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# **Set of 8 Practice Abstract as recommendations for end-users under the EIP- Agri format (D7.4)**



## Document Summary

**Deliverable Title** Set of 8 Practice Abstracts as recommendations for end-users under the EIP-Agri format.

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**Deliverable Lead** IFOAM Organics Europe

**Related Work package** WP7

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## 1. Introduction

The IntercropVALUES project description states that IntercropVALUES will deliver 32 practice abstracts to disseminate the key results of the project in an easy and understandable fashion. For this purpose, practice abstracts were created for dissemination in the EIP-AGRI website and network, the project and partners' website, and the Organic Farm Knowledge platform. The practice abstracts are available in two formats: the EIP-AGRI common format and as 3-page fact sheet with the IntercropVALUES visual identity. This report contains the first batch of 8 Practice Abstract while the next batch of 24 Practice Abstracts are expected by M42. This deliverable describes the details of the Practice Abstracts produced so far.



## 2. Practice Abstracts delivered

The first batch of 8 Practice Abstracts was elaborated by the Co-Innovation Case-Studies (CICS) leaders. During the first Annual Consortium Meeting (Bonn, 2023), Claire Morelle (IFOAM Organics Europe) introduced the Practice Abstract concept and writing guidelines to the project participants. At the end of the session, a workshop was organized for each CICS to start reflecting about the possible topics for their Practice Abstracts. The topics were further defined until November 2023 and the 8 most advanced CICS started the writing process.

Here is a list of the Practice Abstract topics that were produced in the first batch. The full version of the Practice Abstracts can be found in this deliverable.

1. **Growing organic faba bean and wheat for food**, CICS N° 13, Switzerland.
2. **Reducing risk of grain legume production through intercropping in temperate climates**, CICS N° 2, Sweden.
3. **Interplay©: a support tool to help novice farmers choose cereal-legume intercrops**, CICS N° 4, France.
4. **Eliminate lentil bruchids as soon as possible after early harvest to reduce yield losses**, CICS N° 10, France.
5. **Control of the parasitic weed Dodder in buckwheat or lentil cultivation through intercropping with linseed in Central Italy**, CICS N° 11, Italy.
6. **Reduce herbicide use by intercropping sugarcane with service crops**, CICS N°7, La Réunion.
7. **Intercropping wheat and pea for on-farm pasta production**, CICS N° 9, Serbia.
8. **Marketing organic intercropped rapeseed oil**, CICS N° 3, Scotland.



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PRACTICE ABSTRACT N°1

# Growing organic faba bean and wheat for food

## Problem

Simultaneously and efficiently producing organic high-quality wheat for bread-making and a grain legume to address the demand for indigenous plant-based proteins for food.

## Solution

Intercropping winter wheat and faba bean can stabilize the performance of both crops. Sowing density and cultivars need to be adjusted based on the intended harvest goal. The proposed solution fits best in organic farming systems with limited supply of manure.

## Benefits

Intercropping allows for a decrease in nitrogen fertilizers, better weed management, increase in pollinators and secure crop productivity. The quality of the wheat proved to be equal or higher than in sole crop.

## Applicability box

### Theme

Crop production.

### Keywords

Crop production, intercropping, cereal crops, legumes.

### Context

Switzerland, semi-continental climate.

### Application time

Autumn (October-November).

### Required time

Additional time may be required to prepare the seed mixture and for an appropriate harvest. Separation, drying and sorting of the harvested crops is needed at the collection centre.

### Period of impact

Duration of crop, up to delivering to the collection point. N residual effect of legume on following crop.

### Equipment

Standard machinery for cultivation, harvest and sorting.

### Best in

Organic agriculture, suited for farms with limited livestock.

## Practical recommendations

### Choice of varieties

- Faba bean: early winter varieties to match wheat maturity.
- Wheat: tall, late winter varieties

### Sowing depth

- Simple hopper: 5-6 cm
- Double hopper: 2-3 cm for wheat and 5-6 cm for faba bean

### Sowing density

| Production goal | Wheat density (seeds/m <sup>2</sup> ) | Faba bean density (seeds/m <sup>2</sup> ) |
|-----------------|---------------------------------------|-------------------------------------------|
| Bread wheat     | 400 (90% sole crop density)           | 10 (30% sole crop density)                |
| Mix             | 360 (80% sole crop density)           | 14 (40% sole crop density)                |
| Faba bean       | 270 (60% sole crop density)           | 20 (60% sole crop density)                |





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## PRACTICE ABSTRACT N°1

### Fertilization

- Adjust input according to wheat sowing density (e.g 80% wheat fertilization if sowing density is 80% of sole crop density)

### Weed management

- 2-3 passes with a harrow, as needed.

### Harvest

- Best when wheat is dry and faba bean is still slightly moist to limit the amount of broken legume grains. Reduce harvester's speed to limit breakage of grains.

### Post-harvest treatment

- Separation of the crops at the collection centre and drying of faba beans. Separate sorting and storage.

### Valorization

- Agree upfront with a collection point to value wheat for bread-making. For now, faba bean is primarily used for animal feed but demand for food is growing (quality tasting of different faba bean varieties in Figure 2).



**Figure 1: Mixture of winter faba bean (40%) and bread wheat (80%) – Spring 2023.** Photo: Marina Wendling, FiBL



**Figure 2: Quality tasting of spring and winter faba beans varieties**  
Photo: Ludivine Nicod, FiBL



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## PRACTICE ABSTRACT N°1

### Further information

#### Video

- Information on different mixed crops and legumes: [Anbau von Mischkulturen – Körnerleguminosen mit Getreide](#) (Sept. 2015, German with subtitles in English and French).

#### Further readings

- Clerc M., Klaiss M., Messmer M., Arncken C., Dierauer H., Hegglin D., Böhler D. Improving the domestic protein supply with mixed cropping (2015)
- FiBL Factsheet “Erfolgreicher Anbau von Körnerleguminosen in Mischkultur mit Getreide” (German, 2017)

#### Weblinks

- More information about organic intercropping in Switzerland on [Bioactualités.ch](#) (French), [bioaktuell.ch](#) (German)
- Practice abstract on intercropping grain peas with barley is available on [fibl.org](#)
- <https://www.remix-intercrops.eu/>
- Check the [Organic Farm Knowledge Platform](#) for more practical recommendations.

### About this practice abstract

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**Project website:** <https://intercropvalues.eu/>





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## 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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## PRACTICE ABSTRACT N°2

### 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).

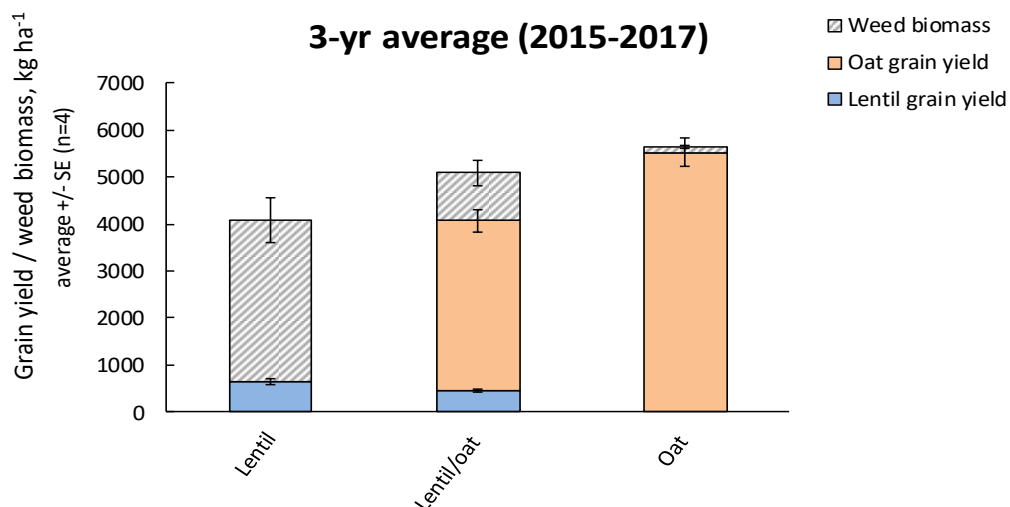


**Figure 2: Higher weed biomass in lentil sole crop compared to lentil/oat intercrop, with similar lentil grain yields in sole and intercrop. Moreover, intercropped oat yield was around 65% of its sole crop despite being sown at only 20% of the sole-crop density.**





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## PRACTICE ABSTRACT N°2

**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                            |                                                                |                                                     |
|----------------|-------------------------|----------------------------------------------------------------|-----------------------------------------------------|-----------------------------------|----------------------------------------------------------------|-----------------------------------------------------|
|                | <i>Sole crop (t/ha)</i> | <i>Intercrop (t/ha) when sown at 67 % of sole crop density</i> | <i>Intercropped yield relative to sole crop (%)</i> | <i>Sole crop (t/ha) in Scania</i> | <i>Intercrop (t/ha) when sown at 33 % of sole crop density</i> | <i>Intercropped yield relative to sole crop (%)</i> |
| 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                                                 |
| <b>Average</b> | <b>1.14</b>             | <b>0.83</b>                                                    | <b>73 %</b>                                         | <b>4.03</b>                       | <b>3.34</b>                                                    | <b>87 %</b>                                         |

### 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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PRACTICE ABSTRACT N°3

# Interplay©: a support tool to help novice farmers choose cereal-legume intercrops

## Problem

If intercropping (IC) is so little explored today, it is probably due to the difficulty of answering all the questions raised by the practice: Which species to combine? When and how to sow? How to manage pests and diseases, weed control operations and phytosanitary treatments? What opportunities are possible? And for which environmental, health or economic purposes?

## Solution

The founders of Interplay© chose to develop a participatory serious game to help farmers explore IC.

It has two objectives:

- Exploring a wide range of cereal-legume IC scenarios sown simultaneously and identifying the most appropriate intercrops based on the context and goals of the players.
- Ensuring that players become more knowledgeable about intercropping.

## Benefits

Interplay© is a tool for reflection enabling assessment of the ecosystem services provided by cereal-legume intercropping, grown under different crop management systems, both organic or conventional.

It can also be a source of inspiration for advisors to create their own tool to help farmers choose IC, to conduct workshops, increase players' knowledge and create a space to exchange knowledge.

## Applicability box

### Theme

Cropping systems, Cereals, Legumes.

### Keywords

Agroecology tool, serious game, Intercropping, Crop management, Environmental impact assessment.

### Context

French soil-climate conditions.

### Application time

Before sowing, with novice farmers, students, advisors (groups of 10 people maximum).

### Required time

4 hours

### Period of impact

NA

### Equipment

NA

### Best in

NA



**Figure 1: Farmer using interplay© game boards.**

Photo: Lionel ALLETTTO



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## PRACTICE ABSTRACT N°3

### Practical recommendations

- Download manual to read complete instruction of the game:  
<https://forms.gle/K8SDGuaxYq2CPkcp9>

- Use the game in small groups (5 players)

It is often more effective and productive to work on real cases, and so it is necessary to collect information from participants before the workshop (choice of plot, type of soil, climatic conditions, etc.).

- If used in bigger group (>10 people), implement individual reflection time and collective sharing sequences.
- This serious game can be used linked to a “causal tree” method to identify problems encountered to use intercrops. [Diverimpacts guideline ideas webinar](#)

## Physical board game

**1 What is your plot context and crop rotation?**

Context and constraints

Cannot be changed

Can be modified

**2 Which issues would you like to solve, and what benefits do you expect from the intercrop?**

• **regulating**

- Slightly endocyclic pest control
- Mildly endocyclic pest control
- Highly endocyclic pest control

• **provisioning**

- Cereal yield
- Legumine yield
- Cereal protein content

• **supporting**

- Soil structure
- Nitrogen supply

**3 In your context, what to grow together?**

Crops grown simultaneously

Two harvested crops

One harvested crop + One companion plant

**4 How to manage the intercrop?**

Selected intercrop

| Culture | Protein | Resistance to lodging | Grain weight/grain |
|---------|---------|-----------------------|--------------------|
| Cereal  | Low     | High                  | Low                |
| Legume  | High    | Low                   | High               |

| Selected intercrop | Protein | Resistance to lodging | Grain weight/grain |
|--------------------|---------|-----------------------|--------------------|
| Cereal             | Low     | High                  | Low                |
| Legume             | High    | Low                   | High               |

| Selected intercrop | Protein | Resistance to lodging | Grain weight/grain |
|--------------------|---------|-----------------------|--------------------|
| Cereal             | Low     | High                  | Low                |
| Legume             | High    | Low                   | High               |

| Selected intercrop | Protein | Resistance to lodging | Grain weight/grain |
|--------------------|---------|-----------------------|--------------------|
| Cereal             | Low     | High                  | Low                |
| Legume             | High    | Low                   | High               |

Sowing

Harvest

ReMix

INRAE

Itab

Interplay

## 1. Design the intercrop scenarios





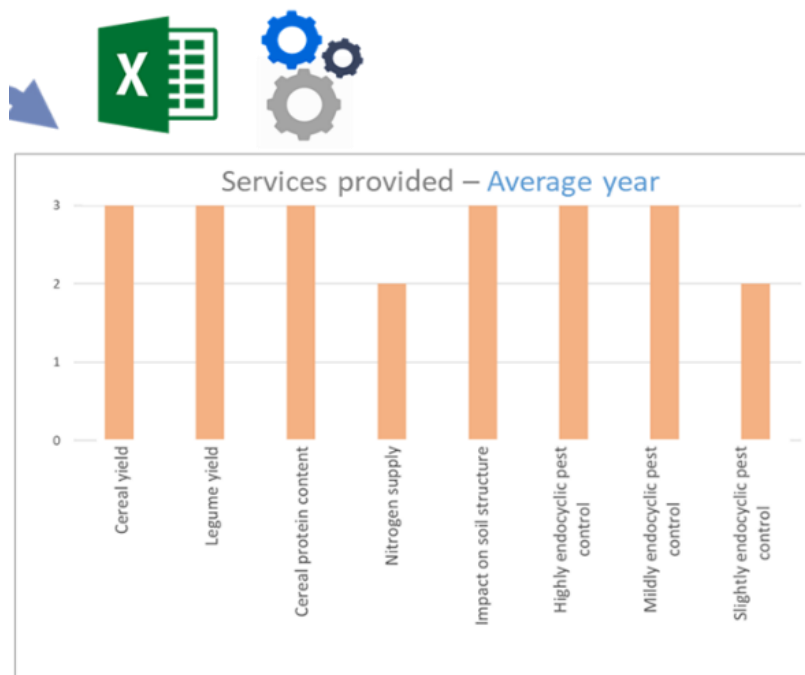
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## PRACTICE ABSTRACT N°3

### Computer evaluation module



## 2. Assess the services designed on the board

### Further information

#### Further readings

- Clémentine Meunier, Marion Casagrande, Blandine Rosiès, Laurent Bedoussac, Cairistiona F.E. Topp, Robin L. Walker, Christine A. Watson, Guillaume Martin., 2022. Interplay: A game for the participatory design of locally adapted cereal-legume intercrops <https://doi.org/10.1016/j.agry.2022.103438>
- Clémentine Meunier, Lionel Alletto, Laurent Bedoussac, Jacques-Eric Bergez, Pierre Casadebaig, Julie Constantin, Noémie Gaudio, Rémi Mahmoud, Jean-Noël Aubertot, Florian Celette, Maé Guinet, Marie-Hélène Jeuffroy, Marie-Hélène Robin, Safia Médiène, Laurence Fontaine, Bernard Nicolardot, Elise Pelzer, Véronique Souchère, Anne-Sophie Voisin, Blandine Rosiès, Marion Casagrande, Guillaume Martin, 2022. A modelling chain combining soft and hard models to assess a bundle of ecosystem services provided by a diversity of cereal-legume intercrops. <https://doi.org/10.1016/j.eja.2021.126412>





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## PRACTICE ABSTRACT N°3

### Weblinks

- [Access to Interplay](#) to download freely the manual for users (English and French) and the game content (boards, cards, technical data sheets...)
- INRAE webpage on Interplay <https://www.inrae.fr/actualites/interplay-jeu-serieux-evaluer-services-fournis-associations-cereales-legumineuses>

### About this practice abstract

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## PRACTICE ABSTRACT N°4

# Eliminate lentil bruchids as soon as possible after early harvest to reduce yield losses

### Problem

In organic and conventional pulse crops, bruchid larvae penetrate green seeds and develop by feeding on them (Figure 1). This leads to a reduction in harvest quality and an average yield loss of 20%, varying from year to year and region to region.

### Solution

The solution proposed to limit the development of bruchids, tested on lentils, consists of early harvesting of the grains, immediate cleaning and sorting of the grains followed by elimination of the bruchids by heat, freezing or asphyxiation.

### Benefits

This improves the grower's gross margin by limiting yield losses due to grains eaten by bruchids after harvest. Also improves the quality of batches intended for human consumption (Figure 2).

### Applicability box

#### Theme

Legumes; Disease and pest control; Postharvest management; Storage; Farm technology and equipment.

#### Keywords

Legumes; Pest control; Postharvest equipment; Storage; Farm equipment.

#### Context

All areas where bruchids are present.

#### Application time

Harvest time for lentils.

#### Required time

Few hours to treat the batches and several days to eliminate the bruchids.

#### Period of impact

Immediately after the grain harvest.

#### Equipment

Grain separator (Figure 3) and depending on the option used to eliminate bruchids: freezer, dryer or hermetic bags (Figure 4).

#### Best in

All systems producing lentils with bruchids problems.

### Practical recommendations

- Harvest the lentils as soon as possible and dry the batches if necessary.
- Immediately clean and sort the grains to remove all impurities, including grains containing bruchids (Figure 3).
- Kill the bruchids with one of three options: (i) freezing, (ii) heating or (iii) asphyxiating using special hermetically sealed bags saturated with CO<sub>2</sub>.





Figure 1: *Bruchus signaticornis* emerging from a lentil seed. Photo : Samuel Loiseau, Laboratoire d'éco-entomologie d'Orléans.

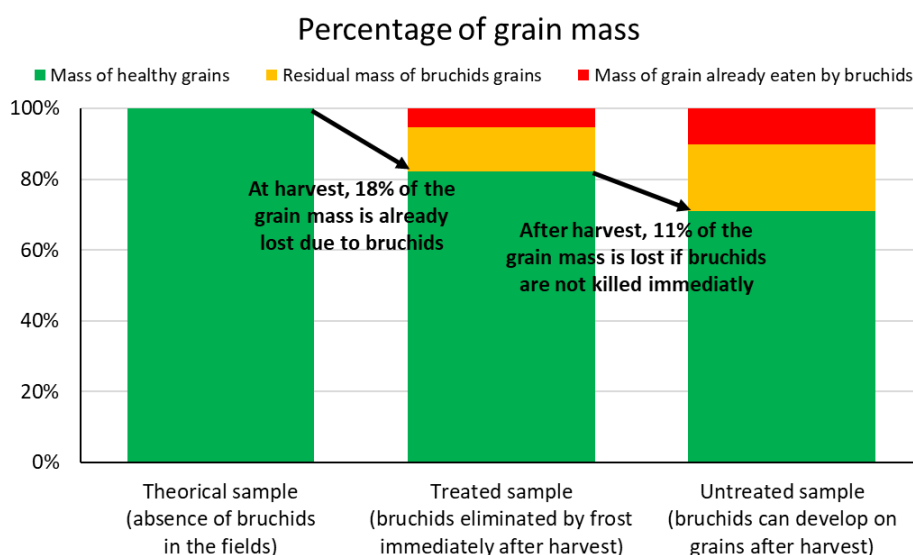


Figure 2: Effect of eliminating bruchids immediately after harvest (here by freezing) on the percentage of healthy grains, residual mass of bruchids grains and mass of grains already eaten by bruchids.

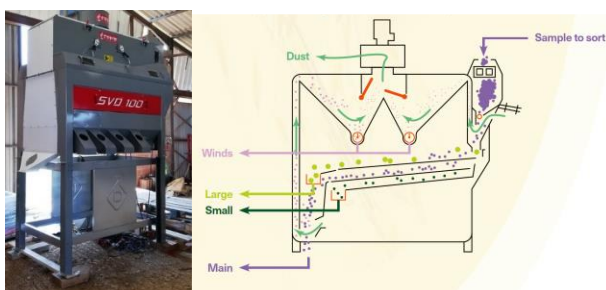


Figure 3: SVD 100 vibrating separator from Denis, tested during the H2020 ReMIX project, which is a flat sorting machine equipped with two blowers (one at the inlet and one at the outlet) and comprising two superimposed floors of two grids, i.e. a total of four grids that can be chosen independently <https://www.denis.fr/materiels/nettoyage/nettoyeur-separateur/292-separateur-vibrant-denis-svd100.html>



Figure 4: Hermetically sealed bags saturated with CO<sub>2</sub> used to asphyxiate bruchids <https://noxstor-age.com>



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## PRACTICE ABSTRACT N°4

### Further information

#### Weblinks

- Bruche des lentilles (2018). GECO Ecophytopic, [https://geco.ecophytopic.fr/geco/Concept/Bruche Des Lentilles](https://geco.ecophytopic.fr/geco/Concept/Bruche%20Des%20Lentilles)

#### Technical report

- Bedoussac L, Albouy L, Deschamps E, Salembier C, Jeuffroy M;-H.. (2021). From theory to practice of species mixtures: Redesigning European cropping systems based on species MIXtures, 108p., <https://hal.inrae.fr/hal-04064291v1>

### About this practice abstract

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## PRACTICE ABSTRACT N°5

# Control of the parasitic weed Dodder in buckwheat or lentil cultivation through intercropping with linseed in Central Italy

### Problem

Buckwheat and lentil are interesting spring crops for providing gluten-free food and maintaining soil fertility, but the severe pressure exerted by the parasitic Dodder weed (*Cuscuta spp*) makes these crops hard to grow.

### Solution

Intercropping buckwheat/lentil with linseed reduces the weed pressure when compared to sole crop cultivation (Figure 1 and 2) This technique has been developed and tested by an organic farmer in Tuscany, Italy.

### Benefits

Linseed covers the soil quickly which hinders Dodder's growth and reduces the need for chemical or mechanical weed control. It also improves water use efficiency in heavy soils and enables a higher crop diversification at farm level.

### Applicability box

#### Theme

Cropping system, Arable Crop, Weed management, Agroecology.

#### Keywords

Legumes, Oil Crops, Weed control, Diversification, Health foods.

#### Context

Temperate and Mediterranean Region.

#### Application time

Spring Sowing.

#### Required time

Crops need to be separated after harvest.

#### Period of impact

From sowing to harvest.

#### Equipment

Wheat sowing machine.

Combine harvester.

Seed cleaner (Rotary cleaner, vibratory sieve or gravity separator).

#### Best in

Farms in dry climate and clay soil conditions, having dodder as the predominant weed.

### Practical recommendations

#### Sowing densities

- 40 kg/ha of lentil with 25kg/ha of linseed (Figure 1).
- 60 kg/ha of buckwheat with 35kg/ha of linseed (Figure 2).

#### Soil preparation

- No tillage is required before the cultivation.

#### Sowing period

- Both crops, buckwheat/lentil with linseed are sown together with a wheat seed drill.





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## PRACTICE ABSTRACT N°5

### Harvesting period

- Lentil and buckwheat have a shorter life cycle than linseed. The harvest occurs at lentil/buckwheat maturity, with a small loss of linseed yield. In this intercropping system, the main role of linseed is weed control rather than production.
- The two crops are harvested together with the same combine harvester.

### Sorting phase

- Linseed can be easily sorted using a seed cleaner (rotary cleaner, vibratory or gravity separator) and sold as food or used as seed for the next cultivation.



Figure 1: Dodder in sole lentil (Left) and Intercrop lentil-linseed (Right) in Tuscany's organic farm. Photo: Sara Passerini



Figure 2: Dodder in sole buckwheat (Left) and intercrop buckwheat-linseed (Right) in Tuscany's organic farm. Photo: Sara Passerini





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## PRACTICE ABSTRACT N°5

### Further information

#### Further readings

- Kumar, P., Siddiqui, M. Z., Prajapati, S. K., Singh, S., Kumar, A., & Rawat, D. K. (2023). Study of the Most Suitable Combination of Intercropping Systems of Indian Mustard (*Brassica juncea* L.) with Chickpea, Lentil, Linseed and Field Pea. *International Journal of Environment and Climate Change*, 13(11), 3777-3789.
- Mandal, B. K., & Mahapatra, S. K. (1990). Barley, lentil, and flax yield under different intercropping systems. *Agronomy Journal*, 82(6), 1066-1068.
- Penny Roberts, Sard Clare and Alyce Dowling, University of Adelaide. T-Intercropping-A Tool to Improve Profitability in Broadacre Systems. 2020 Hartfield day guide [link](#)

#### Weblinks

- Directorate of Pulses Development, Govt of India. Lentil production Technology. 2017. [link](#)

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## PRACTICE ABSTRACT N°6

# Reduce herbicide use by intercropping sugarcane with service crops

### Problem

Weeds are the main pest in sugarcane cropping systems. While the French legislation aims to reduce the use of pesticides by half by 2030 with the Ecophyto Plan, the sugarcane pest is still mostly controlled through herbicide application.

### Solution

Sowing service crops in the sugarcane inter-row, combined with a sugarcane variety adapted to the area, optimized straw management and manual weed management, allows for improved weed control, and hence, the reduction of herbicide use (Figure 2).

### Benefits

Service crops can reduce herbicide use by up to 80% while providing the same level of weed control as conventional methods. Nevertheless, the proposed solution may result in minor crop yield loss (> 4%) and imply increased labour time.

### Applicability box

#### Theme

Cropping system, Weed management, Biodiversity, and nature conservation.

#### Keywords

Cover plants, Weed control, Ecosystem services.

#### Context

Spring in tropical climatic conditions.

(Reunion Island)

#### Application time

45 days after harvest.

#### Required time

Depends on the selected sowing method.

#### Period of impact

During the sugarcane growth.

#### Equipment

Seeds, workforce, adaptative seeders, tractor.

#### Best in

Small farms (>6ha) below 400 meters altitude.

### Practical recommendations

- Potential service crops species: cowpeas and crotalaria species (available from local suppliers) or jack-beans (must be self-produced).
- Inter-row sowing density: 15 kg ha<sup>-1</sup> for cowpea, 25 kg ha<sup>-1</sup> for crotalaria and 70 kg ha<sup>-1</sup> for jack bean.
- Within 7 days after sugarcane harvest, a pre-emergence herbicide treatment is applied. The treatment prevents weed establishment for a 30-day period which allows the service crop to be sown at the ideal moment.
- Services crops are sown 45 days after sugarcane harvest to limit their negative impact on sugarcane growth.
- For mechanical sowing of service crop: the straw is placed manually on the row before sowing as seeders can't pass through it (Figure 1).





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- For manual sowing of the service crop: farmers must push the straw aside and use a hoe to sow service crops, in 1 or 2 lines in the middle of the inter-row (Figure 2)
- After sowing service crop, weeds are removed by hand only, particularly in the row. The weeding frequency depends on the pressure in the field (on average 4 times over a 5-month period).
- Service crops disappear under the sugarcane canopy at 7-8 months of sugarcane growth.



**Figure 1: Straw placed on sugarcane rows before mechanical sowing of service crop.**

Photo: Thomas Lizekne



**Figure 2: Jack bean planted on straw bed, in sugarcane interrow.**

Photo: Julien Chetty

### Further information

#### Video

- ["Semer des plantes de service", 2021 \(French\)](#)
- ["Les plantes de services en canne à sucre : gestion de l'enherbement et de la fertilité des sols", 2022, 1min20-22min20 \(French\)](#)

#### Further readings

- Posters on services crops benefits : [Contrôle des adventices par les plantes de services en couvert - Agritrop \(cirad.fr\)](#) ; [Croissance de plantes de services en fonction de la date de semis dans le Nord de la Réunion - Agritrop \(cirad.fr\)](#) ; [L'utilisation des mélanges de plantes de services pour lutter contre les adventices à la Réunion - Agritrop \(cirad.fr\)](#) (French)

#### Weblinks

- [coatis.rita-dom.fr/plantasso/](https://coatis.rita-dom.fr/plantasso/)



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## PRACTICE ABSTRACT N°6

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## PRACTICE ABSTRACT N°7

# Intercropping wheat and pea for on-farm pasta production

### Problem

While traditional pasta has become a staple food worldwide, several public health strategies agree that their nutritional qualities could be improved. The quality improvement through the crop diversification has not been sufficiently studied in semi-arid climate and organic production.

### Solution

Intercropping winter wheat with field pea in organic systems enables to increase the protein content of the cultivated cereal, and so its nutritional quality.

### Benefits

Intercropping cereals with legumes in organic systems allows a better crop use of resources, brings a higher biodiversity in the agricultural landscape, and delivers ecosystems services (soil fertility and health, C sequestration and water regulation). These benefits can add extra value to the produced pastas.

### Applicability box

#### Theme

Crop production, Food chain management.

#### Keywords

Intercropping, Crop management, Postharvest technology, Food processing and Food quality.

#### Context

South-Eastern Europe, temperate climate, rainfed conditions.

#### Application time

Autumn (October) to summer (June).

#### Required time

No additional time during cultivation of pure winter wheat crop. The harvested grains need to be separated and cleaned before milling.

#### Period of impact

One year

#### Equipment

Standard machinery for the winter wheat cultivation.

#### Best in

Low input/ organic agricultural systems.

### Practical recommendations

#### Variety selection

- An early ripening wheat variety to match with a winter field pea variety. Make sure that the selected legume matches the harvesting period of wheat (e.g., Mraz in Serbia).

#### Seeding density

- Wheat at 70% and legume at 30% of their recommended sole-crop densities.

#### Seeding time

- 2-3 weeks after the optimum sowing date to avoid pest and diseases proliferation, especially in organic agriculture.

#### Weed control

- Usually not needed in autumn, but weeds can be controlled in spring by harrowing.





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### Harvest

- Adjust the harvesting period of winter wheat and field peas to the same time frame and set harvester grain sieves to the pea size.

### Sorting

- Use proper separation methods afterwards in order to leave as little pea seeds as possible (<5%).



**Fig 1: Sowing intercrop winter wheat and field pea.** Photo: Rada Šućur.



**Fig 2: Intercrops of winter wheat and field peas. Picture taken during the stem extension phase of winter wheat.** Photo: Srdjan Šeremešić.



**Fig 3: Variety of on-farm produced pasta.** Photo: Srdjan Šeremešić.

### Further information

#### Video

- <https://intercropvalues.eu/news/short-video-release-sowing-winter-wheat-and-field-pea/> (English)

#### Further readings

- Timaeus, J., Weedon, O. D., & Finckh, M. R. (2022). Harnessing the potential of wheat-pea species mixtures: evaluation of multifunctional performance and wheat diversity. *Frontiers in Plant Science*, 13, 846237.
- [From theory to practice of species mixtures](#), 2022, EU-funded ReMix project
- [Mischkulturen, bioaktuell.ch](#)

#### Weblinks

- [Intercropping of grain pea with cereals - legumehub.eu, 2021](#)



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## PRACTICE ABSTRACT N°7

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## PRACTICE ABSTRACT N°8

# Marketing organic intercropped rapeseed oil

### Problem

Rapeseed is often considered as a low-quality commodity, produced using lots of inputs and harming insects. This is not the case when rapeseed is grown organically in an intercropping system. There is a need to communicate this better.

### Solution

A group of farmers are collaborating with a processor to launch a new, organic culinary oil product. Its marketing will communicate the environmentally friendly benefits of intercropping.

### Benefits

- Builds demand for a new crop that is profitable, fits into crop rotations, and improves soil health and fertility.
- Develops a profitable, local supply chain supporting local businesses.
- Creates a healthy product, produced in an environmentally beneficial way.

### Applicability box

**Theme**

Food chain management.

**Keywords**

Product quality, Packaging, Marketing.

**Context**

Applicable to any new intercropped food product.

**Application time**

Any

**Required time**

Ongoing but the early years are critical.

**Period of impact**

Continuous over the life of the product.

**Equipment**

Processing, bottling and labelling.

**Best in**

Applicable to any organic or intercropped food systems.

### Practical recommendations

These steps are applicable to any new intercropped product:

- Collaborate with growers to support their knowledge exchange to better understand intercropping production, and to support product marketing (Figure 1).
- Conduct market and consumer research to determine potential demand for the product.
- Understanding your product's unique selling point (USP), how it competes in the market.
- Research and adhere to the legal and food safety regulations.
- Produce a 5-year Business Plan, <https://www.gov.uk/write-business-plan>.
- Create a brand, the packaging, labelling, price point and appropriate messaging (Figure 2), <https://www.or-ganic.co.uk/>.





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- Develop a marketing strategy and promotional materials.
- Create a route to market /distribution plan, <https://www.great.gov.uk/learn/categories/prepare-sell-new-country/routes-to-market/choose-right-route-market/>
- Ensure consistent product quality and assurance to specification.
- Monitor sales, gather consumer feedback and take appropriate action as required.



Figure 1: Farmer members of the intercropping group discussing a crop of organic oilseed rape with cereal strips sown to help control flea beetle. Photo: David Michie.



Figure 2. Promotional stand and bottled product at a National Food Fair in London (Ed Smith, 2023)





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## PRACTICE ABSTRACT N°8

### Further information

#### Weblinks

- <https://www.or-ganic.co.uk/>
- <https://www.fas.scot/article/organic-oilseed-rape-production-in-scotland/>
- Organic rapeseed oil in Scotland, a technical guideline <https://www.fas.scot/downloads/organic-oilseed-rape-in-scotland-a-technical-guide/>

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