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Climate change effects on agriculture in southeast Mediterranean: the case of Karla Watershed in Central Greece

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Climate change has already caused major effects in agricultural production and derived earnings on farming income worldwide. The farming areas in southeast Mediterranean are expected to incur production losses due to temperature increase, less precipitation volume and frequent drought occurrences. Such an example may be traced in Lake Karla watershed, in Central Greece, where intensified agricultural production is highly dependent on surface and (mainly) groundwater irrigation. The particular feature of Lake Karla watershed is the current refiling of a large part of the former lake aiming at environmental restoration and sustainable irrigation patterns.

In this paper, we attempt to assess the climate change effects in farming produce of various crops cultivated in Lake Karla watershed by adopting mild, middle and severe climate projections on the period 2006-2100. The climate change projections are conducted through the downscaling of the IPCC's Representative Concentration Pathways (RCPs) based on monthly meteorological data from 1960-2005. We also adopt different scenarios of agricultural water demand depending on separate and conjunctive surface and groundwater use as well as cropping pattern variations. The Water Evaluation and Planning System (WEAP) tool is employed to assess water balance within the selected scenarios while the CROPWAT software is introduced to account for the relevant productivity effects. A linear economic modeling is also employed to measure the profit alterations occurring due to climate change in the farmlands.

The findings suggest that the reinforcement of surface water supply coupled with new cropping patterns may considerably offset climate change impacts and economic losses of agricultural income in Lake Karla watershed. Notwithstanding the major impacts of climate change in agriculture, it is however noticed that different interventions in irrigation volume (regarding technical measures increasing the efficiency in water use) and techniques may mitigate the impacts. More detailed information on the current irrigation demand and sources per farming area is anticipated to better clarify the relations between climate change and irrigation interventions in the study area. Finally, useful outcomes occur about modeling uncertainties carried by climate change hypotheses.