The Determinants of Technology Adoption: A Case of the Rice Sector in Tanzania

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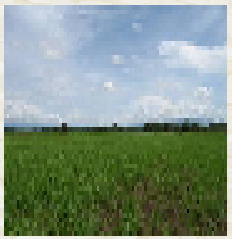
Back Ground and the Purpose of the Study

- The importance of rice is now increasing rapidly in Sub-Saharan Africa (SSA) (Balasubramanian et al., 2007),and improving its productivity is regarded as a key to boosting domestic rice production and to ensuring food security.
- The Asian Green Revolution can be characterized as an increase in paddy yield through the diffusion of high-yielding modern varieties (MVs) together with an increase in chemical fertilizer application (Evenson and Gollin, 2003). The adoption of better crop and water management practices such as bund construction, leveling of plots, and transplanting in rows also enhance paddy yield.
- In order to draw lessons on how to realize a rice Green Revolution in SSA, this paper investigates the determinants of the adoption of rice production technologies in Tanzania by using nationally representative data.

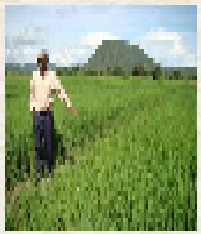
Our Hypotheses

- We particularly focus on the role of credit (Feder et al., 1985; Carter, 1989; Moser and Barrett, 2006; Foter and Rosenzweig, 2010).
- We hypothesize that credit enhances fertilizer use and the adoption of labor-intensive agronomic practices, including bund construction, plot leveling, and transplanting in rows.
- On the other hand, credit would have limited impact on the adoption of MVs, which requires little cash on hand.



Plot without bund

Plot which is not leveled



The same plot after leveled

Data

Rice Extensive Survey in Tanzania (Sep 2009- Jan 2010)

- Six districts were selected from three major rice producing regions (Morogoro, Mbeya, Shinyanga).
- In total, 76 villages were selected by stratified random sampling based on the number of irrigated and rain-fed village in each district.
- Ten households were randomly sampled in each village, generating the total sample of 760 households.
- After dropping outliers and those who did not grow rice, our effective sample size becomes 657.

Methodology

- We examine the impact of credit on technology adoption by using regression analyses.
- The dependent variables are the adoption of MVs (dummy variable), chemical fertilizer use (kg/ha), the adoption of bund construction, plot leveling, and transplanting in rows (dummy variables).
- The main independent variable is credit status. Credit status is categorized into three groups: credit users, credit non-needy, and involuntary credit non-users.
- Since the credit status may be determined endogenously, we estimate instrumental variable (IV) models. In order to avoid including two endogenous variables in one model, we estimate the models which include dummies of being credit user and involuntary credit non-user separately.
- We use the existence of Saving and Credit Cooperative Society in the village, and that of other credit organizations in the village, the value of household asset, the size of owned plot in the upland area as IVs.
- Since our data is clustered at village level, we estimate models with cluster–robust standard errors and cluster specific random effect models.

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Results and Discussions

Table 1: The impact of credit use on the adoption of technologies

Dependent Variables	(1) OLS	(2) OLS (Cluster SE)	(3) IV	(4) IV (Cluster SE)	(5) IV (Cluster RE)
Adoption of MVs	0.021	0.021	0.253	0.253	0.253
	[0.030]	[0.030]	[0.178]	[0.240]	[0.181]
Chemical Fertilizer use (kga/ha)	2.756	2.756	90.374***	90.374+	87.679**
	[4.336]	[4.036]	[31.672]	[62.765]	[37.667]
Bund Construction	-0.007	-0.007	0.140	0.140	0.140
	[0.031]	[0.025]	[0.182]	[0.229]	[0.185]
Plot Leveing	-0.003	-0.003	0.588**	0.588*	0.588**
	[0.044]	[0.044]	[0.286]	[0.307]	[0.291]
Trannsplanting in rows	0.007	0.007	0.840***	0.840*	0.771*
	[0.032]	[0.028]	[0.262]	[0.440]	[0.445]

Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1, + p<0.15.

- Credit has positive impact on chemical fertilizer use, the adoption of plot leveling and transplanting in rows.
- Credit has limited impact on the adoption of MVs, which requires little cash on hand, and the adoption of bund construction.
- Although bund construction is labor intensive, since it is a long-term investment, credit access of current year may have limited impact.

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