
Irrigation and fertigation practices in small-scale family farming systems for water and nutrient efficiency in semi-arid Mediterranean areas

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Abstract

Efficient use of water and nutrients in irrigation system is important in arid and semi-arid regions, where water is a limiting resource. This study aims to analyze irrigation and fertigation practices for a widespread crop (pepper, *Capsicum annuum*) in Tunisia, in a context of highly diverse agricultural practices. The study took place in the irrigated plain of the Merguellil river in Central Tunisia, characterized by its high diversity of crops and practices. In 2019, irrigation and fertilization practices involved in pepper crop cultivation watered by drip irrigation, were compared on fourteen plots. This was carried out through an approach coupling semi-directive surveys with farmers and monitoring of irrigation, done using a temperature logger installed on the irrigation pipes and allowing the detection of irrigation duration. The study covered the three main seasons of pepper cultivation (Spring, Summer and late Summer). The results showed globally an opposition of two main logics. On the one hand, there are strategies aiming to a significant water supply during the first days after planting, followed by a non-irrigated period, forcing the plant to "tap into the soil water reserves", then irrigation at regular rates (once every three to five days or more) thereafter, sometime alternate with fertigation. On the other hand, there are strategies of regular water and nutrients supply, taking into account crop requirements: low water inputs at the beginning (on daily or once every two to four days rate), followed by a progressive increase. In this strategy, application of fertilizers through the drip irrigation occurred right after the first irrigations, the farmer alternating up to three irrigations for one fertigation. Commonly, fertilization was fractioned and application was done in the last quarter of watering time in order to avoid/reduce nutrient leaching. The number of splits varied significantly from a farmer to another and from a strategy to another. These irrigation and fertigation practices may have different effects on the system outputs, mainly on water and nitrogen efficiency and yield.

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