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Water use efficiency and yield of winter wheat under different irrigation regimes in a semi-arid region

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ABSTRACT

In irrigation schemes under rotational water supply in semiarid region, the water allocation and irrigation scheduling are often based on a fixed-area proportionate water depth with every irrigation cycle irrespective of crops and their growth stages, for an equitable water supply. An experiment was conducted during the 2004- 2005 season in Haouz irrigated area in Morocco, which objective was i) to evaluate the effects of the surface irrigation scheduling method (existing rule) adopted by the irrigation agency on winter wheat production compared to a full irrigation method and ii) to evaluate drip irrigation versus surface irrigation impacts on water saving and yield of winter wheat. The methodology was based on the FAO-56 dual approach for the surface irrigation scheduling. Ground measurements of the Normalized Difference Vegetation Index (NDVI) were used to derive the basal crop coefficient and the vegetation fraction cover. The simple FAO-56 approach was used for drip irrigation scheduling. For surface irrigation, the existing rule approach resulted in yield and WUE reductions of 22% and 15%, respectively, compared with the optimized irrigation scheduling proposed by the FAO-56 for full irrigation treatment. This revealed the negative effects of the irrigation schedules adopted in irrigation schemes under rotational water supply on crops productivity. It was also demonstrated that drip irrigation applied to wheat was more efficient with 20% of water saving in comparison with surface irrigation (full irrigation treatment). Drip irrigation gives also higher wheat yield compared to surface irrigation (+28% and +52% for full irrigation and existing rule treatments respectively). The same improvement was observed for water use efficiency (+24 and +59% respectively).

KEYWORDS

Water Use Efficiency; Yield; Surface and Drip Irrigation; FAO-56; Irrigation Scheduling; Wheat

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