AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**Sustainable Intensification and Farmer Preferences for Crop System Attributes:
Evidence from Malawi's Central and Southern Regions**

**David L. Ortega^{*a}, Kurt B. Waldman^b, Robert B. Richardson^b, Daniel C. Clay^b,
Sieglinde Snapp^c**

^{*} Corresponding author: dlortega@msu.edu

^a Dept. of Agricultural, Food and Resource Economics, Michigan State University, USA

^b Dept. of Community Sustainability, Michigan State University, USA

^c Dept. of Plant, Soil and Microbial Sciences, Michigan State University, USA

**Selected Poster prepared for presentation at the 2015 Agricultural & Applied
Economics Association and Western Agricultural Economics
Association Joint Annual Meeting, San Francisco, CA, July 26-28**

Copyright 2015 by David L. Ortega, Kurt B. Waldman, Robert B. Richardson, Daniel C. Clay, and Sieglinde Snapp. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided this copyright notice appears on all such copies.

Sustainable Intensification and Farmer Preferences for Crop System Attributes: Evidence from Malawi's Central and Southern Regions

David L. Ortega*, Kurt B. Waldman†, Robert B. Richardson, Daniel C. Clay, and Sieglinde Snapp

Introduction

Maize is the dominant staple crop in Southern Africa; grown by 97% of households and comprising 66% of total caloric consumption. Despite its contributions to food security there are numerous limitations to intensive maize cultivation. Maize is very sensitive to environmental deficiencies, has high erosivity factors, and lacks amino acids, proteins and vitamin A. In Malawi, a country with high population density and soil nutrient deficiency, continuous maize cultivation can contribute to declining soil fertility.

Nitrogen cycling leguminous crops like groundnut, soybean, and pigeon pea have the potential to reverse the deleterious effects of maize but adoption is slow. Shorter duration legumes like groundnuts and soybean have higher yield but contribute less to soil enhancement. Longer duration legume crops like pigeon pea crops more efficient at fixing N, enhancing K and boosting maize yields.

Objectives

1. Understand preferences for maize-legume system intercrops
2. Identify adoption drivers and barriers to adoption of various legume cropping systems
3. Quantify tradeoffs involved in farmer decision-making

Data: Multistage sampling

- 3 districts with different market access and land holding size
- Randomly chose 4 Extension Planning Areas (EPAs) per district
- Randomly selected 2 villages from each EPA
- Randomly recruited 20 farmers from each villages through extension officers
- Total N= 488 village households

Acknowledgements

Funding for this research came from the USAID funded “Integrating Nutrition in Value Chains” and the Bill and Melinda Gates Foundation “Perennial Grains for Africa” project.

Methods: Choice experiments

- Explore maize-legume yield tradeoff using maize as “currency”
- ❑ Cropping system attributes
 - Legume yield (% relative to previous year: -20, Average, +20, +40)
 - Market distance (5 km, 10km)
 - Labor requirements (low, high)
 - Maize yield (% relative to previous year: -40, -20, Average, +20)
 - Alternative specific constants for groundnut, pigeon pea, & soybean

Sample choice set

- 3 legume-maize intercrops and sole maize status quo
- Branded choices: Groundnut, soybean, pigeon pea, or maize
- 5 choice sets evaluated per farmer
- Efficient & nearly-orthogonal, blocked, labeled design
- Calibrated with actual maize-legume yield data

Results

	RPL		WTP-Space		
<i>Random parameter means</i>	Coeff.	Std. Error	Coeff.	Std. Error	
Legume yied	0.018	0.002 ***	0.443	0.043 ***	
Market distance	-0.025	0.005 ***	-0.599	0.122 ***	
Labor requirement	-0.355	0.066 ***	-8.432	1.724 ***	
Maize yield	0.039	0.002 ***			
<i>Alternative-specific parameters</i>					
Groudnut-maize	2.035	0.123 ***	2.070	0.091 ***	
Soybean-maize	1.860	0.124 ***	1.903	0.093 ***	
Pigeonpea-maize	1.667	0.126 ***	1.721	0.093 ***	
<i>Random parameter standard deviations</i>					
Legume yied	0.015	0.003 ***	0.340	0.059 ***	
Market distance	0.032	0.010 ***	0.902	0.158 ***	
Labor requirement	0.591	0.118 ***	12.349	2.636 ***	
Maize yield	0.029	0.002 ***			
N	2419		2419		
No. of parameters	11		12		
Log-Likelihood	-2681		-2688		
Adjusted Pseudo R-squared	0.200		0.197		
AIC	5385		5401		

Note: ***, **, * represent statistical significance at 1%, 5% and 10% level, respectively.

Results: Random Parameters Logit

- Farmers are willing to trade a 0.44% increase in legume yield for a one percent increase in maize yield
- There is a large and significant tradeoff between maize yield and labor (-8.43)
- Market access constraints are large and significant (-0.60/km) (5.3km on average)

Results: Crop system preferences

Dedza	Ntcheu	Zomba
1. Groundnuts	1. Pigeonpea	1. Groundnuts
2. Pigeonpea	2. groundnuts	2. Soybean
3. Soybeans	3. Soybeans	3. Pigeonpea
4. Maize only	4. Maize only	4. Maize only

- Preferences for groundnut-maize dominate overall, followed by pigeon pea-maize, soybean-maize systems are the least favored legume intercrop, & sole maize is the least preferred system.

Results: Latent Class model

Conclusions

1. There is a substantial legume-maize yield tradeoff (about 2:1), which has implications for both breeders and extension efforts.
2. The differences in labor requirements between legume crops and labor saving technologies need to be explored further.
3. Extension efforts should consider market access & farm level net consumption and selling positions for each legume crop.

*Corresponding author: dlortega@msu.edu
 †Presenting author: waldmank@msu.edu