



The influence of cover crops and tillage on actual and potential soil erosion in an olive grove

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The study was carried out in an olive grove in central Spain (South of Madrid; Tagus River Basin). In this semi-arid zone, the annual mean temperature is 13.8 °C and the annual precipitation is 395 mm. Olive groves are planted in an erosion prone area due to steep slopes up to 15%. Soil is classified as Typic Haploxerept with clay loam texture. The land studied was formerly a vineyard, but it was replaced by the studied olive grove in 2004. It covers approximately 3 ha and olive trees are planted every 6 x 7 metres. They were usually managed by tillage to decrease weed competition. This conventional practice results in a wide surface of bare soil prone to erosion processes. In the long term soil degradation may lead to increase the desertification risk in the area. Storms have important consequences in this shallow and vulnerable soil, as more than 90 Mg ha⁻¹ have been measured after one day with 40 mm of rainfall. In order to avoid this situation, cover crops between the olive trees were planted three years ago: sainfoin (*Onobrychis viciifolia*), barley (*Hordeum vulgare*), and purple false brome (*Brachypodium distachyon*), and they were compared with annual spontaneous vegetation after a minimum tillage treatment (ASV).

The results regarding erosion control were positive. We observed (Oct. 2012/Sept. 2013) annual soil loss up to 11 Mg ha⁻¹ in ASV, but this figure was reduced in the sown covers, being 8 Mg ha⁻¹ in sainfoin treatment, 3,7 Mg ha⁻¹ in barley treatment, and only 1,5 Mg ha⁻¹ in false brome treatment. Those results are used to predict the risk of erosion in long term.

Moreover, soil organic carbon (SOC) increased with treatments, this is significant as it reduces soil erodibility. The increases were found both in topsoil (up to 5 cm) and more in depth, in the root zone (from 5 to 10 cm depth). From higher to lower SOC values we found the false brome (1.05%), barley (0.92%), ASV (0.79%) and sainfoin (0.71%) regarding topsoil. In the root zone (5-10 cm depth) we found 0.76% in false brome and ASV, 0.70% in barley and 0.58% in sainfoin.

Other important variable to estimate erosion processes is soil permeability. During the period of study there were no significant differences between treatments. An average of 45±20 mm h⁻¹ was measured.

This study addresses the comparison between soil erosion rates measured on the ground with soil erosion risk estimated by models. Mapping soil risk can provide the evidence to demonstrate that economic investments in research, good practices and agri-environment payments are worth to achieve sustainable land management. The use of case studies is usually recommended to help in the dissemination of research. This case also includes the influence of treatments in production and quality of olive oil to respond to the needs of land users.