to prevent wildfires, it would be interesting if, as part of its objectives of protecting the environment and keep the rural economy alive, the work of extensive livestock herders in wildfire prevention were recognised. This political and economic recognition would allow extensive livestock herders to have a higher income and would reduce the risk of wildfires.

“...if the CAP were to give more support to extensive grazing systems, then of course the risk of wildfires would be greatly reduced. The problem is that it does not” (A12)

Although the CAP is an important policy with an influence on extensive grazing in the Valencian Community, mainly due to the subsidies that herders can receive, there are other regulations in the Valencian territory that regulate extensive grazing in terms of animal welfare, health and environment. In order to better answer the research questions of this thesis, we will focus on those policies linking extensive grazing and wildfires.

At the Autonomous Community level, the Forest Law of the Valencian Community (Law 3/1993, Valencian Government) establishes the specific legal regime for woodlands located in the Valencian territory, regulating its use. One important issue regarding the regulation of livestock activity in the Valencian territory has to do with the authorisations that herders need to enter public woodlands with their livestock. In line with current regulations, the herder must apply for a permit in order to opt for livestock use on public utility woodlands, which involves

a burdensome administrative procedure (Generalitat Valenciana, n.d.). In addition, as it is a public utility woodland, the herder has to pay for its use. This administrative requirements are counterproductive to the objective of promoting extensive grazing in the territory, as the process could be slow and cumbersome for the herders, as expressed by a specialist of the autonomous government:

“...we have perhaps too many administrative obstacles [...] in order for the herder to be able to opt for a livestock use on a public utility woodland, he needs an authorisation [...] and this involves a slow administrative process, because we are often not as quick as we should be, and it involves presenting a series of documentation to the administrator, which is often difficult for the herders, for whatever reason, [...] and we are also making them pay to come and graze on the woodlands, because it is an exploitation and we have it that way in the law and in the forestry regulations. So, these are aspects that if we really want to encourage or promote extensive grazing in our woodlands, we should try to make it easier for the herder to go to the woodlands, and not put administrative obstacles in his way, which is what we really have now” (A05)

In addition to the administrative formalities, the Forest Law establishes a series of conditions that the land must fulfil to be used for extensive grazing. Of particular relevance to the present study is the prohibition of using livestock on woodlands that have suffered a wildfire in the last five years. This regulation has a substantial impact when the wildfire occurs in woodlands that are normally used by extensive livestock herders.

“On the other hand, we have the whole area that burnt down, where there were two quite large herders, that the legislation says that they cannot go in there for 5 years, until the vegetation regenerate... so we have two herders, each of them has about 600 livestock heads, not many, but they are already relatively large, who cannot go where they went last year, because it is burnt” (A08)

According to the herders and local initiatives interviewed, these regulations are very rigid and should be evaluated according to the degree of damage and the characteristics of the vegetation structure. Specifically, they argue that such arbitrary restriction does not always correspond to reality in the territory, and it is detrimental for their activity, as expressed by one interviewee:

“For them [the herders], another wildfire there would mean that they might have to move or have to feed their livestock intensively with fodder brought in from outside, because after a wildfire they have to spend some time without being able to enter the woodland [...] there for example in Alcublas, after five years, there is no one to enter.... a sheep, a goat, they control the bush, but it's not a brush cutter, if it's been so long that the bush is a metre and a half or two metres high, the goat comes in and browses on the outside, but it doesn't open up a strip in the middle of a bush that is a metre and a half or two metres high” (A07)

Moreover, more studies are needed to evaluate if the establishment of a restriction of five years is appropriate to the Valencian Territory, or how. As an example, the Autonomous Community of Galicia (North-western Spain) has reviewed such regulation for its territory and has established a prohibition of two years instead of five for the extensive grazing use of a woodlands that have been burned (Law 3/2007, Galician Government).

Despite these limitations, the Valencian Government has been encouraging the promotion of extensive grazing for reducing fuel loads in the woodlands. These measures are being implemented by the Wildfire Prevention Department of the autonomic government as they understand that a regulated extensive livestock activity is a sustainable agroforestry practice in which the livestock control the growth of natural vegetation in strategic areas linked to wildfire preventions, such as firebreaks areas, reducing the wildfire risk. This promotion is mainly taking place through the granting of annual subsidy. The amount of subsidy depends on (i) the area extension on which the extensive grazing activity is carried out and (ii) the degree of compliance with the grazing objective. Herders can be paid a maximum of €120/ha/year, and the total amount granted per year cannot be higher than €8000/herder (Generalitat Valenciana, 2022b). It is important to point out that, within the Valencian Government, the responsibilities for woodlands use and wildfire prevention are divided between different departments, which creates contradictions. Examples reported by interviewees include having to pay to use the woodlands and at the same time receiving payment for doing so, which in turn generates administrative obstacles.

“...the department that gives [the authorisation for] the use of pastures [in the woodland] is not the same one that gives the subsidy to the herder... and so it is a contradiction that on the one hand we make him pay and on the other hand we give him subsidy, because that means paperwork on the one side and paperwork on the other. The easiest thing would be not to do, not to generate this duplicity of papers... that really, if he [the herder] is interested, we should give him the benefit and that's it, without making him pay. It is a contradiction in terms and that is one of the things we have to try to change” (A05)

Interviewees explained that the wildfire prevention subsidy packages linked with extensive grazing have not been as successful as expected. According to one interviewee, one of the reasons why herders are not applying to such subsidies is linked with the requirements they must fulfil, which are not always convenient nor profitable for them.

“...the administration, for grazing in firebreak areas and in wildfire prevention areas, gives an economic amount (...), during a certain period of the year, but as far as I know and from what I have spoken with the project's herders and with other herders, it is not working, because they have to go and graze in these specific areas, and it is not very profitable for them, because they have little infrastructure [...] with the livestock herders I have spoken to, they don't see it as a super opportunity” (A07)

Moreover, one of the herders interviewed pointed out that other reasons why the subsidy scheme is not working include administrative bureaucracy and the characteristics of the extensive grazing activity in the territory.

“...the subsidy is very bureaucratized [...] people get discouraged first because of competition, because they don't match and because the scale demands [...] not even 10% of the budget is taken up and people don't do it [...] as I said at the beginning, the territorial base [referring to the herders] is very diffuse and atomized” (A09)

It is important to note that this scheme has been designed by the Valencian Government, in a very top-down manner, and where herders have not been included in the process. For this reason, from civil society, the Extensive Mediterranean Pastoralism Observatory (OPEM, by its acronyms in Spanish) has proposed to the Valencian Government to change the unsuccessful subsidies packages, developed from a top-down approach and not considering the view of the herders, for a bottom-up initiative, in which herders do not receive passively a subsidy, but participate in the design of the intervention jointly with the governmental specialists and get paid for the environmental services they are providing. In other words, OPEM is proposing to establish the woodlands maintenance through extensive grazing as a public service (Gomar et al., 2022). Establishing it as a public service will imply a reassessment of extensive grazing and establishing, *de facto*, a payment for ecosystem services scheme. This bottom-up initiative is interesting as it has gained acceptance by the administration, and, to date, OPEM and the Valencian Government have been discussing technical aspects and institutional arrangements necessary to put it into practice. Moreover, this initiative has been welcomed by many local herders, as it considers their technical opinion and their knowledge for the agreement design.

“...this [the determination of the livestock grazing capacity and time] is done in coordination with the herder... in other words, the forest ranger, the wildfire technician and the herder go to an area and say: indeed, here I have a thicket of Hawthorn undergrowth, [the herder says] for this to reduce the biomass I have to stay for 80 days with 100 sheep [...] we sign an agreement [...] and that is the model” (A09).

At the municipal level there are also policies linking extensive grazing and wildfire prevention. The main instrument being the Local Forest Wildfire Prevention Plan (PLPIF, by its acronyms in Spanish), which each municipality with woodland areas is obliged to draw up. According to one of the interviewees, the PLPIF is a propositional document, in which an analysis of the territory in terms of wildfire risk is carried out and a series of proposals are established to reduce it. To date, out of the 542 municipalities, 423 have an approved PLPIF, while 63 are in the process, 30 are still pending and 27 are exempted from drawing up one, given that they do not have forested land inside their jurisdiction (Generalitat Valenciana, 2022c).

“...that document is what allows the municipality to establish a series of proposals and to implement these proposals to reduce [the wildfire] risk. So this is somewhat the most important document, above all, because it is proactive, it is not a study and stays there, no, it also tells you what things need to be done and prioritises them. So it is easier for a local council to implement actions to reduce the wildfire risk” (A04)

Given that extensive livestock grazing has been gaining popularity among policymakers, it is one of the main measures included in the PLPIF for the maintenance of firebreaks and the reduction of forest biomass. Consequently, several local councils have been promoting extensive livestock grazing, participating in projects linked to improving conditions for extensive livestock herders.

“...one of the proposals established in the PLPIFs or that is usually proposed is to recover abandoned areas, areas where forest vegetation has entered, and that this recovery be in favour of, perhaps, a series of specific crops or to favour extensive grazing” (A04)

However, from the perspective of some of the interviewees, this recognition of the extensive grazing as a tool for wildfire prevention is still limited, even though it has been gaining popularity in the recent years.

“There is still a lot of work to be done because there are some administrations that are timidly betting on this management through extensive grazing [...] there are some administrations that are betting, but it is a very timid bet... but it is beginning to expand more or less” (A10)

In summary, although livestock activity in the Valencian Community has a minority character, its recognition and promotion through public policies and social initiatives reflect its importance for the Valencian territory and the wildfires risk reduction, even though there is still much work to be done in this regard. In the following section, an in-depth analysis of how extensive grazing could be understood as a tool for building socio-ecological resilience in a fire-prone territory such as the Valencian Community will be presented.

6. Building SER in the face of wildfires through extensive grazing

This chapter seeks to critically analyse how does extensive grazing contribute to build socio-ecological resilience in the face of wildfires in the Valencian Community. To this end, the chapter mainly addresses the four principles to build-up SER identified and described under the socio-politically sensitive SER framework presented in section 2.3, based on Folke et al. (2009) and Rodríguez et al. (2022).

6.1. Learning to live with wildfire risk

According to the theoretical framework of this study, one of the principles to be taken into consideration when talking about building socio-ecological resilience is based on the capacity of SES to coexist with expected and unexpected change, avoiding the accumulation of disturbances through collective dialogue and action spaces. In this sense, this subsection will focus on assessing how extensive grazing contributes to the resilience of the SES, being able to coexist with wildfires, and how spaces for discussion and action are being generated around the activity, questioning the predominant way in which wildfires are being addressed.

The results of the research show that extensive herders have been present in the Valencian territory since historical times and that wildfires have always been part of the Mediterranean ecosystem. Thus, herders have coexisted with wildfires since their beginnings, developing valuable socio-ecological knowledge. This traditional knowledge is an important element for building SER (Gadgil et al., 2009) in the face of wildfires, as by recognizing that wildfires are part of the territorial dynamics, extensive herders are able to contribute with ecosystem management adapted to changing socio-environmental conditions.

The role of extensive grazing in reducing fuel loads in the woodlands and consequently reducing the severity of wildfires is recognised at political, technical and social levels. Studies have demonstrated the important role that extensive grazing plays in wildfire prevention, mainly in relation to the maintenance of firebreak areas and the configuration of mosaic landscapes (Dopazo et al., 2009; L. Hernández et al., 2022). The role played by extensive grazing as a regulator of wildfire risk is probably the main reason why it is recognized that the activity contributes to coexist with such disturbance, since risk reduction contributes to SES being able to cope with wildfires, maintaining its fundamental socio-ecological characteristics (Berkes et al., 2009; Cote & Nightingale, 2012; Folke et al., 2016).

However, the analysis carried out indicates that extensive grazing, and wildfire prevention for wildfire risk reduction in general, is an under-budgeted line of action, as historically the emphasis has been on wildfire suppression, which has been successful in reducing the impacts of small wildfires but proving ineffective in cases of increasingly recurrent big wildfires. Both in the literature review and in the opinion of interviewees, it seems evident that the emphasis on wildfire suppression has contributed to the accumulation of increasing forest biomass leading to more severe wildfires, which is known as the fire paradox (Xanthopoulos et al., 2019). Analyzing this situation from the SER framework (Folke et al., 2009), big wildfires

are crises that have revealed that the current wildfire suppression policies have failed. As a response, collective spaces for dialogue and action have been formed, questioning the current policies put in place and revaluating the solutions that can be fostered in the territory considering its socio-ecological characteristics (Ostrom & Cox, 2010; Rodríguez et al., 2022).

In this regard, the collected evidence demonstrates that Pego Viu has served as a base platform for local action, involving the local population in territorial management, testing various alternatives - including extensive grazing - to reduce the occurrence of big wildfires and, therefore, to build SER through the reduction of the wildfire risk. The case of Pego Viú is a clear example of how a disturbance such as a big wildfire evidence unsatisfied needs in the population located in a fire-prone territory, such as risk protection, and promotes the creation of a grassroots initiative that seeks to contribute to the construction of SER in the face of wildfires.

6.2. Nurturing diversity in fire-prone territories

Another important principle for building SER is based on the diversity that must be fostered in the SES, in terms of species, institutions, actors and sources of knowledge. This diversity is important as it provides the SES with a framework to mitigate, cope with and adapt to disturbances (Folke et al., 2009). Moreover, for this principle, the socio-ecological memory of past experiences, in this case related with wildfires, is significant for the reorganization and renewal process, reason why inclusive engagement and active participation of the different actors and institutions involved is needed towards a more resilient SES (Rodríguez et al., 2022). Therefore, this subsection focuses on assessing how extensive grazing contributes to the SES resilience by fostering diversity in the context of wildfire management. In addition, it will deepen in the importance of the socio-ecological memory of extensive herders and how SER could be built through it.

The diversity of functional groups at the ecological level is an important characteristic in resilient SES (Low et al., 2009). The collected data evidence that herbivores have played an important role as shapers of the vegetation structure and composition in the Valencian territory, which has been reflected in the landscape configuration. However, during the last decades, the presence of wild herbivores has been reduced due to hunting, while extensive grazing, despite declining, is an activity still present in the territory that traditionally have been used to manage the fire-prone Mediterranean ecosystems, producing a diversity of habitats in the landscape, such as agrosilvopastoral systems. Therefore, the recovering of extensive grazing could contribute to the SES resilience from an ecological perspective given that it is ensuring that a functional group such as herbivores are still present in the territory, avoiding the landscape homogenization and nurturing diversity of habitats and species (Folke et al., 2009; Herrera et al., 2018).

Although the main objective of extensive grazing is the production of livestock products, its development has different impacts on the SES of which it is a part. In this sense, extensive

grazing fulfils various roles in the territory. The most direct and well-documented role that extensive grazing has towards the construction of SER in the face of wildfire is its contribution to woodland management, reducing forest fuel accumulation and maintaining firebreak areas. Moreover, extensive grazing contributes to foster biodiversity through the raising of autochthonous breeds of goats and sheep, which are well adapted to the territory. However, the results of the research reveal that extensive grazing plays different roles in the SES, such as fixing population in the territory and keeping it alive. Furthermore, extensive herders, being in the woodland for long time periods, beside their work with the livestock, they carry out surveillance work, being able to alert when the wildfire is on an early stage, contributing to its early suppression and reduction of the impacts associated with big wildfires.

“...with regard to wildfire prevention, it would be an opportunity because it would be a way of being able, on the one hand, to maintain these wildfire prevention infrastructures, that there would be less biomass in our forest lands and in our woodlands, and then also [...] prevent the wildfire start... if you have people in the woodlands who can alert you in case there is a wildfire or they have seen smoke, it is also a plus to fight wildfires” (A05)

Extensive grazing also facilitates the work of firefighters, since by maintaining a low fuel load in the territory and in firebreak areas, the suppression of fires become easier, provided they do not exceed the wildfire suppression capacity. As pointed out by the interviewees in this research, extensive grazing represents a complementary strategy that contributes to build resilient in a fire-prone territory such as the Valencian Community. This meaning that it is not the only way in which the territory can be managed to reduce the wildfire risk, but it is considered a well-fit solution considering the characteristics of the SES and its history (Moritz et al., 2014). It is important to consider that a fundamental part of building SER is based on the diversity of actors and institutions present in the SES and their overlapping roles (Folke et al., 2009). In this regard, the users of the resources in the SES are valuable as, through their social-ecological memory, can provide insights for the reorganization and renewal concerning management practices. Extensive herders, as resource users in the woodlands, are relevant actors towards the construction of SER in the Valencian Territory in terms of reducing the wildfire risk.

The inclusion of extensive grazing as a wildfire prevention measure in the PLPIFs reflects how the activity is being recognized by the local governments as an important and complementary strategy for the construction of SER in fire-prone territories. Moreover, the fact that several local councils have been promoting extensive grazing, participating in projects linked to improving conditions for extensive herders, such as A Paso Lento in Alcublas and the project developed by AMUFOR in Bicorp, could be understood as part of enhancing social-ecological memory since they are acknowledging the role of local herders and revaluing their knowledge about the fire-prone territory they live in, which is considered a characteristic of resilient systems (Berkes et al., 2009; Folke et al., 2009). However, this efforts are still timid since extensive grazing is still showing a negative growth trend in the Valencian Community.

6.3. Integrating diverse knowledge systems to improve socio-ecological learning

The third principle to build SER refers to the importance of complementing conventional scientific knowledge with the traditional ecological knowledge of the local resource users (Folke et al., 2009). Moreover, in order to reinforce the resilience building process, bottom-link governance formulas with collective spaces for multi-stakeholder dialogue where the local knowledge is equally considered must be fostered (Rodríguez et al., 2022). Therefore, this subsection focuses on the different types of knowledge that exists around the extensive grazing activity and its contribution to SER in the face of wildfires. Moreover, a focus to grassroot initiatives that are working towards a bottom-linked governance in the SES is given.

The analysis conducted indicates that the system governing and regulating extensive grazing in the Valencian Community is complex, and it is influenced by two different views of the territory: the urban and the rural. However, it has been observed that, for example, the policy instruments that directly or indirectly regulate the extensive grazing activity in the Valencian Territory are often designed with a top-down approach from the urban world based mainly on technical knowledge and do not reflect the reality of the rural world. Thus, wildfire prevention policies, such as the wildfire prevention subsidies packages, have not been as successful as expected. Alternatively, resilience theory suggests that when the actors immediately concerned are actively involved, policy measures are more likely to be successful (Gadgil et al., 2009).

Studies have shown that building SER is strongly related with the collaboration of multiple actors, from herders to governmental decision-makers (Castellnou et al., 2019; McWethy et al., 2019), working together to find diverse and learning-oriented solutions (Wunder et al., 2021). As mentioned, herders held knowledge related to territorial management that, if used, would contribute to the construction of SER in the face of wildfires. There are currently various local initiatives - such as A Paso Lento - that seek to revalue extensive livestock activity and disseminate the knowledge that herders have about the territory management. Moreover, in the particular case of wildfire prevention, the need to include this knowledge of the territorial dynamics between extensive livestock and the structure and composition of vegetation in the formulation of public policies has become evident.

However, due to the atomization of the extensive grazing sector in the Valencian territory and the socioeconomical characteristics of the activity, it is difficult for extensive herders to be able to transfer their knowledge to the administration. In this context, different initiatives and projects have emerged to make the work of herders visible and give them a space to disseminate their knowledge throughout society. The initiative developed by OPEM, putting forward an understanding of extensive grazing as a public service and the role of herders in establishing the terms and conditions of territorial management is the clearest in this regard. The proposal to involve extensive herders in the design of the territorial intervention,

determining in a collaborative way with the technicians how much livestock and under which conditions extensive grazing should be carried out in the woodlands to achieve the desired result, revalue the knowledge that the herders have about the dynamics between their livestock and the woodland. Therefore, the management system could be enriched by insights from the local resource users, thus contributing to enhancing SER (Folke et al., 2009). Although to date OPEM and the administration are refining technical aspects and institutional arrangements necessary to put it into practice, the project can be characterized as a bottom-linked governance example (Moulaert et al., 2019), which if implemented will foster a space for dialogue and knowledge exchange that will contribute to the construction of SER in the face of wildfires.

6.4. Wildfires as triggers of change and self-organization

Finally, the fourth principle to be considered when building SER is based on the opportunity for self-organization that socio-ecological changes create. It is linked with the momentum that disturbances create, where needs are revealed and local initiatives appear in the SES to respond and shape change using its memory, knowledge, and learnings (Folke et al., 2009; Rodríguez et al., 2022). For the purpose of this research, wildfires represent the disturbance in the SES that creates an opportunity to question and reevaluate whether the predominant approach to wildfires in the SES is working or not. Therefore, this subsection address how fostering extensive grazing is gaining popularity as a complementary measure to prevent big wildfires, given the increasing impacts of wildfires in the SES.

It is clearly observed through the research that the Valencian Community is a fire-prone territory, where wildfires risk represents one of the main concerns for the rural population and policymakers. Thus, wildfires are currently among the political priorities and are contributing to shape stakeholders' perceptions about wildfire risk and how to increase resilience in the territory. In this regard, extensive grazing has been gaining popularity as a tool to build SER in the face of wildfires. As mentioned in the previous sections, extensive herders hold socio-ecological knowledge that could contribute to improve the SES preparedness, which is an important element of SER (Barnes et al., 2017; Olsson et al., 2006). The momentum big wildfires generate, particularly when fire suppression services cannot cope, is somehow contributing to rethink how the woodlands are being managed.

In the particular case of big wildfires, this events reveal the vulnerability of the SES and provide a window of opportunity for grassroots initiatives to appear or reinforce, articulating different actors in the SES (Rodríguez et al., 2022). A particular example is the case of the Pego Viu initiative, which was born as response to a big wildfire where the local population witnessed the magnitude of the wildfire risk and decide to act. Their collaborative interventions in the woodland management respond to the socio-ecological memory that the local population have. Particularly important for the case study is the fact that they decide to introduce extensive grazing as a suggestion from the elder rural population. With more years of experience in the territory, elders perceive that the wildfire risk has increased. They

attributed this directly to the decreased presence of herders, and the subsequent encroachment of the woodland.

“Older people say, when there is a wildfire, that this did not happen before, because before there were sheep and there were goats that kept the woodland clean. All these stories... now there are no herders, there are only two or three herders left with only five or six sheep” (A08)

Therefore, big wildfires are creating an opportunity to rethink the fire-prone territory and the woodland management practices to foster spaces of dialogue and action where the knowledge of the local population is considered (Folke et al., 2009). As with Pego Viu, other initiatives have come to light, such as A Paso Lento, that even though reducing the wildfire risk was not its main purpose, contributes to the construction of SER in the face of wildfires throughout the reinforcement of the activity in the territory and the involvement of the local government in this regard. As mentioned, wildfire prevention is an argument that is frequently used by the local initiatives working with herders for the dissemination of their activities and the capitalization of resources, taking advantage of the momentum wildfires create. However, it is important to note that the extensive grazing contribution to SER goes beyond reducing wildfire risk, as the activity contributes to other structural problems such as rural exodus and biodiversity loss.

7. Conclusions

The role at an ecological level that extensive grazing has regarding the prevention of wildfires through the control of the structure and composition of the vegetation is widely developed. However, how this activity contributes to the construction of socio-ecological resilience from a socio-politically sensitive perspective remains underexplored. This research has aimed at filling this knowledge gap, by deepening into the socio-ecological aspects of the extensive grazing activity using the SES framework as a starting point, looking into the interactions of its coupled social and ecological dimensions, and deepening into the understanding of how extensive grazing contributes to build SER in the face of wildfires following a socio-politically sensitive interpretation of the theoretical framework related to the principles to build SER. This has allowed framing the role of the extensive livestock activity beyond its ecological function and delving into how it contributes to the construction of SER through its governance system and the actors involved.

The results of the research have shown that extensive grazing is an activity geographically limited to rural areas, where there is greater availability of pastures and less competition for land use. In addition, the activity is atomized in the territory, with a negative growth trend as a consequence of various socio-economic factors, such as low profitability and harsh labour conditions. However, although in the Valencian Territory the extensive grazing is not the main socio-economic activity, due to its territorial importance, the development of a governance system that fosters the activity to contribute to wildfire prevention has been promoted.

At a technical level, the different actors interviewed acknowledge the important role that extensive grazing has for the construction of SER in terms of reducing forest biomass and maintaining firebreaks, affirming the complementary role that the activity has in reducing the wildfire risk. On the other hand, the results indicate that from a socio-politically sensitive perspective, there is currently a predominant participation of urban actors within the governance system, so what is lacking in the Valencian Community is an inclusive governance structure for the involvement and participation of rural actors, such as herders. Likewise, it is important to highlight how through a disturbance such as wildfires, various local initiatives have managed to position themselves in the territory to demonstrate the work of extensive grazing and its importance for the SES, building SER through its intervention and its collaboration with the governmental authorities.

Although extensive grazing has been gaining popularity as a complementary strategy for building SER in the face of wildfires at the political level, much remains to be done. According to the findings of this research, it is not only a question of granting a payment to herders for grazing in firebreak zones; but it is important to involve them in the design and implementation of the strategies so that their knowledge of the territory is revalued and used. In addition, it has been shown that the extensive grazing activity presents many barriers at the socio-economic level beyond the profitability of the activity, so the social problems that

the herders go through, such as the need for the dignification of the activity and its low representation within of the governance system, should also be considered by decision makers.

While these findings are significant, it is also important to highlight the limitations of the research. In particular, it is necessary to recognize that for this research, two types of information sources were mainly used: literature review and interviews. In the case of the literature review, although there is ample information on extensive grazing and its link with the prevention of wildfires, it is important to highlight the lack of statistical information focused on extensive grazing in the territory. Having more detailed information would have allowed a better understanding of the evolution of livestock activity, its link with the processes of depopulation and encroachment of the territory, as well as its link with wildfires.

On the other hand, in the case of the interviews, these were developed entirely online, mainly due to resource limitations. Although it was possible to interview different local actors and, mainly, herders, conducting on-site interviews could have facilitated the inclusion of more herders in the study, considering that many of them spend most of the day with their livestock in the woodlands and they have limited resources to have an online interview. Despite this, it is considered that the research has managed to gather the perspectives of the herders, either through representatives of organizations and/or initiatives that work closely with them, or by the herders themselves who were interviewed.

Based on the findings of this research, it is recommended that future research further examines the governance system of extensive grazing and its link to wildfire prevention, focusing on how this can be improved through the involvement of various stakeholders in order to continue building SER in the face of wildfires. In addition, considering the importance at a political level that the subject has been gaining in recent years, it is relevant to continue adding to the growing literature on extensive grazing and wildfire prevention from a socio-politically sensitive perspective on the subject, specially looking into the power imbalances and always keeping in mind the questions of resilience for whom and by whom.

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Appendices

Appendix 1 – Interview Guide

E(#)- Tipo de Actor – Nombre

Explicación de la investigación.

El objetivo principal de esta tesis de máster es analizar cómo la ganadería extensiva contribuye a la construcción de resiliencia socio-ecológica frente a incendios forestales, teniendo como caso de estudio a la Comunidad Valenciana. Para ello, se busca profundizar en la comprensión de la problemática en torno a la ganadería extensiva en el área de estudio y reflexionar sobre las perspectivas de los diferentes actores clave involucrados.

	<i>Preguntas de investigación (PI)</i>
<i>Pregunta principal (PP)</i>	<i>¿Cómo contribuye la ganadería extensiva al desarrollo de la resiliencia socioecológica ante los incendios forestales en la Comunidad Valenciana?</i>
	Analizar cómo contribuye la ganadería extensiva al desarrollo de la resiliencia socioecológica frente a los incendios forestales, a partir del análisis de la situación de la actividad económica en la Comunidad Valenciana. Además, esta tesis de maestría tiene como objetivo contribuir a la comprensión de la problemática en torno a la ganadería extensiva en el área de estudio y reflexionar sobre las perspectivas de los diferentes actores clave involucrados.
<i>Sub-pregunta 1 (SP1)</i>	<i>¿Cuál es la situación actual de la ganadería extensiva en la Comunidad Valenciana?</i>
<i>Objetivo – SP1</i>	Esta pregunta permitirá realizar un diagnóstico de la situación de la ganadería extensiva como estrategia de construcción de resiliencia socioecológica frente a los incendios forestales, así como identificar los actores clave implicados en esta actividad, en la Comunidad Valenciana.
<i>Sub-pregunta 2 (SP2)</i>	<i>¿Cuáles son las perspectivas sobre la ganadería extensiva como estrategia para aumentar la resiliencia ante los incendios forestales de los diferentes actores clave de la Comunidad Valenciana?</i>
<i>Objetivo – SP2</i>	Esta pregunta permitirá contrastar las diferentes perspectivas sobre la ganadería extensiva como estrategia para aumentar la resiliencia socioecológica frente a los incendios forestales en la Comunidad Valenciana.
<i>Sub-pregunta 3 (SP3)</i>	<i>¿Cuáles han sido las barreras y oportunidades de la incorporación de la ganadería extensiva como estrategia para aumentar la resiliencia socioecológica ante los incendios forestales en la Comunidad Valenciana?</i>
<i>Objetivo – SP3</i>	Esta pregunta permitirá un análisis crítico de las diferentes barreras y oportunidades de la ganadería extensiva como estrategia para construir resiliencia socioecológica frente a los incendios forestales, desde la perspectiva de los diferentes actores clave, lo que permitirá identificar mejoras para gestionar la actividad o la exploración de otras estrategias.

Cuestionario general

Preguntas para entrevista	PI que busca responder
1. Para comenzar, ¿podría comentarme sobre usted y su trabajo?	-
2. ¿Diría que los incendios forestales son un problema en la Comunidad Valenciana? ¿Por qué?	-
3. ¿Cómo afecta los IIFF a la población? ¿Se considera una persona a la que los IIFF le afectan directamente?	-
4. A nivel político o institucional - ¿Qué es lo que se está haciendo para dar respuesta al problema de los incendios forestales? (regulaciones/gestión del territorio/ campañas de incendios...)	SP1
5. ¿Cómo evalúa, desde su perspectiva, las políticas de prevención y extinción de incendios?	SP2
6. ¿Desde su punto de vista, cree que la administración considera a la ganadería extensiva como estrategia para prevenir incendios forestales? En caso sí, ¿cómo?	SP1
7. Respecto a la ganadería extensiva, ¿considera que es una actividad económica que se desarrolla en el presente en la Comunidad Valencina? ¿Por qué?	SP1
8. ¿Tiene conocimiento sobre políticas vinculadas a la promoción de la ganadería extensiva en la Comunidad Valenciana? En caso sí, ¿cuáles considera que son las más relevantes? ¿Por qué?	SP1
9. ¿Cómo evalúa, desde su perspectiva, las políticas vinculadas a la promoción de la ganadería extensiva en la Comunidad Valenciana? ¿Cómo considera que pueden mejorarse? (¿Qué echa en falta?)	SP2 – SP3
10. ¿Diría que la ganadería extensiva es una estrategia efectiva para la prevención de incendios forestales? ¿Por qué?	SP2
11. ¿Conoce de iniciativas vinculadas a la ganadería extensiva en la Comunidad Valenciana?	SP1 – SP2
12. ¿Cuáles considera que son los principales desafíos a los que se enfrentan los ganaderos en las zonas rurales de la Comunidad Valenciana hoy en día?	SP1 – SP3
13. ¿Cuáles considera que son las principales oportunidades para la proliferación de la ganadería extensiva en la Comunidad Valenciana?	SP3
14. ¿Hay algún tema relevante por el que no te haya preguntado, pero que creas importante mencionar?	-

Cuestionario para iniciativas locales

Preguntas para entrevista	PI que busca responder
1. Para comenzar, ¿podría comentarme sobre usted y su trabajo? ¿Qué rol/cargo desempeña, desde cuándo?	-
2. ¿Cómo nace la iniciativa? ¿en qué zona trabajan? ¿cuáles son las características del rebaño que utilizan?	SP2
3. ¿La iniciativa ha recibido el apoyo de otros actores locales? (ej. Ayuntamiento, Generalitat, entidades del sector forestal, asociaciones, etc.)	SP1 – SP3
4. ¿Diría que los incendios forestales son un problema en la Comunidad Valenciana? ¿Por qué?	-
5. ¿Cómo afecta los IIFF a la población? ¿Se considera una persona a la que los IIFF le afectan directamente?	-
6. A nivel político o institucional - ¿Qué es lo que se está haciendo para dar respuesta al problema de los incendios forestales? (regulaciones/gestión del territorio/ campañas de incendios...)	SP1
7. ¿Cómo evalúa, desde su perspectiva, las políticas de prevención y extinción de incendios?	SP2
8. ¿Desde su punto de vista las respuestas a nivel político o institucional consideran a la ganadería extensiva como estrategia para prevenir incendios forestales? En caso sí, ¿cómo?	SP1
9. Respecto a la ganadería extensiva en la Comunidad Valenciana, ¿considera que es una actividad económica vigente en la Comunidad Valenciana? ¿Por qué?	SP1
10. ¿Tiene conocimiento sobre políticas vinculadas a la promoción de la ganadería extensiva en la Comunidad Valenciana? En caso sí, ¿cuáles considera que son las más relevantes? ¿Por qué?	SP1
11. ¿Cómo evalúa, desde su perspectiva, las políticas vinculadas a la promoción de la ganadería extensiva en la Comunidad Valenciana? ¿Cómo considera que pueden mejorarse? (¿Qué echa en falta?)	SP2 – SP3
12. ¿Diría que la ganadería extensiva es una estrategia efectiva para la prevención de incendios forestales? ¿Por qué?	SP2
13. ¿Conoce de otras iniciativas locales vinculadas a la ganadería extensiva en la Comunidad Valenciana?	SP1 – SP2
14. ¿Cuáles considera que son los principales desafíos a los que se enfrentan los ganaderos en las zonas rurales de la Comunidad Valenciana hoy en día?	SP1 – SP3
15. ¿Cuáles considera que son las principales oportunidades para la proliferación de la ganadería extensiva en la Comunidad Valenciana?	SP3
16. ¿Hay algún tema relevante por el que no te haya preguntado, pero que creas importante mencionar?	-

Appendix 2 – Informed Consent

Formulario de consentimiento informado

Permiso para participar en el estudio – Copia para el participante

Tema de la investigación:

La ganadería extensiva como estrategia para aumentar la resiliencia socioecológica ante los incendios forestales en la Comunidad Valenciana

Entrevistador/a

Diego Calero Valdez

Objetivo y metodología

El objetivo principal de esta tesis de máster es analizar cómo la ganadería extensiva contribuye a la construcción de resiliencia socio-ecológica frente a incendios forestales, teniendo como caso de estudio a la Comunidad Valenciana. Para ello, se busca profundizar en la comprensión de la problemática en torno a la ganadería extensiva en el área de estudio y reflexionar sobre las perspectivas de los diferentes actores clave involucrados. Las herramientas de recojo de información utilizadas son entrevistas semiestructuradas y la revisión de fuentes secundarias.

- ✓ Entiendo lo que se espera de mí durante esta investigación.
- ✓ Entiendo quién tendrá acceso a mis datos personales, cómo serán almacenados y procesados, y qué ocurrirá con esos datos al final del proyecto.
- ✓ Entiendo que la información será procesada por el investigador principal y almacenadas de manera segura para su análisis posterior.
- ✓ Entiendo que mi participación en este estudio es voluntaria. Tengo derecho a dejar de participar en la investigación en cualquier momento. No he de proporcionar ninguna razón para ello, y sé que esto no tendrá ningún tipo de repercusiones negativas.
- ✓ Puedo escoger no contestar a algunas de las preguntas.
- ✓ Los resultados de esta investigación pueden ser utilizados y publicados con fines científicos. Mi nombre no será publicado, y la anonimidad y confidencialidad de los datos estará garantizada en todo momento durante la investigación.
- ✓ Se me ha informado de las ventajas y desventajas de mi participación.
- ✓ He tenido la oportunidad de pedir más información, y las preguntas que tenía han sido resueltas de manera satisfactoria.
- ✓ Sé a quién debería de contactar para cualquier pregunta en relación a este estudio y/o en relación a mis datos personales. Además, sé a dónde acudir en caso de tener alguna queja.
- ✓ Accedo a que la conversación sea grabada en audio Sí No

- ✓ (Sólo para entrevistas online) Accedo a que la entrevista sea grabada en vídeo Sí
 No
- ✓ Accedo a ser fotografiado Sí No
- ✓ Solicito una transcripción de mi entrevista Sí No
- ✓ Doy permiso para que el investigador me contacte de nuevo en relación a este estudio Sí No
- ✓ Deseo ser informado/a sobre los resultados de esta investigación. Los investigadores pueden contactarme para ello en la siguiente dirección de e-mail:

Para preguntas y para la ejecución de mis derechos (acceso a mis datos, rectificación de los datos, ...) después de mi participación sé que puedo contactar con:

diego.calerovaldez@student.kuleuven.be

En caso de quejas u otras preocupaciones con respecto a los aspectos éticos de esta investigación puedo contactar con el Comité de Ética Social y Societaria de la KU Leuven:

smec@kuleuven.be

Puede encontrar más información sobre la privacidad en la investigación en

<https://kuleuven.be/privacy/en/>.

Si tiene más preguntas sobre cuestiones de privacidad, puede ponerse en contacto con el responsable de la protección de datos: dpo@kuleuven.be

He leído y comprendido la información de este documento y he recibido respuesta a todas mis preguntas sobre esta investigación. Doy mi consentimiento para participar.

Fecha:

Nombre y firma del participante

Nombre y firma del investigador

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