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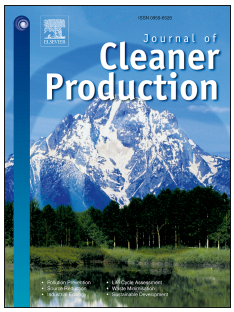

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Agricultural development in Ecuador: a compromise between water and food security?

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Abstract

Ecuador is facing several threats to its food and water security, with over a tenth of its population currently undernourished and living in poverty. As a response, its government is incorporating new patterns of land use and developing regional water infrastructure to cope with the related challenges. In this study, we assess to what point these efforts contribute to integrated water and food security in the country. We investigated the period 2004-2013 in the most productive agricultural region - the Guayas river basin district (GRBD) - and analysed the impacts of different scenarios of agricultural change on local water security. Our approach integrates MuSIASEM (Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism) with the hydrological SWAT model. Freshwater allocation is evaluated within all the water cycle from its source (natural systems) to the final users (societal systems). Water security is assessed spatiotemporally in terms of water stress for the population living in poverty. Water productivity is obtained in relation to agricultural production and nutrition. The multi-scale analysis shows that whereas at national level the median annual streamflow has a similar magnitude than rainfall stored in soil, these two parameters differ spatiotemporally at subbasin level. The study finds the greatest challenges in achieving water security is the south-east and central part of the GRBD, due to water scarcity and a larger population living in poverty. However, these areas are also simultaneously, where the greatest crop water productivity is found. We conclude that food production for both domestic consumption and market-oriented exports can be increased while meeting ecosystem water demands in all the GRBD regions except for the east. Our integration of methods provide a better approach to inform integrated land and water management and is relevant for academics, practitioners and policymakers alike.

Keywords: irrigation; national development policy; SWAT; water metabolism; Socio-Ecosystems.