Mixed intercropping between four lentil and three hull-less barley varieties:

Performance under Swiss climatic conditions

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Background

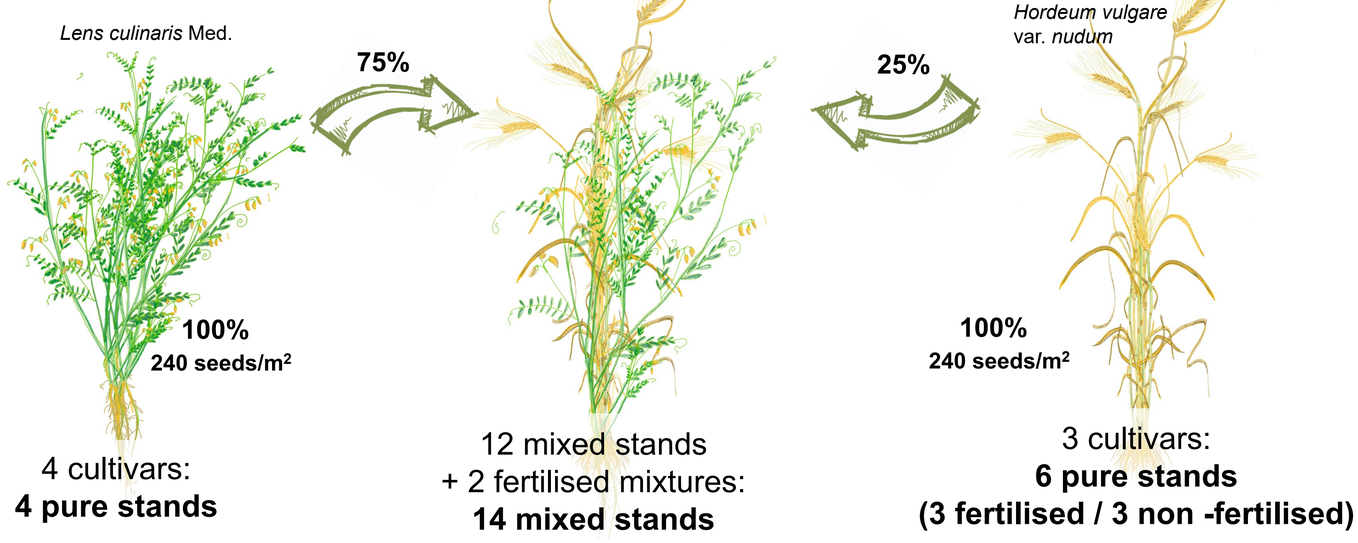
As part of the European project **CROPDIVA**, a **three-year field experiment** is conducted at **two Swiss locations** (Reckenholz, Tänikon) to assess the agronomic performance of four **spring lentil** (*Lens culinaris*) (Anicia, Grüne Berry, Château, Beluga) and three **spring hull-less barley** (*Hordeum vulgare* var. *nudum*) (Oak Ruby, Goljiat, AF Cesar) **varieties**.

Using an identical overall plant density across 24 treatments, different cropping systems (**pure versus mixed**) and fertilisation levels **were compared** to assess whether mixed intercropping would improve land use efficiency, reduce the pressure of weeds, diseases and pests, and reduce lodging of lentils, while achieving comparable yields with these crops in pure stands.

Treatments and collected data

Pre-harvest data

- Dates for growth stages 11, 31, 55, 89
- Pest and diseases
- Coverage and homogeneity
- Weed species and volume
- Plant height
- Lodging



4 cultivars:
4 pure stands

12 mixed stands
+ 2 fertilised mixtures:
14 mixed stands

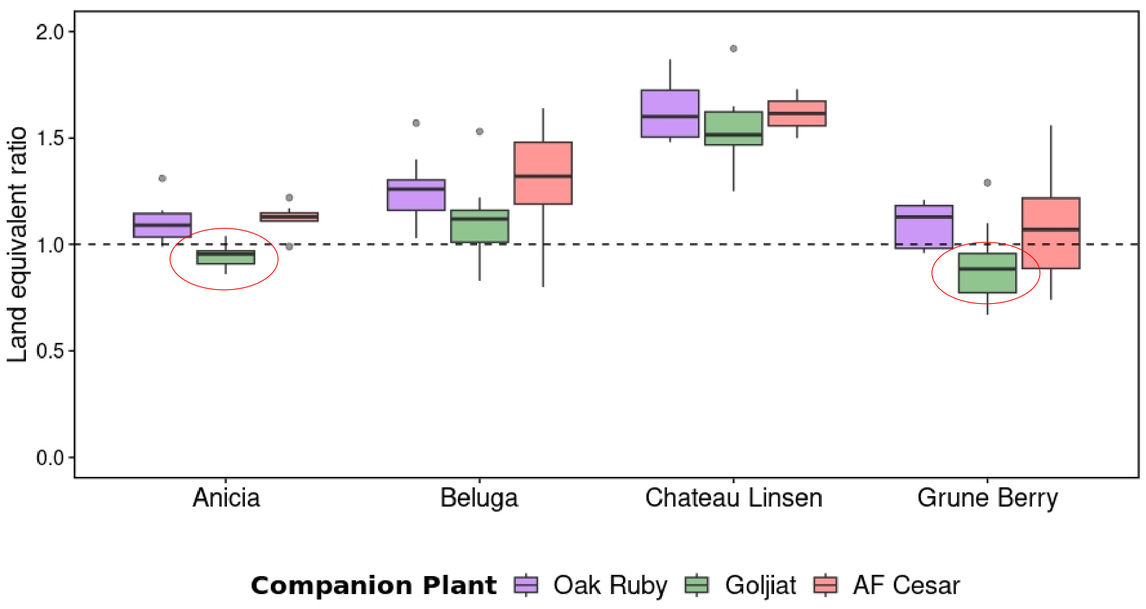
3 cultivars:
6 pure stands
(3 fertilised / 3 non -fertilised)

Post-harvest data

- Hectolitre weight
- Protein content, TKW
- Separation ability
- Dry yield
- Seed health

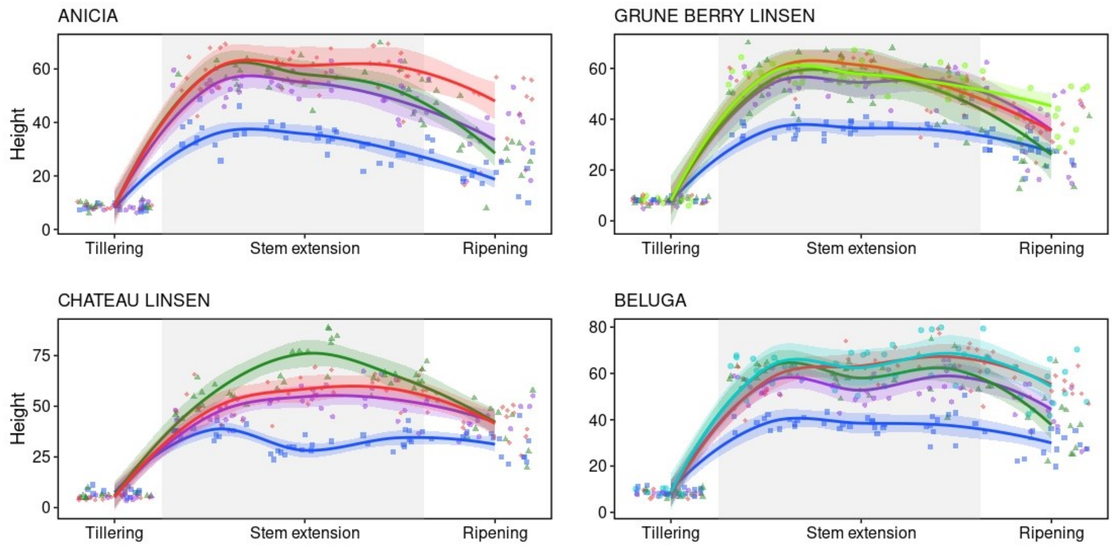
Land equivalent ratio (LER) and lentil height development: Preliminary results of 2022 (data pooled from two sites)

- **LER for mixed stands of four lentils and three hull less barley varieties**



Among the lentil varieties, all combinations resulted in LER > 1 whereas Grüne Berry and Anicia performed better in pure stands than mixed with Goljiat. Overall, AF Cesar and Oak Ruby were more suitable companion varieties (LER > 1) than Goljiat.

- **Plant height of the four lentils cultivars**



In all combinations, there was a positive effect in intercropping compar with pure stands. The presence of a companion plant favoured the upward development of the lentils.

Ongoing studies and results to be published

- Preliminary results show that cropping mixtures increase land efficiency compared to sole cropping by supporting lentil growth through companion plants. However, ideal combinations require similar maturity times and short-stemmed barley varieties to minimize competition with lentils
- The forthcoming study will assess weed volume, pest (insects), pathogens, variety compatibility, grain yield, separation ability, seed health, and metabolites to recommend superior lentil-hull-less barley mixed cropping systems

Co-growth in mixed stand lentils
(cv. Beluga / cv Oak Ruby)
Reckenholz June 2023

Lodging in mixed stand lentils
(cv. Anicia / cv Goljiat)
Reckenholz June 2023

Lodging in pure stand lentils
(cv. Anicia)
Reckenholz June 2023)

Lodging in pure stand lentils
(cv. Beluga)
Reckenholz June 2023

What's Next?

- Following this, the third year of the study will be conducted together field trials on private farms.
- Beside mixed cropping experiment, within CROPDIVA we will conduct:
  - **Diversity pannel** of **300 spring hull less barley accession** was performed simultaneously **in 3 locations (UK, CH, SE)** over **2 years ('23 , '24).**
  - **Evaluation** of **regulating** and **providing ecosystem services** from **four underutilized crops** (lentils, buckwheat, narrow leaved lupin and hull less barley) comparing **pure** and **mixed stands** using

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