

LIFE REGENERATE PROJECT: REVITALIZING MULTIFUNCTIONAL MEDITERRANEAN AGROSILVOPASTORAL SYSTEMS USING DYNAMIC AND PROFITABLE OPERATIONAL PRACTICES (LIFE16 ENV/ES/000276)

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Abstract

LIFE Regenerate is seeking to recover the land and the economies of the oak-based silvopastoral systems of the Mediterranean basin biome through integral land, livestock and biomass waste management. Measures to be applied in this project with the aim to contributing to a more healthy and balanced ecosystem include: incorporating the innovating Keyline water management design to decrease water stress and strengthen the system overall, making it less vulnerable to extreme climatic and weather conditions; implement well managed, holistic and rotational grazing which can effectively clear organic material that would otherwise be at risk of catching fire; harness biological control of pests combined with the planting of native and medicinal plant species, and natural fertilization from livestock rotation to increase floral and faunal biodiversity; find alternative uses for biomass after pruning; eliminate agro-chemical use; and finally inoculate the soil with beneficial fungi to improve the soils' biological properties and quality.

Keywords: silvopastoral systems; mosaic landscape management; rotational grazing; improving soil quality; circular economy in agricultural production systems

Introduction

The oak-based silvopastoral systems of the Mediterranean basin biome (for example *dehesas*, *montados* and *meriagos* that cover up to 6 million ha in the EU) (den Herder et al. 2016) are in rapid decline (Plieninger et al. 2015). Estimates show that *dehesas* currently produce a deficit of 200€/ha. Prices for their products are similar to those 30 years ago, and land owners face losses of up to 500€/ha due to *phytophthora*-related diseases. It is estimated that these agro silvopastoral lands have lost up to 20% of their value and currently lose millions of euros in productivity each year (Oviedo et al. 2015; Limón 2016).

Simultaneously, agro-subsidies are steadily decreasing. In 2015, farmers in Andalucía reported up to 60% of cutbacks in CAP subsidies. Regional subsidies in this area now only cover about 8% of landowners (Donaire 2015). In Sardinia, rural abandonment has caused an increasing of the number of rented and leased farms and the loss of local typical micro-economies.

Many anthropogenic and environmental factors challenge the survival and sustainability of these valuable ecosystems. The younger generation inheriting these broken systems needs to transform current production models into cost-efficient operations that work with nature, not against it. They will have to lower input costs, find alternative sources of income, recycle resources, stimulate natural regeneration, improve soil health and increase forage productivity and quality, and farm productivity so that their land can become economically and environmentally sustainable.

LIFE Regenerate's main objective is to demonstrate that these SMEs can become self-sufficient and profitable based on resource efficiency principles and incorporating added value products, both at a demonstration and a larger scale.

The project has the following specific objectives:

1. Combat the loss of natural regeneration and soil degradation in 100 ha of degraded silvopastoral areas by providing effective, mosaic landscape management procedures and improving soil quality
2. Recover the practice of multi-species rotational grazing, adapted to improve natural capital and optimize commercial advantages
3. Recycle biomass waste from undergrowth and pruning within the farm, reducing external input of fodder and creating alternative sources of income
4. Replicate the project's best practices to 5,000 ha in Spain, Italy and Portugal, proving it is a representative, effective model
5. Integrate new technologies and monitoring of project advances
6. Influence policy-making and involve external stakeholders to promote replication and long term sustainability

Materials and methods

The project will demonstrate the potential of soil and ecosystem regeneration through proper management of livestock, pastures, woodland and cropland and the reuse and recycling of waste within the exploitations. The management plan will put into practice and combine knowledge uptake from other areas/sectors especially concerning grassland, agroforestry and livestock rotation; test innovative methods such as production of livestock fodder from biomass waste from undergrowth and pruning; evaluate the results obtained, provide viable farm and waste management models, disseminate and raise awareness on the issues and results; and involve external stakeholders to promote long-term sustainability. The main innovation behind this business model scheme is to break away from the trade-offs typically assumed to these types of management plans; mainly the idea that to achieve multi-functionality and conservation of natural resources, productivity must be sacrificed and vice versa. The different technical innovations used in the management strategy are listed below:

- Technical innovations on land-use
 - Keyline and contour line water management
 - Diversify plant species (e.g. medicinal plants + pastures)
 - Detection and healing of fungal diseases (*La Seca*) through trial designs of treatments for early detection. Since soil ploughing is an important vector of dispersion and infection, staff will be instructed on how to restrict it as much as possible. Keylines will be designed to reduce waterlogging or swamping since this reinforces *Phytophthora* infections. ID Forest will also design the steps to prevent the spread of the infection such as inoculation with beneficial mycorrhizae and lime amendments to improve tree health.
 - Inoculation of soil with beneficial bacteria and truffles for production
- Technical innovations in livestock planning
 - Mosaic movement imitations in rotational grazing, thereby avoiding overgrazing while simultaneously stimulating pasture production and quality

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- Introduce multispecies to grazing cycle to optimize nutritional intake for animals and improve soil fertility
- Grazing, fencing and smart water points which will protect livestock from wild animals and the diseases they may carry
- Improving livestock health by introducing legumes into the fields
- Technical innovations in biomass waste management
 - Alternative sources of income by harvesting, chipping and fermenting biomass from undergrowth and pruning, converting it into a rich humus which can be used as biofertilizer, or for high value mushroom production
 - The humus can also be used to feed beetle larvae, serving as an alternative source of protein for pigs, horses and poultry

This project will involve two different phases: demonstration and replication. During the demonstration stage, the model will be tested over 100 ha in Salamanca (40 ha in Spain, CSIC) and Sardinia (60 ha in Italy, NRD-UNISS). During the replication action, the area size will be scaled 50 times, to a total of at least 5,000 ha. We calculate that 3 years after the closure of the project, the above results will have multiplied with at least the same factor due to consolidation at partners and spill-over effects to other farmers and landowners taking up the regenerative practices.

Figure 1 shows the farm of Salamanca and the new paddock division in red where the trials will be carried out.



Figure 1: Farm "Muñovela" in Salamanca (Spain).

Expected results

The Regenerate project expects to achieve (summary of main principles in Figure 2):

1. Demonstration of an environmentally friendly, economically feasible and highly replicable business model for small and medium-sized farms in oak-based silvopastoral systems;
2. Economic benefits of €65,400 per year ($€654 \text{ ha}^{-1} \text{ year}^{-1}$), both from cost savings (less external feed and lower veterinary costs) and from additional income sources (free-range meat, mushrooms, truffle production, acorns, bedding for horses, and mulching), making the farms profitable and eliminating the need for subsidies;

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3. Total elimination of biomass waste, implementing a circular economy approach and recycling waste into value-added resources;
4. Improvement of soil quality (30-50%) by increasing the carbon sink, water retention capacity, soil nutrient availability, beneficial microorganisms, and prevention of erosion;
5. Improvement of pasture production and pasture quality (25-50% of agricultural land), leading to self-sufficiency in animal feed and higher profitability of livestock-raising practices;
6. Increase in plant diversity (15%) and overall biodiversity (20%). The project will plant 2,000 new multi-species trees during the demonstration phase;
7. Improvement of tree health and resilience in 50 ha of woodlands;
8. Overall increase in animal health and productivity, through reduction in mortality and decrease in calving intervals;
9. Active knowledge transfer and up-scaling through replication and training courses.

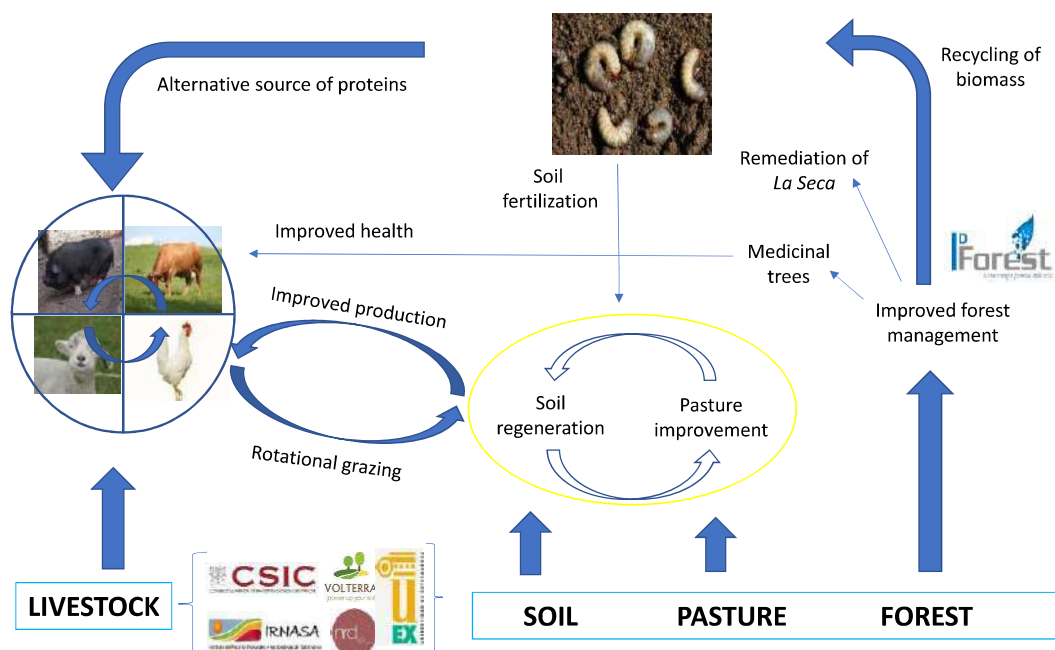


Figure 2: Circular economy principles put in practice in the LIFE Regenerate project.

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