ECONOMY AND LEGAL ASPECTS OF EUROPEAN AGROFORESTRY

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MODULE 10

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AGFOSY

Co-funded by the
Erasmus+ Programme
of the European Union

AIM OF THE MODULE

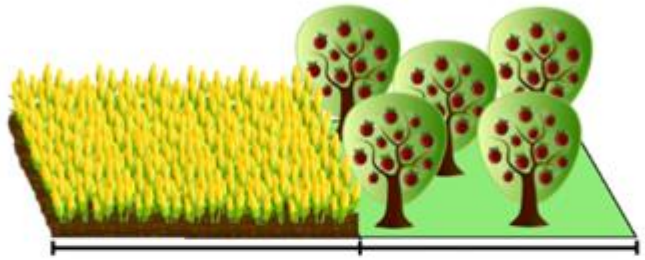
- Financial evaluation of agroforestry systems
- Market opportunities in agroforestry systems
- Support schemes and legislative framework of agroforestry in EU

FINANCIAL EVALUATION OF AGROFORESTRY SYSTEMS

Productive potential of agroforestry

The FAO defines the land equivalent ratio (LER) as:
The ratio of the area under sole cropping to the area under intercropping needed to give equal amounts of yield at the same management level. It is the sum of the fractions of the intercropped yields divided by the sole-crop yields.

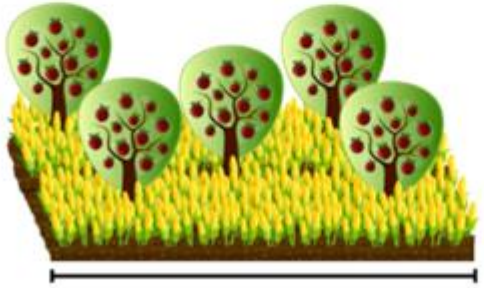
Sole yields:
Grain:5t/ha
Fruit:15t/ha



5t/ha x 0.8ha = 4t/ha x 1ha

15t/ha x 0.6ha = 9t/ha x 1ha

Intercropped:
Grain:4t/ha
Fruit:9t/ha



$$LER = \frac{4t/ha}{5t/ha} + \frac{9t/ha}{15t/ha}$$
$$= 0.8 + 0.6$$
$$= 1.4$$

An interpretation of this result would be that a total of 1.4 ha of sole cropping area would be required to produce the same yields as 1 ha of the intercropped system.

FINANCIAL EVALUATION OF AGROFORESTRY SYSTEMS

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Example of LER calculation, walnut & weat silvoarable system, year 3

	Land area %	Yield ha/yr	Value £/t	Total component output	
				£/ha/yr	£/ha/yr
Monoculture					
Apple orchard @ 1,000 trees/ha	100	10.4 t	650	6,760	**6,760**
Wheat	100	10 t	150	1,500	**1,500**
Apple @ 90 trees/ha	8	1.1 t	650	715	715
Wheat	92	9.5 t	150	1311	1,311
					2,026
LER = 1.06	1.1	$\frac{\text{Tree agroforestry yield}}{\text{Tree monoculture yield}} + \frac{\text{Crop or livestock agroforestry yield}}{\text{Crop or livestock monioculture yield}}$			9.5
	10.4				10

Assuming that the fruit trees use 8 %, and the cereal component 92 % of the land area and that the relatively small fruit trees do not negatively impact on cereal productivity, with only minimal shading, water and nutrient competition.

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Example of LER calculation, short rotation coppice willow (SRC) & wheat

	Land area %	Yield ha/yr	Value £/t	Component output	Total output
				£/ha/yr	£/ha/yr
Monoculture					
SRC plantation willow	100	8.33 odt	60	499.8	**499.8**
Organic wheat	100	10 t	150	1,500	**1,500**
Agroforestry					
Willow	20	3.35 odt	60	201	201
Wheat 100%	67	9 t	150	1,350	
Shaded wheat 50%	13	0.9 t	150	135	
		9.9 t	150		1,485
					1,686
LER = 1.39	3.35	$\frac{\text{Tree agroforestry yield}}{\text{Tree monoculture yield}} + \frac{\text{Crop or livestock agroforestry yield}}{\text{Crop or livestock monioculture yield}}$			9.9
	8.33				10

Assuming that the SRC willow uses 20 % of the land area and the wheat 80 % of the land area and that the SRC willow impacts on 50% of the wheat productivity through shading, water and nutrient competition.

FINANCIAL EVALUATION OF AGROFORESTRY SYSTEMS

Fast-growing tree species: the example of poplar

On-going experiment : arable crops under poplar, Haute Garonne, France

System characteristics :

- 28ha planted in 2011
- 100 trees/ha
- Cost of the tree planting + pruning over 7 years: 42 000€ total (15€/tree)
- The first 7 years after planting : cereals were intercropped with the trees (wheat, colza, maize)

FINANCIAL EVALUATION OF AGROFORESTRY SYSTEMS

Results :

- Crop yield: 7 years after planting, no significant difference in yield is observed compared to a neighbouring field with no trees
- Wood is expected to be sold 15 years after planting, at a price of 60€/m3 (~1m3/tree)

- Cost efficient system : + 45€/tree planted (2800 trees), 15 years after planting
- Fast return on investment
- More resilient system : Diversification of the production

MARKET OPPORTUNITIES OF AGROFORESTRY SYSTEMS

- A great diversity of products (fruits, fuel wood, timber wood, …)
- Agroforestry allows additional productions for self and collective consomption at a local level (ex. market channel for fuelwood)
- Answer to the current market demand for more local production

MARKET OPPORTUNITIES OF AGROFORESTRY SYSTEMS

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Agroforestry for carbon capture

Research has demonstrated carbon sequestration of between 1.0 to 4.0 tonnes of carbon per ha per year from agroforestry tree densities of between 50–100 trees per ha. Faster-growing trees with higher density sequester more than slower growing less densely populated systems.

Tree type	Rotation years	Tree density (trees/ha)	Storage potential (tC/ha)	Average storage during the rotation (tC/ha)	Total storage (tC/ha)
Slow-growing	50	50	1.5	37.5	75
Slow-growing	50	100	3	75	150
Quick-growing	15	50	2	15	30
Quick-growing	15	100	4	30	60

Agroforestry can contribute to climate change mitigation, with more potential than most other options for carbon sequestration in European agriculture.

SUPPORT SCHEMES AND LEGISLATIVE FRAMEWORK OF AGROFORESTRY IN EU

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Agroforestry in the CAP 2014-2020

➢ Defined as "land use systems in which trees are grown in combination with agriculture on the same land"

➢ Pillar 1:

- Eligibility of agroforestry, under conditions depending on member state
- AF recognised as an Ecological Focus Area in some countries (greening)

➢ Pillar 2: Supporting measures

- Measure 8.2 : supports implementation of silvoarable agroforestry systems
- Measure 4.4 : supports implementation and maintenance of hedgerows

✓ Conditions of eligibility (tree density, species, …) are defined by each member state

✓ Example : French

And outside of the CAP?

Some private organizations also support agroforestry practices, thus allowing to widen the support framework

SUMMARY OF THE MODULE

LESSON LEARNED

- Agroforestry systems are …
  - **cost efficient**
  - **resilient**
  - allowing production and **consumption** at a **local level**

- Agroforestry is supported by the **CAP**, under conditions depending on the member **state policy**

- **Private organizations** also support agroforestry, widening the supporting framework