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► To cite this version:

Fida Temani, S. El Mrini, K. Daoui, Ahmed Bouaziz, Jacques Wéry, et al.. Effect of water gradient on the intensity of competition and productivity of annual crops intercropped with olive trees. 4. World Congress of Agroforestry, May 2019, Montpellier, France. 933 p. hal-02736817

HAL Id: hal-02736817

<https://hal.inrae.fr/hal-02736817>

Submitted on 2 Jun 2020

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Effect of water gradient on the intensity of competition and productivity of annual crops intercropped with olive trees

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Olive-based agroforestry with annual crops is wide spread in Northern Morocco and more generally in the Mediterranean, but poor information is available on their functioning in the context of increasing aridity. In order to evaluate the changes in tree-crop interactions due to water shortage, we assessed the productivity of both a cereal (durum wheat) and a legume (faba bean) species intercropped with olive trees under three contrasting levels of water availability in an experimental trial in Morocco during 2017-2018. Water availability treatments were determined by adding different amounts of irrigation water to precipitation (P) during the growing phase (very wet treatment =P+37%; moderately wet treatment =P+15%; and control rainfed treatment =P). We assessed crop aboveground biomass, height, yield components and determine final grain yield at harvest. Water dynamics was also monitored each two weeks. Crops under olive trees were compared to full sun crops as control. Aboveground biomass and grain yield of both crops were significantly lower under olive trees than in full sun control (up to 27% yield reduction for durum wheat and 38% for faba bean). Indeed, strong reductions in number of grain per m² explained observed yield reductions. Our results suggest that competition for light under olive trees is intense and prevails under Mediterranean subhumid conditions (experienced in 2017/2018) but trees could have beneficial impacts on crop water efficiency in a drier future.



Olive-based agroforestry system: durum wheat intercropped with olive trees

Keywords: agroforestry, annual crops, olive tree, interactions, water gradient.