Geophysical Research Abstracts
Vol. 14, EGU2012-8160, 2012
EGU General Assembly 2012

Sustainability of irrigated crops under future climate: the interplay of irrigation strategies and cultivar responses

F. De Lorenzi (1), A. Bonfante (1), S. Alfieri (1), C. Patanè (1), A. Basile (1), P. Di Tommasi (1), E. Monaco (1), and M. Menenti (2)

(1) ISAFOM-CNR, Ercolano (NA) and Catania, Italy (francesca.delorenzi@cnr.it), (2) Delft University of Technology, Delft, The Netherlands

Climate evolution will cause significant changes in the quality and availability of water resources, affecting many sectors including food production, where available water resources for irrigation play a crucial role.
Strategies focused on managing and conserving water are one way to deal with the impact; moreover concurring adaptation measurements will be needed to cope with the foreseen decline of water resource.

This work deals with i) the impacts of climate change on water requirements of an horticultural crop, determined in an irrigated district in Southern Italy, ii) the possible irrigation scheduling options and their sustainability in the future, iii) the adaptation measurements that can be undertaken to protect production, relying on intra-specific biodiversity of agricultural crops.

Two climate scenarios were considered: present climate (1961-90) and future climate (2021-2050), the former from climatic statistics, and the latter from statistical downscaling of general circulation models (AOGCM). Climatic data set consists of daily time series of maximum and minimum temperature, and rainfall on a grid with spatial resolution of 35 km. The analysis of climate scenarios showed that significant increases in summer maximum daily temperature could be expected in 2021-2050 period.
Soil water regime was determined by means of a mechanistic model (SWAP) of water flow in the soil-plant-atmosphere system. Twenty? soil units were identified in the district (in Sele Plain, Campania Region) and simulations were performed accounting for hydro-pedological properties of different soil units. Parameters of a generic tomato crop, in a rotation typical of the area, were used in simulations. Soil water balance was simulated in the present and future climate, both with optimal water availability and under constrains that irrigation schemes will pose. Indicators of soil water availability were calculated, in terms of soil water or evapotranspiration deficit.
For several tomato cultivars, quantitative yield response functions to water availability were determined through the re-analysis of experimental data, derived from scientific literature. Variety-specific threshold values of yield reduction in dependence of soil water and evapotranspiration deficit were determined.
The spatial pattern of soil water availability indicators was calculated., for present and future climate scenarios and for different irrigation scheduling options. Cultivars' threshold values were matched with indicators' values in all soil units. The future adaptability of the crop in the area is thus evaluated, and adaptation options that exploit the intra-specific biodiversity of the crop are indicated.
The work was carried out within the Italian national project AGROSCENARI funded by the Ministry for Agricultural, Food and Forest Policies (MIPAAF, D.M. 8608/7303/2008)

Keywords: climate change, tomato, deficit irrigation, biodiversity