PRACTICE ABSTRACT N°2

Reducing risk of grain legume production through intercropping in temperate climates

Problem

Legumes such as peas and lentils, when grown as sole crops, are weak competitors for nutrients and water, prone to lodging and sensitive to adverse environmental conditions.

Solution

Intercropping legumes with cereals is a solution for the described problem as it increases resource use efficiency. Research on intercropping of pea & barley and lentil & oat, in Sweden (Scania province) has shown promising results in terms of grain yields, weed suppression and reduced lodging. (Figure 1, 2 and Table 1).

Benefits

- Reduced legume lodging (increased harvestable yield)
- Reduced weed pressure
- Improved nitrogen use efficiency
- Improved cereal grain quality

Applicability box

Theme

Arable crops, Crop production, Cropping systems, Nutrient management, Weed management.

Keywords

Cereal crops, Diversification, Legumes, Nitrogen, Weed control.

Context

Temperate climate.

Application time

Simultaneous sowing and harvesting.

Required time

NA

Period of impact

NA

Equipment

Most common sowing machines can sow two seed types simultaneously.

Best in

Organic arable cropping system for reducing weed pressure. Equally relevant in conventional systems for reducing inputs.

Practical recommendations

Sowing densities

- Pea/barley: pea at 67% and barley at 33% of their recommended sole-crop densities (Figure 1).
- Lentil/oat: 100% lentil and 20% oat of their recommended sole-crop sowing densities (Figure 2).

To promote legume grain yield, prioritizing the legume in the seed mixture prevents excessive competition from the cereal for water, nutrients (except nitrogen) and sunlight.

Varieties for simultaneous sowing and harvest

- Modern varieties of barley (Planet) and oat (Belinda, Nike, Symphony) can be sown and harvested at the same time as intercropped pea (Clara) or lentil (Anicia).

Important to note: During water stress conditions (*e.g.* drought), there is tendency for grain legumes to mature earlier than cereals, posing a risk of pod shattering and loss of legume grains before the cereal is ready for harvest.

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Management of crops

- Mechanical weeding was not necessary in our trials.

Harvest

- Crops can be harvested simultaneously as mixtures.

Post-harvest sorting and cleaning:

- Pea/barley: due to different grain sizes, this mixture can be easily sorted with classical equipment (vibrating, screen cleaner, indented cylinder, gravity cleaner).
- Lentil/oat: more time-consuming sorting due to similar diameters and densities of the seeds. Gravity cleaner and optical sensors are efficiently used in commercial production for separation of such similar grains.

Figure 1: Lodged sole crop pea of variety Clara (left) and standing with the support of intercropped barley of variety Planet (right). Photo: Raj Chongtham (taken on the same day in adjacent plots).

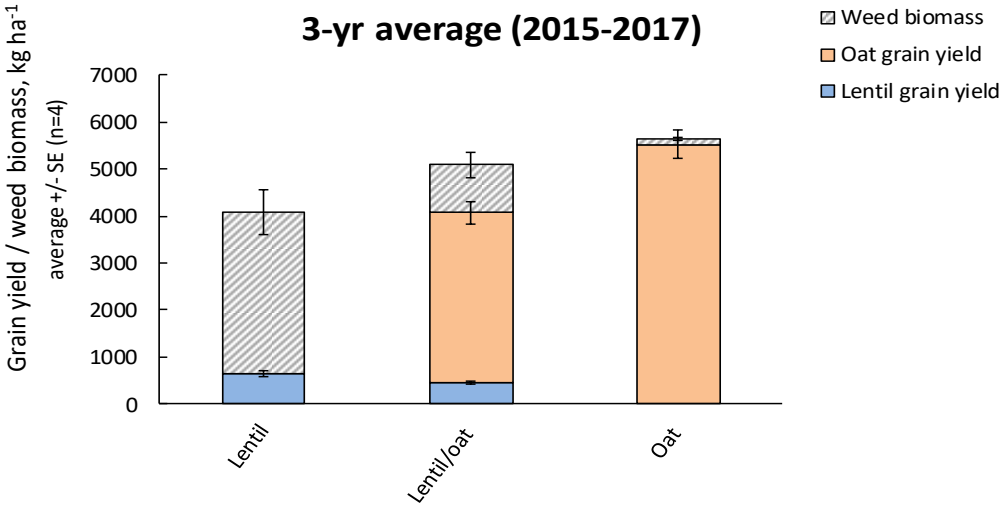

Figure 2: Higher weed biomass in lentil sole crop compared to lentil/oat intercrop, with similar lentil grain yields in sole and intercrop. Moreover, intercropped oat yield was around 65% of its sole crop despite being sown at only 20% of the sole-crop density.

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Table 1: Intercropped pea sown at 67% of the sole-crop density produced on average 73% of the sole-crop yield while intercropped barley, sown at 33% of sole-crop density, yielded on average 87% of the sole-crop barley production.

Years	*Pea*			*Barley*		
	Sole crop (t/ha)	***Intercrop (t/ha) when sown at 67 % of sole crop density***	***Intercropped yield relative to sole crop (%)***	***Sole crop (t/ha) in Scania***	***Intercrop (t/ha) when sown at 33 % of sole crop density***	***Intercropped yield relative to sole crop (%)***
2020	1.42	0.73	51 %	4.19	2.76	66 %
2021	1.03	0.81	79%	3.03	3.34	110%
2022	0.53	0.57	107 %	4.87	4.23	86 %
2023	1.58	1.22	77 %	N/A yet	3.02	N/A
Average	**1.14**	**0.83**	**73** %	**4.03**	**3.34**	**87** %

Further information

Video

- Small-scale sorting of pulses and grains (English)

Further readings

- Munz S, Zachmann J, Chongtham IR, Dhamala NR, Hartung J, Jensen ES, Carlsson G. 2023. Yield stability and weed dry matter in response to field-scale soil variability in pea-oat intercropping. Plant and Soil. doi: 10.1007/s11104-023-06316-9
- Jensen ES, Chongtham IR, Dhamala NR, Rodriguez C, Carton N, Carlsson G. 2020. Diversifying European agricultural systems by intercropping grain legumes and cereals. International Journal of Agriculture and Natural Resources 47 (3): 174-186. http://dx.doi.org/10.7764/ijanr.v47i3.2241
- Bedoussac et al. 2021. Harvesting and separating crop mixtures: Yes we can. Policy Brief. https://www.remix-intercrops.eu/news/policy-briefs-intercropping-new
- Rodriguez C, Carlsson G, Englund J-E, Flöhr A, Pelzer E, Jeuffroy M-H, Makowski D, Jensen ES. 2020. Grain legume-cereal intercropping enhances the use of soil-derived and biologically fixed nitrogen in temperate agroecosystems. A meta-analysis. European Journal of Agronomy 118: 126077. doi: https://doi.org/10.1016/j.eja.2020.126077

About this practice abstract

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IntercropVALUES aims to exploit the benefits of intercropping to design and manage productive, diversified, resilient, profitable, environmentally friendly cropping systems acceptable to farmers and actors in the agri-food chain. As a multi-disciplinary and multi-actor project, it brings together scientists and local actors representing the food value chain. It includes 27 participants from 15 countries (3 continents) from a wide diversity of organizations and stakeholders. The project will run for four years and started in November 2022.

Project website: https://intercropvalues.eu/

Permalink: Organic-farmknowledge.org/tool/53671

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