

# Essays on the impacts of climate-smart agricultural innovations on household welfare

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## VALORISATION ADDENDUM

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In accordance with article 23.5 of the “Regulation governing the attainment of doctoral degrees at Maastricht University” decreed by resolution of the Board of Deans, dated 3 July 2013, this chapter on addendum discusses the valorization opportunities of this doctoral thesis.

The dissertation seeks to increase our understanding of the microeconomic challenges facing rural households in Sub-Saharan Africa (SSA). It comprises three essays that investigate the decisions agricultural households make in crop and land management, crop portfolio choices and postharvest storage to cope with economic and environmental risks and improve their welfare. Understanding the relationship between the choices of agricultural households in the production process and their welfare can help us better understand the economic growth constraints in the region. The study employs empirical strategies backed by theoretical foundations that help us identify causal relations. The findings have important contributions to the literature and provide relevant policy recommendations that could assist rural households on their path to development.

Rural households in SSA face food crisis of many dimensions including malnutrition, poverty, and food insecurity. They are also at the front lines of climate variability and extremes that exacerbate food insecurity and poverty. These households are also burdened by the challenges of low soil fertility and postharvest loss. In a disconcerting paradox, they are pushed out of the credit and insurance markets. As a result, they are unable to adapt to and cope with shocks. As a result of these interlinked challenges, promoting economic growth and poverty reduction in the region becomes a daunting task. What is most striking is that nearly three-quarters of the poor people still live in rural areas and work in agriculture. Due to the sheer number of people employed in agriculture and limited non-farm employment opportunities, agriculture continues to be the most important sector of focus in SSA.

Conventional wisdom holds that growth in agricultural productivity is central to alleviating poverty, reducing malnutrition and improving food security in developing countries. Despite this enthusiasm, climate change and rising demographic pressures in SSA are putting pressure on the capacity of agriculture to meet the growing demand for food and to raise rural incomes. The challenge to do so also lies in the fact that the natural resource base that supports agriculture is significantly constrained and degraded. As a panacea to the old input-intensive production systems, sustainable intensification and climate-smart agricultural practices are being promoted as

a way forward for future productivity growth and to aid sustainable and inclusive development in SSA.

This dissertation investigates the impacts of three climate-smart innovations, conservation agriculture, crop diversity and improved crop storage on household welfare and risk management. The primacy of the policy contribution of the study is that the essays in the dissertation have a strong link with the discussion of the Sustainable Development Goals (SDGs), particularly goal 1, 2 and 13. The findings of the study provide evidence that climate action in agriculture (goal 13) through climate-smart innovations will help to reduce poverty and combat hunger (goals 1 and 2). The empirical strategies employed in the dissertation enable us to address common econometric challenges and produce credible estimates. Our study provides important insights for policy makers, agricultural policy advisors, as well as researchers in the field of agricultural and development economics.

As Schultz puts it during his lecture to the memory of Alfred Nobel in 1979, we could best know about the economics of being poor if we knew the economics of agriculture because most of the poor people are employed in agriculture. With this thrust, in chapter 2, we investigate the potential of conservation agriculture (CA), a climate smart and sustainable agricultural practice, to reduce the incidence and extent of poverty in rural Ethiopia. The findings from the study suggest that combined use of minimum tillage and cereal-legume intercropping is a promising technology to increase agricultural performance, mitigate risk of crop failure and reduce rural poverty. From policy perspectives, promoting minimum tillage and cereal-legume intercropping would mark a path forward for alleviating poverty in regions facing environmental risks. The study provides important evidence for policy initiatives that aim at reducing rural poverty which is at the forefront of the Sustainable Development Goals (SDGs).

In chapter 3, we assess the economic impacts of crop diversification on household welfare and risk coping in Uganda. While the discussion of the economics of specialization versus diversification has a long history in applied economics and related disciplines, the debate remains important in recent works. The findings from the study show that crop diversification improves household diets and increases consumption expenditure. An interesting finding is that crop diversification improves consumption for poor households compared to richer households. Furthermore, farmers' risk management decision in the form of crop diversification reduces the need for reliance on external help as a risk coping mechanism in the event of shocks. Our finding suggests that increased crop diversity would be more important to enhance food security and improve household welfare. Therefore, policies need to encourage crop diversity than farm-level specialization towards few staple crops to spur growth in agriculture.

Economic theory asserts that rural households in developing countries that face uncertainty and incomplete insurance markets use various mechanisms to smooth

consumption and stabilize utility. Liquidity constrained households engage in self-accumulation of assets in the form of crop or food storage as a measure of *ex-post* consumption smoothing. In chapter 4, we investigate how improved crop storage methods affect food and nutrition security, consumption expenditure and child growth in Ethiopia. We find evidence that improved storage innovations generate benefits both at the household and individual (child) levels. The findings have policy implications for crop loss mitigation, enhancing food and nutrition security and climate change adaptation.

To recap, the findings of the study will support the development of climate smart policies that would emphasize incentives and capabilities to encourage improved decision-making at the farm household level. The evidence could be of interest to policy makers and other stakeholders at different levels. The research will be available to governments, researchers and policymakers through various means. Preliminary findings of chapter 2 were presented at Cornell University in July 2017 and at the Structural Transformation of African Agriculture and Rural Spaces (STAARS) workshop in Abidjan (Côte d’Ivoire) at the African Development Bank (AfDB) Headquarters in December 2017. Chapter 4 is already published in the Journal of Food Policy as “Tesfaye, W. & Tirivayi, N. (2018). The impacts of postharvest storage innovations on food security and welfare in Ethiopia. *Food Policy*, 75(100), 52–67”. The link between climate risks, climate-smart innovations and welfare in SSA is an active area of research. We also suggest future research avenues that could expand the present study.