

# Intercropping legumes with rapeseed to reduce nitrogen and pesticide use in a 10-year diversified cropping system in Champagne, France

## Problem

In Champagne, cropping systems are dominated by a 4-year rotation including 5 crops (wheat - spring barley - beetroot - rapeseed - wheat). It requires relatively high levels of mineral nitrogen (N) inputs and pesticides to control weeds (knotweed, lamb's quarters, bedstraw and vulpine), some of which are becoming herbicide-resistant. Rapeseed is well-suited to this region due to the mild winter temperatures, but in recent years pests such as flea beetle larvae and terminal bud weevil have become increasingly damaging to this crop.



Picture 1: Rapeseed intercropped with legumes (faba beans and lentils) (source: Syppre)

## Solution

A 10-year diversified cropping system integrating legumes, as shown in figure 1, is considered to provide ecosystem services and reduce the use of N inputs and pesticides. In this cropping system, intercropping rapeseed with legumes (Picture 1 and Figure 1) such as lentils and beans, maintained yields and reduced the use of N inputs and pesticides.

## Benefits

Results of a 3-years trial show that the mean yield of rapeseed intercropped with legumes was slightly higher than that of rapeseed grown as a sole crop (3.6 t.ha<sup>-1</sup> and 3.3 t.ha<sup>-1</sup>, respectively). When the implementation is well done, as in 2019, input costs were reduced by 16% thanks to (i) fewer insecticide treatments on rapeseed (-21%) and no pea regrowth chemical control; and

## Applicability box

### Theme

Intercropping, Ecosystem Services, Assessment, Cropping system

### Agronomic conditions of Champagne region

Climate : oceanic-continental

Average T°C in winter : 3°C

Average T° in summer : 21°C

Precipitation/year : 750-800mm

Soil of the region : clay-limestone on chalky soil



### Application time

Winter crops

### Required time

Sow rapeseed and associated legumes around mid-August

### Equipment

Common equipment

### Best in

Alternative to relatively short rotations with nitrogen deficit soils

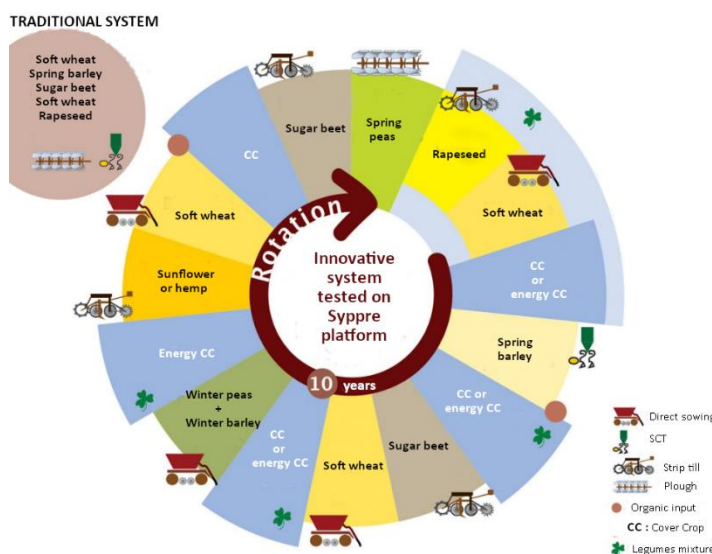


Figure 1 : 10-year diversified cropping system. Rapeseed intercropped with legumes is displayed in the red box (source: Syppre)

(ii) fewer N inputs (-24%) due to the release of fixed N after winter.

## Practical recommendations

- Legumes: good emergence before the end of August is essential to make them more sensitive to frost in winter.
- Rapeseed: a good biomass at the start of winter enables a good absorption of N left in the soil and limits susceptibility to pests.
- Weed management: avoid products that may cause phytotoxicity and enhance soil cover with legumes.
- Pest management: legumes help to reduce the prevalence of insects in the autumn and therefore insecticide usage can be decreased in some situations.
- Nitrogen management: benefits of legumes to rapeseed in spring can allow a reduction in the use of N of 30 kg.ha<sup>-1</sup>.

## Further information

### Article

- **TAUVEL et al., 2019. Réduire l'usage des intrants en maintenant les marges.** Perspectives agricoles n° 471, November 2019, p.42-47 (FRENCH)

### Video

- **Building together tomorrow's crops systems (ENGLISH SUBTITLES)**  
<https://www.english.arvalisinstitutduvegetal.fr/view-3095-arvsonvideo.html?region=>
- **Syppe en Champagne**  
<https://www.youtube.com/watch?v=tii3kqOclP0>

### Weblinks

- **Syppe Champagne:** <https://syppe.fr/terres-de-craie-de-champagne/>
- **Terres Inovia (ENGLISH):** <https://www.terresinovia.fr/en/web/institutionnel/our-institute>
- **ITB (ENGLISH):** <http://www.itbfr.org/en/>
- Use the comment section on the [DiverIMPACTS discussion forum](#) to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the author of the practice abstract by e-mail.



## About this practice abstract and DiverIMPACTS

### Publishers:

ARVALIS-Institut du végétal

3-5 Rue Joseph et Marie Hackin, 75116 Paris, France

Institut technique de la betterave sucrière

45 Rue de Naples, 75008 Paris, France

Terres Inovia

1 Rue de Monceau, 75008 Paris, France

**Authors:** Pierre Rochepeau (Arvalis), Paul Tauvel (ITB)

The project DiverIMPACTS - "Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability" is supported by the European Union's HORIZON 2020 research and innovation programme under Grant Agreement no 727482 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00092. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the EC and the Swiss government. Neither the European Commission/SERI nor any person acting behalf of the Commission/SERI is responsible for the use which might be made of the information provided in this practice abstract.

**Permalink:** <https://zenodo.org/record/5803146>

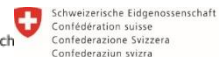
This practice abstract was elaborated in the DiverIMPACTS project, based on the EIP AGRI practice abstract format. It was tested in Champagne region (France). DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

**Site internet:** [www.diverimpacts.net](http://www.diverimpacts.net)

© 2021



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727482 (DiverIMPACTS)



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
  
Swiss Confederation  
  
Federal Department of Economic Affairs,  
Education and Research EAER  
State Secretariat for Education,  
Research and Innovation SERI