Geophysical Research Abstracts
Vol. 20, EGU2018-15459, 2018
EGU General Assembly 2018

The crucial role of the soil in irrigated crop under water scarcity condition: a case study in Lebanon.

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Cereals production is becoming a challenge in the Agriculture of the Bekaa valley in Lebanon. Lack of water is the driving force of agricultural research which is mainly focused on introduction of drought resistant cultivars, application of conservation tillage and supplemental irrigation. In this context, within of ACLIMAS demonstration project within the Sustainable Water Integrated Management Program (SWIM) of the European Commission, a field experiment on barley and durum wheat crop responses to different treatments (conservative and conservation soil tillage and supplemental irrigation) was realized. Forty-eight experimental plots were laid out for three years in a statistical split plot design. The statistical analyses showed that aboveground biomass and yield were significantly affected by supplemental irrigation for barley but not for the yield of durum wheat.
A soil survey indicated that the implicit assumption of soil homogeneity of the agronomic design was correct for soil surface soil but that two different soil types (Cambisols and Fluvisols) had to be distinguished considering subsoil conditions and corresponding rooting patterns. Then, a simulation modelling analysis on crop responses under climate change, considering the soil spatial heterogeneity was done. This last by means the use of the simulation model SWAP, validated for local conditions using measurements of soil water contents, aboveground biomass and yield of wheat. The validated model was applied to estimate yields focusing on the application of supplemental irrigation. Yields for “Mikii3” a durum wheat cultivar are expected to increase by 14% in both soils due to climate change. More importantly, only 3 supplemental irrigations would be needed for the deep soil requiring 5% more water as compared with current climate trend, while the shallow soil needs 35% more water.