

AquaCrop Model Simulation for Water Productivity of Teff (Eragrostic tef): A Case Study in the Central Rift Valley of Ethiopia

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Abstract : Teff (Eragrostic tef) is a staple food in Ethiopia. The local and international demand for the crop is ever increasing pushing the current price five times compared with that in 2006. To meet this escalating demand increasing production including using irrigation is imperative. Optimum application of irrigation water, especially in semi-arid areas is profoundly important. AquaCrop model application in irrigation water scheduling and simulation of water productivity helps both irrigation planners and agricultural water managers. This paper presents simulation and evaluation of AquaCrop model in optimizing the yield and biomass response to variation in timing and rate of irrigation water application. Canopy expansion, canopy senescence and harvest index are the key physiological processes sensitive to water stress. For full irrigation water application treatment there was a strong relationship between the measured and simulated canopy and biomass with r^2 and d values of 0.87 and 0.96 for canopy and 0.97 and 0.74 for biomass, respectively. However, the model under estimated the simulated yield and biomass for higher water stress level. For treatment receiving full irrigation the harvest index value obtained were 29%. The harvest index value shows generally a decreasing trend under water stress condition. AquaCrop model calibration and validation using the dry season field experiments of 2010/2011 and 2011/2012 shows that AquaCrop adequately simulated the yield response to different irrigation water scenarios. We conclude that the AquaCrop model can be used in irrigation water scheduling and optimizing water productivity of Teff grown under water scarce semi-arid conditions.

Keywords : AquaCrop, climate smart agriculture, simulation, teff, water security, water stress regions

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