Walnut in silvoarable alley cropping system

Startup and first results of a long-term practice-oriented agroforestry research field in Flanders, Belgium

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ONDERZOEK & ADVIES IN LAND- & TUINBOUW

OBJECTIVE

Long-term research
- Tree-crop interaction & yield
- Ecosystem services (soil, water, biodiversity)
- Practical feasibility
- Profitability in Flemish agricultural context

Demonstration
- Need for good-example
- Share lessons learned on implementing, managing and functioning of an agroforestry system
- Main target group: farmers

Improve tailored advice & Increase adoption in Flanders

Drone picture of the recently established agroforestry research and demonstration plot located on the trial fields of Inagro, West-Flanders.
This plot is one of the seven REFOREST living labs across Europe.

REGIONAL CHALLENGE

Fertile sandy loam soils make the central part of West-Flanders suitable for **intensive, highly productive and profitable vegetable growing**. As a result, agricultural land prices in West-Flanders are amongst the highest in Europe.

Trees need to produce and eventually compensate for relatively **high loss of income by loss of cropping area**, while impact on yield of intercrops needs to be limited.

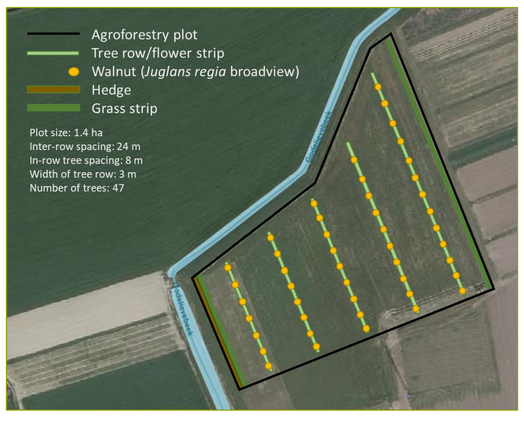
Walnuts as high value product.
Late-leafing and open crown reduce competition for light with intercrops.

STARTUP LONG-TERM AGROFORESTRY RESEARCH PLOT

Plot design – 'keep it simple'

Design is based on **practical feasibility**, **profitability** and **reproducibility** in the Flemish agricultural context.

- Silvoarable alley cropping system
- Conventional farming system
- **Tree**: walnut (*Juglans regia* 'Broadview')
- **Tree row**: perennial flower mix attracting beneficial insects
- **Intercrop**: 6 year crop rotation with arable crops (maize, potatoes, winter cereals, field beans) and vegetables (leeks, carrots, cabbages, celereac)
  -> In cooperation with local farmers
- **Mixed hedge:** windbreak and habitat for insects and birds



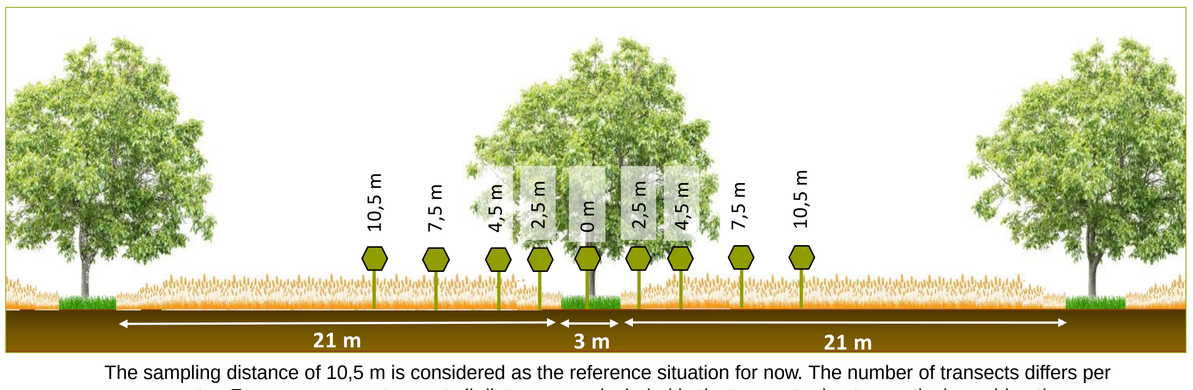
Long-term monitoring

Intercrops
- Yield, quality, diseases

Trees
- Yield, growth, diseases

Soil
- Chemical soil analysis (0-30 cm)
- Organic carbon (0 – 90 cm)
- Moisture (20 cm + 60 cm)
- Compaction (penetrologger)
- Bulk density (Kopecky rings)
- Nematods (under development)
- Bacteria & fungi (PLFA analysis)
- Earthworms

MONITORING TRANSECTS



The sampling distance of 10,5 m is considered as the reference situation for now. The number of transects differs per parameter. For some parameters not all distances are included in the transects due to practical considerations.

Microclimate
- Light (pyranometer)
- Rain, wind, temperature & humidity (weather stations)

Biodiversity
- Overwintering soil invertebrates (soil incubations)
- Moths (LED buckets)
- Surface dwelling arthropodes (pitfall traps)
- Flying arthropodes (window traps)
- Birds and bats (Audiomoth)

Financial – ins and outs

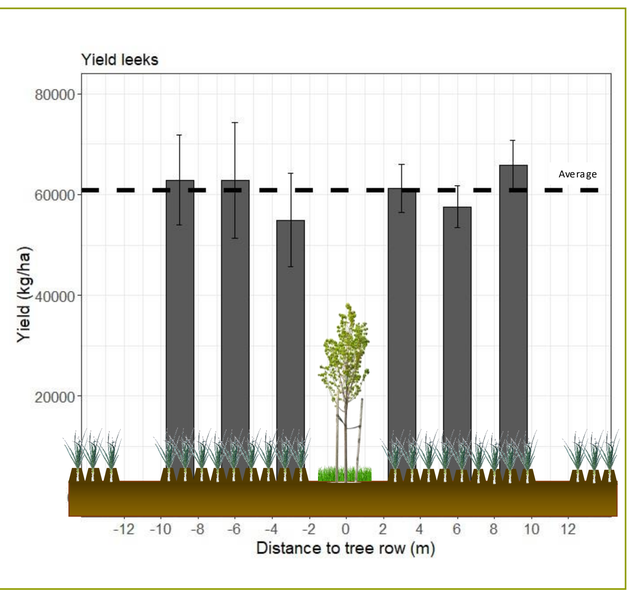
FIRST RESULTS

Leeks in (young) agroforestry

Impact of tree rows on preparatory soil work and planting of leek is limited

Yield per ha and quality of leek is **unaffected**
- Average yield of 61 tons per ha is comparable to other fields in region
- No differences in terms of distance to tree row
- Visual inspections confirm good quality and health

Loss of cropping area is decisive in early stage
- Tree rows and hedge reduce cropping area by 11%
- Harvest machinery requires additional uncultivated strips
  -> 5% extra loss of cropping area
- 84% of the plot was cultivated with leek, resulting in a production loss of 13,6 ton = loss of income ± € 2.700



Establishment costs

Type of cost	Description	Cost €
Materials	Planting material mixed hedge	270
	Planting material walnut trees	1900
	Support poles	1050
	Binding wires	100
	Tree protection	35
	Total material costs	**€ 3355**
Labour	Planting hedge	350
	Planting trees	1500
	Total labour costs	**€ 1850**
Total costs (materials + labour)		**€ 5205**

As an active farmer, you can have your agroforestry planting subsidized by the Flemish Agency for Agriculture & Fisheries. Subjected to certain conditions, you will be reimbursed up to a maximum of 75 % of your planting costs (materials and labour).

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