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Viability of an Irrigation Development Intervention in Tigray: an Application of Stochastic Impact Evaluation

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Abstract

Irrigation dams and other forms of flood and rainwater harvesting infrastructure may make important contributions to help farmers reduce poverty, improve food and nutrition security, and adapt to the impacts of climate change. Water harvesting and retention systems are of particular importance in arid and semi-arid areas, such as Northern Ethiopia, where rain fed agricultural production faces severe drought risks. Dam construction incurs high costs, however, and governments or other investors are often unsure of whether such investments are justified. Assessing the feasibility of water harvesting infrastructure investments and optimising expected returns from them requires detailed ex ante appraisal. Due to the inherently complex and uncertain consequences of agricultural investments and often severe data scarcity, traditional cost-benefit assessment methods face limitations. Stochastic Impact Evaluation (SIE) attempts to overcome the particular challenges of evaluating investments in such contexts. Here we assess the viability of an irrigation dam intervention in Raya valley, Ethiopia. To achieve this, we worked with stakeholders to generate a causal model of the planned intervention’s impact pathway. We then applied an SIE approach based on integration of Monte Carlo simulation, Partial Least Squares regression, and Value of Information analysis. The model was developed and estimates for the input variables were collected from ten subject matter experts via expert data elicitation methods. Preliminary results indicate that the effect of the proposed dam project varies for the different stakeholders involved. Further analysis is underway to identify the variables with high information value and whose measurement could best inform the investment decision. If further information is needed in order to decide on a preferable course of action, decision makers should target these variables for measurement. Our results demonstrate that SIE is an effective approach for providing guidance to decision-makers in agricultural development, in the face of system complexity and uncertainty.

Keywords: Dam construction, investment viability, Irrigation, probabilistic simulation, Stochastic Impact Evaluation