IMPACT OF IMPROVED COMMON BEAN VARIETIES ON HOUSEHOLD FOOD SECURITY ON ADOPTERS IN TANZANIA

E. Letaa[1], E. Katungi[1], C. Kabungo[2], and A. Ndunguru[2]

[1]International Center for Tropical Agriculture (CIAT), Uganda

[2]Agricultural Research Institute – Uyole, Tanzania

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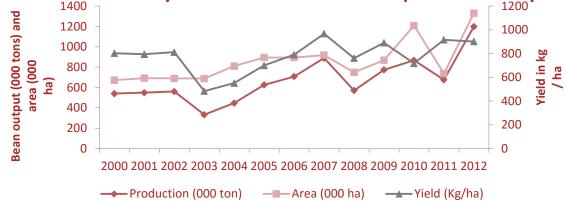# Outline

❑ Introduction

❑ Data and methods

❑ Results

❑ Conclusion and recommendations

Introduction

❑ Common bean is an important grain legume crop in Tanzania – constitutes 7.37 % of food consumption expenditure.

❑ It is highly vulnerable to biotic and abiotic stresses.
- Common Bacterial Blight (yield losses of up to 75%)
- Angular Leaf Spot (> 50% yield loss)

❑ Productivity is low below the potential yield.

❑ Bean improvement research- breeding and promotion of varieties.
- 18 varieties released between 2001 and 2013 with multiple resistance to biotic and abiotic stresses.

Introduction Cont. ….

❑ There is increasing uptake and diffusion of the improved (Letaa et al., 2015).

❑ Previous research analyzed impact of beans using binary Propensity Score Matching (Larochelle and Alwang, 2014).

❑ We use the continuous treatment impact evaluation - Generalized Propensity Score (GPS) methodology (Hirano and Imbens, 2004).

- Evaluate the effect of heterogeneity in adoption levels of improved bean varieties on household food security (dose-response).

- Assess determinants of intensity of adoption.

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Method

❑ GPS implementation: 3 steps

- Step 1: Estimate the conditional distribution of the treatment given the covariates.

$$\widehat{R}_i = \frac{1}{\sqrt{2\pi\widehat{\sigma}^2}} \exp^{f0}(-\frac{1}{2\pi\widehat{\sigma}^2} \left(ln\,(T_i) - \widehat{\beta}_o - \widehat{\beta}_i\widehat{X}_i)^2 \right))$$

- Step 2: Model conditional expectation of outcome given the treatment, estimated GPS and a flexible function of the two.

$$\beta(t,r) = g\left([Y_i|T,\widehat{R}_i]\right) = \alpha_o + \alpha_1 T_i + \alpha_2 \widehat{R}_i + \alpha_3 T_i^2 + \alpha_4 \widehat{R}_i^2 + T_i\widehat{R}_i$$

- Step 3: Averaging the estimated regression function over the score function evaluated at the desired level of the treatment.

$$\mu(t)E\left(Y_i(t)\right) = \frac{1}{N}\sum_{i=1}^N g^{-1}\,(\widehat{\alpha}_o + \widehat{\alpha}_1.t + \widehat{\alpha}_2.t^2 + \widehat{\alpha}_3.\widehat{r}\,(t,X_i) + \widehat{\alpha}_4.\widehat{r}\,(t,X_i)^2 + \widehat{\alpha}_5.t.\widehat{r}\,(t,X_i)$$

Data sources and collection

❑ The study was conducted in Southern Highlands Zone which constitutes 24.3% of national bean area.

❑ A representative sample of 750 households from 75 villages were selected though multistage sampling procedure to collect data on:

- Socioeconomic characteristics (age, gender, education level etc.)
- Plot characteristics (plot distance, soil fertility)
- Bean production and marketing

❑ 75 community questionnaire were also administered through Focus Group Discussions, one in each village.

- Distance to nearest market
- Availability of farmer co-operatives
- Availability of input distribution centers
- Road accessibility

Data sources and collection Cont.
❑ Food security measures

- Per capita food expenditure: Household consumption expenditure on food in a year/ family size.

- Household Dietary Diversity Score: The sum of 9 food groups consumed in a period of 7 days (Kennedy and Nantel. 2006).

❑ Treatment variable- Intensity of adoption (acre).

Variable	Mean	Std. Dev
Per capita food expenditure (Tsh)	480237.40	244295.90
Household Dietary Diversity Score	6.25	1.09
Adoption intensity (acre)	0.65	0.97
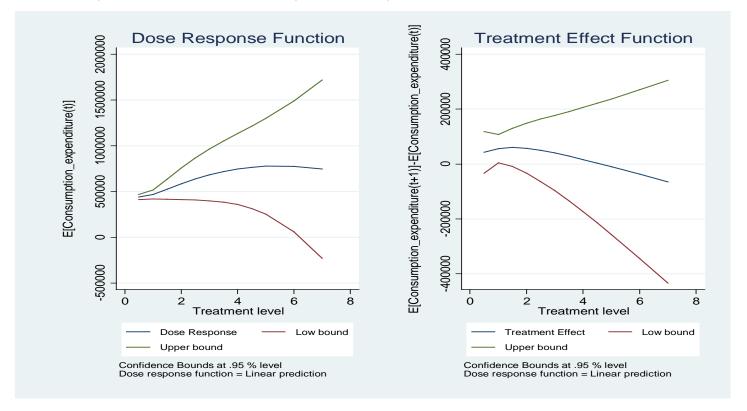
Results

❑ Determinants of intensity of adoption (GPS estimates)

| Variable	Coefficient	Std. Err.
Household head education	0.020	0.022
Household head gender	0.265	0.244
Experience – age ratio	-0.052	0.295
Livestock units	0.187***	0.050
Household size	0.126	0.176
Dependents	0.052	0.040
People sharing information	0.002	0.001
Farm size (acres)	0.007*	0.003
Off-farm activity	0.208*	0.123
Farmer group membership	0.253**	0.119
Soil fertility good	0.662	0.668
Soil fertility moderate	1.174*	0.637
Plot distance from home (walking minutes)	0.000	0.003
Extension visits	0.296*	0.153
Distance to nearest market (km)	-0.037	0.036
Village road is accessible throughout the year	0.229*	0.126
Farmer associations/ co-operatives in the village	0.339***	0.148
Input distribution center for improved seeds in the village	0.113	0.128
Constant	-4.539***	0.963
Number of observations	222	
Wald chi2 (2)	86.5***	
Log likelihood	-280.255	

Results Cont. ….
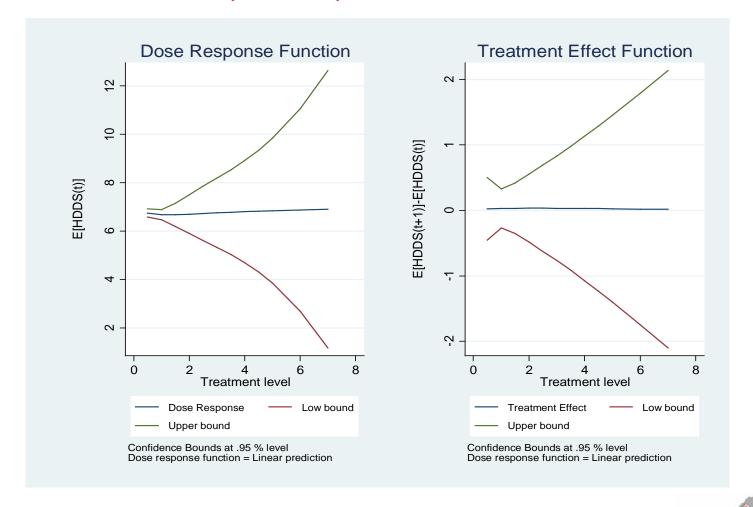
❑ Impact of intensity of adoption on food security: dose-response function

- Per capita food consumption expenditure

- Average per capita food expenditure increases with intensity (up to 5 acres) and then starts to decline.

Results Cont. ….

- Household Dietary Diversity Score

- Dietary Diversity Score increases remains almost constant as intensity increases.

Conclusion and recommendation

❑ Household wealth, social capital, market access, soil quality and extension influence Intensity of adoption.

❑The results of dose-response function reveal that food security increase with intensity of adoption.

❑ Policies that reduce seed access constraints and support dissemination of the improved bean seeds especially among smallholder farmers are central to improving household food security

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Thank you