

# “Can Agricultural Input Subsidies Foster an African Green Revolution? Insights from Malawi”

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**Other Participants:** Christopher Chibwana, Monica Fisher, Stein Holden, Rodney Lunduka, Jerry Shively



Organized Symposium for the Joint AAEA & NERA Annual Meeting.  
Pittsburgh, PA; July 24-26, 2011

# Introduction/Background

- Low use of fertilizer and hybrid seed in Sub-Saharan Africa (SSA):

SSA	= 13 kg fert/ha
Latin America	= 73 kg fert/ha
Asia	= 100-135 kg fert/ha
- After losing support in 1980's, fertilizer subsidies have been promoted in recent years to spark an African Green Revolution
- Components of current wave of subsidies:
  - Smart subsidies: involve private sector
  - Input vouchers: “official targeting guidelines” given to farmers who meet certain criteria

# Objectives of this symposium

General: Bring together researchers from three separate teams that are conducting independent evaluations of the Malawi subsidy program

Specific: Share findings

- How have the evaluations been designed and implemented?
- What are the common conclusions?
- What issues must still be addressed?
- What lessons can other countries can take away from Malawi?
- Issues of sustainability and strategies for transition/exit from fertilizer subsidies.

# Malawi's Subsidy Program Characteristics

	2005/06	2006/07	2007/08	2008/09
<b>Metric tons of subsidized fertilizer distributed</b>	131,388	174,688	216,553	202,278
<b>Metric tons of subsidized seed distributed</b>	NA	4,524	5,541	5,365
<b>% of households reached by the program (officially)</b>	NA	54	59	65
<b>% Subsidy rate for fertilizer</b>	64	72	79	91
<b>Cost as % of national budget</b>	5.6	8.4	8.9	16.2

Source: Dorward & Chirwa 2011

Subsidy program scaled up starting in the 2005/06 growing season  
 Fertilizer prices drop by about 50% in 2009/10

# Group: Ricker-Gilbert & Jayne, Michigan St. Univ.

## What we did

- Used panel data (2003, 2007, 2009) to measure HH level impacts of the subsidy program
- Nationally representative, 1,375 HH in all three waves
- Addressed certain program evaluation questions
  - targeting issues, crowding out of commercial fertilizer, well-being impacts (current year effects & dynamic effects), labor market impacts, distributional impacts.
- Dealt with modeling challenge
  - endogeneity; panel estimators and instrumental vars.
  - corner solution issues

# What we learned

- **Targeting** - difficult to reach resource poor farmers. Political/social connections affect who receives subsidy, and how much they get.
- **Crowding out** – considering 2003 & 2007;
  - crowding out of commercial fertilizer averages 22%.
  - 18% for poorest 1/5 of sample, 30% for wealthiest 1/5 of sample.
- **Production and distribution effects** – avg. maize to fertilizer response: 2.48 kg

10 <sup>th</sup> percentile	25 <sup>th</sup> percentile	50 <sup>th</sup> percentile	75 <sup>th</sup> percentile	90 <sup>th</sup> percentile
0.76	1.19	1.99	2.78	2.58

- **Enduring well-being Impacts:** Considers past fertilizer use
  - One kg of subsidized fert. boosts maize production by 1.65 kgs in current yr.
  - One kg of subsidized fert. in each of previous three yrs. boosts mz prod by 3.16 kgs in current year.
  - One kg of subsidized fert. boosts crop income by US \$1.16 in current yr.
  - No current year or dynamic effects on asset wealth, off-farm income or total HH income.
- **Labor market Impacts**
  - Average household who acquires subsidized fertilizer reduces days supplied. About 6 days for HH w/50 kgs.; 10-15%
  - No significant impact on demand for labor from the subsidy.
  - One kg increase in avg. amount of subsidized fertilizer/HH in a community. boosts median off-farm ag. wage rate by 0.2%.



# WHAT WAS DONE

## Used farm plot level data to assess impacts of access to subsidies on:

- Farm plot level fertilizer and organic manure use intensities
- Access to improved seeds
- Maize yields of local and hybrid maize
- Maize areas and maize area shares
- Maize/fertilizer ratios
- Intercropping of maize
- Tree planting

## Data Analysis

- Combined parametric , non-parametric and experimental methods to address issues of endogeneity and sample selection

# WHAT WE LEARNT

## **Leakages:**

- There was substantial leakages of coupons and fertilizers entering a black market, up to 1/3 of the coupons did not reach the households the proper way.

## **Targeting efficiency:**

- Targeting did not function better than a program that distributes fertilizer coupons randomly. Targeting errors caused local frustrations and conflicts.

## **Impacts on self-sufficiency and production:**

- Improved household self-sufficiency but >60% of households remain net buyers of maize

## **Fertilizer subsidies did not crowd out use of organic manure**

# WHAT WE LEARNT Cont'

- **Maize/fertilizer ratios are lower on plots receiving subsidized fertilizer and on plots planted with local maize as compared to plots planted with hybrid maize**
- **Subsidies do not lead to monocropping of maize as intercropping is more common on plots receiving fertilizer**
- **There is still a high demand for fertilizer and high WTP for small amounts of fertilizer provided at the farm gate. Supplying more inputs at harvesting time may enhance demand**
- **Splitting the input packages to reach more households can enhance fertilizer use efficiency as well as targeting efficiency**
- **Only 50% of the maize plots receiving subsidized fertilizer were planted with improved seeds. More distribution of improved seeds can enhance fertilizer use efficiency**
- **Combining conservation agriculture with lower fertilizer rates can enhance fertilizer use efficiency as well as reduce the vulnerability to dry spells (drought)**

## Group: Chibwana, Fisher & Shively; IFPRI, Purdue

### What we did

- Used 2002, 2006 & 2009 data to measure HH level impacts of the subsidy program
- 380 HH in two regions of Malawi
- Addressed certain program evaluation questions
  - targeting, fertilizer use intensity, maize yields, cropland allocation (simplification/diversification), forest clearing (intensification/extensification).
- Dealt with modeling challenge
  - endogeneity; instrumental vars.

# What we learned

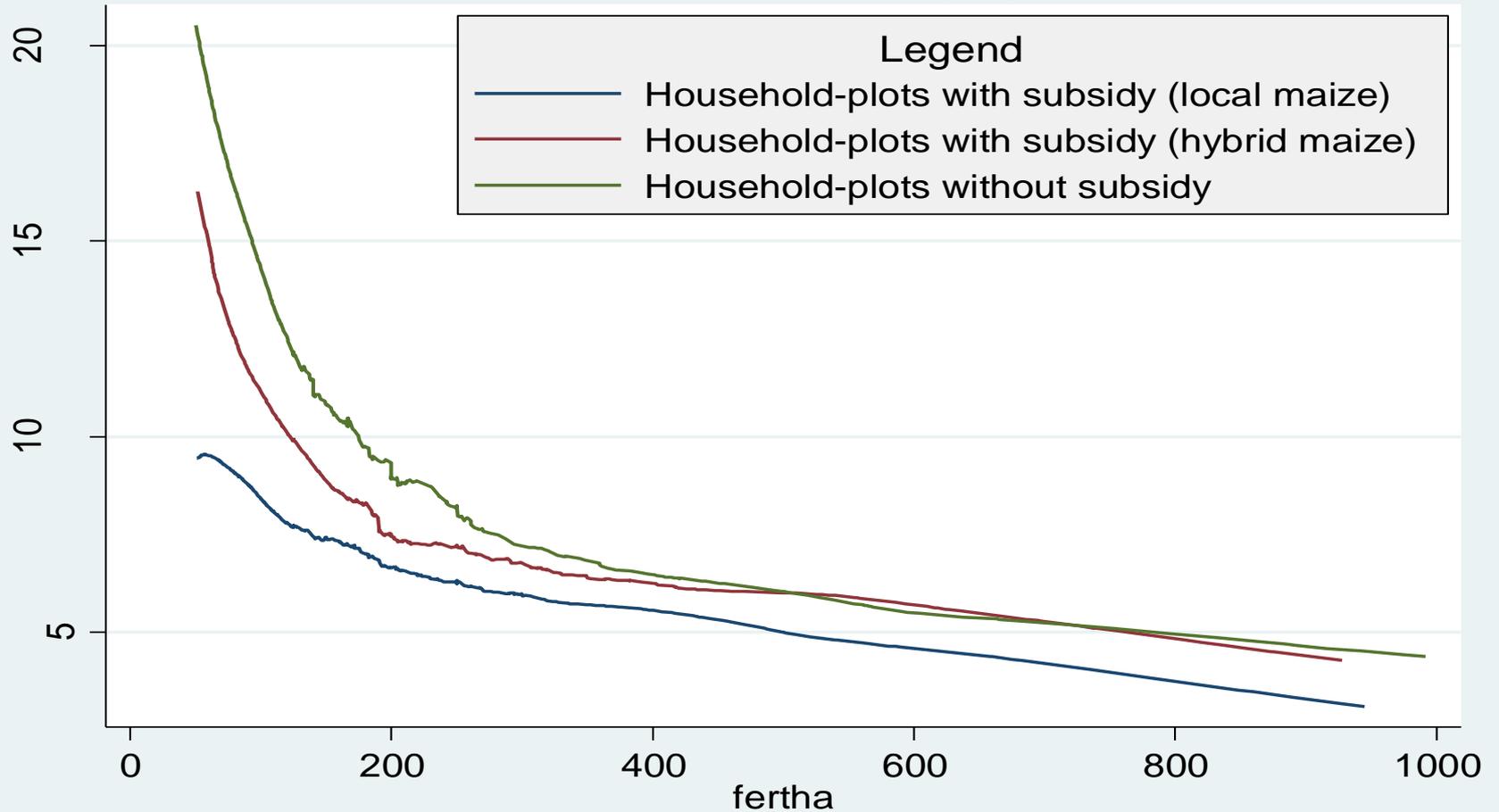
- **Targeting**
  - Asset-poor farmers generally participated at low rates (excluded?).
  - Age, previous receipt of subsidy increases probability of receiving subsidy.
- **Fertilizer use intensity**
  - Coupon receipt positively and significantly corr. w/fertilizer use
  - Controlling for prior (2002 and 2006) fertilizer use intensity reduces point estimates of FISP impact in 2009 by approximately 50%.
- **Maize yields**
  - 100kg fert. plus 4kg seed boosts maize production by 447kg/ha
  - 100kg fert. only boosts maize production by 249kg/ha (seeds matter!!)
  - Some evidence that mz/fert ratio is lower with subsidized fertilizer
- **Cropland allocation**
  - Farmers w/seed & fertilizer subsidy allocated 16% more land to maize than those who did not.
  - Farmers who received tobacco fertilizer subsidies allocated 46% more land to tobacco
  - Increased land allocation to maize and tobacco occurred at expense of other crops (legumes, cassava, etc), which were allocated 17% less land by subsidy recipients.
- **Forest clearing**
  - No evidence of policy-induced forest clearing for agricultural expansion
  - Negative impacts on forests from off-take of trees for tobacco drying sheds.

# References

- Chibwana, C., M. Fisher, G. Shively. "Cropland Allocation Effects of Fertilizer Subsidies in Malawi." *World Development*. (Forthcoming) 2011
- Dorward, A., and E. Chirwa. 2011. "The Malawi Agricultural Input Subsidy Programme: 2005/06 to 2008/09." *International Journal of Agricultural Sustainability* (16): 232-247.
- Ricker-Gilbert, J., T.S. Jayne, E. Chirwa. 2011. "Subsidies and Crowding out: A Double-Hurdle Model of Fertilizer Demand in Malawi." *American Journal of Agricultural Economics* (93)1: 26-42.

# Maize-fertilizer ratios vs. Fertilizer subsidy vs. Maize type

lowess smoother graph



# Maize yield response to fertilizer

