

**LONG TERM EFFECTS OF COVER CROPS ON WEEDS IN MEDITERRANEAN LOW INPUT  
ARABLE MANAGEMENT SYSTEMS**

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The introduction of cover crops (CC) in crop rotations is a key tool to control weed and ameliorate soil conditions in low input arable systems. In 1992 a long term experiment (LTE) was set up at Centre for Agri-environmental Research "E. Avanzi" (CIRAA), University of Pisa to determine the combined effect of tillage intensity, nitrogen fertilization levels and CC types on soil quality, crop yield and weed communities.

The LTE is based on 4-year crop rotation (maize, durum wheat, sunflower, durum wheat) with cover crops grown twice, in between wheat and summer crops. Two tillage systems were compared: i) a conventional system (CS), with annual ploughing (30 cm depth); ii) a low input system (LIS), with chiseling (30 cm depth) for summer crops and no till for wheat. Four Nitrogen levels (from 0 to a maximum rate, varying across crop type) were applied. Cover types were: control; *Brassica juncea* L.; *Trifolium squarrosum* L.; and *Vicia villosa* Roth.). The experiment was replicated in 4 blocks for a total of 128 plots (21 x 11 m). The experiment is arranged as split-split plot design with tillage system in main plots, nitrogen dose in sub-plots and cover crop type in sub-sub-plots. Weed and CC above-ground biomass were assessed at CC termination, while weed species cover and total biomass were assessed at harvest. Data collected in CC (2011, 2014), sunflower (2012), durum wheat (2012) were used to calculate species richness, weed community diversity indices (Shannon's H' and inverse Simpson index) and Pielou equitability. Weed biomass and cover were analyzed by split-split plot ANOVA. Weed community composition was analyzed by a permutational multivariate analysis of variance based on Bray Curtis dissimilarity and Non-metric Multidimensional Scaling.

During both CC cycles, CC type significantly affected weed composition, biomass and species richness. Compared to the control, cover crops significantly reduced weed biomass with different effectiveness depending on CC type.

In sunflower, weed species richness at an early stage was higher after *T. squarrosum* whereas no difference due to CC effect were recorded at harvest. Tillage system and nitrogen dose significantly affected weed community composition but not diversity. In durum wheat, weed community composition at harvest was significantly affected by tillage system and nitrogen dose but not by cover crop type, unlike weed biomass and cover.

CC type strongly influenced weed community composition during CC cycle but this effect was barely detectable in summer and winter cash crops. LIS favored mainly the presence of perennial weeds, increasing also weed total biomass compared to CS. This suggests that some adjustments in CC management under LIS may be needed to prevent potentially troublesome weed shifts which might offset the benefits attained by reduced tillage systems on other production-related agroecosystem services.