Intercropping cereal with grain legume, an application of ecological principles to improve overall productivity and quality

Laurent Bedoussac, Etienne-Pascal Journet, Henrik Hauggaard - Nielsen, Christophe Naudin, Guenaelle Corre - Hellou, Loïc Prieur, E.S Jensen, Eric E. Justes

To cite this version:

Laurent Bedoussac, Etienne-Pascal Journet, Henrik Hauggaard - Nielsen, Christophe Naudin, Guenaelle Corre - Hellou, et al.. Intercropping cereal with grain legume, an application of ecological principles to improve overall productivity and quality. 13. Congress of European Society for Agronomy, Aug 2014, Debrecen, Hungary. , 2014. hal-02796061

HAL Id: hal-02796061
https://hal.inrae.fr/hal-02796061
Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Intercropping (IC) is the simultaneous growth of two or more species in the same field for a significant period. It is often regarded as determinant factors in the development of intercrops. An application of ecological principles known to use available abiotic resources more efficiently than the corresponding sole crops particularly in low-input systems due to functional complementarity within species.

**OBJECTIVES**

1. Evaluate the potential advantages of cereal-legume intercrops for grain yield, grain protein concentration and weed control.
2. Analyze the functioning of cereal-grain legume intercrops to further propose optimized intercropped systems.

**MATERIALS AND METHODS**

- 48 organic experiments from 2001 to 2010 in experimental and farm contexts
- 3 pedoclimatic situations: France (south and west) and Denmark.
- Spring and Winter crops: barley; soft and hard wheat intercropped with pea or faba bean
- Large range of practices: with or without organic N fertilization; sowing species within row or in separate rows; considering different sowing proportions and cultivars

**RESULTS AND DISCUSSION**

- Total intercrop grain yield was almost always higher than that of the mean sole crops (3.3 vs. 2.7 Mg ha⁻¹).
- Proportion of cereal > 50% → Cereal more competitive
- IC more efficient than sole crops without N fertilization or when N was applied late
- Cereal grain protein concentration higher in IC than in sole crop (11.1% vs. 9.8%)
  - Due to: 1) lower cereal grain yield and 2) low use of soil N by the legume (75% of its N from air)
  - More N available per plant, per tiller and per grain for IC cereal

- Less weeds in IC compared to the legume (0.40 vs. 1.38 Mg ha⁻¹)

**CONCLUSIONS AND PERSPECTIVES**

- Development of intercrops need the collaboration of all the actors in the value chain (farmers, collectors, breeders, agribusiness companies, technical institutions & researchers)
- Modelling multi-species cropping systems (e.g. using STICS model) could be helpful to optimize intercropping systems and determine varietal characteristics suited to mixtures

**REFERENCES**

