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# Measuring the Impacts of Malawi's Farm Input Subsidy Program

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# INTRODUCTION

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## Productivity challenges in Malawi:

- Declining landholding (incentive for intensification of production)
- Low usage of improved agricultural technologies (fertilizer and hybrid seed) by smallholders.

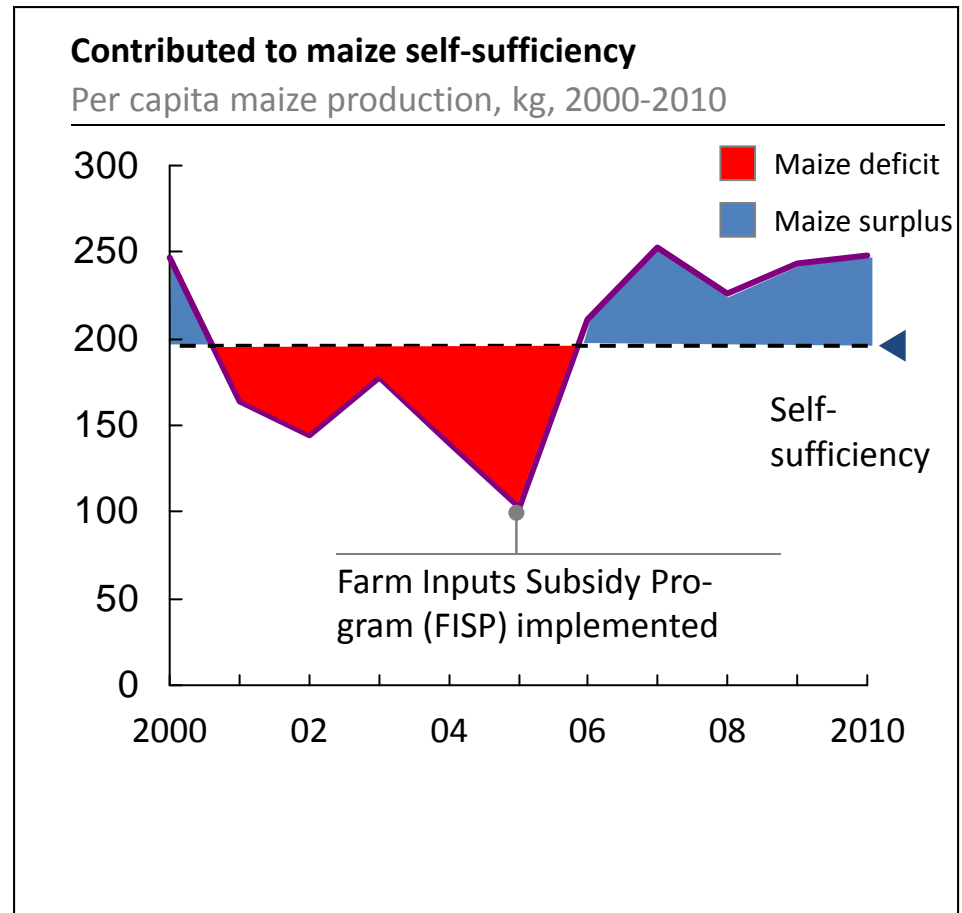
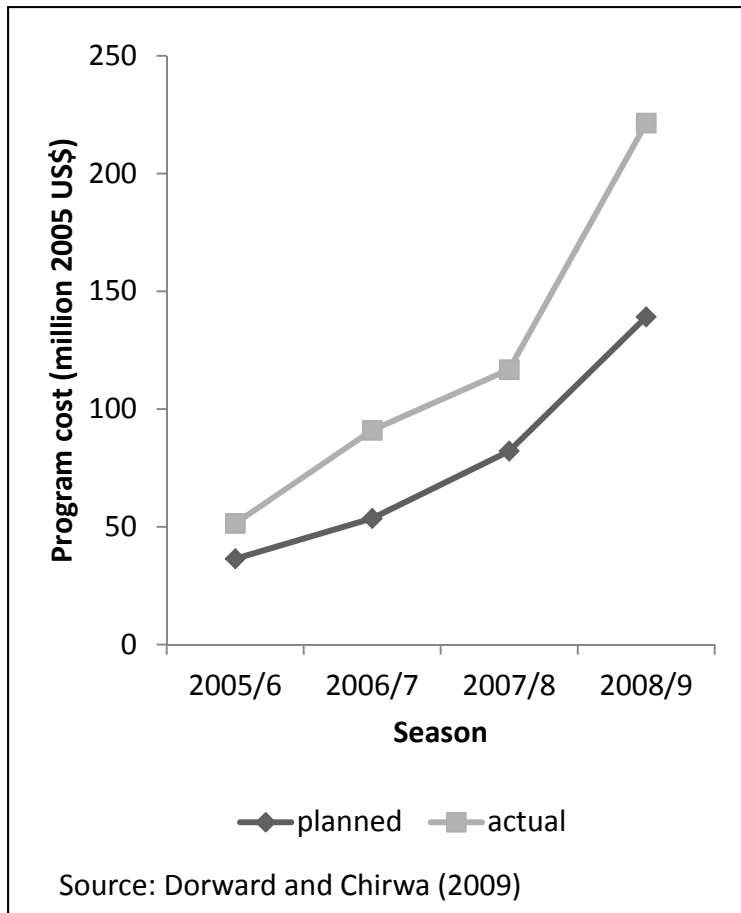
**Ending Famine, Simply by Ignoring the Experts**  
New York Times  
Dec 2, 2007

# THE FARM INPUT SUBSIDY PROGRAM (FISP)

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- Program objective: food security
  - Intensifying maize production
  - Improved incomes
- Implemented through a voucher system to identify eligible households
- Targeted 1.7 million farm households in 2008/9.
- Inputs:
  - Maize fertilizer (NPK), tobacco fertilizer, maize seed (OPV+Hybrid)
  - Cotton seed, legume seed, grain storage pesticides
- 2 fertilizer coupons per household (100kg NPK) and 1 seed coupon (2kg hybrid or 4kg OPV)

# PROGRAM COST AND IMPACT



# FISP ELIGIBILITY CRITERIA

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- Malawians who own a piece of land that has been cultivated during the relevant season
- Farmers that are bona fide residents of their villages
- Only one beneficiary per household
- Priority is to be given to vulnerable groups, which include households that are either child- or female-headed.

(GOM, 2008)

# RESEARCH QUESTIONS

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1. Who benefited from the subsidy program?
2. How did participation impact fertilizer use intensity?
3. How did participation impact maize yields?

# DATA

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- Household survey data from 2009
- Drawn from two districts in central and southern Malawi
- Data collected on demographics, crop production, subsidy program participation
- 380 respondents – smallholder farmers

# ESTIMATION

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- Although designed as a targeted program with exogenous selection criteria, subsidy has been criticized for uneven roll out and widespread leakage (Dorward et al., 2008; Ricker-Gilbert and Jayne, 2008; Holden and Lunduka, 2010)
- Program participation cannot be interpreted as exogenously determined
  - In some instances the criteria for selecting households seem to have been ignored or adjusted to meet local goals.
  - In addition, subsidies have been heterogeneous, consisting of either seed or fertilizer, or some combination of the two.



# ESTIMATION

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1. We use a two-stage, IV regression approach to analyze the effect of the FISP on fertilizer use.
  - The two-stage approach accounts for the latent characteristics of participants, and provides a clear perspective on the pathway by which the FISP impacted fertilizer use.
2. Impact on maize yields – production function

# RESULTS: PARTICIPATION

Variable	Seed only	50kg fertilizer	50kg fertilizer and seed	100kg fertilizer & seed
Age (years)	-0.0157** (-2.117)	0.0282*** (4.056)	0.00805*** (21.04)	0.0282*** (3.003)
Family size (number)	-0.0470 (-0.339)	-0.125*** (-6.709)	-0.0850*** (-3.552)	-0.176** (-2.020)
2009 tobacco coupon (0/1)	-1.013** (-2.306)	-15.02*** (-12.29)	-0.623 (-1.084)	-0.385 (-1.573)
2008 maize seed coupon (0/1)	2.714** (2.370)	0.316 (0.894)	1.686 (1.109)	1.431** (1.970)
2008 fertilizer coupon (0/1)	0.969 (0.580)	1.290*** (3.761)	1.935* (1.675)	1.692* (1.797)
2008 maize seed & fert. (0/1)	0.789*** (11.03)	0.206 (0.379)	1.731*** (4.641)	2.728*** (7.887)
Female (0=no, 1=yes)	-0.981 (-0.823)	-0.863*** (-5.642)	-0.689*** (-3.688)	-1.194*** (-3.161)
Asset-poor (0=no, 1=yes)	-1.027*** (-2.983)	-0.571 (-1.080)	-0.309*** (-6.542)	-0.755** (-2.469)
Village size (# hholds)	0.00119 (0.315)	0.00313** (2.251)	0.00225 (0.337)	0.00701 (0.920)

# RESULTS: PARTICIPATION

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- Older heads more likely to receive coupons for fertilizer and seed
- Female-heads less likely to receive any type of coupons
- Participation in previous season positively correlated with likelihood of participation in current season
- Asset-poor households less likely to receive coupons

# FERTILIZER USE INTENSITY (IV REGRESSIONS)

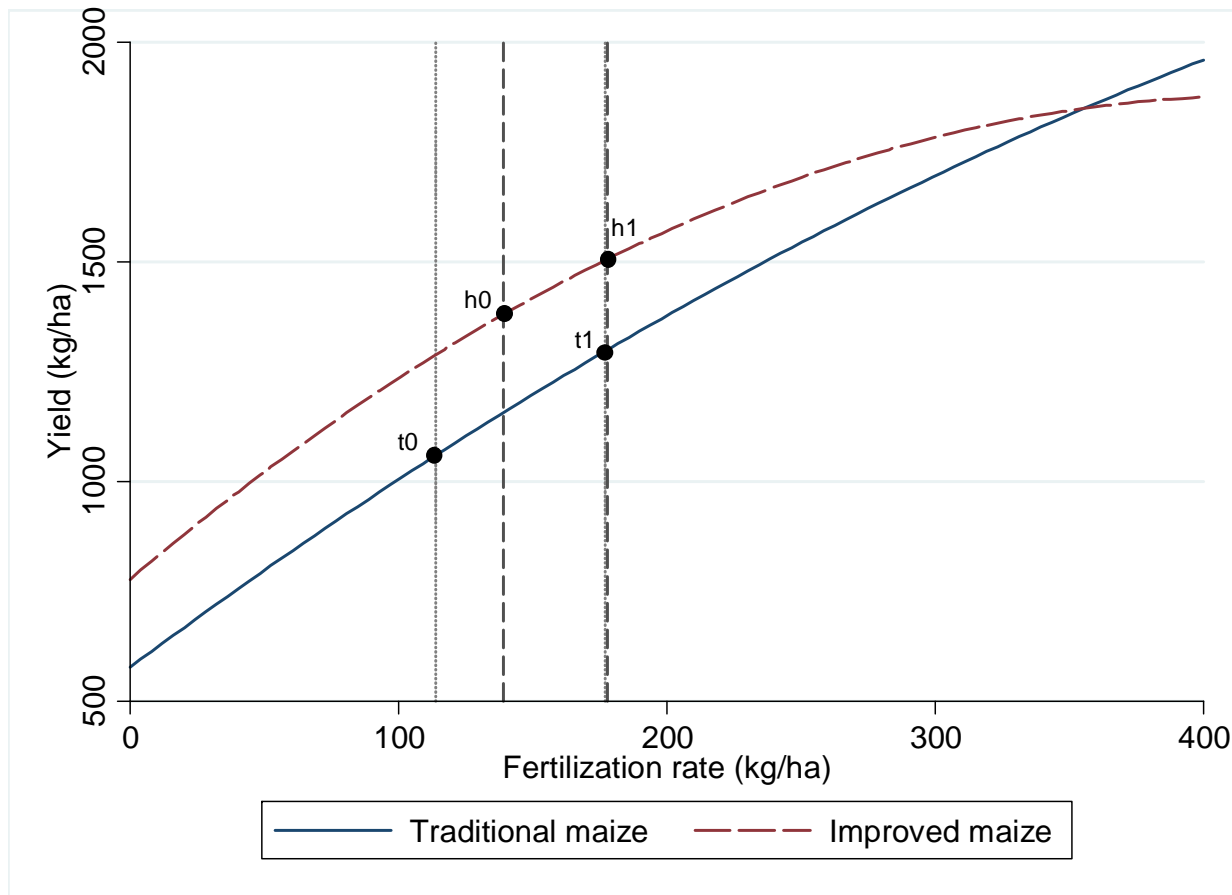
	2009 variables only	with 2006 fertilizer	2002 and 2006 fertilizer
Age	-0.87*	-0.64	-0.34*
(years)	(0.53)	(0.46)	(0.17)
Farm size	-51.54*	-50.39*	-28.06*
(hectares)	(2.37)	(0.49)	(4.87)
Farm size squared	3.29*	3.27*	1.85*
(hectares <sup>2</sup> )	(0.05)	(0.13)	(0.30)
Improved maize	-7.85	-1.45	24.57*
(0=no, 1=yes)	(13.51)	(9.51)	(7.51)
Fertilizer-maize price ratio	23.11*	19.41*	-0.33
( $P_F/P_M$ )	(7.52)	(3.00)	(2.83)
Distance to market	0.28*	0.25*	0.13*
(walking minutes)	(0.15)	(0.06)	(0.02)
Coupon value	1.21*	0.97*	0.50*
(100 Mk)	(0.68)	(0.49)	(0.25)
Fertilizer use in 2006/07	—	-0.01	0.01
growing season (kg/ha)		(0.01)	(0.04)
Fertilizer use in 2002/03	—	—	0.02*
growing season (kg/ha)			(0.01)
N	380	352	178
Sargan N*R2 test	2.19	2.22	4.84
Basmann test	2.11	2.13	4.50

# RESULTS: FERTILIZER USE IMPACTS

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- Coupon receipt is positively associated with fertilizer use at statistically significant levels
- Inclusion of indicators for previous levels of fertilizer use reduces the size of the estimated coefficient on the FISP variable by more than half across the three models from 1.21 to 0.50.
- This suggests that a sizable amount of fertilizer use in 2009 can be explained by household farming proclivities, as proxied by previously observed fertilization rates, leaving a smaller proportion to be attributed to coupon receipt.

# Impact on maize yields



Yield gain from FISP:

$$\Delta y = y_{h1} - y_{t0}$$

= 447 kg/ha

= 249 kg/ha with  
fertilizer only

Note: Marked points on the graph correspond to the following (fertilizer-yield) combinations: t0 (114; 1,063); t1 (177; 1,312); h0 (139; 1,389); h1 (178; 1,510)

# POLICY IMPLICATIONS

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- Effective targeting is necessary to stimulate the use of improved maize technologies among resource-poor smallholder farmers
- The FISP may be placing too much emphasis on fertilizer relative to hybrid seed (the average increase in maize yield attributable to the receipt of coupons for both seed and fertilizer subsidies was 447 kg/ha, which is only about twice the gain from receiving fertilizer only).



Thank You