Constraints on FISP as a Poverty Reduction Strategy

W.J. Burke, T.S. Jayne, J.R. Black and N.J. Sitko

Presentation for the Agricultural Cooperating Partners Meeting, Lusaka, Zambia, February 21\textsuperscript{st}, 2012
FISP’s Objective and Constraints

- **Objective:** Poverty reduction
  - Rural poverty rates remain at nearly 80% in 2010 (roughly the same as in 2000)

- **Constraints:**
  - Targeting the less poor
  - Leakage of benefits
  - Inappropriate technology
FISP’s Objective and Constraints

- **Objective: Poverty reduction**
  - Rural poverty rates remain at nearly 80% in 2010 (roughly the same as in 2000)

- **Constraints:**
  - Targeting the less poor
  - Leakage of benefits
  - Inappropriate technology
Targeting

- “Viable” farmers (>0.5 ha)
  - Rules out 15-20% of the poorest

- Cost of FISP to the farmer
  - Co-op Membership = K 50,000
  - Co-op Share = K 200,000
  - FISP packet = K 280,000
  - K 530,000 is more than 20% of annual income for 60% HH
  - Roughly a 50% subsidy
## Targeting

### Distribution of Smallholder Farm Households and FISP Fertilizer (2011)

<table>
<thead>
<tr>
<th>Farm size (ha)</th>
<th>Percent of households</th>
<th>Percent of FISP kgs distributed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>31.6</td>
<td>9.8</td>
</tr>
<tr>
<td>1 - 2</td>
<td>31.7</td>
<td>25.9</td>
</tr>
<tr>
<td>2 - 5</td>
<td>30.0</td>
<td>43.9</td>
</tr>
<tr>
<td>5 - 10</td>
<td>5.6</td>
<td>16.2</td>
</tr>
<tr>
<td>More than 10</td>
<td>1.1</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Source: Crop Forecast Survey, 2011. “Farm size” is total area cultivated and fallow.

- 64% of FISP kgs went to the top 37% of farms
FISP’s Objective and Constraints

- **Objective:** Poverty reduction
  - Rural poverty rates remain at nearly 80% in 2010 (roughly the same as in 2000)

- **Constraints:**
  - Targeting the less poor
  - Leakage of benefits
  - Inappropriate technology
# Leakage

<table>
<thead>
<tr>
<th>Planting year</th>
<th>Farmer claims</th>
<th>FSP/FISP distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>31,722</td>
<td>48,000</td>
</tr>
<tr>
<td>2003</td>
<td>33,372</td>
<td>60,000</td>
</tr>
<tr>
<td>2004</td>
<td>16,792</td>
<td>50,000</td>
</tr>
<tr>
<td>2005</td>
<td>23,595</td>
<td>50,000</td>
</tr>
<tr>
<td>2006</td>
<td>58,404</td>
<td>84,000</td>
</tr>
<tr>
<td>2007</td>
<td>43,596</td>
<td>50,000</td>
</tr>
<tr>
<td>2008</td>
<td>55,114</td>
<td>80,000</td>
</tr>
<tr>
<td>2009</td>
<td>69,103</td>
<td>106,000</td>
</tr>
<tr>
<td>2010</td>
<td>116,116</td>
<td>179,000</td>
</tr>
<tr>
<td><strong>2002 - 10</strong></td>
<td><strong>447,814</strong></td>
<td><strong>707,000</strong></td>
</tr>
</tbody>
</table>

Source: Mason, 2011
FISP’s Objective and Constraints

- **Objective: Poverty reduction**
  - Rural poverty rates remain at nearly 80% in 2010 (roughly the same as in 2000)

- **Constraints:**
  - Targeting the less poor
  - Leakage of benefits
  - Inappropriate technology
Appropriate Technology?

Is fertilizer the answer?

Source: FAOStat
Maize, Phosphorus and pH

pH

- 9.0: Tricalcium Phosphates (unavailable)
- 7.0: Mono & Dicalcium Phosphates (max available)
- 5.5: Iron and Aluminum Phosphates (unavailable)
- 4.4: Inhibited ability for maize to consume nutrients (Aluminum toxicity)

Source: Griffiths (2010); ZARI (2002)
## Basal Productivity

Maize yield response to basal fertilizer over soil acidity ranges

<table>
<thead>
<tr>
<th>Soil pH</th>
<th>3.1 - 4.3</th>
<th>4.4 - 5.4</th>
<th>5.5 - 7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average partial effect of basal fertilizer application (kg/kg)</td>
<td>2.140** (0.01)</td>
<td>3.735*** (0.00)</td>
<td>7.552*** (0.00)</td>
</tr>
<tr>
<td>% of sample</td>
<td>51%</td>
<td>47%</td>
<td>2%</td>
</tr>
</tbody>
</table>

***, ** denotes significance at the 5% and 1% level respectively, delta method p-values in parentheses

Effects of pH on yield response are as expected ...

... unfortunately
Policy Implications

- Target the poor more effectively
  - Program Against Malnutrition
  - Food Security Packs

- Prevent leakages
  - District-level monitoring using CFS data
  - Targeting will also help

- Address soil acidity
What can be done?

- Diversify subsidies beyond fertilizer
  - Lime
  - “Phosphorus enhancers”
  - Application method (banding)
  - Develop acid tolerant seed varieties

- Diversify strategy beyond subsidies
  - Research
  - Extension → Very Affordable
Thank You!

Contact: burkewi2@msu.edu
## Fertilizer Productivity on Small Farms

### Fertilizer Yield Response Rates and Yield Differences by farm size

<table>
<thead>
<tr>
<th>Farm Size (ha)</th>
<th>Yield response to fertilizer application (kgs maize per kg of fertilizer)</th>
<th>Difference if yield for fertilized vs. unfertilized fields (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>3.73</td>
<td>924</td>
</tr>
<tr>
<td>1 - 2</td>
<td>3.48</td>
<td>710</td>
</tr>
<tr>
<td>2 - 5</td>
<td>3.52</td>
<td>751</td>
</tr>
<tr>
<td>5 - 10</td>
<td>3.68</td>
<td>812</td>
</tr>
<tr>
<td>More than 10</td>
<td>3.46</td>
<td>786</td>
</tr>
</tbody>
</table>

Source: CSO/FSRP Supplemental Survey data 2004, 2008 and Author’s estimation

- Highest response rate
- Biggest difference in yields
- Net buyers of maize
## Top Dress Productivity

### Yield response to top dressing fertilizer by tillage and soil types

<table>
<thead>
<tr>
<th>Soil type</th>
<th>Tillage method</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plowing</td>
<td>Other tillage methods</td>
<td></td>
</tr>
<tr>
<td>Sandy soils</td>
<td>2.625** (0.02)</td>
<td>3.285*** (0.00)</td>
<td></td>
</tr>
<tr>
<td>Other soil types</td>
<td>4.197*** (0.00)</td>
<td>4.978*** (0.00)</td>
<td></td>
</tr>
</tbody>
</table>

- 50% neither plow nor plant on sand
- 12% plow on sandy soil
- 13% other tillage on sand
- 25% plow on other soils
Fertilizer Profitability

Cumulative distribution of average product of fertilizer use (maize kg/kg)

Profitable level

- Basal Application
- Top Dressing

0.37
0.93