Geophysical Research Abstracts
Vol. 18, EGU2016-11330, 2016
EGU General Assembly 2016

On the Water-Food Nexus: an Optimization Approach for Water and Food Security

Sarah Mortada (1), Majdi Abou Najm (1), Ali Yassine (2), Ibrahim Alameddine (1), and Mutasem El-Fadel (1)

(1) Civil & Environmental Engineering, American University of Beirut, Beirut, Lebanon (majdian@aub.edu.lb), (2) Industrial Engineering & Management, American University of Beirut, Beirut, Lebanon

Water and food security is facing increased challenges with population increase, climate and land use change, as well as resource depletion coupled with pollution and unsustainable practices. Coordinated and effective management of limited natural resources have become an imperative to meet these challenges by optimizing the usage of resources under various constraints. In this study, an optimization model is developed for optimal resource allocation towards sustainable water and food security under nutritional, socio-economic, agricultural, environmental, and natural resources constraints. The core objective of this model is to maximize the composite water-food security status by recommending an optimal water and agricultural strategy. The model balances between the healthy nutritional demand side and the constrained supply side while considering the supply chain in between. It equally ensures that the population achieves recommended nutritional guidelines and population food-preferences by quantifying an optimum agricultural and water policy through transforming optimum food demands into optimum cropping policy given the water and land footprints of each crop or agricultural product. Through this process, water and food security are optimized considering factors that include crop-food transformation (food processing), water footprints, crop yields, climate, blue and green water resources, irrigation efficiency, arable land resources, soil texture, and economic policies. The model performance regarding agricultural practices and sustainable food and water security was successfully tested and verified both at a hypothetical and pilot scale levels.