Promoting Fertilizer Use in Africa:
Current Issues and Empirical Evidence from Malawi, Zambia, and Kenya

Isaac Minde, T.S. Jayne, Joshua Ariga, Jones Govereh, and Eric Crawford

Southern Africa Regional Conference on Agriculture
“Theme: Agriculture-led Development for Southern Africa: Strategic Investment Priorities for Halving Hunger and Poverty by 2015”
Grand Palm Hotel, Gaborone, 8-9 December, 2008

Key challenges

1. How to raise incentives (i.e., profitability) of using fertilizer in a sustainable way
   – How to reduce costs of acquiring fertilizer (marketing)?
   – How to improve the efficiency of farmers’ use of fertilizer?
   – How to achieve reasonable output market stability?
   – How to promote access to input credit?
Key challenges (cont.)

2. Recognizing that progress on the above requires major public investments in crop science, extension, infrastructure, and nurturing of private input supply channels, then:

*What is the appropriate balance between expenditures on these investments vs. input subsidies?*

Objectives of this presentation:

1. To highlight lessons from experience with fertilizer subsidies in Malawi and Zambia
2. To highlight lessons from Kenya’s experience of rapid smallholder adoption of fertilizer without subsidies
3. To assess the implications of sharply higher world food and fertilizer prices in 2008
4. To provide guiding principles of a “smart” fertilizer subsidy program
### Intensity of fertilizer use (1996-2002)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; +30%</td>
<td>&gt; +30%</td>
</tr>
<tr>
<td></td>
<td>DRC</td>
<td>Uganda (0.6, +237%)</td>
</tr>
<tr>
<td></td>
<td>Angola</td>
<td>Rwanda (1.8, +89%)</td>
</tr>
<tr>
<td></td>
<td>Niger</td>
<td>Mozambique (3.2, +142%)</td>
</tr>
<tr>
<td></td>
<td>Guinea</td>
<td>Ghana (3.6, +68%)</td>
</tr>
<tr>
<td></td>
<td>Burundi</td>
<td>Chad (4.3, +93%)</td>
</tr>
<tr>
<td></td>
<td>Madagascar</td>
<td>Cameroon (5.9, +77%)</td>
</tr>
<tr>
<td></td>
<td>Mauritania</td>
<td>Togo (7.0, +30%)</td>
</tr>
<tr>
<td></td>
<td>Tanzania</td>
<td>Cote d'Ivoire (11.8, +53%)</td>
</tr>
<tr>
<td></td>
<td>Gambia</td>
<td>Botswana (11.8, +294%)</td>
</tr>
<tr>
<td></td>
<td>Nigeria</td>
<td>Senegal (13.2, +67%)</td>
</tr>
<tr>
<td></td>
<td>Burkina Faso</td>
<td>Ethiopia (14.4, +71%)</td>
</tr>
<tr>
<td></td>
<td>Zambia</td>
<td>Benin (17.6, +76%)</td>
</tr>
<tr>
<td></td>
<td>Mali</td>
<td>Lesotho (23.2, +35%)</td>
</tr>
</tbody>
</table>

### Zambia: trend in % of smallholders using fertilizer nationwide

![Bar chart showing the trend in % of smallholders using fertilizer in Zambia from 2002/03 to 2007/08](chart.png)

Swaziland (30.5, -40%), Malawi (30.8, +9%), Zimbabwe (48.3, +9%)
Zambia: Fertilizer acquisition sources among small-scale farmers using fertilizer on maize, 2003/04 and 2007/08**

** note: NGOs and other farmers account for less than 6% of primary fertilizer acquisition source by small-scale farmers.

### Zambia

<table>
<thead>
<tr>
<th>Fertilizer source:</th>
<th>Total Income</th>
<th>Assets</th>
<th>Landholding size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'000 kwacha per capita</td>
<td>ha per capita</td>
<td></td>
</tr>
<tr>
<td>Households not acquiring fertilizer:</td>
<td>266</td>
<td>173</td>
<td>.15</td>
</tr>
<tr>
<td>Cash purchases from private retailers:</td>
<td>774</td>
<td>342</td>
<td>.20</td>
</tr>
<tr>
<td>Government Fertilizer Support Program (50% subsidy)</td>
<td>804</td>
<td>425</td>
<td>.23</td>
</tr>
</tbody>
</table>

Source: Govereh et al, 2006
Insight #1

Benefits of fertilizer subsidy programs tend to be disproportionately captured by the better-off or non-poor farmers

Concept of incremental fertilizer use from a subsidy program

How much fertilizer is added to the total fertilizer farmers use per ton of subsidized fertilizer distributed?
Farmer fertilizer purchases, Malawi

Displacement of commercial sales by subsidized fertilizer

- Each additional ton of subsidized fertilizer reduced overall commercial purchase by
  - 0.48 tons in Malawi
  - 0.41 tons in Zambia

- Each additional ton of subsidized fertilizer
  - reduced commercial fertilizer purchase by 0.85 tons for non-poor farmers
  - reduced commercial fertilizer purchase by 0.28 tons for poor farmers
Insight #2

Few poor households can afford to buy fertilizer – incremental fertilizer use from subsidies is high for them.

Insight #3

Relatively non-poor households tend to buy fertilizer if profitable. For them, incremental fertilizer use from subsidies is relatively low.
Upshot:

Targeting poorer households will simultaneously contribute to many government policy objectives:
1. Achieve more maize output per unit of subsidized fertilizer distributed
2. Contribute more to national food security
3. More effectively reduce hunger by allowing the poor to produce more for themselves
4. Promotes equity and reduces the widening rift between the “haves” and “have-nots”

Insights from Kenya
Kenya fertilizer use, 1990-2008

% of Small-scale Farmers Using Fertilizer on Maize

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% of households using fertilizer on maize</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Lowlands</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Eastern Lowlands</td>
<td>21</td>
<td>27</td>
<td>25</td>
<td>47</td>
<td>43</td>
</tr>
<tr>
<td>Western Lowlands</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Western Transitional</td>
<td>39</td>
<td>41</td>
<td>70</td>
<td>71</td>
<td>81</td>
</tr>
<tr>
<td>High-Pot. Maize Zone</td>
<td>85</td>
<td>84</td>
<td>90</td>
<td>87</td>
<td>91</td>
</tr>
<tr>
<td>Western Highlands</td>
<td>81</td>
<td>75</td>
<td>91</td>
<td>91</td>
<td>95</td>
</tr>
<tr>
<td>Central Highlands</td>
<td>88</td>
<td>90</td>
<td>90</td>
<td>91</td>
<td>93</td>
</tr>
<tr>
<td>Marginal Rain Shadow</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total Sample</strong></td>
<td><strong>56</strong></td>
<td><strong>58</strong></td>
<td><strong>64</strong></td>
<td><strong>66</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>
Fertilizer Dose Rate (kgs/acre) on maize

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal Lowlands</td>
<td>11</td>
<td>5</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Eastern Lowlands</td>
<td>10</td>
<td>18</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Western Lowlands</td>
<td>24</td>
<td>14</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Western Transitional</td>
<td>54</td>
<td>48</td>
<td>62</td>
<td>71</td>
</tr>
<tr>
<td>High-Pot. Maize Zone</td>
<td>65</td>
<td>67</td>
<td>74</td>
<td>75</td>
</tr>
<tr>
<td>Western Highlands</td>
<td>31</td>
<td>36</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>Central Highlands</td>
<td>68</td>
<td>64</td>
<td>64</td>
<td>58</td>
</tr>
<tr>
<td>Marginal Rain Shadow</td>
<td>12</td>
<td>15</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>National sample</td>
<td>56</td>
<td>55</td>
<td>60</td>
<td>59</td>
</tr>
</tbody>
</table>

Dose rate (kgs/acre) on fertilized maize fields

Maize Yields by Seed-Fertilizer Combination Group 1997-2007

Not counting other crops grown on intercropped maize fields
Reasons for the Upsurge in Fertilizer Use in Kenya

1. GoK has maintained a stable fertilizer policy stance since 1990
   - Eliminated import licensing quotas
   - Eliminated foreign exchange controls
   - Eliminated retail price controls

2. Private sector investment in fertilizer distribution has expanded rapidly
   - 10-11 importers
   - 500 wholesalers
   - 8,000 retailers
4 Reasons for the Upsurge in Fertilizer Use in Kenya

3. In response to expansion of input stockists, small farmers’ are now much closer to fertilizer retailers
   - 1997: 7.4kms
   - 2000: 5.6kms
   - 2004: 3.7kms
   - 2007: 3.2kms

4. Greater competition among importers and wholesalers has led to declining fertilizer marketing costs
Price of DAP (Di-Ammonium Phosphate) in Mombasa and Nakuru (nominal Shillings per 50kg bag)

Price of DAP (Di-Ammonium Phosphate) in Mombasa and Nakuru (constant 2007 Shillings per 50kg bag)
How has the private sector been able to reduce fertilizer marketing margins?

1. Greater competition has led to lower margins
2. Emergence of brokerage services for exploiting opportunities for cheaper backhaul transport, e.g., linking upcountry fertilizer supply with trucks transporting cargo from Rwanda and Congo to the port of Mombasa;
3. Private importers are increasingly using international partners to source credit at lower interest and financing costs than are available in the domestic economy
4. Mergers between local and international firms in which knowledge and economies of scope are being passed onto local firms to achieve cost savings in local distribution (e.g., Mea partnering with CONAGRA)

How has the private sector been able to reduce fertilizer marketing margins?

1. These cost reductions occur as a result of market development and a stable policy environment for private sector investment
2. These cost reductions directly benefit smallholder farmers
Insight #4

From 1990 to 2007, commitment to development of viable commercial input distribution systems was sustained.

No market uncertainties introduced by large scale subsidy programs.

This stable policy environment fostered an impressive private sector response.

Insight # 6

If subsidy programs are to be implemented, design them in ways that involve the full range of private importers, wholesalers, and retailers.

Providing tenders to only 2-3 firms can:
- entrench their position in the market
- cause other firms to cease making investments in the system or drop out altogether
- lead to a more concentrated input marketing system and restricted competition when the input subsidy program ends
Zambia: maize prices in USD per ton

Zambia: maize prices in real kwacha per ton
Malawi: maize price trends

Zambia: maize to comp. D price ratios
Kenya: maize to DAP price ratios

Malawi: maize to NPK price ratios
Insight #5:

Maize-fertilizer price ratios are relatively low in 2008, but not abnormally low when compared to the past 10 years.

Profitability of using fertilizer

\[
\text{Farm-gate Maize Price} \quad \Delta \text{kg maize} \\
\text{------------------------------} \quad \ast \quad \text{---------} \\
\text{Farm-gate Fertilizer Price} \quad \Delta \text{kg fert}
\]
Factors that could promote fertilizer use more generally

1. Prioritize R&D to generate improved fertilizer-responsive seeds
2. Open regional trade (especially in good harvest years) will raise and stabilize the price of maize → improve profitability of using fertilizer on maize
3. Invest in physical infrastructure, especially between countries in the region, to help stabilize output prices

Thank you
http://www.aec.msu.edu/fs2/
- Supplementary slides

<table>
<thead>
<tr>
<th>Intensity of fertilizer use (1996-2002)</th>
<th>% growth in fertilizer use intensity (kg/ha cultivated) (mean 1996-2002 / mean 1990-95)</th>
<th>&lt; +30%</th>
<th>&gt; +30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 25 kg/ha</td>
<td>DRC (0.5, -47%) &lt;br&gt; Angola (0.7, -69%) &lt;br&gt; Niger (0.9, +5%) &lt;br&gt; Guinea (2.0, -4%) &lt;br&gt; Burundi (2.3, -6%) &lt;br&gt; Madagascar (2.9, -8%) &lt;br&gt; Mauritania (4.0, -64%) &lt;br&gt; Tanzania (4.8, -47%) &lt;br&gt; Gambia (5.2, +15%) &lt;br&gt; Nigeria (5.6, -73%) &lt;br&gt; Burkina Faso (5.9, -28%) &lt;br&gt; Zambia (8.4, -34%) &lt;br&gt; Mali (9.0, +7%)</td>
<td>Uganda (0.6, +237%) &lt;br&gt; Rwanda (1.8, +89%) &lt;br&gt; Mozambique (3.2, +142%) &lt;br&gt; Ghana (3.6, +68%) &lt;br&gt; Chad (4.3, +93%) &lt;br&gt; Cameroon (5.9, +77%) &lt;br&gt; Togo (7.0, +30%) &lt;br&gt; Cote d'Ivoire (11.8, +53%) &lt;br&gt; Botswana (11.8, +294%) &lt;br&gt; Senegal (13.2, +67%) &lt;br&gt; Ethiopia (14.4, +71%) &lt;br&gt; Benin (17.6, +76%) &lt;br&gt; Lesotho (23.2, +35%)</td>
<td></td>
</tr>
<tr>
<td>&gt; 25 kg/ha</td>
<td>Swaziland (30.5, -40%) &lt;br&gt; Malawi (30.8, +9%) &lt;br&gt; Zimbabwe (48.3, +9%)</td>
<td></td>
<td>Kenya (31.8, +33%)</td>
</tr>
</tbody>
</table>
Budget allocation to Agricultural Sector in Zambia: ZMK465 million in 2005

Summary of research evidence about fertilizer subsidies in Africa:

- can help to raise production, but little sustained benefit after subsidies are withdrawn
  - Examples of snuffed-out maize revolutions (Zimbabwe, Zambia, Kenya, Malawi)
- Benefits tend to be disproportionately captured by better-off farmers, unless near universal coverage
- often captured by first-beneficiaries, not farmers → questionable effect on total input use
- Costly – foregone payoffs from alternative public investments
- Inhibits development of private sector capacity