



*Module 2 for LL2, Agroforestry for Grazed Woodlands*

*Course 4 – Success Stories*

## ***Chapter 1 - Silvopastoral Systems: Success Stories***

*By Yara Khairallah, PhD*

*Lebanese Agricultural Research Institute*





# Silvopastoral Systems: Success Stories

1. **Silvopastoralism within European Policy (Rois-Díaz *et al.*, 2006)**
2. **Lakes Free Range Egg Company (Bremer and Farley, 2010)**
3. **Silvopasture at Early Boots Farm (Robinson, 2013)**





# CASE STUDY 1

# Silvopastoralism within European Policy

Rois-Díaz *et al.*, 2006

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## This case study presents

1. Historical background
2. The types of silvopastoral systems across Europe
3. The benefits of silvopastoral systems
4. Biodiversity in silvopastoral systems
5. Policies on silvopastoral systems in Europe

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*Silvopastoralism is one of the oldest practices of agroforestry, a deliberate growing of woody perennials on the same unit of land as livestock in interacting combinations for multiple products or benefits from the same management unit.*

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## LIVINGAGRO Silvopastoralism within European Policy (Rois-Díaz *et al.*, 2006)

### Outline

#### 1. Historical background

#### 2. Types of silvopastoral systems across Europe

2.1. Silvopastoral systems within the same area and time-scale

- Pure silvopastoral systems (grazing in the forest)
- Ligniculture on sward
- Silvopastoral systems in lines

2.2. Silvopastoral systems in the same time-scale, but not the same area: forestry on a livestock farm

#### 3. Benefits of silvopastoral systems

- Economic benefits
- Social benefits
- Environmental benefits

#### 4. Biodiversity in silvopastoral systems

#### 5. Policies on silvopastoral systems in Europe

#### 6. Main species occurring in silvopastoral systems across Europe





# 1. Historical background

## The history of silvopastoral systems in Europe

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## The history of silvopastoral systems in Europe

### Middle Ages

- Fell degraded forests
- Burn the area
- Establish crops for several years
- Plant or sow trees before, during or after sowing the crops

### 17<sup>th</sup> century

- High demand for wood products (e.g. for naval construction)
- Forests started to be closed to livestock





## The history of silvopastoral systems in Europe

### 18<sup>th</sup> century

- Agriculture and forest occupy different land
- The main functions of the forests were the provision of acorns or other fruits for the livestock and game, and the production of firewood and timber as well as forage for grazing
- In some places such as Northern Scandinavia, mountain areas and the Mediterranean basin, forests were also used for grazing



## The history of silvopastoral systems in Europe

### 19<sup>th</sup> century

- Priority was then given to subsistence agriculture: it is above all a question of feeding people.
- The mountain was cultivated wherever possible, on flat land or managed by systems of terraces.
- Livestock appeared subordinated to crops, relegated to non-cultivable areas, forests and high-altitude meadows.



## The history of silvopastoral systems in Europe

### 19<sup>th</sup> century

- Pastoral farming appears as an organizing principle of the rules of social life.
- This balance was shaken throughout the 19th century under the combined blows of the resumption of management of the space by the Forestry Administration, encroachments on territories, and an unprecedented demographic crisis.
- The population of the mountains were then emptied of their inhabitants just as quickly and inexorably.



## 2. Types of silvopastoral systems across Europe

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There are **two types of silvopastoral systems in Europe**, (spatio-temporal ):

- 2.1. Silvopastoral systems within the same area and time-scale
- 2.2. Silvopastoral systems in the same time-scale, but not the same area



## 2.1. Silvopastoral systems within the same area and time-scale

- a. Pure silvopastoral systems, or grazing in the forest
- b. Ligniculture on sward
- c. Silvopastoral systems in lines

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## a. Pure silvopastoral systems, or grazing in the forest

### *The Spanish dehesa and Portuguese montado*

- Animals: pigs, sheep, goats, cows or bulls
- Nutrition: Quercus suber or Quercus ilex
- This system dates back more than 1000 years.
- Oaks provide acorns for both animal and human consumption, as well as other products such as timber, coal, tannins and cork.

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## Reindeer husbandry in northern boreal forests

- Animals: Semi-domesticated reindeer
- Nutrition: lichens, dwarf bushes and grasses
- They can dig into the snow to find food until the snow layer is too thick, when they turn to lichens from the tree crown for their sustenance.
- Since the number of old trees rich in lichens is low, there should be plans to fell such trees in winter and leave the branches in the stand for some time.
- The summer harvest affects the reindeer much less, since there are enough grasses and vegetation for the reindeer then.







## **LIVINGAGRO** b. Ligniculture on sward: forest trees planted at very low density

This low density allows the pasture to be maintained as the main product of the area, while generating additional income with forest products.

### United Kingdom and Ireland

- Animals: sheep or cattle
- Nutrition: maple, aspen, ash or oak
- Spacing may range from 100 to 400 trees/ha.

### Navarre, Spain

- Animals: bovine breeds
- Nutrition: poplars

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## c. Silvopastoral systems in lines

- Trees are established in straight lines to act as living fences or windbreaks, while offering shelter for livestock.
- Their main function is to prevent erosion from wind, but at the same time trees provide shelter for animals as well as a source of firewood and timber.
- Widely used in France, Denmark and the Russian steppe

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## 2.2. Silvopastoral systems in the same time-scale, but not the same area

Forestry on a livestock farm





**Silvopastoral systems in the same time-scale, but not the same area** form a mosaic of swards, crops and forest trees not within the same stand, but at the landscape level. This type of silvopastoral system is more expensive to maintain, but it is quite valuable in terms of both the landscape and ecology. The different patches form a discontinuity that offers greater resistance to the spread of forest fires, compared to large continuous forest stands. In Europe, these systems can be broadly characterized based on criteria that vary with the biogeographical regions; the species and management should be adapted to fit the conditions in each region.

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- **Atlantic area:** wood pastures in northern Spain, living fences or hedgerows in Great Britain
- **Continental area:** windbreaks in the Russian Alpine area; larchenwisen (larch meadows) in the eastern Alps and Jura mountains
- **Boreal area:** lovangar (foliage meadows) of Sweden, reindeer husbandry in Finland
- **Mediterranean area:** dehesas in Spain, montados in Portugal, kouri (wood pastures) in Greece, pascoli arborati in Italy





# 3. Benefits of silvopastoral systems

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## Silvopastoral systems provide

- a. Economic benefits
- b. Social benefits
- c. Environmental benefits

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## LIVINGAGRO a. Economic benefits of silvopastoral systems

- The interaction of many components promotes a complementary use of the available resources, leading to higher overall productivity than each component would provide individually
- High diversification of products
- Long-term productivity
- Low-cost production
- Some expensive management practices become unnecessary, such as clearing weeds, since livestock will graze the understorey.

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## LIVINGAGRO a. Economic benefits of silvopastoral systems

- Pruning practices allow more light to reach the understory, which results in higher and longer pasture productivity
- Several forage species under tree shelter tend to have lower fibre content, making them more easily digestible due to slower ripening in the shade and softer wind
- Shelter for forage species and for livestock improves livestock productivity and also diminishes its mortality
- Tree leaf fodder has high nutrient value and provides healthier food for animals since it has not received either chemical components or livestock manure



## b. Social benefits of silvopastoral systems

- Enhance rural development
- Help keep the population living in the countryside
- Revitalize rural economies by implementing diversified sustainable practices
- Promote tourism by forming landscapes highly appreciated by society and favoring game production





## LIVINGAGRO **c. Environmental benefits of silvopastoral systems**

- Biodiversity is favored due to the several gradients of light, moisture, physical aspects, etc. generated by trees in combination with grasses and shrubs, leading to more diversity than in arable land without trees
- More environmentally friendly than intensive farms in terms of water quality, odors, noise levels, treatment and sickness of animals
- By reducing mechanized activities that release carbon into the atmosphere compared to standard agriculture (soil preparation, irrigation, sowing, transport, fertilizers, pesticides, etc.), these systems help control the emission of greenhouse gases, as well as functioning as carbon sinks
- Reduction of forest fire risk



## 4. Biodiversity in silvopastoral systems

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## **LIVINGAGRO** **Silvopastoral systems improve biodiversity because**

- They create gradients of moisture, light and fertility in soil so that many different microbial and vegetal species adapted to the different microclimates can thrive
- The size, structure and pattern of the trees' leaves allows different intensities of sunlight in the understorey, leading to different chemical composition and decomposition rates that determine which species develop in the stand
- Livestock will favor certain species and modify their interactions
- The connection between forest and agricultural habitats creates corridors for the movement of species

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# 5. Policies on silvopastoral systems in Europe

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## LIVINGAGRO Policies on silvopastoral systems in Europe

### *World level*

- i. Rio Convention
- ii. Lugo and Orlando Declarations
- iii. United Nations Education, Scientific and Cultural Organization (UNESCO)

### *Pan-European level*

- iv. Ministerial Conference “Environment for Europe”
- v. Ministerial Conference on the Protection of Forests in Europe (MCPFE)
- vi. Pan-European Biodiversity and Landscape Strategy (PEBLS)
- vii. European Convention on Landscapes

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## Policies on silvopastoral systems in Europe

### *Community level (European Union)*

#### viii. Common Agricultural Policy (CAP)

- a. Market policy
- b. Rural development policy
  - For example, forestry measures







## Policies on silvopastoral systems in Europe

### *Environment: Sixth Environmental Action Program*

#### ix. Policy of Nature and Diversity

##### a. Policy of Nature Conservation

###### i. Biodiversity Strategy

###### ii. Habitats and Birds Directives

##### b. Forests

###### i. European Forest Strategy

###### ii. Forest Focus: Regulation No. 2152/2003 on the monitoring of forests and the environmental interactions within the Community

#### x. Policy of Sustainable Development

##### a. European Strategy for Sustainable Development



## 6. Main species occurring in silvopastoral systems across Europe

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## Tree species

- **Autochthonous or subsontaneous**

*Abies alba, Acer monpessulanum, Acer opalus, Acer platanoides, Acer pseudoplatanus, Alnus glutinosa, Alnus incana, Betula alba, Betula pendula, Castanea sativa, Celtis australis, Ceratonia siliqua, Corylus avellana, Cupressus orientalis, Fagus sylvatica, Fraxinus angustifolia, Fraxinus excelsior, Fraxinus ornus, Juniperus thurifera, Ilex aquifolium, Larix decidua, Picea abies, Pinus brutia, P. halepensis, P. nigra, P. pinaster, P. pinea, P. sylvestris, P. uncinata, Populus sp., Prunus avium, Quercus aegilops, Q. canariensis, Q. cerris, Q. faginea, Q. ilex, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur, Q. suber, Salix sp., Sorbus aucuparia, Sorbus hybrida, Taxus baccata, Ulmus minor*

- **Exotic**

*Eucalyptus globulus, Pinus radiata, Pseudotsuga menziesii, Quercus rubra, Robinia pseudoacacia, Eucalyptus camaldulensis*



## Understorey

- **Herbaceous**

*Agropyron, Agrostis, Anthoxanthun, Anthyllis, Arrhenatherum, Astragalus, Avena, Avenula, Brachypodium, Bromus, Cynodon, Cynosurus, Dactylis, Deschampsia, Festuca, Hippocrepis, Holcus, Lolium, Lotus, Lupinus, Medicago, Melilothus, Molinia, Nardus, Ornithopus, Phleum, Poa, Pseudoarrhenatherum, Pteridium aquilinum, Scorpiurus, Stipa, Trifolium*

- **Shrubs**

*Adenocarpus, Arbutus, Arctostahylos, Bupleurum, Buxus, Calicotome, Calluna, Chamaerops, Cistus, Colutea, Coronilla, Cornus, Cytisus, Echisnopartium, Erica, Erinacea, Evonymus, Halimium, Hedera, Helianthemum, Helichrysum, Fumaria, Genista, Juniperus, Laurus, Ligustrum, Medicago, Myrtus, Olea, Ononis, Origanum, Pistacia, Ptilotrichum, Pterospartium, Prunus, Quercus coccifera, Quercus lusitanica, Rhammus, Rhododendron, Rosa, Rosmarinus, Rubus, Santolina, Satureja, Sideritis, Spartium, Stanrachanthus, Thymus, Ulex, Vaccinium*



# Livestock

## Domestic livestock breeds in Europe

Livestock breeds in Europe include:  
sheep, horses, goats, pigs, cows and wild ungulates (hoofed mammals)

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# CASE STUDY 2

## Lakes Free Range Egg Company

Bremer and Farley, 2010

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**Location:** Cumbria, Northwest England



## Type of work:

family business, producing and packing free-range and organic free-range eggs.

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For generations, the family has had a **rich history of livestock farming**. They moved to a farm in Cumbria in the 1870s. In 1989, the current owner took over the running of the family farm.

In 1997, he started **planting trees on the farm** on a trial basis and came to appreciate the **economic and health benefits** that trees deliver.

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At least 20 per cent of all The Lakes Free Range Egg Company ranging areas are now tree-planted, and any other farm supplying eggs to the firm must meet the same requirement.

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## Benefits

- It costs The Lakes Free Range Egg Company £2,000 per hectare to plant trees, but **payback is achieved in six months.**
- Data proves that tree planting improves shell quality and can **drive up the percentage of Grade A eggs** by some two per cent. This is equivalent to an extra 4,800 Grade A eggs from a flock of 10,000 hens laying 24 dozen eggs per bird.
- **Health and welfare benefits** include reduced stress, lower levels of injurious feather pecking and improved conditions within sheds.

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## Benefits

- **Hen mortality can also be reduced**, particularly if hens die trying to access houses in periods of panic.
- **Trees draw surface water into the soil**: this reduces muddiness and prevents the run-off of contaminants, such as phosphates, into water courses.
- Chicken sheds produce ammonia, and **tree planting can help intercept ammonia emissions**, which is important for buffering sensitive habitats.
- Planting at The Lakes Free Range Egg Company has had **an immediate effect on wildlife and biodiversity**, with barn owls and red squirrels now re-established on the farm.

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## Planting

- The Lakes Free Range Egg Company plants trees at **two meter spacing in rows four meters apart**.
- Previously, Forestry Commission schemes required trees to be planted too densely for grass to grow and chickens to forage. Now **the Forestry Commission accepts lower density planting**.
- Good planting helps grass thrive right up to the sheds. **Planting often starts near the sheds** to encourage chickens to venture out, and then spreads.
- **Planting includes fast growing species** (poplar and willow) and authentic local varieties (birch, oak, wild cherry, holly and sycamore).
- Some farmers are incorporating **fruit trees** into their planting as an **additional cash crop**.
- **Bushy plants are avoided**, as the objective is to get good grass cover underneath. Long grass and low bushes encourage chickens to lay eggs outside the barns.

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## Maintenance

- **Young trees are thinned, and low quality wood is pulped** for the farm's biomass boiler. This is in line with the Government's Renewable Heat Incentive payment scheme.
- **Maintenance is simple and inexpensive**, but it does require specialist knowledge. For this reason, The Lakes Free Range Egg Company runs training courses for supplier farmers.
- As the trees mature, **sheep and cattle can also be introduced** into the planted areas. |

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# CASE STUDY 3

## Silvopasture at Early Boots Farm

(Robinson 2013)





**Location:** Sauk Centre, Minnesota, USA



**Type of work:** family business, selling grass-fed beef

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## The Story

- While in college, the owner studied biology, geology, horticulture, and sustainable agriculture and began to make the connection between nature and food, realizing that our current system is not sustainable.
- In 2011, he started farming land purchased by his family in the 1960s.
- He has planted thousands of red oak and red and white pine saplings on 20 acres of old crop fields. The trees shade pasture to improve feed value and shelter a growing herd of lowline angus beef cattle.
- The owner is trying a rotational grazing system known as ultra high stock density grazing, within a framework of holistic planned grazing.

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## The Story

- The farmer received cost-share assistance from the USDA's Environmental Quality Incentives Program to establish fencing for rotational grazing and to help pay for trees and planting assistance.
- He gained valuable information and mentorship from the University of Minnesota Extension and the Farm Beginnings© training course sponsored by the Land Stewardship Project.
- He is involved in research on the benefits of agroforestry for producing food, managing risks and increasing landscape resiliency.

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## Good practices and advice

- Plant trees that are as large as you can afford. Larger trees are more resilient and stand up better to rubbing and browsing by cattle and deer.
- Plan the width between tree rows based on the width of your mower or other equipment you'll want to use to manage the space.





## Good practices and advice

- Get your pasture and soils in good shape before you plant trees. After the trees are planted, it is more difficult to work on the soil in the area.
- Integrate trees, fields, and water with an eye to connecting habitats with corridors for pollinators, other insects and wildlife. This farmer is planning his landscape design to help defragment a fragmented agricultural landscape, intentionally planting trees to connect areas of cover. His planning considerations also include managing edge effects to create viable areas of refuge, especially for birds.

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Agenzia forestale regionale per lo sviluppo del territorio e dell'ambiente della Sardegna  
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**Forestas**  
Agencia forestal regional pro etitulu de su territorio e de cambiatu de sa Sardegna  
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Agencia forestal regional per lo sviluppo del territorio e dell'ambiente della Sardegna

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