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Assessing the impact of improved agricultural technologies on household income in rural Mozambique

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ABSTRACT

In many areas of Africa, rural livelihoods depend heavily on subsistence farming. Using improved agricultural technologies can increase productivity in smallholder agriculture and thus raise household income and reduce poverty. Data from a nationally representative rural household survey from 2005 is used to assess the impact of four technologies – improved maize seeds, improved granaries, tractor mechanization, and animal traction – on household income in Mozambique. To ensure the robustness of the results, three econometric approaches were used: the doubly-robust estimator, sub-classification and regression, and matching and regression. The results show that, overall, using an improved technology did not have a statistically significant impact on household income. This may be associated with a widespread drought that occurred in 2005. Despite drought, distinguishing between households based on propensity score quintiles revealed that using improved technologies, especially improved maize seeds and tractors, significantly increased the income of those households who had better market access. Thus, to allow households to benefit from the use of improved technologies, policy makers need to reduce structural impediments to market participation by ensuring adequate road infrastructure and enabling access to markets.

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Introduction

Agricultural productivity in Sub-Saharan Africa is among the lowest in the world (Savadogo et al., 1998; Fulginiti et al., 2004). For example, in Mozambique the yield of the most important staple crop, maize, is estimated at 1.4 tons ha^{-1}, which is far below the potential yield of 5–6.5 tons ha^{-1} (Howard et al., 2003). The low productivity can be linked to poor farmer health during the late dry season and the beginning of the cropping season (Abellana et al., 2008); the failure of agricultural commodity and credit markets (Mather, 2009); and the very limited use of improved agricultural technologies (Mather et al., 2008). To increase agricultural productivity, both the Government of Mozambique and Non-Governmental Organizations (NGO) are promoting the use of improved agricultural technologies in crop production (e.g. drought tolerant seeds, animal traction) as well as promoting the use of adequate storage facility for the harvested grain e.g., through improved granaries (Government of Mozambique, 2006).

The goal of promoting these improved technologies is to increase productivity so as to reduce food insecurity as well as produce a marketable surplus which contributes to household income. This approach has been summarized as the agricultural productivity pathway out of poverty and subsistence agriculture (Barrett, 2008). The first hurdle to be overcome is the adoption of the improved technology, which has been the subject of numerous studies (for a review see Feder et al., 1985; Sunding and Zilberman, 2001; Doss, 2006). Much less attention has been given to assess whether once a technology has been adopted, it has indeed fulfilled its promise of increasing household incomes.

Indeed, many studies focus on assessing the profitability of a technology. Some studies have used the net present value (see for example, Oehmke and Crawford, 1996; Howard et al., 2003). This approach implicitly assumes that users and non-users had the same productivity levels before the adoption took place, which may not be the case and may affect the validity of the results. Also, to assess the profitability for a wider population, baseline data on probable adopters would be needed before the adoption takes place. This may be possible in research trials or on a small scale, but is not feasible at the regional or national scale. Other studies estimate an Ordinary Least Squares (OLS) model and obtain the impact of the adoption by including a dummy variable indicating whether the farmer cultivated a certain crop (Walker et al., 2004)

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