BOOK OF ABSTRACTS

NUORO
16th — 20th
MAY 2022

EURAF2022

6th EUROPEAN AGROFORESTRY CONFERENCE

Agroforestry for the Green Deal transition. Research and innovation towards the sustainable development of agriculture and forestry.

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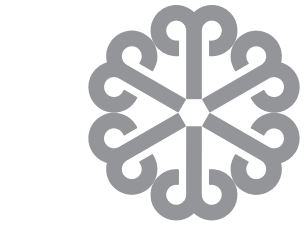

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Donatella Spano, Department of Agricultural Sciences, and CMCC Foundation Euro-Mediterranean Center on Climate Change, University of Sassari

Antonio Trabucco, Impacts on Agriculture, Forests and Ecosystem Services Division, Foundation Euro-Mediterranean Center on Climate Change (CMCC)

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Antoine Libert, Impacts on Agriculture, Forests and Ecosystem Services Division, Foundation Euro-Mediterranean Center on Climate Change (CMCC)

CO-EDITORS

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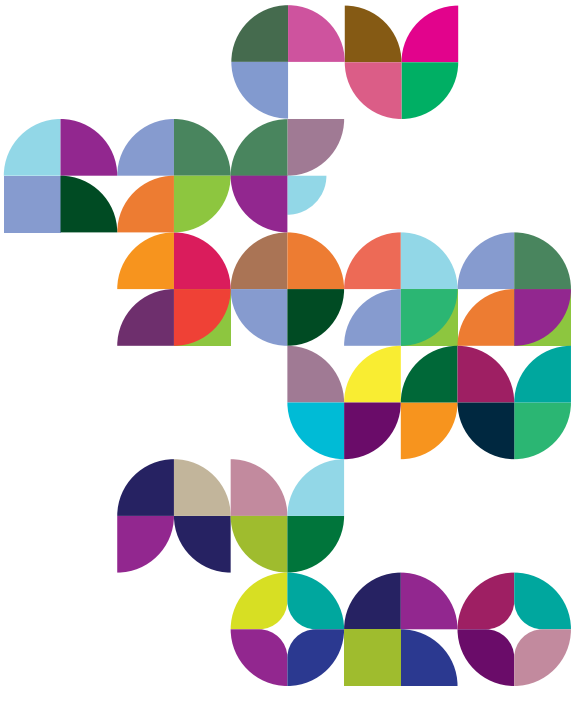

THURSDAY

19th MAY

Eliseo Theatre, via Roma 73 - Nuoro

ROOM_A

TOPIC 1
Agroforestry and the environment

T1.1 - Climate change (adaptation & mitigation)

Parallel session co-hosted by the project SALAM-MED

Chair - Pier Paolo Roggero, University of Sassari, Department of Agricultural Sciences

09:00 **O_1.1_21 Sustainable approaches to land and water management in Mediterranean drylands: the SALAM-MED project**
Chiara Ceseracciu, Elena Bresci, Mauro Centritto, Nicola Lamaddalena, Ehab Zaghloul, Mongi Ben Zaied, Stavros Solomos, Zein Kallas, Said Wahbi, Antonio Del Campo, Houssemedin Henchir, Alessio Merella, Andrea Galante, Jean Marc Fures, Youssef Brahimi, Taysir Arbasi, Pier Paolo Roggero

09:15 **O_1.1_7 DIGITAF, a European project to help agroforestry meet climate, biodiversity and farming sustainability goals: linking field and cloud**
Marie Gosme, Bert Reubens, Gerry Lawson, Paul J. Burgess, Sonja Kay, Marco DeBoer, Patrick Worms

09:30 **O_1.1_19 Harvest index and nitrogen uptake of barley in intercropped walnut orchard**
Helena Žalac, Ante Bubalo, Vladimir Ivezić, Jurica Jović, Miro Stošić, Vladimir Zebec

09:45 **O_1.1_20 Framework for building climate change resilience into landscape restoration through agroforestry: an England case study**
Will Simonson, Colin Tosh, David Wolfe, Daan Verstand, Saskia Houben, Isabella Selin Norén, Michelle Allen

Harvest index and nitrogen uptake of barley in intercropped walnut orchard

EURAF 2022
Agroforestry for the Green Deal transition.
Research and innovation towards the
sustainable development of agriculture and
forestry

Corresponding Author:
vivezic@fazos.hr

Helena Žalac[1], Ante Bubalo[1], Vladimir Ivezić[1], Jurica Jović[1], Miro Stošić[1], Vladimir Zebec[1]

[1] *University of J.J. Strossmayer in Osijek, Faculty of Agriobiotehnical Sciences Osijek, Vladimira Preloga 1, 31000 Osijek, Croatia (e-mail: vivezic@fazos.hr)*

Theme: Climate Change (adaptation & mitigation)

Keywords: barley, intercropping, harvest index, nitrogen use efficiency

Abstract

Introduction. Intercropping of annual crops with woody species has shown to be a great ecologically sustainable alternative to conventional agricultural systems. Besides ecological benefits, intercropped systems may be more efficient in terms of productivity and resource capture. Trees can help intercrops acquire nutrients by different mechanisms; absorption of nutrients from deeper soil layers outside the root zone of agricultural crops or absorption of nutrients in chemical forms that are not available for crops, and fixation of atmospheric nitrogen (Cannell et al. 1996). Aim of our research is to investigate barley productivity and nitrogen use efficiency in an intercropped system with common walnut (*Juglans regia*). Materials and methods. The trial was set up in Eastern Croatia near city of Đakovo. It consisted of a barley monoculture plot and an intercropped walnut orchard. The orchard was 12 years old with a distance between tree rows of 8 m and barley was sown in strips of 6 m width from October 2019 until June 2020. At harvest, plant samples were collected form 0,5 m^2 subplots where the plants were cut at the soil level and grain and straw were weighted separately for determination of yield and harvest index. Harvest index was calculated as ratio of barley grain yield and total aboveground biomass. From dried samples, nitrogen concentration was determined by Kjeldahl digestion method. Nitrogen uptake (whole plant) and nitrogen use efficiency (NUE) were calculated as follows:

N-uptake (kg ha^{-1}) = N% * DM/100 eq. 1

NUE (kg kg^{-1}) = Grain Yield/Nuptake eq. 2

Results. Barley yield in monoculture plot was 7383.86 kg ha-1 and in intercropped orchard 7094.59 kg ha-1 (per cropped area). Since intercropped orchard had generally better soil properties than monoculture plot, this yield reduction is probably due to shading effect by walnut trees. However, harvest index (HI) was significantly greater in intercropped orchard and accordingly had significantly lower total aboveground biomass. This observation suggests that barley in intercropped orchard allocated more assimilates to grains in expense of biomass production. Since HI strongly depends on water availability, this improved reproductive/yield efficiency could be a result of improved microclimatic conditions in intercropped orchards (Gosme et al., 2016). Furthermore, strong correlation was found between HI and NUE ($r=0.81$, $p<0.01$). Although barley in monoculture plot has taken up more N in kg ha-1, intercropped barley had better NUE in terms of producing more grain yield per N taken up. Also, intercropped barley had higher grain N content than monoculture barley, which is a result of better N remobilization. This high N content, however, is negatively correlated with the final grain yield due to the dilution effect. This observation could be connected with shading by walnut trees and it is in accordance with results obtained by Artru et al. (2016) and Dufour et al. (2012) who found the highest grain protein content in wheat grown in continuous/uniform shade. In conclusion, our results show that intercropping may improve

harvest index and nitrogen use efficiency of crops as well as possibly produce more nutritious food without high inputs.

Table 1.

System	Grain Yield kg ha^{-1}	Total biomass kg ha^{-1} *	Harvest index (HI) *	N % in grain *	N uptake kg ha^{-1}	NUE kg kg^{-1}
Monoculture	7383.86	17400	0.44	0.74	177.27	43.60
Intercropped	7094.59	12107	0.59	1.09	159.74	46.61

*statistically significant difference obtained from ANOVA, $p < 0.001$

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Cagliari, Sardinia (Italy)
www.betools.it
office@betools.it

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