

Are There Enduring Benefits of Fertilizer Subsidies on Household Well-Being? Evidence from Malawi



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I. Introduction

Conference theme: “Smallholder-led Commercialization and Poverty Reduction.”

When discussing public policies that may promote growth & development, we need to consider:

1. *Growth & Poverty Reduction*: Can a fertilizer subsidy program increase agricultural productivity and reduce poverty at the same time?
2. *Growth & Sustainability*: Can the program produce benefits that are sustained over time?

Outline

- I. Introduction
- II. Objectives
- III. Background of subsidy program
- IV. Measuring Impacts
- V. Methods
- VI. Data
- VII. Results
- VIII. Conclusions & Policy Implications

II. Objective of this work

To begin quantifying benefits

Measure impacts of fertilizer subsidies on household livelihood

1. How does receiving subsidized fertilizer in a given year affect household well-being in that same year? (**CURRENT YEAR EFFECT**)
2. How does receiving subsidized fertilizer in past years (or in combinations of past years) affect household well-being in the current year? (**ENDURING EFFECT**)
3. Does receiving subsidized fertilizer affect all households in the same way? (**DISTRIBUTIONAL EFFECT**)

III. Modalities of Subsidy Distribution

key points

1. Fertilizer subsidies are not new, scaled up in Malawi during 2005/06
- help overcome credit and profitability constraint (Dorward et al. '04)
2. Goal to improve food security by boosting smallholder production.
3. Officially, each selected household entitled to two 50kg bags (1 NPK, 1 urea); Recently 2kg bag of seed for free
4. Both rate of subsidy & fertilizer market price increasing over time
 - 64% subsidy in 2005/06; 90% subsidy in 2008/09
 - Market price: \$0.23/kg in 2005/06; \$1.00/kg in 2008/09
 - 5.6% of nat. budget in 2005/06; 16% in 2008/09

III. Modalities of Subsidy Distribution

key points (continued)

5. Coupons for subsidy distributed at regional level based on area under cultivation.
6. Methods for local coupon allocation had the potential to vary across villages.
 - Village leaders & distribution committee, open forums.
 - Supposed to go to people who could contribute to national level production but could not afford 1-2 50 kg bags of fertilizer at commercial prices
 - Female headed household officially supposed to be targeted

Evaluation Standpoint: Due to non-random distribution we need to understand how people were targeted.

IV. Impacts Measured

We measure how providing subsidized fertilizer to farm households over a period of time affects the following;

- 1) Value of livestock and durable assets**
- 2) Household production of crops (maize and tobacco)**
- 3) Rainy-season crop income (value of crops harvested – costs)**
primary season when subsidy is distributed
- 4) Non-farm and total household income**
Measure spill-over effects and tradeoffs

(Note: These are the dependent variables used in the analyses)

V. Methods

Factors affecting household well-being

- Kilograms of subsidized fertilizer receive in current year (Current year effect)
- Kgs of Sub. fertilizer received over the previous three years (Enduring effect)
- Household characteristics
- Input prices
- Output prices
- Rainfall

Factors affecting how much subsidized fertilizer a household receives

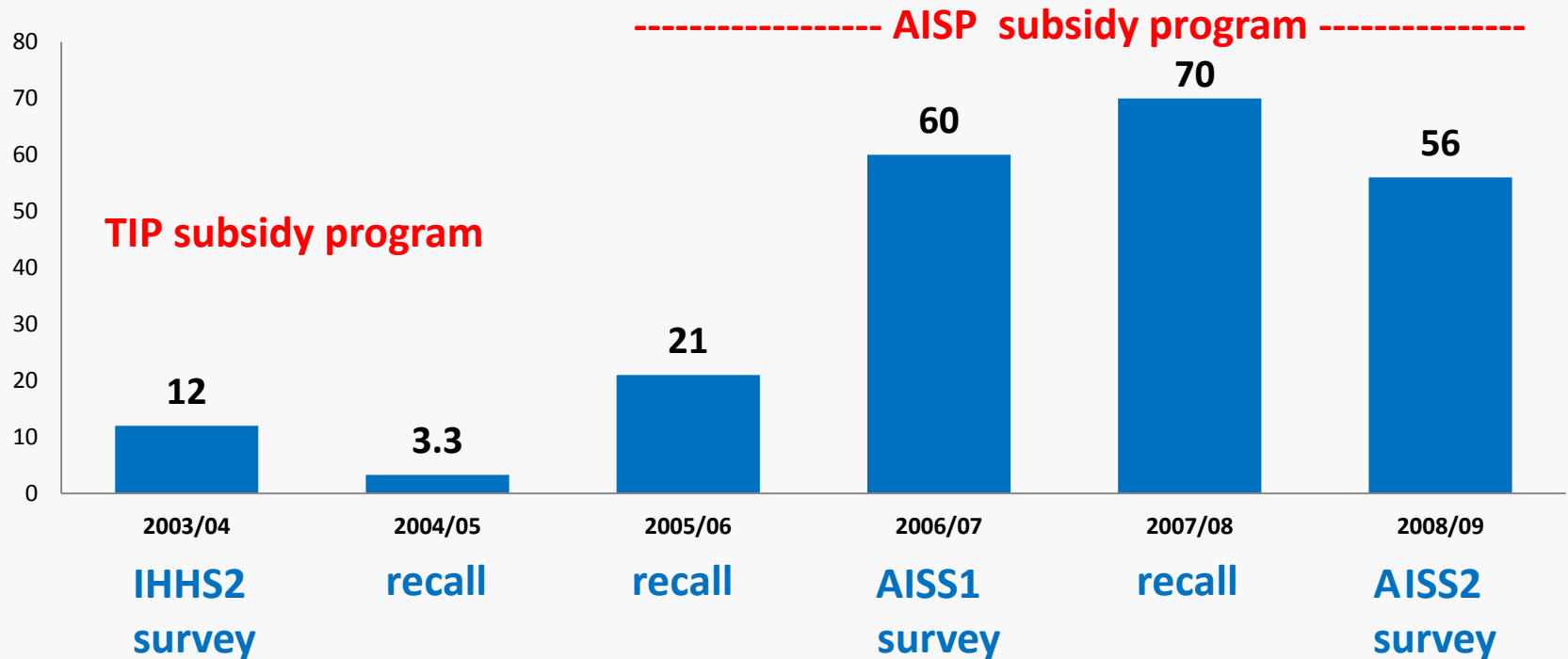
- If Member of parliament in community
- Kilograms of subsidized fertilizer receive in current year
- Kgs of Sub. fertilizer received over the previous three years
- Household characteristics
- Input prices
- Output prices
- Rainfall

Models estimated using econometrics

- first-difference
- instrumental variable methods

VI. Data

Mean Kgs of Subsidized Fertilizer Obtained By Respondents in Survey, by Year



- Data collected by Malawi National Statistical Office
- 1,375 respondents; can trace fertilizer use for 6 years.
- Have production, income and household information during 3 survey years.
- If we want longer-run effect, we can use the two most recent surveys.
 - ultimately have two waves of prod, inc. & HH data
 - with 4 years of subsidized fertilizer use data.

VII. Results

Who got the subsidy & how much?

Estimated change in kgs of subsidized fertilizer received during the current year

	Coefficient
If Member of parliament resides in community	7.5
Effect of getting subsidy in three previous years	- 0.7
Household landholding	4.3

Note: Avg. qty of subsidized fertilizer received by household is 59 kilograms

Note: Red denotes statistical significance at 10% level;

Evidence that female headed households and poorer households did not get significantly more subsidized fertilizer.

VII. Results

How does subsidized fertilizer affect value of assets?

Estimated change in value of livestock + durable assets given 1 kg increase in subsidized fertilizer.

	Asset Percent Change Coefficient
Current Year Effect	Not significant
Enduring Effect	Not significant
Note: Mean value of assets	US \$367

Note: **Red** denotes statistical significance at 10% level;

Evidence that households with more land have higher assets. Female headed household have lower assets.

VII. Results

How does subsidized fertilizer affect crop production?

Estimated change in maize & tobacco production given 1 kg increase in subsidized fertilizer.

	Maize Kg Change Coefficient	Tobacco kg Change (percent) Coefficient
Current Year Effect	2.52	1.0%
Enduring Effect	1.88	Not significant
Note: Mean HH production	420 kgs	55 kgs

Evidence that households with more land and assets produced significantly more maize.

Note: Red denotes statistical significance at 10% level;

VII. Results

Effects at different points in the distribution

Estimated change in maize production given 1 kg increase in subsidized fertilizer.

	Average Effect	10%	25%	50%	75%	90%
Current Year Effect	2.52	0.39	0.59	1.33	1.88	2.92

Note: Red denotes statistical significance at 10% level;

- Current year effects greatest for those at the high end of the maize production distribution.
- People at the top skew the average.
- People at the top of the distribution probably have most incentive to pay commercial prices for fertilizer.

VII. Results

How does subsidized fertilizer affect income?

Estimated change in income given 1 kg increase in subsidized fertilizer.

	Rainy season income (US \$) Coefficient	non-farm income (US \$) Coefficient	Total HH income (US \$) Coefficient
Current Year Effect	\$1.55	- \$0.72	\$0.97
Enduring Effect	\$0.33	-\$0.06	-0.33
Note: Mean HH income	\$130	\$137	\$313

Note: Red denotes statistical significance at 10% level;

Total HH income=rainy season income + dry-season income + animal income + ag. labor income + off-farm income

VII. Results

Effects at different points in the distribution

Estimated change in net value of rainy season crop income given 1 kg increase in subsidized fertilizer.

	Average Effect Coefficient	10% Coeff.	25% Coeff.	50% Coeff.	75% Coeff.	90% Coeff.
Current Year Effect	\$1.55	\$0.38	\$0.34	\$0.56	\$0.84	\$1.35

Note: Red denotes statistical significance at 10% level;

- Households at the top of the income distribution clearly getting the highest return to subsidized fertilizer.
- Households at the top skew the average.

VIII. Conclusions & Policy Implications

The goal of this study:

- 1) to estimate impacts of the fertilizer subsidy program in Malawi on key indicators of household well-being
- 2) take a step towards addressing program impacts over time & distribution

Key Findings: Current Year Effect of receiving one kg of subsidized fertilizer in that year

- 1) Maize production: response of 2.52 kgs of maize
- 2) Rainy-season crop income: increase of US \$1.55
- 3) No increase in non-farm or total income
- 4) No significant increase in value of livestock and durable assets

Key Findings: Enduring effect of receiving one kg subsidized fertilizer in the previous 3 years

- 1) increase in maize production: response of 1.88 kgs. of maize
- 2) no increase in rainy-season crop income or total income

Key Findings: Distributional Effects

- 1) Returns to subsidized fertilizer generally higher for households at the top of the distribution

VIII. Conclusions & Policy Implications

Implications

- 1) Evidence of some contemporaneous farm-level benefits (value of rainy season crop prod & maize prod & tobacco prod)
- 2) Main dynamic effects on maize prod (1.88 kg maize : kg fert)
 - maybe some build up of P or organic matter in soil
 - maybe some learning or adaptation over time
- 3) Why dynamic effects on maize prod but not crop income?
 - could be some resource re-allocation (labor & planting)
 - variability in income from year to year (input & output price)
- 4) Uneven returns to subsidized fertilizer across distribution
 - is program goal to increase production or alleviate poverty?
- 5) Targeting issues: evidence that there are some inefficiencies.
- 6) This study focuses on the direct benefit side to recipients
 - may be some spill-over benefits (labor mkt, nutrition, milling)
 - costs to consider (farmer, gov't, priv. sector, macro effects)
- 7) Clear program objectives and effective targeting can improve program benefits and efficiency.

VIII. Conclusions & Policy Implications

Implications

This study is an impact assessment, not a formal cost-benefit analysis

2005/06 to 2008/09: Benefit/Cost ratio for subsidy program in Malawi Range: 1.90 to 0.72 (Dorward, Chirwa & Jayne 2010)

Consider Rainy-Season Income Effects (Our Study)

US \$1.55 per kg subsidy in current year (mean effect, median lower)

Consider Fertilizer Cost in Malawi

To farmer: \$0.13/kg in 2006/07; \$0.10/kg in 2008/09

Full cost: \$0.33/kg in 2006/07; \$1.00/kg in 2008/09

Consider Displacement Rate & Administrative Costs:

Possible that benefits to some farmers may be positive

Possible that benefits to social welfare may not be as high¹⁸

VI. Conclusions & Policy Implications

So what other investments could work?

Returns in Ag Growth to Investments & Subsidies in India, 1960-2000

Returns to Ag. GDP	1960's		1970's		1980's		1990's	
Rup. prod/Rup. spent	Return	rank	Return	rank	Return	rank	Return	rank
Road investment	8.79	1	3.80	3	3.03	5	3.17	5
Education investment	5.97	2	7.88	1	3.88	3	1.53	3
Irrigation investment	2.65	5	2.10	5	3.61	4	1.41	4
Irrigation subsidies	2.24	7	1.22	7	2.28	6	NA	6
Fertilizer subsidies	2.41	6	3.03	4	0.88	8	0.53	8
Power subsidies	1.18	8	0.95	8	1.66	7	0.58	7
Credit subsidies	3.86	3	1.68	6	5.20	2	0.89	2
Agriculture R&D	3.12	4	5.90	2	6.95	1	6.93	1

Source: Fan et al. 2007

Worth evaluating fertilizer subsidies next to other investments

- 1) effectiveness of other possible programs/investment in Africa
- 2) potential spill-over benefits of fert. subsidy (nutrition, wages, milling)

Thank you for your time!



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