

PhD offer

Agronomical evaluation of the new almond production systems



The Institute of Sustainable Agriculture (IAS) is a research institute of the CSIC. Its purpose is to make food production compatible with the conservation of natural resources and environmental protection. The research carried out by the Institute of Sustainable Agriculture (IAS) of the CSIC addresses sustainability, both in rainfed and irrigated farming systems characteristic of Mediterranean climate zones. The Department of Agronomy's research lines address water scarcity and soil conservation problems, two of the most important challenges facing Mediterranean agriculture. The researchers are specialized in irrigation management, crop modeling, irrigation hydrology, and engineering, soil erosion and conservation agriculture, agriculture for development, and remote sensing applied to irrigation.

Background

Almond production has undergone significant changes in the last 20 years. The traditional almond production systems, under rainfed and marginal areas, evolved towards intensive, irrigated, more productive plantations. Research has focused on the study of intensive almond orchards, and currently, we have good knowledge about these systems' agronomy and water use. Similarly to the olive tree, systems are evolving towards super-high densities, generating plantations in hedgerows. The structure of such orchards differs from intensive systems, which can have differences in potential productivity. The root system of the rootstocks used for new plantations is selected for decreasing vigor, which results in shallow root systems with greater limitation to water uptake. The working hypothesis of this proposal is that the change in the production system produces a shift in crop productivity and water needs. In addition, this change can lead to differences in the relationship between tree size, crop load, and yield, affecting water relations and the

response to deficit irrigation. The objective of this proposal is the agronomic characterization of super-intensive almond systems, with a particular emphasis on water use and optimal management strategies in case of water restrictions.

Objectives

This Ph.D. thesis will study the structure of the system and its relationship with the use of water and the potential productivity, the assessment of the crop water needs for maximum yield, and deficit irrigation strategies. A series of experiments will be carried out in a commercial adult plantation. The structural characterization will use the "Structure from motion" technique from images obtained by flights with airborne cameras. The ET at the plot scale will be measured using an eddy covariance tower, allowing the carbon balance analysis. An experiment will be carried out with four irrigation treatments: a control treatment, an over-irrigated one that will allow determining ET under non-limiting water conditions, and two deficit irrigation treatments, whose quantities will be adjusted to allocations expected in case of restrictions. The water balance through the soil water measurement using a neutron probe will allow the calculation of the ET in each treatment. Physiological measures and ET will serve as the basis for studying crop-water relations. The results of this interdisciplinary proposal will make it possible to advance the knowledge of these systems and answer the producers' questions about the management of super-intensive systems.

Keywords

Almond, hedgerow, water use, yield, ET, transpiration, deficit irrigation

Profile required and selection criteria

- Master/MSc in agricultural science
- Willingness to do fieldwork
- Experience in computing techniques
- Team player
- Communication skills
- Work autonomously with a well-organized work style and time management.

Contract

- Fully funded contract (four years).
- Doctoral school: Ingeniería Agraria, Alimentaria, Forestal y de Desarrollo Rural Sostenible (University of Cordoba).

Academic supervision

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