Water Variability and the Economic Impacts on Small-Scale Farmers. A Farm Risk-Based Integrated Modelling Approach

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Abstract

Strengthening the planning of hydrological resources to optimize the use of water in agriculture is a key adaptation measure of the Chilean agricultural sector to cope with future climate change. To address this challenge, decision-makers call for tools capable of representing farmers' behaviours under the likely stresses generated by future climate conditions. In this context, of special concern are the effects of water variability on small-scale farmers, who commonly operate with narrow profit margins and who lack access to financial resources and technological knowledge. This paper sheds light on the economic impacts of changes in water availability on small-scale agriculture. We provide a hydro-economic modelling framework that captures the socio-economic effects of water shocks on smallholders in the Vergara River Basin, Chile. This approach links a farm risk-based economic optimization model to a hydrologic simulation model adjusted for the basin. Our results indicate that at the aggregated level, there will be minor economic impacts of climate change on the basin's small-scale agriculture, with small decreases in both expected utility and wealth. However, large differences in the economic impacts of wealthy and poor small-scale farmers are found. Changes in water availability, reduce the options of land reallocation to increase farmer's expected utility, being the poor small-scale farmers the most negatively affected.

Keywords

Author Keywords: Hydro-economic model; Small-scale farmers; Risk; Water variability; Climate change

KeyWords Plus: CLIMATE-CHANGE IMPACTS; FRANCISCO RIVER-BASIN; FOOD SECURITY; RIO-GRANDE; AGRICULTURE; SMALLHOLDER; MANAGEMENT; FRAMEWORK; SCARCITY; FUTURE