

To N-fertilize cereal-legume intercrops or not?

Problem

Nitrogen fertilization of cereal-legume intercrops could be debatable, since this mixture could benefit from complementary N sources (from soil and atmospheric N₂).

How to determine the necessity of N fertilizer in intercrop?

Solution

The relevance of N fertilization depends on the farmer's objective in terms of grains proportion between the cereal and the legume at harvest and cereal grain protein concentration.

Outcome

Intercropping cereal-legume usually results in a higher cereal grain protein concentration compared to sole crop cereal and the greatest benefit is always obtain without N-fertilizer.

Applicability box

Geographical coverage

Temperate climate

Application period

Spring, during the fast-growing period

Required time

In field to observe the cover and assess the species proportion

At farm to calculate the N dose and determine the timing for spraying

In field to spray N-fertilizer (0.5 h/ha)

Period of impact

Second part of the intercrop cycle

Equipment

Standard machinery for N fertilization

Practical recommendations

- The efficiency of synthetic N-fertilizer is generally high (> 75% of N applied) and it always increases the proportion of cereal in an intercrop with legumes, regardless the sowing density and pedoclimatic conditions.
- The efficiency of organic N-fertilizer is always low (< 20%), so it is not relevant to apply in organic farming.
- For winter intercrops (e.g. wheat-winter pea) the N fertilization must be adapted and based on the : i) proportion of species observed in March, ii) grain yield targeted, and iii) proportion of the 2 species expected at harvest. To increase cereal grain yield, N-fertilizer could be applied during stem elongation (40-80 kg N/ha), while to increase the cereal grain protein concentration, it should be applied at earing (30-50 kg N/ha).
- For spring intercrops (e.g. spring barley-spring pea), no N fertilization is generally required, except to ensure a high proportion of cereal grains at harvest by applying N-fertilizer at the end of tillering (30-60 kg N/ha).



Figure 1: Pea-Wheat intercrops with & without N



Figure 2: Durum wheat-fababean mixture (no N-fertilizer)

Practical testing/ Farmers' experiences

Farmers should try different N fertilization rates and/or times, for example in strips across a field, to visually compare the effect of N fertilization on yield, species proportion and cereal grain protein concentration. Start with a small number of rates and/or times (including no fertilizer) and repeat the test for more than a year for improving its know-how.





Further information

- Scientific Journal: Bedoussac, L., Justes, E., 2010. The efficiency of a durum wheat-winter pea intercrop to improve yield and wheat grain protein concentration depends on N availability during early growth. *Plant Soil* 330, 19–35.
- Scientific Journal: Bedoussac, L., Journet, E.P., Hauggaard-Nielsen, H., Naudin, C., Corre-Hellou, G., Jensen, E.S., Prieur, L., Justes, E., 2015. Ecological principles underlying the increase of productivity achieved by cereal-grain leg-ume intercrops in organic farming. A review. *Agron. Sustain. Dev.* 35, 911–935.
- Webpage: <https://www.remix-intercrops.eu/> Facebook Page: <https://www.facebook.com/RemixIntercrops/>
- Link to other Practice Abstracts (see the Practice Abstract on the effect of intercropping on protein in the cereal)
- Check the [Organic Farm Knowledge Platform](#) for more practical recommendations.

About this abstract

Authors: Eric Justes (Cirad) and Laurent Bedoussac (ENSFEA, INRAE)

Publisher: IFOAM EU, Rue du Commerce 124, BE-1000 Brussels www.ifoam-eu.org

Date: 30/04/2020

ReMIX is a H2020 multi-actor project that will allow designing cropping systems based on agro-ecology for the benefit of farmers and the whole EU agricultural community. ReMIX will exploit the benefits of species mixtures to design more diversified and resilient agro-ecological arable cropping systems. Based on a multi-actor approach, ReMIX will produce new knowledge that is both scientifically credible and socially valuable in conventional and organic agriculture. The project will tackle practical questions and co-design ready-to-use practical solutions. The project will span from the specification of end-user needs and the co-design of in-field and on-farm experiments to demonstrations with evaluation of new varieties and practices. ReMIX will contribute to the adoption of productive and resilient agricultural systems. The project is running from May 2017 to April 2021

Website: www.remix-intercrops.eu

