

IWM PRAISE	
Work Package	3 Annual narrow-row crops

**WP3 leaders:** Ludovic Bonin, ACTA-ARV; deputy WP leader: John Cussans, NIAB

**Italian cluster leader:** Anna Camilla Moonen (Scuola Superiore Sant'Anna ([SSSA](#)))

**Partner:** Centro di Ricerche Agro-Ambientali "Enrico Avanzi" ([CIRAA](#)), [HORTA srl](#), [ISEA srl](#), [DONDI spa.](#), [CNR](#)

**IWM PRAISE** supports the implementation of innovative and effective **Integrated Weed Management (IWM)** practices in European agriculture to improve agronomic, economic and environmental sustainability.

- ✓ **WP 3** The aim of this WP is to design, demonstrate, conduct an agronomic assessment of context-specific IWM strategies on annual narrow row crops (e.g. small grain cereals, oilseed rape and pea) and provide data for an environmental and economic assessment. The Italian cluster will focus on durum wheat.

Wheat, is one of most important narrow-row crops in Italy and the competition with weeds and N deficiency are the main causes of grain yield and quality reduction, especially in organic and low-input system.

In order to tackle these problem in IWM PRAISE WP3, the Italian team will carry out two studies

- 1) The first located in Tuscany and Emilia-Romagna, aimed at testing, in a participatory research, the best relay cropping systems with legumes in durum wheat with the objective to improve weed control and N fertility. ([SSSA](#), [CIRAA](#), [HORTA srl](#), [ISEA srl](#))
- 1) The second located in Veneto aimed at evaluating efficacy of IWM strategies with progressive reduction of herbicide use and substitution with mechanical control in a cropping system with rotation of wheat and spring crops. ([CNR](#))

## 1) Integrated weeds management through relay cropping of legume with durum wheat

In particular, the relay-cropping study will focus on:

- Cultivar of durum wheat most suitable for this cropping system,
- Selection of the best performing legume species for this cropping system.

The objectives and hypothesis of this study are:

- **Improve Weeds control:** Legume cover crops will be able to improve weed control in spring, after wheat harvest and in following cash crops.
- **Improve Yield and grain quality of wheat.**
- **Improve soil fertilization:** Relay cropping of legume species will be able to improve soil fertility, in particular N fertility, to the advantage of wheat and the following cash crop (e.g. sunflower).

### Experimental design

The experimental fields are located at the Centre for Agro-Environmental Research of the University of Pisa (CIRAA), in San Piero a Grado (43°40'7.23N, 10°18'31.5'' E) and at HORTA srl near Ravenna. We will test wheat durum cv. MINOSSE provided by ISEA and we relay cropping different legume species before the elongation phases of wheat. We have already sown durum wheat in rows in November 2017, and we will sow the legumes proximally in February 2018.

## 2) integrated weeds management through mechanical and agronomical control

In particular, the integrated weed control study will focus on:

- Comparison of control strategies based on only chemical control, integration of chemical and mechanical control, and only mechanical control,
- Feasibility and efficacy of mechanical weed control tools for wheat, considering both autumn and spring applications under the Northern Italy environmental conditions.

The objectives and hypothesis of this study are:

- **Design mechanical weed control strategies for wheat:** weed control can be optimized by advanced strategies, including spring and autumn applications, machineries calibration according to local environmental conditions and considering the limitations due to timing of cropping operations and weather trends.
- **Reduce environmental impact of weed control in wheat:** the introduction of effective mechanical control can decrease or avoid herbicide application.

### Experimental design

Experiment is being conducted at the “Lucio Toniolo” Experimental Farm of the University of Padova at Legnaro ((45°20'48.9"N, 11°57'00.3"E) in a field where soyabean and maize were grown in the two previous years. This reproduces the situation of the typical 3-year rotation adopted in this area. After maize harvest in September 2017, ploughing and rotatory harrowing was performed on 10<sup>th</sup> October for false seedbed preparation on the plots with weed management strategies based on only mechanical control or integrated mechanical-chemical control. Soil cultivation for seedbed preparation was then performed on the whole field on 25<sup>th</sup> October and on the same day summer wheat cv Rubisco was sown. Weed emergence will be monitored during autumn 2017 to evaluate the necessity of autumn mechanical control (with flexible tin harrow) for the plots managed according to the mechanical control strategy. Herbicide application or mechanical weed control will be performed on all plots in March 2018 according to the different strategies.

**Fig. 1** On the right the experimental field at CIRAA (43°40'7.23N, 10°18'31.5" E within which the relay cropping will be carried out in the first year (yellow) and in second year (blue) (Immagini ©2017 Google); on the left, experimental field at Horta in Ravenna.



**Fig. 2** Experimental field at HORTA in Ravenna with wheat row planted



**Fig. 3** Sowing of durum wheat at CIRAA



**Fig. 4** Wheat plots at “L. Toniolo” Experimental Farm during autumn 2017

