

Do different extension approaches affect smallholder farmers' willingness-to-pay for new agricultural technologies? Experimental auction results from Tanzania



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Incentivizing Technology Adoption

- Donor education and promotion in the presence of weak government extension systems (Anderson & Feder 2007)
- Emphasis on farmer-to-farmer education combining:
 - Learning-by-doing and social learning (Foster & Rosensweig 1995; Bandiera & Rasul 2006; Conley & Udry 2010)
 - Traditional extension and field days (Emerick et al. 2016)
- We see a consistent pattern (e.g. Bensch et al. 2015):
 1. **Robust take-up during promotion period**
 2. **Rapid disadoption once a project ends**



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Research questions:

1. How do NGO lead-farmer extension programs influence farmers' WTP for new agricultural technologies?
2. To what extent do smallholder farmers value the provision of local agricultural services (seed treatment)?



Study Area and Extension Partner

- Fieldwork in Aug.-Sept. 2017 in Tanzania
 - 18 villages in Southern Highlands region
 - Mbeya and Mbozi districts
 - Maize-bean districts
 - Focus on 2 improved bean varieties and Apron Star, a Syngenta seed treatment
- Village-Based Agricultural Advisors (VBAA)s
 - Provide information to farmers
 - Maintain demonstration plots
 - Distribute technology samples



Farm Input Promotions Africa Ltd.



Research Design = RCT + Real Auctions

Demonstration Plot

- VBAA provided resources & training to maintain plot
- Demonstrate improved bean technologies next to traditional

Sample size:
6 auction villages
147 farmers

Demo Plot + Trial Packs

- All characteristics of the Demo plot group
- Additionally distributed input trial packs (100g)

Sample size:
6 auction villages
144 farmers

Control Group

- No VBAA involvement in the village
- Selected in partnership with FIPS-Africa

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How do VBAA activities affect farmers' WTP for improved bean seed technologies?

- Treatment status has a direct impact on information flows:
 - **Demonstration plot** -> learning from others
 - **Demonstration plot + trial packs** -> learning from others & learning-by-doing
 - **Control group** -> no targeted information
- Assuming the technologies are profitable, we might expect farmers exposed to a demonstration plot and trial packs to exhibit a higher WTP for the improved technologies



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Sampling & Data Collection

- Farmer Selection:
 - Used village rosters to identify bean-growing households
 - Village chairperson, extension agent, and VBAA assisted
 - Sampled 25 farmers (with replacement) per village
- Survey + BDM Mechanism:
 - Practice round with a bar of soap
 - Endowment = 5000 Tsh (\$2.20 USD)
 - Bids placed on 6 products
 - 1 bid chosen to be binding
 - Bid order randomized at the individual level



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Improved Bean Seed Technologies

- Improved bean seed varieties
 - Njano Uyole
 - Uyole 96
- Apron Star seed treatment (Syngenta)
 - Chemical fungicide-insecticide seed treatment
 - Controls mildew & early season disease
 - Cheap to apply



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Auction Mechanics

Products for Auction
1kg untreated Uyole 96
1kg untreated Njano Uyole
1kg untreated Uyole 96 with 2.5g sachet of Apron Star
1kg untreated Njano Uyole with 2.5g sachet of Apron Star
1kg Uyole 96 pre-treated with Apron Star
1kg Njano Uyole pre-treated with Apron Star



We also included 6 random orders for presentation of the seeds.



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Empirical Strategy

- Dependent Variable:
 - Willingness-to-Pay – of farmer i for product j
- Empirical Model (OLS with wild cluster bootstrapping)

$$WTP_{ij} = \alpha + \mathbf{Treat}_{ij}\beta + \mathbf{Z}_j\gamma + \mathbf{X}_i\delta + \epsilon_{ij}$$

- \mathbf{Treat}_{ij} is the vector of VBAA treatment status (control as baseline)
- \mathbf{Z}_j is the vector of product attributes (variety, self-treat, pre-treated seed)
- \mathbf{X}_i is the vector of demographic/geographic characteristics and auction order controls



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Effect of Treatment on WTP

Wild-cluster p-values in brackets. Standard errors clustered at village level. ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Demonstration Plot Only	-65.91 [0.820]	-104.06 [0.682]
Demo Plot + Trial Packs	-161.58 [0.576]	-147.08 [0.549]
Njano Uyole Variety	42.15* [0.092]	42.15* [0.092]
Apron Star Sachet	574.25*** [0.000]	574.25*** [0.000]
Pre-treated Seed	752.92*** [0.000]	752.92*** [0.000]
Mbozi District		377.18** [0.030]
Education Level		46.94*** [0.009]
Observations	2610	2610



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Discussion & Policy Implications

- Little evidence that lead-farmer activities have any impact on farmer WTP for improved bean seed technologies
 - Signs on the estimates are even negative (see Waldman et al. 2014)
- Suggests resources might be better spent elsewhere if we're only interested in increasing adoption and diffusion of these specific bean technologies
- Could be implementation challenges, other binding constraints (income)
- Reasons to be cautious:
 - **Low power – however coefficient estimates are < 8% effect size**



On the brighter side...

- Farmer's do value improved technologies. Based on the current seed price of 2500Tsh/kg of untreated seed:
 - **2%** price premium on Njano Uyole over Uyole 96
 - **23%** price premium for improved varieties with an Apron Star sachet
 - **30%** price premium for improved varieties pre-treated with Apron Star
- Suggests there is demand for new technologies and potentially better agricultural services, even among small-scale farmers
 - **178Tsh/kg premium** for pre-treated seed over self-treated
 - Services, not education, might be the most important role of the VBAA



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Extra Slides



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Incentivizing Technology Adoption

- Donor education and promotion in the presence of weak government extension systems (Anderson & Feder 2007)
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 1. **Robust take-up during promotion period**
 - Subsidies, discounts, training, ample supply
 - Often repeated visits during project evaluation
 2. **Rapid disadoption once a project ends**
 - Prices often rise to market levels (especially in the case of transfer)
 - Limited technical support



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 2. **Rapid disadoption once a project ends**
 - Prices often rise to market levels (especially in the case of transfer)
 - Limited technical support
- Why do we see this?**
1. **Not profitable**
 2. **Low local buy-in**
 3. **Poor understanding of farmer value**
 4. **High costs without support**



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Emphasis on Farmer-to-Farmer Education

- Two main pathways of learning:
 - Learning-by-doing and social learning (Foster & Rosensweig 1995; Bandiera & Rasul 2006; Conley & Udry 2010)
 - Traditional extension and field days (Emerick et al. 2016)
- Farmer-led programs combine these concepts



How do NGO lead-farmer extension programs influence farmers' WTP for new agricultural technologies ?



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Random Sampling Process

- Villages
 - Randomly sampled 6 treatment villages per district
 - Conditional on VBAA compliance
 - Selected 6 control villages
- Farmers
 - Used village rosters to identify bean-growing households
 - Village chairperson, extension agent, and VBAA assisted
 - Sampled 25 farmers (with replacement) per village



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Data Collection

- Survey questionnaire:
 - Household demographics
 - Bean production (2012-2016)
 - Technology perceptions/preferences
- Survey + BDM Mechanism
 - Practice round with a bar of soap
 - Endowment = 5000 Tsh (\$2.20 USD)
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