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Impact of site-specific fertilizing management in carbon and water footprint. The case of cotton under Mediterranean conditions

Antonios Papadopoulos, Gerasimos Troyanos, Dionissios Kalivas, Maria Doula, Stamatios Kavasilis, Georgios Zagklis, and Chronis Kolovos
Benaki Phytopathological Institute, Phytopathology, Greece (a.papadopoulos@bpi.gr)

In field homogenous application of fertilizers can be considered as a non-environment friendly agricultural practice as it ignores site specific variations of soil and plant properties. Conventional fertilizing management usually results in overfertilization guiding to burdens of the environment in terms of chemical pollution in soil-water system and Greenhouse Gas (GHG) emissions in the atmosphere. The effects are expected to be more severe in Mediterranean region under the evolving climate change. Site-specific fertilizing management on the other hand, poses a practice that is adapted to high precision spatial soil, climatic and plant conditions. In this sense, the agricultural practices are properly adjusted to the needs of the crops. The research is focused on the assessment of the impacts of conventional and site-specific management of nitrogen fertilization to carbon and water footprint at cotton cultivation in field level. The study area concerns two cotton fields in Central Greece that were monitored with the use of classical soil analytical methods and remote sensing sensors throughout a cultivation period. The monitoring process led to the delineation of the fields in different management zones needing variable fertilizing doses. Further, all conventionally applied practices were annotated concerning the last 4-year period in order to collect historical fertilizing data. In both cases (conventional and site-specific) the carbon and water (blue, green, grey) footprints of the two fields were calculated. Carbon footprint was calculated by assessing IPCC 2006 guidelines (updated in 2019) as regards direct and LULUCF emissions. For this, Tier 2 emission factors were used for the main emission categories, as these were defined by the Greek State, while for the other categories, emission factors of Tier 1 of IPCC guidelines were used. For the determination of water footprint, local meteorological data and cotton development stages concerning Greek conditions were used. The determination of the footprints was realized with the use of a software tool developed by the BalkanROAD project in the framework of INTERREG Balkan-Mediterranean 2014-2020 programme, which addresses territorial competitiveness and environment. Preliminary results show encouraging prospective for the improvement of carbon and water footprint when shifting from conventional to site-specific management.