What do we know about smallholder input use in Mozambique?

Background information from MADÉR’s national agricultural surveys

Tom Walker, Raul Pitoro, and Duncan Boughton
MADER/IIAM/MSU

MSU’s capacity building role....

- Areas of emphasis within MADER
  - (1990) National Market Information System (SIMA)
  - (1998) Department of Policy Analysis
  - (2001) Department of Statistics
  - (2004) Socio-economics unit for ag research (IIAM)

- Results
  - reliable and timely market information
  - value of policy analysis in policy decision making increasingly recognized and utilized
  - Mozambicans trained to take over TA roles: 2 PhD and 7 MS (USA), and 20 BS (in-service)
  - 50 policy briefs, 60 research papers, survey methods, training materials, internet research portal

www.aec.msu.edu/agecon/fs2/index.htm
Presentation objective and road map.

- Provide background information on current levels of input use from nationally representative surveys

Outline of the presentation

- Data sources
- Use of labor, animal traction, pesticide, fertilizer
- Fertilizer costs and profitability for maize in Malawi

National agricultural sample survey data sources.

- National agricultural sample surveys:
  - TIA 96 (ag production, MSE’s in 4 provinces)
  - CAP 2000 (ag resource base and production)
  - TIA 02 and 03 (rural household income)

- Sample characteristics
  - 5000 small/medium households, in 557 communities, in 80 districts
  - Representing 3.2 million households
  - Potential for comparison at provincial level, and for major agro-ecological zones
### Cash Crop Impact on Smallholder Incomes
#### 2001/2002

<table>
<thead>
<tr>
<th>Cultura</th>
<th>Sinal esperado</th>
<th>Frequência</th>
<th>Renda (‘+’ mais pobre)</th>
<th>Pobreza (‘+’ melhor ou ‘-’ pior)</th>
<th>Percepção (‘+’ melhor ou ‘-’ pior)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Não cultiva Algodão</td>
<td>--</td>
<td>93%</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Cultiva Algodão</td>
<td>+</td>
<td>7%</td>
<td>5%</td>
<td>-0.01</td>
<td>+0.02</td>
</tr>
<tr>
<td>Não cultiva Tabaco</td>
<td>--</td>
<td>96%</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Cultiva Tabaco</td>
<td>+</td>
<td>4%</td>
<td>29%**</td>
<td>-0.12**</td>
<td>+0.20**</td>
</tr>
</tbody>
</table>

### Mean Household Shares of Total Gross Household Income by Given Income Source, by Income Quintile, Mozambique 1996-2002 (IM)

<table>
<thead>
<tr>
<th>Quintiles of Net HH Income/AE</th>
<th>Gross Crop Income</th>
<th>Livestock Sales Value</th>
<th>Wage Income</th>
<th>Net MSE Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - low</td>
<td>93%</td>
<td>86%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>2</td>
<td>88%</td>
<td>84%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>3 - mid</td>
<td>81%</td>
<td>80%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>4</td>
<td>79%</td>
<td>73%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>5 - high</td>
<td>76%</td>
<td>49%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>84%</td>
<td>74%</td>
<td>1%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Percent of Households Using Given Agricultural Inputs, Mozambique 1996-2002

<table>
<thead>
<tr>
<th>Quintiles of Net HH Income/AE</th>
<th>Uses Chemical Fertilizer</th>
<th>Uses Manure Fertilizer</th>
<th>Uses Irrigation</th>
<th>Hires Ag Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - low</td>
<td>0% 1%</td>
<td>2% 5%</td>
<td>3% 8%</td>
<td>12% 8%</td>
</tr>
<tr>
<td>2</td>
<td>1% 2%</td>
<td>3% 4%</td>
<td>3% 9%</td>
<td>12% 10%</td>
</tr>
<tr>
<td>3 - mid</td>
<td>1% 3%</td>
<td>5% 5%</td>
<td>4% 10%</td>
<td>18% 14%</td>
</tr>
<tr>
<td>4</td>
<td>1% 4%</td>
<td>3% 6%</td>
<td>4% 11%</td>
<td>25% 17%</td>
</tr>
<tr>
<td>5 - high</td>
<td>4% 8%</td>
<td>3% 10%</td>
<td>6% 17%</td>
<td>28% 34%</td>
</tr>
<tr>
<td>Total</td>
<td>1% 4%</td>
<td>3% 6%</td>
<td>4% 11%</td>
<td>19% 16%</td>
</tr>
</tbody>
</table>

Use of hired labor

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Niassa</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Cabo Delgado</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>Nampula</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Zambezia</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Tete</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>Manica</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>Sofala</td>
<td>18</td>
<td>29</td>
</tr>
<tr>
<td>Inhambane</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Gaza</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Maputo</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

- Highest districts:
  - Tete-Macanga 81%
  - Tete-Maravia 46%
  - Tete-Tsangano 38%
  - CD-Montepuez 38%
  - Tete-Angonia 37%
### Use of animal traction

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Niassa</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cabo Delgado</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nampula</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Zambezia</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tete</td>
<td>35</td>
<td>31</td>
</tr>
<tr>
<td>Manica</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Sofala</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Inhambane</td>
<td>47</td>
<td>46</td>
</tr>
<tr>
<td>Gaza</td>
<td>44</td>
<td>49</td>
</tr>
<tr>
<td>Maputo</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

- **Highest Districts**
  - Gaza-Mabalane 91%
  - Inhambane-Morrumbene 74%
  - Inhambane-Jangamo 65%
  - Tete-Maravia 64%
  - Gaza-Guija 62%

### Use of pesticides

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Niassa</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Cabo Delgado</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Nampula</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Zambezia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tete</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Manica</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Sofala</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Inhambane</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Gaza</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Maputo</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

- **Highest districts**
  - Nampula-Mecuburi 41%
  - Nampula-Monapo 36%
  - CD-Namuno 33%
  - Nampula-Meconta 23%
  - Sofala-Maringue 23%
Use of inorganic fertilizer

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Niassa</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Cabo Delgado</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Nampula</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Zambezia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tete</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Manica</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Sofala</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Inhambane</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Gaza</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Maputo</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

- Highest districts:
  - Tete-Angonia 42%
  - Tete-Macanga 37%
  - Tete-Tsangano 29%
  - Gaza-Chokwe 24%
  - Nampula-Monapo 15%

Inorganic fertilizer acquisition patterns

- Most common types applied were urea (39%) and NPK (35%)
- Majority obtained on credit (56%), 40% purchased for cash and 4% gift
- 50kg sack the most common unit (71%), but 22% obtained by kilogram
- Median number of sacks acquired = 3
- Median cost of $0.90/kg of nutrient
Inorganic fertilizer use patterns

- First priority in fertilizer application went to tobacco in about half of all applications, while the other half were allocated to a variety of crops.

- Tobacco growers gave second priority to maize while not tobacco growers emphasized a variety of horticultural crops.

Profitability of fertilizer use on maize in Malawi in 1991

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Hybrid maize with fertilizer</th>
<th>Local maize no fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (kg/ha)</td>
<td>2,774.00</td>
<td>745.00</td>
</tr>
<tr>
<td>Producer Price (MK/kg)</td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>Harvest and transport cost (MK/kg)</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Gross Margin (MK/ha)</td>
<td>638.02</td>
<td>171.35</td>
</tr>
<tr>
<td>Seed cost (MK/ha)</td>
<td>37.50</td>
<td>6.50</td>
</tr>
<tr>
<td>Fertilizer cost (MK/ha)</td>
<td>196.35</td>
<td>0.00</td>
</tr>
<tr>
<td>Interest charges (MK/ha)</td>
<td>28.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Variable costs (MK/ha)</td>
<td>261.91</td>
<td>6.50</td>
</tr>
<tr>
<td>Returns to land (MK/ha)</td>
<td>376.11</td>
<td>164.85</td>
</tr>
<tr>
<td>Returns to land (US$/ha)</td>
<td>137.27</td>
<td>60.16</td>
</tr>
<tr>
<td>Returns to labor (MK/day)</td>
<td>6.07</td>
<td>3.23</td>
</tr>
<tr>
<td>Returns to labor (US$/day)</td>
<td>2.21</td>
<td>1.18</td>
</tr>
</tbody>
</table>
Profitability of fertilizer use in Malawi in 1996 *

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Hybrid maize with fertilizer</th>
<th>Local maize no fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (kg/ha)</td>
<td>2,774.00</td>
<td>745.00</td>
</tr>
<tr>
<td>Producer Price (MK/kg)</td>
<td>0.24</td>
<td>0.27</td>
</tr>
<tr>
<td>Harvest and transport cost (MK/kg)</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Gross Margin (MK/ha)</td>
<td>561.88</td>
<td>150.90</td>
</tr>
<tr>
<td>Seed cost (MK/ha)</td>
<td>77.28</td>
<td>10.53</td>
</tr>
<tr>
<td>Fertilizer cost (MK/ha)</td>
<td>358.98</td>
<td>0.00</td>
</tr>
<tr>
<td>Interest charges (MK/ha)</td>
<td>174.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Variable costs (MK/ha)</td>
<td>610.75</td>
<td>10.53</td>
</tr>
<tr>
<td>Returns to land (MK/ha)</td>
<td>-48.88</td>
<td>140.37</td>
</tr>
<tr>
<td>Returns to land (US$/ha)</td>
<td>-17.84</td>
<td>51.23</td>
</tr>
<tr>
<td>Returns to labor (MK/day)</td>
<td>-0.79</td>
<td>2.75</td>
</tr>
<tr>
<td>Returns to labor (US$/day)</td>
<td>-0.29</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* constant 1991 prices