

IWPRAISE	
Work Package	4 Annual row crops
Tasks	4.1, 4.2, 4.3

Leaders: Daniele Antichi and Christian Frascioni (Centro di Ricerche Agro-Ambientali "Enrico Avanzi" ([CIRAA](#)))

Partner: Scuola Superiore Sant'Anna ([SSSA](#))

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

- ✓ **WP 4** The overall objective is to define, implement and test IWM solutions for annual row crops (i.e. arable row crops like maize, ARC, and horticulture field crops, HFC)
 - ✓ **Task 4.1** For each of the two crop groups national clusters will be formed in participating countries consisting of lead users, end-users and research institutes. They will design context-specific IWM strategies based on the available tool box, including those made available by WP 2. Tested strategies will ideally combine three types of tools, aiming to limit weed establishment (e.g. management of the intercrop period, mechanical control, strip tillage, banded herbicide applications, precision spraying, cover crops, decision support systems, dead and living mulches, flaming), limiting competition for resources (e.g. intercropping, cultivar choice, sowing date) and limiting return of seeds/vegetative organs (e.g. stubble management, using available tools for weed seed collection and destruction).
 - ✓ **Task 4.2** Experiments will be done for three years (year 2, 3 and 4) in each of the participating countries. The strategies designed in Task 4.1 will be tested in field experiments (on-farm and/or on demonstration farms), which will compare the local conventional management and two IWM strategies defined by the national clusters. IWM strategies will be locally adapted and key crops may change in different countries, however selected crops will be of relevance for much of Europe in order to increase the potential impact. Likely key arable crops are maize, soybean, beets and sunflower, whereas cabbage and leafy vegetables could be considered key horticultural field crops. Data obtained from ongoing long-term experiments in each country may also be considered.
 - ✓ **Task 4.3** A preliminary evaluation will be done every year by national clusters to assess the efficacy of weed control, costs and applicability of tested IWM strategies. This assessment will provide feedback to improve the strategies for the next year of experimentation. Field days for stakeholders will be organised to further disseminate results.

The focus will be on strategies aiming at reducing at most the use of herbicide and that could be adopted also in organic farming conditions with some adjustments. Tactics will include crop rotation issues, cover cropping, reduced soil disturbance (i.e. no-till or reduced tillage) and combination of mechanical and thermal weed control.

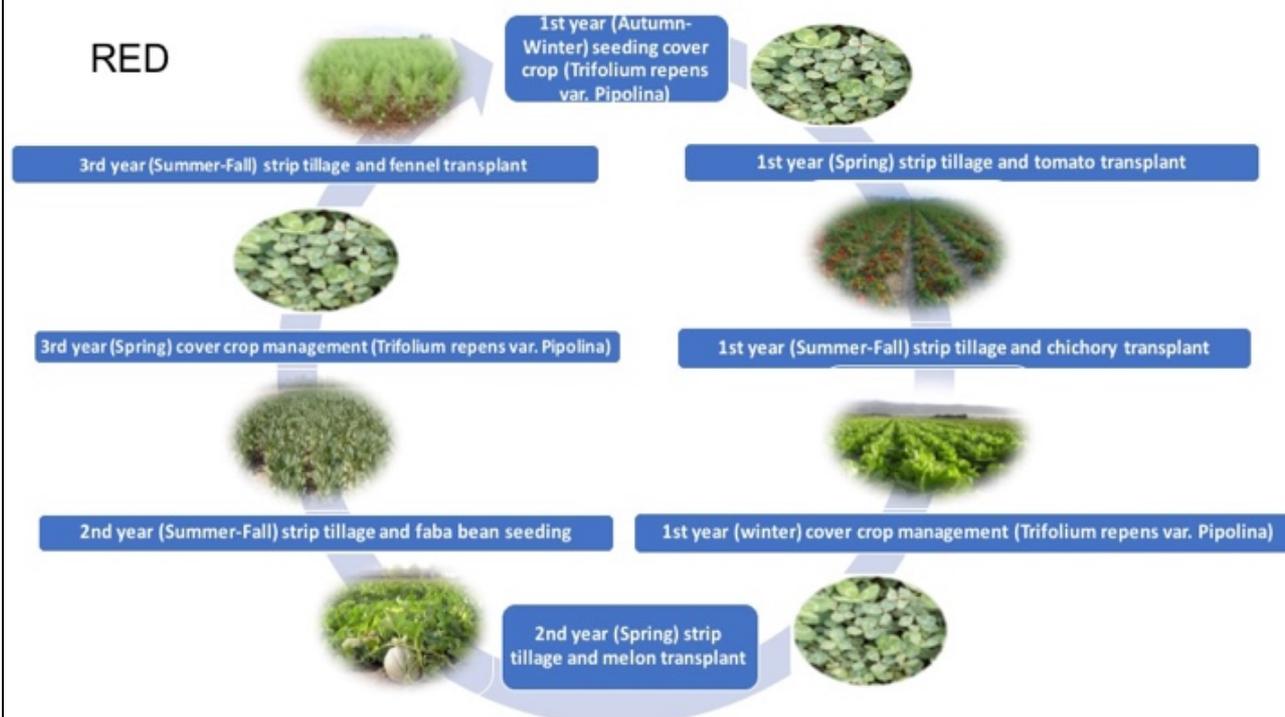
Summary description of cropping system

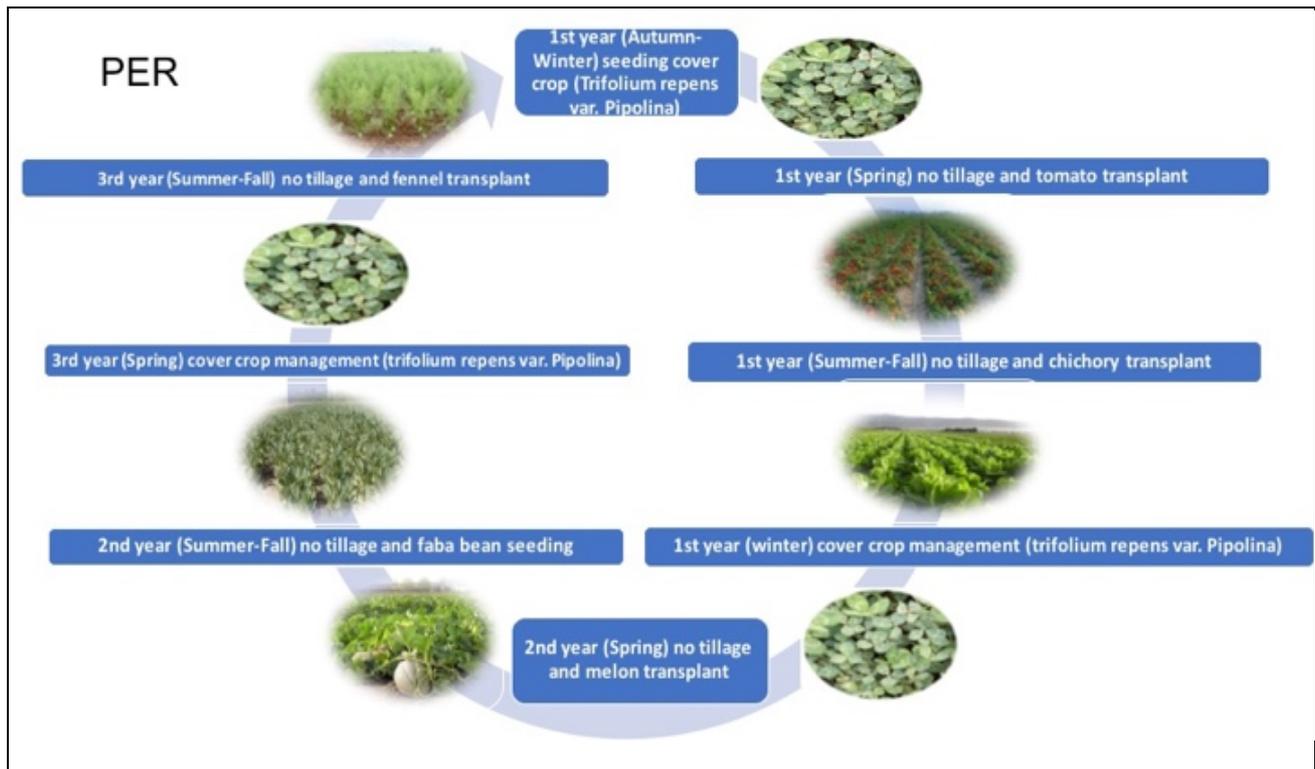
Three different management of
Partners: **CIRAA, SSSA**

ORG



RED





SMOCA Long Term Experiment

Objective:

Test the agri-environmental performances of the combination between conservation agriculture practices (i.e. no-till or strip tillage, permanent soil cover with living mulch) and organic farming in field vegetable production. Three different cropping systems based on the same 3-yr crop sequence (process tomato-chicory-melon-faba bean-fennel) but with a decreasing level of soil disturbance are being compared in terms of crop performances, economic viability, soil fertility and weed abundance and composition.

Hypothesis:

- H1:** The application of conservation agriculture practices in organic field vegetable production may lead to the implementation of sustainable agroecologically based cropping systems
- H2:** Permanent soil cover achieved through the cultivation of perennial cover crops can lead to an effective prevention of weed infestation (and many other agroecological services) in organic field vegetables
- H3:** Strip-tillage combined with permanent soil cover in the inter-row space can be the optimal trade-off between the target of an effective weed control and support of crop production.

Experimental design

The experimental field is located at the Centre for Agro-Environmental Research of the University of Pisa (**CIRAA**), in San Piero a Grado (Pisa, Tuscany). Here 3 different cropping systems (ORG, RED, PER) will be established in winter 2017-18 and compared applying a system approach for three years. ORG is mainly based on standard organic practices such as annual soil tillage, green manures incorporated into the soil, organic fertilization, mechanical and thermal weed control. RED is based on permanent soil cover with a perennial cover crop (a dwarf variety of white clover), strip-tillage performed along seed furrow, reduced use of organic fertilizers. PER, which is established on plots managed under no-till for the previous 3 years, is based on permanent soil cover with white clover and no-till transplanting of vegetables, whilst fertilization is reduced at a minimum level. The experimental design is a randomized complete block (RCB) design with 3 replications. The field is split in two parts hosting the two different segments of crop sequence in order to half the time needed to replicate twice the crop sequence.

Performance parameters assessed per each cropping system

- Biomass and soil cover produced by cover crops and cash crops (i.e., yield and residues) at maturity
- Nutrient uptake of cash crops and cover crops
- N₂-fixation by legume plants
- Weed abundance and composition in cover crops and cash crops
- Soil chemical, physical and biological fertility parameters
- Crop produce rheological quality
- Energy consumption and monetary cost of each field operation

Fig. 1 Experimental field at CIRAA (43°40'18.47"N, 10°20'40.25" E)
(Immagini ©2017 Google)

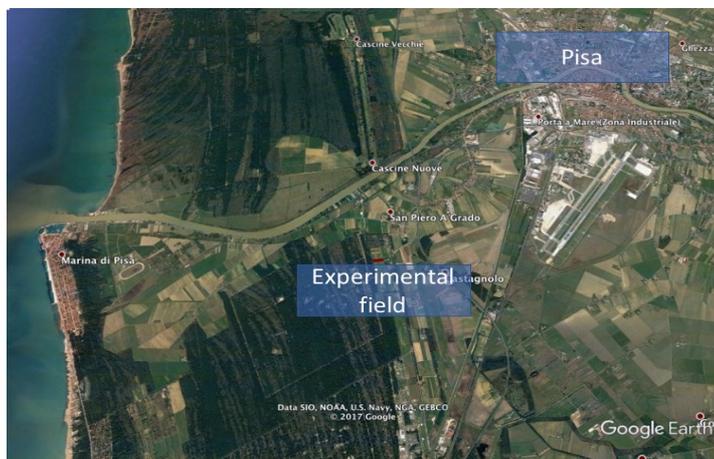


Fig. 2 Fennel grown on dead mulch of summer cover crop mixture

