

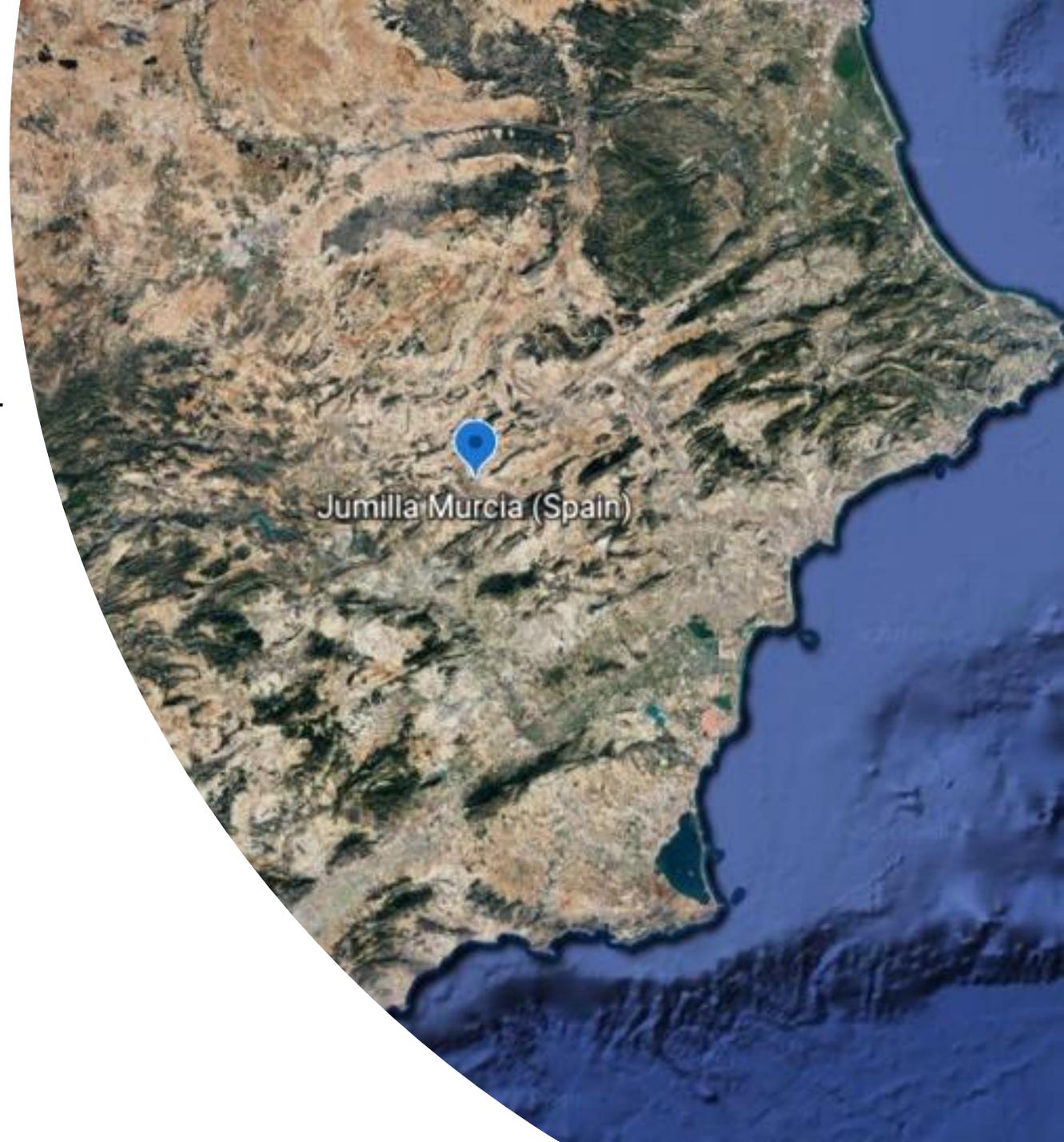
Jumilla

Murcia (Spain)

EXPERIMENT GOALS

The EU project FERTIPLUS focused on the agricultural application of biochar, compost, and a mixture of both materials (biochar-blended compost) to evaluate their potential for closing the cycle of nutrients in different agro-climatic regions across Europe. In particular, this report shows the results obtained from the application on a commercial organic olive orchard located in South-East Spain.

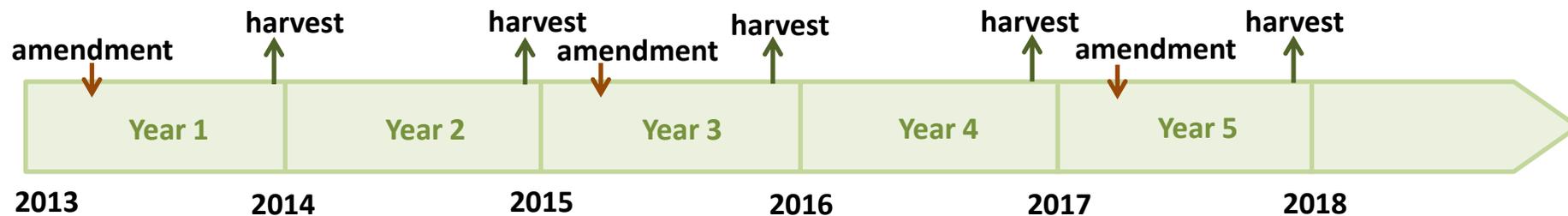
Five-years experiment.



SITE DESCRIPTION

The experiment was set up in May 2013 on a commercial organic olive crop within the farm “SAT Casa Pareja” (<https://www.casapareja.es/>), located in Southeast Spain (38°23' N; 1°22' W). The area has a semi-arid Mediterranean climate. It has an annual rainfall of 250 mm, which is mainly during the autumn and spring months. The mean daily maximum temperature is 20.7 °C and mean daily minimum temperature is 11.5 °C. During the summer, the dry period coincides with the highest insolation rates and temperatures, which is characteristic of the Mediterranean climate.

The soil is a Haplic Calcisol (WRB classification), with 57% sand and 16% clay, 30% carbonate and a pH of 8.01. The olive trees were 20 years old in a framework of 4 x 7 m² and fertilisation consisted exclusively of compost application every two years. Other culture practices consisted of low tillage intensity (three times per year) and deficit drip irrigation during summer periods.

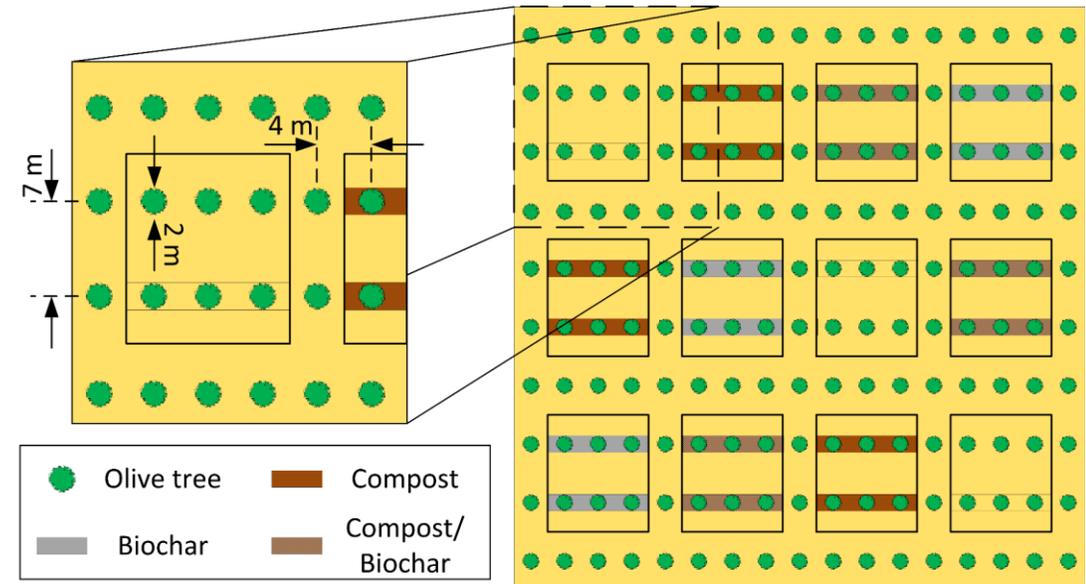


BIOCHAR AND ITS APPLICATION IN THE FIELD

The biochar was produced by PROININSO (Málaga, Spain) from the pyrolysis of oak (650 °C pyrolysis temperature, 12–18 h residence time in kiln, 0% Oxygen content).

The organic amendment was olive-mill waste compost.

The field trial layout was with four treatments: (i) Control (no amendment) (ii) compost, (iii) biochar and (iv) a mixture of compost:biochar at 90:10 (dry weight), in a randomized block design with three replicates. Amendments were manually applied at 20 tons ha⁻¹ along the irrigation pipelines and immediately incorporated into the soil by ploughing at 15 cm.



Measured parameters

Field conditions: rainfall, meteorological data

Soil analysis and interactions with biochar: periodic soil analysis during four years, TOC, total N, extractable organic C, extractable organic N, mineral N, denitrification enzyme activity, soil carbon contribution, soil fertility

Carbon dynamics: soil respiration with and without biochar, N₂O trade-offs

Production data: crop production, crop nutritional status

Other production parameters: Total concentrations of macro- micro-nutrients



Key findings

- Biochar and mixture treatments led to the highest and most persistent increase in TOC in soil, whereas compost significantly increased soluble C and N.
- Application of a compost/biochar mixture showed a synergistic effect, suggesting a boost on the microbial processes transforming N, without a parallel increase in N₂O emissions.
- Under this type of agro-ecosystem N₂O emissions are negligible and biochar would not play a significant role in N₂O mitigation.

Planned activities or potential experimental activities

Production and agricultural application of biochar, compost, and a mixture of both materials (biochar-blended compost) to evaluate their potential for closing the cycle of nutrients in different agro-climatic regions across Europe

PRESENTATION OF THE WORKING GROUP

This study was performed under the framework of the EU project FP7 KBBE.2011.1.2–02 FERTIPLUS (Grant Agreement N° 28985), co-funded by the European Commission, Directorate General for Research & Innovation, within the 7th Framework Programme of RTD. Financial support was also provided by Projects N° CTM2015-67200-R and RTI2018-099417-B-I00 from the Spanish Ministry of Science and Innovation, cofounded with EU FEDER funds.

Bibliography and publications of the experiment

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- Sánchez-García, M., Sánchez-Monedero, M.A., Cayuela M.L. 2021. Biochar and compost application in an olive orchard, Spain. In FAO and ITPS (Eds.) Recarbonizing global soils: A technical manual of best management practices, Volume 4. Cropland, Grassland, Integrated systems and farming approaches – Case-studies. Food and Agriculture Organization of the United Nations, Rome, Italy. *In Press*



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