

Weed cover in olive orchards enhances the ecosystem's capacity as a CO₂ sink

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Scientists at the University of Granada (UGR) studied the effects and benefits of maintaining weed cover in olive grove soil. In a recently published article in the journal *Agriculture, Ecosystems and Environment*, the scientists showed that over a year, weed cover significantly increases carbon uptake in olive groves, acting as a sink for one of the principal greenhouse effect gases, CO₂.

Olive trees are among the most widespread crops in the Mediterranean and specifically in Spain, where they occupy an area of 2.6Mha. In Andalusia, this crop is especially relevant as it not only represents 60 percent of total Spanish olive cultivation (1.5 Mha), but also has important economic, social and environmental benefits.

Currently, olive crops are facing several environmental problems caused by conventional agricultural practices such as intense tillage, weed cover elimination and the use of chemical pesticides and fertilizers. These practices have caused large losses in [soil](#) organic carbon (SOC) and reduced the ecosystem's capacity to act as a CO₂ sink, resulting in environmental damage and high economic costs.

The maintenance of weed cover in the alleys of olive groves has many benefits such as controlling erosion and increasing soil organic carbon levels. However, little research has been done on its effect on CO₂ fluxes in the ecosystem.

Project CARBOLIVAR and Project GEI-Spain

The Excellence project CARBOLIVAR studied the effect of weed cover in CO₂ fluxes in [olive groves](#) using the eddy covariance technique.

This technique allows the continuous and non-destructive measurement of CO₂ exchanges between an ecosystem and the atmosphere and obtains the carbon balance of an ecosystem at different temporal scales, revealing whether the ecosystem acts as a source or sink of CO₂. This technique is applied using instruments that measure high frequency (10Hz) variables like CO₂ concentration in the air, wind velocity and direction, as well as other additional instruments to measure humidity, air temperature and atmospheric pressure.

Results after one year of measurement

The researchers recently published the article "Net ecosystem CO₂ exchange in an irrigated olive orchard of SE Spain: influence of weed cover" in the journal *Agriculture, Ecosystems and Environment*, in which they published their results after a year of measurement in an olive orchard in Jaen (SE Spain) where two different treatments were applied: maintenance of weed cover in the alleys of the olive crops and weed cover elimination with an herbicide.

The results showed that weed cover significantly increased CO₂ fixation, especially during growing periods. In March, when the weeds reached their maximum size, the monthly net fixation of CO₂ was three times higher with weed cover than without it. When the weeds were cut in April, leaving the weed residue on the soil, the CO₂ emissions rose from the increase in soil respiration. Despite these major CO₂ emissions in the spring, annual net CO₂ uptake, also known as net ecosystem exchange (NEE), was two times higher in the weed cover treatment

(1.40 ton C/ha/y) than in the [weed](#)-free treatment (0.7 ton C/ha/y). In the long run, this higher CO₂ fixation translates into an increase in soil organic carbon levels and a reduction in CO₂ emissions in the atmosphere. In this way, applying these sustainable practices in olive and other crops mitigates the effects of climate change. At the same time, it also reduces the costs of corrective measures used to avoid soil erosion, improving the product's competitiveness.

More information: Sonia Chamizo et al. Net ecosystem CO₂ exchange in an irrigated olive orchard of SE Spain: Influence of weed cover, *Agriculture, Ecosystems & Environment* (2017). [DOI: 10.1016/j.agee.2017.01.016](#)

Provided by University of Granada

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