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"Solidarity in a competing world — fair use of resources"

Evaluating Irrigation Investments in Malawi: Economy-Wide Impacts under Uncertainty

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Abstract

Africa is rapidly becoming the developing region where food insecurity and extreme poverty are concentrated, making irrigation crucial to increase crop yields and mitigate effects from climate change. However, there is still very little irrigation use despite a large potential in terms of water resources. One reason for this is that returns are often too low to cover the costs of infrastructure investment, because the various impact channels are not considered. Benefits from irrigation arise directly at the household level and indirectly from multiplier effects on the rest of the economy. Higher agricultural productivity and higher cropping intensity directly increase incomes and economy-wide output. Through minimising risks from weather variability, irrigation reduces vulnerability to climate change. In addition, agronomic linkages through the interaction between water and nutrients determine the profitability of irrigation. While irrigation studies have examined one or more impact channels, an assessment and decomposition of the combined benefits is still missing.

Our paper closes this research gap on the potential value of irrigation beyond measuring direct effects using an integrated modelling framework on the example of Malawi, whose government launched a major irrigation investment plan to increase land under irrigation substantially. To assess the economy-wide effects of irrigation expansion we develop a computable general equilibrium (CGE) model of Malawi extended with irrigated agricultural sectors. The CGE model is linked to a process-based crop model that simulates yield effects due to irrigation considering historical climate data and agro-ecological conditions. We model the effect of higher cropping intensity by introducing a second season and estimate the additional benefit accruing from agronomic linkages as well as the impact of irrigation on risk reduction. We find that if the joint benefits of the varying impact channels are considered the returns to irrigation exceed the costs. Moreover, our results emphasise that irrigation can make a decisive contribution to food security and poverty reduction for the whole economy and simultaneously mitigate effects from climate change calling for intensive investments in irrigation in Africa.

Keywords: Africa, climate change, food security, irrigation, poverty

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