



ASSESSMENT OF POLICIES FOR LL2

SYLVOPASTORAL SYSTEMS

WP3 - OUTPUT 3.1 - ACTIVITY 3.1.7



LIVINGAGRO Cross Border Living Laboratories for Agroforestry

**ENI CBC Med Programme 2014 – 2020, first call for standard projects
Grant Contract Number: 38/1315 OP of the 29/08/2019**

VERSION 28/02/2021



COORDINATED BY



DOCUMENT INFORMATION

Lead Author	CLAUDIO PORQUEDDU, CNR ISPAAM; ANDREA PISANELLI, CNR IRET (PP1)
Contributors	CLAUDIA CONSALVO, CNR IRET; ANTONELLO FRANCA, CNR ISPAAM (PP1)
Dissemination Level	Public Document

© MEMBERS OF THE LIVINGAGRO CONSORTIUM
Month 18 and year 2



Introduction: Project Summary

“LIVINGAGRO – Cross Border Living laboratories for Agroforestry” project is funded under the ENI CBC Med Programme 2014–2020, first call for standard projects, and refers to thematic objective A.2 “Support to education, research, technological development and innovation”, priority A.2.1 “Technological transfer and commercialization of research results”.

With a total budget of 3,3 Million Euros and a 2,9 Million EU-contribution through the ENI CBC Med Programme, LIVINGAGRO project involves 6 organizations from 4 different countries (Italy, Greece, Lebanon and Jordan) and addresses the challenge of knowledge and technological transfer in Mediterranean agriculture and forestry systems for achieving and sharing good practices aimed at sustainable production, protecting biodiversity, enhancing transfer of innovation and increasing profitability for territories and main actors as well as stakeholders involved. Using an open innovation-oriented approach for co-creating economic and social values and interactions between supply and demand, eliminating geographical and cultural barriers, two Living Laboratories will be established focusing on olive multifunctional system (LL 1) and grazed woodlands (LL 2).

Expected results

- ✓ Creation of two Laboratories (Living Labs) on the themes of multi-functional olive systems and grazed woodlands whose activation phases include the localization and identification of relevant stakeholders;
- ✓ Establishment of "Living Labs" through specific agreements between public - private entities;
- ✓ Development of the dedicated ICT platform;
- ✓ Creation of a public-private community which shall include also people and launch of pilot actions aimed at experimentation;
- ✓ Stipulation of at least 4 research agreements between universities and research centers in collaboration with the economic operators of the project partner countries;
- ✓ Organization of 6 field visits by research institutions to assess and identify companies' innovation needs;
- ✓ Cooperation between at least 8 companies / research organizations for the development of innovative activities and services;
- ✓ Activation of 6 courses related to the creation of innovative companies / startups;
- ✓ Creation of 10 corporate-scientific brokerage events in Jordan (4 B2B events), Lebanon (4 B2B events) and Crete (2 B2B events);
- ✓ Analysis and development of 10 new products / services for the agro-forestry sector;
- ✓ Activation of 20 technology transfer and intellectual property brokerage services for companies, universities, research institutes and the general public.



Partnership

Beneficiary (LP):

Regional Forest Agency for Land and Environment of Sardinia (Fo.Re.S.T.A.S.), Italy

Partners (PPs):

PP 1: Italian National Research Council, Department of Biology, Agriculture and Food Science (CNR), Italy

PP 2: National Agricultural Research Center (NARC), Jordan

PP 3: Lebanese Agricultural Research Institute (LARI), Lebanon

PP 4: Mediterranean Agronomic Institute of Chania (MAICH), Greece

PP 5: ATM Consulting S.a.s. (ATM), Italy

Associated Partners (APs):

AP1: Autonomous Region of Sardinia, Dept. of Environment defense

AP2: Autonomous Region of Sardinia, Dept. of Agriculture and agro-pastoral reform

AP3: Coldiretti Sardinia

AP4: Regional Association of Sardinian Breeders

AP5: The Lebanese University (Faculty of Agronomy, Beirut)

Project Duration

September 2019 – September 2022 (36 months)



EXECUTIVE SUMMARY (TO BE INCLUDED ONLY FOR SCIENTIFIC PUBLICATIONS WITH LENGTH OF MORE THAN 10 PAGES)

This document contains / refers to / represents / describes

.....

.....

.....

.....



INDEX

INTRODUCTION.....	7
1. SYLVOPASTORAL SYSTEMS IN EUROPE.....	8
1.1 POLICIES SUPPORTING SILVOPASTORAL SYSTEMS IN EUROPE	8
2. SYLVOPASTORAL SYSTEMS IN WEST ASIA AND NORTH AFRICA (WANA) REGION	10
3. THE SILVOPASTORALISM IN LEBANON	10
3.1 POLICIES SUPPORTING PASTORALISM IN LEBANON	11
4. SILVOPASTORALISM IN JORDAN.....	13
4.1 POLICIES SUPPORTING SILVOPASTORALISM IN JORDAN	14
REFERENCES.....	17
ANNEX 1	20



INTRODUCTION

Silvopastoral systems (SPs) have significantly contributed in shaping the landscapes of the Mediterranean basin. The high seasonal and inter-annual variability of Mediterranean grasslands have likely been important determinants of the abundance and diversity of SPs (Rolo and Moreno, 2019). Trees and shrubs provide forage resources that complement for months the grass shortage (Porqueddu et al., 2016). These systems vary widely according to the differing climatic, cultural and socio-economic conditions under which they are developed; from the Parcours of the Maghreb steppes to the Dehesas in the Iberian Peninsula, and from the Mediterranean islands like Sardinia to inland mountain regions. SPs present particularities developed both in response to internal needs within the farming systems (need to increase production while reducing costs) and external forces (competition with other activities for the use of land). Sheep and goats play a crucial role in the farming economy of the Mediterranean basin thanks to their ability to exploit marginal areas, and as well for the limited labour and capital required for their management (Porqueddu et al., 2017). These farming systems have been shown to be resilient to frequent but moderate disturbance factors (i.e. deforestation, periodic fires and grazing) by developing strategies to maximize production of multiple goods and ecosystem services over several millennia (Zapata and Robledano, 2014). Under global changing conditions, the resilience of the Mediterranean SPs with their own flexible, improvised and mobile responses, becomes a strategic resource (Neri and Scoones, 2019) for the less favored areas of the Mediterranean basin. This background gives room for optimism on the perspective that new “complex” farming systems could be developed also in response to changing climate scenarios. Unfortunately, such systems are currently subjected to the contrasting threats of intensification and abandonment (Kyriazopoulos et al., 2013). In very difficult and degraded areas, or in harsh climates, this breeding type is the only possible primary activity able to prevent land abandonment but in many cases overgrazing represents one of the causes for land degradation and desertification. To mitigate this problem a better knowledge of agropastoral systems is first needed (Enne et al. 2004). Moreover, as pointed out by Porqueddu et al. (2016), the decreasing public sector support for the research on grasslands as well as on SPs requires a greater level of international scientific cooperation among the few institutions operating in the different Mediterranean-climate areas of the World.



1. SYLVOPASTORAL SYSTEMS IN EUROPE

Silvopastoral systems are defined as a combination of trees, pastures or crops and/or livestock on the same plot of land (Mosquera-Losada et al., 2012). In more marginal, stress-prone regions and mountains, where agriculture was hardly viable, extensive pastoralism has been the most common and traditional land use practice. Across Europe, different pastoral landscapes are still dominated by SPs that include grazed forests, wood pastures (trees as fodder), grazed plantations, but also grazed fruit orchards (Moreno et al., 2014).

In Iberian Peninsula, SPs cover 4.5 million ha, mainly represented by Dehesa and Montados. Similar systems are present in many other Mediterranean regions (Sardinia, Corsica, Crete, Greece, Albania, northern Africa and Western Asia) and in less extension in many other European biogeographic regions (Riguiero-Rodríguez et al., 2009). SPs cover ca. 17 M km² in the world (Zomer et al., 2009). Depending on the region, SPs occurs as vanishing relic of historical land-use, or still more or less widespread as multiple-use rangeland (Bergmeier et al., 2010). SPs are frequently diffuse transitions from agriculture to forest lands, and there is still a lack of reliable maps of distribution or any official statistics of their extension (Van Doorn and Pinto-Correia, 2007).

In Europe SPs are managed in different ways according to the different socio-economic, political, cultural and environmental scenarios. Somewhere, there has been a deliberate and purposeful integration of woody vegetation (trees or shrubs) with crop and/or animal production systems to benefit from the resulting ecological and economic interactions. However, in many cases woody vegetation has been hardly managed and/or management did not follow underwent ecological and economical changes. Some of them are suffering declining processes as lack of regeneration and exhaustion of resources (Riguiero-Rodríguez et al., 2009). In other cases, especially in mountain areas, abandonment is the harsh reality. Also, the low value of the traditional silvopastoral products in the actual markets is a common concern.

SPs should not be regarded as only productive activities but also, and mainly, as major conservation tools. Ecosystem services (CO₂ sequestration, soil protection, stability, landscape, structural heterogeneity, fire prevention) and non-timber products (cork, fungus, fodder, fruits, honey) from the tree layer are usually much more important than timber products, including fuelwood, the demand for which has almost disappeared due to the availability of other sources of energy. The decrease of shepherding and transhumance, the partial substitution of extensive sheep herds by cattle and the excessive use of concentrate feed, results in an unbalanced distribution of stocking levels and an uneven utilization of grazing and browsing resources. These changes result in local shrub encroachment, increased fire hazard and loss of biodiversity (San Miguel-Ayanz., 2005). Understanding at what scale ecosystem services are produced, managed, consumed, and accessed is essential for designing management strategies and governance structures that are effective, accurate, and fair (Raudsepp-Hearne and Peterson, 2016). Ecosystem services emerge at the territorial scale from the interaction between silvopastoral practices and ecological processes. The understanding of the ecological processes influencing such relationships and dynamics is fundamental when addressing the governance of SPs, as agricultural and environmental values, and related socio-economic structures and processes are structurally coupled (Ison et al., 2011).

1.1 POLICIES SUPPORTING SYLVOPASTORAL SYSTEMS IN EUROPE

In the second part of the last century, the abandonment of traditional land use practices such as SPs practices in favour of more specialized agriculture lead to several environmental concerns (biodiversity



loss, nitrate pollution, pesticides use, erosion, forest fire...). Such environmental concerns are currently discussed and considered in policies at different levels. Afforestation became a priority objective in Europe, nevertheless rural abandonment continues taking place and this should have counteracted. SPs are a sustainable land use that may contribute to solve some of the problems that Europe has to face. They are systems that need more complicated management than forestry or agricultural systems and farmers need proper training based on traditional knowledge that is threatened of extinction and the new technical knowledge. The obstacles for the implementation of these practices are either technical (e.g. tree protection in particular during regeneration) or related to the lack of supporting policies (Rois-Diaz and Mosquera-Losada, 2006).

Silvopasture represents the 85% of the agroforestry practices in Europe, being the most extended among other agroforestry practices (silvoarable, riparian buffer strips, forest farming and homegardens) and it is particularly an important practice across the Mediterranean region, mostly associated with oak forests, but also with permanent crops (olive trees). Silvopasture is a practice that can be associated to sustainable grassland management mainly located in the South and North of Europe, that provides enormous advantages to reduce livestock production costs. However, it is not extensively used in Europe as only the 10% of the grassland area is occupied by silvopasture. One of the main drawbacks to foster agroforestry in Europe for farmers is to really identify the potential that silvopasture has to increase productivity in livestock systems (Mosquera-Losada et al., 2018).

Nowadays it is possible to appreciate a change in the approaches and these systems may obtain financial support for its implementation (Balandier et al. 2002), e.g. under the new proposed rural development measures of the Common Agricultural Policy (CAP). The CAP is the policy that most influences the decisions on agricultural production in Europe. From its beginning, it promoted specialization and intensification but in the last years it has been amended several times to minimize the negative impacts of the intensification especially by means of e.g. agri-environmental measures, less favoured areas, good farming practices, etc. The first pillar of the CAP is related to the agricultural production. More and more subsidies to farmers are being decoupled from quantity production with wider list of crops, introducing some environmental standards to be met (EEA/UNEP, 2004). The second pillar is based in the Rural Development Regulation. Support can be provided to farmers to adapt their businesses, management techniques or practices to a rural sustainable development.

Despite the well-known socioeconomic and ecological importance of SPs across Europe, only in 2006 this land use system was considered as a specific agroforestry practice in the Common Agricultural Policy (CAP), namely under the Pillar 1 and 2 of the CAP 2007-2013. However, adoption of this financial support schemes has been limited and no relevant impacts on the future sustainability of this land use systems was observed. Many efforts have been conducted in last years to ensure the full recognition of the SPs as an eligible land use for Basic Farm payments in the CAP 2014-2020 period. One of the most interesting windows of opportunity to maintain in a sustainable way the SPs across Europe has been the new greening architecture of the CAP 2014-2020 scheme. However, some rules concerning the effective application/adoption of this measure has been determined by each member state, representing thus an important moment to highlight the specificities and relevancies of the SPs that occurs in each country (Moreno et al., 2014).

The European Commission proposes that the next CAP 2021–2027 be built around nine key objectives which are focused on the three sustainable goals of the United Nations (economic, environment, and social) (European Union, 2029). The CAP 2021–2027 should also recognize the need for providing sustainable practices that can be adapted at the national level. Therefore, there will not be EU general rules with regard to land use for farmers to receive direct payments. Instead, Member States should fulfil



the nine main aims of the CAP and different types of EU strategies (bioeconomy strategy, farm to fork strategy, European green deal) by demonstrating results linked to key actions such as biodiversity, nutrient efficiency, or climate mitigation.

Agroforestry, and therefore silvopasture, presents multiple environmental, economic and social benefits compared with exclusively forest and agricultural systems. For this reason, agroforestry is expanding across Europe despite the lack of technical knowledge transfer and adequate policies promoting agroforestry practices at field level (Rodríguez-Rigueiro FJ et al., 2021).

In this context, there are 118 Research & Development Projects (RDP) in the whole 28 member states, out of which 29 are included in the Mediterranean area of Europe. However, these RDP do not consider in depth the role that agroforestry has to play. Moreover, the Mediterranean area of Europe is one of the most vulnerable regions in the world to the impacts of global warming, which makes necessary to provide policy tools to foster sustainable land use systems in this region of Europe (IPCC, 2013).

2. SYLVOPASTORAL SYSTEMS IN WEST ASIA AND NORTH AFRICA (WANA) REGION

Over the last decades, there have been significant increases in both small ruminant population and production in the WANA region, all associated with growing demand for animal products that has risen from increases in per capita real income, urbanization and population growth (Ates and Louhaichi, 2012). This in turn has caused unrelenting pressure on natural resources, primarily on rangelands that are gradually giving way to the desertification. At present, it is generally considered that the WANA region does not contain any terrestrial ecosystems that are unaltered by human activity (Aronson, et al., 1993). With the gloomy predictions of high population growth in these developing countries, it is likely that constraints on both the land and food supply will become increasingly evident in both crop/livestock and grazing systems. The traditional pastoral system of “nomadism”, which evolved over hundreds of years, contained strategies for coping with various climatic, physical and biological environments. The free movement of livestock was severely restricted through the creation of international boundaries, which cut across pastoral routes. Furthermore, the administrative boundaries set by governments during the post colonization period did not match tribal boundaries (Abu-Zanat, 2005). This mismatch accentuated the sedentarisation of herders, overgrazing and destruction of woody plant species through burning for fuel and contributed to land degradation. The main issues in these pastoral systems that need to be addressed, such as grazing and access to water, are often policy or institutional ones. Pastoral communities, however, are often socially and politically marginalized. Their livelihoods are undermined by inappropriate policies and laws. Although, several countries have already established pastoral codes that help manage these natural resources, unfortunately, in many cases these regulations are not widely enforced.

3. THE SYLVOPASTORALISM IN LEBANON

Pastoralism was a widespread traditional way of life in the Arab countries, especially in the rural areas. Livestock remains a major contributor to the livelihoods of these communities although many factors are limiting the productivity and growth of the sector. Pastures and rangelands are put under pressure due to biased policies in relation to land access, agricultural encroachment, urbanization, overgrazing and harsh



climatic conditions. Studies on the small ruminant sector in the Bekaa valley of Lebanon showed important adaptive changes in production systems over time including: income diversification through off-farm activities, reduction in herd size and limited transhumance. A complete shift away from livestock production was also noticed with some farmers opting for a totally different source of living.

Specific change factors compromising the sustainability of pastoral systems have been identified in Lebanon: i) lack of policies and laws related to pastoralism and land tenure; ii) urbanization and rural migration; iii) encroachment by agriculture; iv) deforestation and overgrazing; v) lack of technical skills and data for range management; and vi) climate variability and change. The weight of these factors (and probably others) on pastoral systems results in a decrease in rangeland resources in terms mainly of water and food, a shortage of nutrients due to the conversion of pastures, a shift to more sedentary systems, changes in social practices, a decrease in the number of animals and herds and even the abandonment of agricultural activities (Ben Salem and Smith, 2008; Dick et al., 2008; Daoud et al., 2016; Chedid et al., 2018).

Nevertheless, pastoral systems known for their great resilience, have developed adaptive mechanisms (Hamadeh et al., 1999; Kratli et al., 2013) which, associated with adequate local policies, allow these systems to overcome challenges and therefore maintain the livelihoods of their communities (Daoud et al., 2016). These mechanisms have been widely documented around the world and include among others the diversification of on-farm and off-farm income-generating activities, reduction in overall herd size, restricted mobility, food supplementation, etc. (Hamadeh et al., 1999; Ben Salem and Smith, 2008; Dick et al., 2008; Alary et al., 2016).

To reduce the vulnerability of pastoral systems and increase their resilience to global change, the responses of pastoral systems and their coping mechanisms to stressors need to be analyzed and understood (Dong et al., 2016). The inclusion of farmers in policy making and program planning is also imperative for successful development plans and therefore needs to be considered. Based on the above the participative approach should offer a useful tool to the development actors concerned (ministries and development agencies) to define the means of intervention in order to strengthen the sustainability of traditional agro-pastoralism breaking up under the effect of global change. It has been shown that planning and risk reduction efforts are not enough to help pastoralists cope with external threats, but it would be more effective to enable and strengthen their innate adaptive capacity and help them to be more independent rather than providing them with coping strategies.

A complete abandonment of animal production has been observed in certain regions of Lebanon, and some farmers have opted for an entirely different source of life. The challenges facing pastoral livestock systems remain largely ignored, although the demand for animal products is steadily increasing, due to population growth and increased wealth. Policies favouring access to pasture and rehabilitation of rangelands are absolutely necessary, in addition to financial, veterinary and technical services.

3.1 POLICIES SUPPORTING PASTORALISM IN LEBANON

Sheep and goats are the main species of livestock adapted to a range of climate variability and dryness in Lebanon. According to latest statistics made by the ministry of agriculture with the collaboration FAO, the production of sheep and goats is being practiced by 9900 farmers across the country, normally in mixed herds. The small ruminant population in Lebanon is around 700.000 heads around 300.000 sheep and 400.000 goats, with an average of 100 sheep per farmer.

The problems that are affecting the sector of rising small ruminants are social, economic and technical.



The lifestyle has changed from rural to urban with the consequent abandonment of traditional livestock grazing activity. Furthermore, there is a lack of sufficient natural pastures due to land fragmentation and the productivity of the herd is very low. The absence of official support and lack of necessary social development services for the herders make impossible the economic sustainability of the farms.

Land tenure and the form of ownership significantly affect the opportunities to exploit natural resources and to decide where and how to expand the land (Zurayk et al., 2001; Enne et al., 2004). This is why farmers, who have access to only marginal lands, or who temporarily or illegally use the land, will practice activities disregarding the risks of land degradation (Zurayk et al., 2001). In Lebanon, national policies on land use and land tenure relevant to pastures management and preservation are either very old (outdated) or do not exist at all. As most of the shepherds do not own the land they graze, they resort to lease and use public and/or private forest areas and rangelands and crop residues to feed their animals (Hosri and Nehme, 2006; Asmar, 2011) which, added to the feed supplement expenses, represent a big limitation to the profitability and hence the sustainability of these systems (Hamadeh et al., 2001). The main problems of land ownership in Lebanon are related to land tenure insecurity especially for poor people and farmers, the unclear overlapping land rights caused by legal ambiguity or practices, the land encroachment and illegal settlers that farmers cannot prevent in the absence of legal protection, and finally the absence of land survey either by municipalities or local authorities (Hamadeh et al., 2005). All these reasons, complemented with the lack of regulations, have weakened the traditional institutions and the system of communal range management in maintaining common lands (Mabel Chedid, 2019).

Another problem is the conversion of marginal lands to agricultural activities is preventing their use as rangelands. The investments done in the marginal lands, such as planting rain-fed fruit trees, are not taking into consideration the long-term effect of these activities such as soil erosion which will decrease the quality and quantity of pastures and lead to animal loss eventually and a reduction of the pastoralists' income (Hamadeh, 2002). This is the case of Aarsal, which used to be a traditional agro-pastoral area, and where the plantation of 1.5 million of cherry and apricot trees resulted in the fragmentation of the land and hence the loss of rangelands (Chahine, 1995). Shepherds were pushed to seek new pastures, and sometimes graze in the newly established orchard which resulted in conflicts between them and the orchard growers, and ended in an acute drop of the number of small ruminants (Zurayk et al., 2001).

The poor management of the sector and the absence of a comprehensive rangeland management plan, the limited technical capacity of staff and the centralization of decisions related to the investment of natural resources, particularly pastures, worsen the already precarious situation of pastoralism in Lebanon.

The strategy of the Ministry Of Agriculture (MOA) for 2015-2019 promoted good governance in rangeland management through updating national legislation to comply with international standards of laws and decisions, developing the capacities of the relevant official departments (human and infrastructure), activating local participation in the management and protection of rangeland in coordination with municipalities and environmental associations and raising awareness on the economic importance of rangelands in rural development. During the programming period MOA developed a sustainable plan for rangeland and pastoral plants at a national level aimed at: assessment of pasture land and rangelands, their fodder capacity and their pastoral load in cooperation with the Agricultural Scientific Research Authority; identification of grazing systems and pathways; development of a national management plan for rangelands; improvement of existing rangelands.

A legislation to protect forests and rangelands exists but need for application and control to manage grazing and shepherds' movements. The national policy for the management is not adapted, governance system with limited human resources and lack of community-based management are the main constraints.



The overgrazing with limited spaces to graze and conflicts between land users and the impact, causes rangelands and forests degradation, soil erosion and destruction of landscapes. Protected areas are needed to ensure the regeneration of the spontaneous vegetation.

4. SILVOPASTORALISM IN JORDAN

Jordan is a semi-arid and drought-prone country largely dominated by range of mountains in the west. The highlands have a Mediterranean climate characterized by a hot, dry summer and a cool, wet winter separated by two short transitional periods.

Jordan has five agro-ecological zones (AEZs) based on the annual rain levels: Arid, Marginal zone, Semiarid, Subumid, Jordan Valley, Water bodies. A common element in all AEZs is the rainfall factor that determines the land use and farming systems in each zone. Drier zones are areas of small ruminant grazing and rainfed barley cultivation. Wheat is also rainfed but in higher rain areas, whereas irrigated farming, including intensive dairy, fruits and vegetables are in the settled permanently irrigated areas.

The grazing resources used to sustain the flocks of grazing animals most of the year, and supplemental feeding was practiced only in drastic situations such as severe-prolonged drought or very cold conditions. Different studies reported that the natural grazing resources are highly degraded and their contribution to the feeding calendar of grazing animals is less than 20% (Juniedi and Abu-Zanat 1993, Abu-Zanat and Tabba'a 2001, Abu-Zanat 2001, Abu-Zanat 2002). The original productivity of the steppe and Badia before 1990 was estimated at 20kg and 8kg per dunum of dry matter, respectively. While after 1990 and due to the unsustainable policies and practices that prevailed during that era, the productivity of the rangeland represented by the steppe and Badia was estimated at 10kg and 4kg per dunum of dry matter, respectively. This means that the traditional pastoral systems are at risk and about 250,000 of inhabitants (5% of Jordan's population) engaging directly or indirectly in pastoral activities will be severely affected (MoA, Rangeland Strategy, 2013).

Livestock contributes about 55% of the agricultural production. Sheep and goats are the predominant livestock species in Jordan. The animals are generally raised on a crop-residue, planted fodder and barley grain based system with the rangeland contributing about one month of livestock feeding in normal years. This contribution is severely reduced in overgrazed areas and during extended drought years. The maximum potential contribution of improved rangeland is not expected to exceed 30% of the daily feed requirements of one adult sheep or goat (Sidahmed 2011).

Supplementary feed has been encouraged by the government barley subsidies and reducing forage availability and has as a result led to decreasing profit margins of producers and low competitiveness of their products at national and international markets. Twenty years of subsidies and ease of transportation around the desert have encouraged the livestock industry to become dependent on barley, which accounted for 63% of feed costs for producers. The government policy for subsidizing prices of imported inputs especially during the dry seasons has also encouraged livestock herders to keep large number of animals exceeding the carrying capacity of the rangeland (MoA, Rangeland Strategy, 2013).

The Rangeland Patterns in Jordan Rangelands comprise the low rainfall and variable climate arid and semi-arid areas of Jordan. The main ecosystem types are native grasslands, shrub lands and woodlands. There is no clearly defined boundary to the rangelands. Boundaries move according to climatic conditions. The rangelands are a strong element in the Jordanian culture, historical course, social imagery, and social history, and have a significant cultural and heritage value.



4.1 POLICIES SUPPORTING SILVOPASTORALISM IN JORDAN

The land area of Jordan's rangelands depends largely on the definition adopted. An inclusive definition joins together much of the desert, the steppe region and the highlands, thus making some 97% of the land area of Jordan as 'rangelands'. "The wide-open, non-fenced lands where fodder grow naturally, that are not suitable for traditional farming due to lack of rain, low fertility, rough terrain and high rockiness or because of a combination of these factors, which makes the lands optimum use restricted to production of fodder for animals. However, only the regions unsuitable for rain-fed cropping, with rainfall below 200mm annually, are defined as range which gives a figure near to 80% of the total land area. The Agriculture Law No. 20 for the year 1973 defined the ranges as "all lands registered as such and any other state-owned lands where annual rainfall is below 200mm and that do not have sustainable irrigation, or the lands confined for public use". Since 1985 there has been an acceleration of all types of agriculture, gradually eating into the area of the rangeland. The most significant economic use of the rangelands is pastoralism. The most common animal herded is sheep, although goats are more numerous in the south. This represents a major change from camel production, which was predominant until the 1940s. Camels are still kept in certain areas, but their numbers are much reduced. This change has almost certainly affected the vegetation patterns as the large thorny bushes that camels graze cannot be eaten by sheep or goats. Controlled systems of land use in the rangelands, such as the Hima system, (a traditional conservation system used by Bedouins to organize grazing and keep lands protected and conserved) persisted until the early twentieth century (MoA, Rangeland Strategy, 2013).

For a long period in the past, Jordan's grazing lands were characterized by effective traditional land tenure systems and grazing rights which were associated with tribal institutions. This protected the resources in these lands and organized their use in a way that assisted in their conservation and continued productivity under the prevailing environmental and social conditions. With the elimination of these systems and rights and declaration of grazing lands as state-owned land, open for everybody, new land uses encroached such as overgrazing and early grazing of range plants, ploughing of rangelands to establish ownership rights, property rights, urbanization, uprooting of bushes for use as fuel wood, arbitrary movement of vehicles, quarries and mining activities. Many of these areas were over-used without consideration to their resource requirements or their productivity. The change in land tenure also led to a lack of the incentives that encourage pastoralists and Bedouins to maintain and conserve their resources and lands and control their grazing. Therefore, the identification and definition of the ownership of these lands would greatly assist in setting plans for their development and improvement (MoA, Rangeland Strategy, 2013).

The rangeland management includes:

1. Protection: Protecting the natural resources of rangelands by reversing improper grazing practices and detrimental actions such as logging.
2. Improvement and development of rangelands through water harvesting, planting rangelands seedlings, reseeding rangelands species and regulating the exploitation of pastures. The Ministry of Agriculture has established 34 reserves to protect and manage the rangelands plant species and conserve the ecosystem.
3. Production Systems in Jordan. Policies, Strategies and Laws Related to the Agricultural Sector Policies, strategies, laws, and temporary laws for agriculture, land use, livestock, rangeland use, water resources, environmental protection and biodiversity were developed and are coordinated by various public ministries as relevant, with varied degrees of performance and effectiveness. Brief descriptions of each one are summarized in Table 1.



Document	Year	Type	Description
Agricultural Policy Charter (ACP).	1995	Policy	The Charter aims at achieving consistency of agricultural development with local, regional and international requirements and changes, and an integrated socio-economic development characterized by efficiency, sustainability and equity. Clear policy objectives and priority sub-sectors were defined.
National Strategy for Agricultural Development:2002-2010	2002	Strategy	The strategy discusses the role of the agricultural sector in social and economic development to achieve a sustainable agricultural and rural development, taking into consideration the socio- economic and environmental aspects e.g. protection and conservation of ago-biodiversity during such development. The strategy presents profiles of proposed projects in the five agricultural sub sectors of rain fed agriculture, irrigated agriculture in the Jordan Valley, irrigated agriculture in the highlands, livestock and rangelands and marketing of agricultural produce.
National Rangeland Strategy	2001	Strategy	This strategy was developed in 2001 with the main objectives of controlling deterioration of the rangelands and reversing the desertification process; increasing sustainable livestock production by restoring the productivity of rangelands and increasing sustainable range fodder production; supporting fodder production in order to encourage intensive breeding; and encouraging local communities and sheep breeders to adopt intensive breeding techniques to regulate stocking rates.
National Environmental Strategy (NES)	1992	Strategy	The NES catalogues all environmental pressures and problems and includes over 400 specific recommendations and suggested actions in the field of environmental protection and conservation.
National Strategy and Action Plan to Combat Desertification	2006	Strategy	The National Strategy and Action Plan (NAP) to combat desertification was launched in 2006. It includes six major programmes that are mainly "project-based". The programmes include several projects related to desertification monitoring and control, capacity building, natural resources rehabilitation and development.
The National Agenda 2006	2006	National Strategy	The National Agenda was launched in 2006 comprising a comprehensive political and socio-economic reform plan for the country until 2017. The main goal of the National Agenda is to achieve consistent policies and ensure that they will not be subject to government change while taking into considerations the need to regularly develop and update these policies.

Table 1 - Policies, Strategies and Laws Related to Agricultural Sector. Ministry of Agriculture, Directorate of Rangelands and Badia Development 2013/2014, Updated Rangeland Strategy for Jordan

Bedouin people in Jordan have governed their rangelands through their own land tenure systems and grazing rights known as "Hima" for millennia. Jordan's Rangeland Strategy embraces this traditional, holistic concept, which effectively integrates natural resources, community life, ethics, animal welfare, and more. Promising pilot projects have achieved excellent biodiversity benefits. Jordan's policy was bestowed with the Future Policy Bronze Award 2017, awarded by the World Future Council in partnership with the UNCCD.

In 2013-14, Jordan updated its Rangeland Strategy, building on the ancient tradition of Hima. The Hima concept mirrors the landscape restoration approach which is promoted globally by key stakeholders in combating land degradation.

Jordan's rangelands – which cover 80 per cent of the country – are degraded. First results of the strategy's



implementation can be seen in successful pilot projects, for example in the Bani Hashem community in central Jordan. After one year of activities with the local community protecting their Hima area, biodiversity benefits have already been observed. Indigenous floral species are back; shrubs and grasses are regenerating, and a total of 36 native plant species were recorded on the site.

In 2015 has been launched Law No. 13 concerning Agriculture that Law Repeals Law No. 20 of 1973. This Law consisting of 73 articles divided in XIV Sections aims at reorganizing agriculture sector in the Kingdom of Jordan.

The Updated Rangeland Strategy for Jordan (2013/2014) has a strong focus on participation, already realised during the design phase. It fosters involvement of local communities in land management, enhances their roles and responsibilities and empowers local governance mechanisms.

The strategy has been implemented and first results can be seen in promising pilot projects. However, the political situation in the region has put strong pressure on the government to focus budget on social, migration-related issues, since Jordan is host to some of the greatest numbers of refugees, with an estimated 2.7 million people. The policy adopts a landscape approach in restoration, integrating issues of erosion control, groundwater and water harvesting, biodiversity, land tenure, investment and more.

For the future, was proposed to introduce a cross-compliance scheme where current “unconditional fodder subsidies” are partially diverted to encourage sustainable land management practices, and exploring voluntary contractual payments for ecosystem service agreements, where downstream beneficiaries of rangeland restoration compensate upstream communities for their efforts (Myint, M.M., & Westerberg, V. 2014).



REFERENCES

- Abu-Zanat M.M.W., Miqdady H.A. and Tabba'a M.J., 2005. Production systems of small ruminants in the Middle Badia of Jordan. In: *Dirasat, Agricultural Sciences*, 32 (2): 205-214.
- Asmar F., 2011. Country Pasture/Forage Resource Profiles – LEBANON. FAO, Rome.
- Aronson J., Floret C., Le Floc'h E., Ovalle C. and Pontainer, 1993. Restoration and rehabilitation of degraded ecosystems in arid and semi-arid lands. I. A view from the South. In *Restoration Ecology*, 1: 8-17.
- Ates S, and Louhaichi M., 2012. Reflexions on agro-pastoralists in WANA region: challenges and future priorities. *Options méditerranéennes* No. 102:511-516.
- Balandier P., Rapey H., Ruchaud F., Montard F.X., 2002. Agroforestry in Western Europe: an overview of the silvopastoral practices and experiments in uplands of the temperate area. *Cahiers d'études et de recherches francophones/Agricultures* 11:103-113.
- Bergmeier E., Jörg Petermann, Eckhard Schröder, 2010. Geobotanical survey of wood-pasture habitats in Europe: diversity, threats and conservation. *Biodiversity and Conservation* 19: 2995-3014.
- Chahine R., 1995. Low- input cherry production in Lebanese marginal lands: Irsal a case study. Thesis, American University of Beirut.
- Enne G., Zucca C. Montoldi A. and Noe L., 2004. The Role of Grazing in Agropastoral Systems in the Mediterranean Region and their Environmental sustainability. *Advances in GeoEcology*. Reiskirchen: Catena Verlag, 29- 46. S. Schnabel and A. Ferreira (eds.)
- EEA/UNEP, 2004. High nature value farmland: characteristics, trends and policy challenges. EEA report No 1/2004. Copenhagen, European Environment Agency: 32 pp.
- EU (European Union). Key policy objectives of the future CAP. 2019 [cited 29 July 2020]. https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap/key-policyobjectives-future-cap_en.
- Hamadeh S.K., Bistanji G.N., Darwish M.R., Abi Said M. and Abi Ghanem D., 2001. Economic sustainability of small ruminants' production in semi- arid areas of Lebanon. *Small Rumin. Res.*, 40, 41-49. *Revue de la littérature Chapitre 1: Défis des systèmes agro- pastoraux dans la région Arabe aride: une étude de cas du Liban*
- Hamadeh S.K., 2002. Feeding Calendar and grazing survey and development of rangeland management options for target areas in Northern Beka' – Final report. Conservation and Sustainable use of Dryland Agrobiodiversity in Lebanon (LEB 97/G34)
- Hamadeh S., Ghosn S. and Rachid G., 2005. Lebanon Country Case Study In: *Regional Workshop: Equitable Access to Land and Water Resources Promoting Sustainable Livelihoods in the Arab States Region*, UNDP – Drylands Development Centre, Beirut, Lebanon.
- Hosri C. and Nehme M., 2006. Small ruminant production systems in north Lebanon: technical and economic analysis In: Mena Y. (ed.), Castel J.M. (ed.), Morand- Fehr P. (ed.) *Analyse technico-économique des systèmes de production ovine et caprine: méthodologie et valorisation pour le développement et la prospective*. Zaragoza: CIHEAM / FAO / Universidad de Sevil



IPCC (Intergovernmental Panel on Climate Change). (2013). Climate change in the Mediterranean, 2013. <https://www.iucn.org/regions/mediterranean/our-work/climate-change/mediterranean>.

Kyriazopoulos A.P., Arabatzis G., Abraham E.M. and Parissi Z.M. (2013) Threats to Mediterranean rangelands: a case study based on the views of citizens in the Viotia prefecture, Greece. *Journal of Environmental Management* 129, 615-620.

Mabelle Chedid. Sustainability of agro-pastoralist systems undergoing global changes as reflected by farmers' perception and value chain analysis: a Lebanese case-study. *Agronomy*. Institut agronomique, vétérinaire et forestier de France, 2019. English. NNT: 2019IAVF0016. tel-02522019

Ministry of Agriculture, Directorate of Rangelands and Badia Development 2013/2014, *Updated Rangeland Strategy for Jordan*

Myint, M.M., & Westerberg, V. (2014). An economic valuation of a large-scale rangeland restoration project through in Jordan. Report for the ELD Initiative by International Union for Conservation of Nature, Nairobi, Kenya. Available from: www.eld-initiative.org

MOA 2011 Compiled by Sidahmed for IFAD Evaluation Mission April 2011; DOS 2011, Statistical Annual Report.

Moreno G., Franca A., Pinto Correia M.T. and Godinho S., 2014. Multifunctionality and dynamics of silvopastoral systems. *Options Méditerranéennes*, A, no. 109, 2014 – Forage resources and ecosystem services provided by Mountain and Mediterranean grasslands and rangelands

Mosquera-Losada M.R., Moreno G., Pardini A., McAdam J.H., Papanastasis V., Burgess P.J., Lamersdorf N., Castro M., Liagre F., Rigueiro-Rodríguez A., 2012. Past, Present and Future of Agroforestry Systems in Europe. In: P.K.R. Nair and D. Garrity (eds.), *Agroforestry - The Future of Global Land Use*. *Advances in Agroforestry* 9, Springer Science, p. 285-312.

Mosquera-Losada MR, Santiago-Freijanes JJ, Rois M, Moreno G, den Herder M, Aldrey JA, Ferreiro-Domínguez M, Pantera A, Pisanelli A, Rigueiro-Rodríguez A 2018 Agroforestry in Europe: a land management policy tool to combat climate change. *Land Use Policy* 78:603-613.

Porqueddu C., Ates S., Louhaichi M., Kyriazopoulos A.P., Moreno G., del Pozo A., Ovalle C., Ewing M.A., Nichols P.G.H. (2016) Grasslands in 'Old World' and 'New World' Mediterranean-climate zones: Past trends, current status and future research priorities. *Grass and Forage Science*, 71: 1-35.

Porqueddu C., Melis R.A.M., Franca A., Sanna F., Hadjigeorgiou I. and Casasús I. (2017) The role of grasslands in the less favoured areas of Mediterranean Europe. *Grassland Science in Europe*, Vol. 22:3-22.

Raudsepp-Hearne, C., & Peterson, G. D. (2016). Scale and ecosystem services: how do observation, management, and analysis shift with scale—lessons from Québec. *Ecology and Society*, 21(3).

Rigueiro-Rodríguez A., Fernández-Núñez E., González-Hernández P., McAdam J.H., Mosquera-Losada M.R., 2009. Agroforestry Systems in Europe: Productive, Ecological and Social Perspectives. *Libro Lugo*

Rodríguez-Rigueiro FJ, Santiago-Freijanes JJ, Mosquera-Losada MR, Castro M, Silva-Losada P, Pisanelli A, et al. (2021) Silvopasture policy promotion in European Mediterranean areas. *PLoS ONE* 16(1): e0245846. <https://doi.org/10.1371/journal.pone.0245846>

Rois-Diaz M., Mosquera-Losada R., Rigueiro-Rodríguez A., 2006, *Biodiversity Indicators on*



Silvopastoralism across Europe. European Forest Institute - EFI Technical Report 21, 2006.

Rolo, V. and Moreno, G., 2019. Shrub encroachment and climate change increase the exposure to drought of Mediterranean wood-pastures. *Science of The Total Environment*, 660, pp.550-558

SanMiguelAyanz, doi 10.1079/9781845930011.0036, *Mediterranean European silvopastoral systems*, book: Silvopastoralism and sustainable land management. Proceedings of an international congress on silvopastoralism and sustainable management held, pages 36-40, in Lugo, Spain, April 2004

van Doorn A.M., Pinto-Correia T., 2007. Differences in land cover interpretation in landscapes rich in cover gradients: reflections based on the montado of South Portugal. *Agroforestry Systems* 70: 169-183.

Zapata V.M. and Robledano F. (2014) Assessing biodiversity and conservation value of forest patches secondarily fragmented by urbanisation in semiarid southeastern Spain. *Journal for Nature Conservation* 22, 166-175.

Zomer R.J., Trabucco A., Coe R., Place F., 2009. Trees on Farm: Analysis of Global Extent and Geographical Patterns of Agroforestry. ICRAF Working Paper no. 89. Nairobi, Kenya.

Zurayk R., el- Awar F., Hamadeh S., Talhouk S., Sayegh S., Chehab A. and al Shab K., 2001. Using indigenous knowledge in land use investigations: a participatory study in a semi- arid mountainous region of Lebanon. *Agriculture, Ecosystems and Environment* 86: 247–262

<https://www.futurepolicy.org/healthy-ecosystems/jordans-updated-rangeland-strategy/>



ANNEX 1



LIVINGAGRO project has been funded by the EU under the ENI CBC Mediterranean Sea Basin Programme 2014-2020.

The total budget of **LIVINGAGRO** project amounts to 3.3 Million € with an EU contribution of 2.9 Million € (90%).

This publication has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Programme. The contents of this document are the sole responsibility of National Research Council (CNR - 1) and can under no circumstances be regarded as reflecting the position of the European Union or Programme management structures.

The **2014-2020 ENI CBC Mediterranean Sea Basin Programme** is a multilateral Cross-Border Cooperation (CBC) initiative funded by the European Neighborhood Instrument (ENI). The Programme objective is to foster fair, equitable and sustainable economic, social and territorial development, which may advance cross-border integration and valorize participating countries' territories and values. The following 13 countries participate in the Programme: Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, Palestine, Portugal, Spain, Tunisia. The Managing Authority (JMA) is the Autonomous Region of Sardinia (Italy). Official Programme languages are Arabic, English and French. For more information, please visit: www.enicbcmed.eu.

The **European Union** is made up of 27 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

CONTACTS

Fo.Re.S.T.A.S. (LIVINGAGRO project Leading Partner)
Viale Luigi Merello, 86 • 09123 Cagliari • Italy
Tel. +39 070 279 91 • livingagro.project@forestas.it

www.enicbcmed.eu/projects/livingagro
www.facebook.com/Livingagro

