

## **The role of cover crop and hedges in intensive olive orchards: Preventing soil erosion and promoting biodiversity**

Juan Castro (1), José A. Gómez (2), and Francisco S. Tortosa (1)

(1) (1) Dpto. Zoología. Universidad de Córdoba. C1-Campus de Rabanales 14071 Córdoba (Spain). ba1satof@uco.es, (2) Institute for Sustainable Agriculture. CSIC., Agronomy, Cordoba, Spain. (joseagomez@ias.csic.es, +34 957499252)

Agricultural intensification entails the simplification and homogenization of the landscape, which leads to a decline in farmland biodiversity (Benton et al., 2003). Reversal of the negative effects of modern agriculture on the environment is an important concern at the European level. Biodiversity conservation on farmland encompasses a range of different measures. Many measures aim to enhance biodiversity by restricting farming intensity. In Europe, many of these measures are subsidized in the framework of agro-environment schemes (AESs) of the European Common Agricultural Policy (CAP). , it has been showed that an increase of structural complexity in woody crops had a positive effect on biodiversity. For instance, herbaceous ground cover in olive groves greatly benefits bird communities. In the Mediterranean Basin, olive orchards are one of the primary agro-ecosystems and they are important winter quarters and breeding ranges for numerous European birds species (Rey 2011). In Europe, the largest area of olive farming is in Spain, where 2.5 million ha are dedicated to this crop. Conventional farming that involves the intensive use of agrochemicals, is the traditional and most common production system (85% of the crop area), which has lead to significant negative environmental consequences including water pollution and especially soil erosion (Gómez et al. 2009). However, to prevent erosion, many farmers are now maintaining herbaceous ground cover within crops, which likely increases structural complexity and provides resources for foraging birds (Vickery et al. 2009). For instance, Castro-Caro et al. (2013) have shown that herbaceous ground cover consistently favored the abundance and richness of songbirds in the olive groves in southern Spain.

The aim of this study is to evaluate the combined effect of two agro-environmental measures, the promotion of hedges and the implementation of ground covers, on songbird communities in intensive agricultural landscapes of Southern Spain. Specifically, our questions are: 1) do hedges and cover crops similarly benefit the abundance and richness of different groups of farmland songbirds? And 2) if so, at which scale is the effect of hedges more relevant to songbirds? Our results show a positive effect of both measures on song birds community although hedges showed a stronger effect. We conclude that both cover crops and hedges strongly promote biodiversity at the same time that prevents soil erosion.

### References

- Benton, T.G., Vickery, J.A., Wilson, J.D., 2003. Farmland biodiversity: is habitat heterogeneity the key? *TRENDS in Ecology and Evolution* 18: 182-188.
- Castro J.C., Barrio I, Tortosa, F.S. 2013. Is the effect of farming practices on songbird communities landscape dependent? A case study of olive groves in southern Spain . *J. of Ornithology* DOI 10.1007/s10336-013-1010-z.
- Gómez, J.A., Giráldez, J.V., Fereres, E. 2009. The influence of cover crops and tillage on water and sediment yield, and on nutrient, and organic matter losses in an olive orchard on a sandy loam soil. *Soil and Tillage Research* 106: 137 - 144
- Rey, P.J., 2011. Preserving frugivorous birds in agro-ecosystems: lessons from Spanish olive orchards. *Journal of Applied Ecology* 48: 228–237.
- Vickery, J.A., Feber, R.E., Fuller, R.J., 2009. Arable field margins managed for biodiversity conservation: A review of food resource provision for farmland birds. *Agriculture, Ecosystems and Environment* 133: 1–13