

Intercropping to improve the nutritional quality of wheat under low-input conditions

Problem

The protein content of bread wheat grown under low-input conditions depends on the soil N content and is in most cases low, requiring alternative ways to increase protein content and nutritional quality.

Solution

Intercropping can improve the nutritional quality of bread wheat grown under low input conditions and increase resource use efficiency and crop productivity.

Benefits

Intercropping pea significantly increased the grain protein concentration of bread wheat compared to their sole crops. Cereal-legume intercropping elevates the nutritional density of wheat grain, reducing dependence on synthetic fertilisers while contributing to food and nutritional security.

Practical recommendations

- **Seed bed preparation:** the seed bed should not be too fine after cultivation.
- **Varieties:** select cultivars (cereal and grain legume) with the same maturity time taking the local seed costs and availability on the market into account.
- **Sowing densities and machinery**
 - Mix the seeds 75% grain legume and 25% cereal (compared to the standard crop density of both crops) in the seed tank, check that the mixture is homogenous, and sow with a conventional seeder.
 - Use the same row spacing as for cereals.
 - Check matching seed depth and homogeneity of the mixture.
- **Protein content:** mixtures with different crop species increased protein content.
- **Harvest:** adjust the height of the harvester to pick up grain legumes close to the ground.
- Separate a part of your field before sowing and apply the mixture.
- Cultivate the rest of the field as usual and **compare the intercrop to the sole crop** cereals and/or legumes.
- **Test** this method under your own farm conditions. You can communicate your experience with us as well as with other farmers, advisors, and scientists.

Applicability box

Theme

Cropping systems, Arable crops, Nutritive values

Keywords

Low input agriculture, Cereal crops, Legumes, Proteins

Context

Temperate areas, Mediterranean climate.

Application time

Autumn crops.

Required time, if relevant

No additional time during cultivation. The harvested crop needs to be separated at a collection point.

Period of impact, if relevant

Duration of the crop.

Equipment

Standard machinery used for wheat cultivation.

Best in

Winter cereals and legumes and especially in rain-fed agricultural systems under low input conditions.

PRACTICE ABSTRACT N° 15

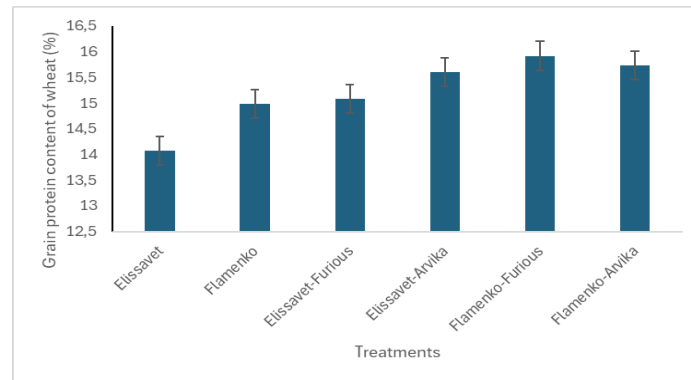


Figure 1. Grain protein content of bread wheat under monocropping and intercropping systems in Commercial farms (1, 2 and 3) and University farms.



Figure 2. Initial growth of wheat with pea in an intercropping system in University farm.



Figure 3. Mixture of different intercropping systems in Commercial farm 1 (Giannitsa).



Figure 4. Intercropping systems of cereal and legume in Commercial farm 2 (Kilkis).



Figure 5. Intercropping systems of cereal and legume in Commercial farm 3 (Galateia).

PRACTICE ABSTRACT N° 15

Further information

Further readings

- Pankou, C., Lithourgidis, A., Dordas, C. Effect of Irrigation on Intercropping Systems of Wheat (*Triticum aestivum* L.) with Pea (*Pisum sativum* L.). *Agronomy* 2021, 11, 283.
- Michalitsis, A.; Papakaloudis, P.; Pankou, C.; Lithourgidis, A.; Menexes, G.; Dordas, C. Effect of cultivar on faba bean–wheat intercrop productivity under a Mediterranean environment. *Agronomy* 2024, 14 (1), 70.
- Check the [Organic Farm Knowledge Platform](#) for more practical recommendations.

About this practice abstract

Authors: Christos Dordas, Andreas Michalitsis, Paschalis Papakaloudis, Aristotle University of Thessaloniki, Faculty of Agriculture, Forestry and Natural Environment, School of Agriculture (AUTH), University Campus, 54124, Thessaloniki, Greece, <http://www.agro.auth.gr>.

Publisher: IFOAM Organics Europe, Rue Marie Thérèse 11, 1000 Brussels -BE, organicseurope.bio

Date: April 2026

Contact: chdordas@agro.auth.gr

Review: Boglarka Bozsogi, IFOAM Organics Europe; Christine Watson, SRUC; Odette Weedon, University of Kassel

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/>