Trees in the Field:

An Economic Assessment of *Faidherbia albida*-maize Agroforestry Systems in Malawi

Camp Resources 2013, Wilmington, NC

Project Status

- Past
  - Research conducted for MS at NCSU
- Future
  - Preparing for publication
  - How do I take this further and refine what I have?
    - Econometric modeling sophistication
    - New places to take the data
    - Climate change mitigation/adaptation

Project Basics

Agroforestry

- Crops + trees= increased crop yield

Why Malawi?

- Lack of access to food and cash for rural smallholders in SE Africa
- Fertilizer is **extremely** expensive in these settings and does not treat underlying soil fertility issues

Why *Faidherbia albida*?

- Nitrogen fixing, indigenous, reverse leaf phenology

Data

- Household survey of 391 farmers holding 497 fields
- Two districts, 30 days of field work
- Supported by ICRAF, Malawi Department of Forestry, NCSU
- Quantitative data and open-ended questions

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Study Goals

- Should farmers implement this technology? Are the incentives right?
  - Question 1: Can the intercropping system be associated with higher maize yields outside of an experimental setting?
  - Question 2: Is this system compatible with farmer resources and goals?
- Question 3: If this is a valid use of resources, how can adoption be expanded?

The Models

Maize yield (kg/ha) = f(**tree**, **farmer**, **crop management**, **physical land** characteristics)

$$y = \beta_0 + \begin{matrix}1 \\ 2\end{matrix} \begin{matrix}\longrightarrow \\ \longrightarrow\end{matrix} \begin{matrix}\partial_1 presence \\ \gamma_1 count - \gamma_2 count^2 + \gamma_3 medianDBH\end{matrix}$$

Tree – Varies by Model

Farmer

$+\beta_1 wealth$
$-\beta_2 femalehead$
$-\beta_3 age$

Crop Management

$+\beta_4 otheragroforestrytree$
$+\beta_5 chemicalfert$
$+\beta_6 manure$
$-\beta_7 residburning$
$+\beta_8 residinc$
$+\beta_9 hybridmaize$

Physical Land

$+\beta_{10} district$
$+\beta_{11} wetland$
$+\beta_{12} soilfertility$
$+\beta_{13} soiltype$

Regression Results

Dep. Var: Maize yield per hectare, mean 1,418kg

	Independent Variables	1	2
Tree	**Presence of trees**	168.5***	
	Trees per ha		17.1***
	Trees per ha, squared		-0.2**
	Median DBH (CM)		2*
Farmer	**Age of head of household**	-6.9***	-7***
	Single female head of household	75	77.8
	Iron roof (wealth)	200***	190***
Management	Other agroforestry tree	96.8	116.1*
	Chemical fertilizer	172.8**	205.4**
	Farmyard manure	91.4	92.9
	Residue burning	-158.2**	-165.9**
	Residue incorporation	-328.6***	-317.4***
	Hybrid maize	143.4**	120.1*
Land	District	Insig.	88.4
	Wetland	229.3***	230.8***
	Soil Fertility	138.8***	124.1***
	Mkanda Soil	109.1*	101.1*

Significance: 1% *, 5% **, 10% ***

Thank You

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But what does it really mean?

- All tree variables are highly significant(<1%)
- Magnitude of tree variables comparable or greater than other crop management practices
  - 12-14% increase over average (1.4 tons/ha)
  - 168.5 kg/ha for presence
  - 206-211 kg per/ha for physical characteristic models