Evaluation of Farmer Use of the Magoye Ripper

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Food Security Research Project, Zambia
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Outline

- Introduction: Review of earlier results
- Research methods: Regression and Profitability.
- Regression Modeling and Results
- Profitability
  - Income and cost estimations
  - Profitability results
- Implications/recommendations
Area of the Study and Sample

- Study Locations:
  - Eastern Province: Chipata, Katete, Lundazi
  - Southern Province: Choma, Mazabuka, Monze, Namwala
- Population: All farmers who bought the ripper
- Sample:
  - Farmers stratified by zone, then randomly selected,
    - EP 84 farmers
    - SP 94 farmers
- Crops and fields
  - Crops: maize and cotton
  - Ripped fields
  - Ploughed fields

Definition of “Ripper Farmers”

- All farmers owned rippers
- “Ripper farmers” used ripper for minimum tillage land preparation, 2004/2005 season
- “Non ripper farmers” used traditional animal traction ploughing in land preparation, 2004/05
Distribution of the Sample

- Sample of 178 farmers who have all purchased rippers
  - 44% of 178 farmers were ripper farmers
  - 39% of ripper farmers were from Eastern Province
  - 48% of ripper farmers were from Southern Province

Distribution of fields in 2004/2005

<table>
<thead>
<tr>
<th>Tillage type</th>
<th>Count</th>
<th>Eastern</th>
<th>Southern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton Ripped field</td>
<td>61</td>
<td>34.4</td>
<td>65.6</td>
</tr>
<tr>
<td>Cotton Ploughed field</td>
<td>125</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Maize Ripped field</td>
<td>55</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Maize Ploughed field</td>
<td>143</td>
<td>51.7</td>
<td>48.3</td>
</tr>
</tbody>
</table>

Total fields surveyed: 384

Source: FSRP/GART Magoye ripper survey 2005
### What were the major problems identified? Farmers’ responses

- Too many weeds (32%)
- Blunt tine (26%)
- Lack of spare parts (16%)
- Insufficient animals (12%)

*By all farmers who had used the ripper at least once; farmers may have more than 1 response*

### Why did I not use the ripper in 2004/05? Farmer responses

- Lack of sufficient draught power
  - No animals
  - Immature animals
- Blunt tine
- Lack of spare parts
- Insufficient training
- Weeds were the major problem in ripped fields but did not force stop ripping

*By all non ripper farmers in 2004/2005*
A farmer saying the ripper has no wings

General Practices

- 11% of farmers used the ripper in other farmers fields as well as their own, but only 1% farmers indicated revenues from it.

- About 9% of plots used hired animals for either ploughing or ripping (spread across both types).

- Only 13% of ripper farmers sharpened the tines prior to the season, at a cost of 5,000 – 10,000 kwacha.

- 74% (ripped fields) were on medium soils (as opposed to coarse or fine soils), whereas 47% (ploughed fields) were on medium soils.
**What are the mean area of fields?**

- Maize ripped field: 1.08 ha  
  (Maximum: 3.65  Minimum: 0.11)

- Maize ploughed field: 1.78 ha  
  (Maximum: 8.0  Minimum: 0.20)

- Cotton ripped field: 1.24 ha  
  (Maximum: 6.37  Minimum: 0.24)

- Cotton ploughed field: 1.94 ha  
  (Maximum: 6.37  Minimum: 0.28)  

Areas based on actual measurements

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**Planting dates:**

Maize in Eastern Province

Graphs show frequency distribution: Green solid line to the left means that ripping farmers planted earlier
Planting dates: Eastern Province

Graphs show frequency distribution: Green solid line to the left means that ripping farmers planted earlier.

Planting dates: Southern Province

Graphs show frequency distribution: Green solid line to the left means that ripping farmers planted earlier.
Procedures

- The regression analysis was used to understand the effect of various practices and factors on yield of maize and cotton
  - Yield = f (plot size, nitrogen, coarse soils etc)

- Crop budgets were used to understand the financial benefits of the technology

- Weeding: difficulty in assessing due to lack of accounting for weed pressure

Association of Tillage System on maize yield

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Coefficient</th>
<th>Robust Std error</th>
<th>Robust t-stat</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot Size</td>
<td>-128</td>
<td>58</td>
<td>-2.20</td>
<td>0.03</td>
<td>**</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>10</td>
<td>2</td>
<td>4.33</td>
<td>0.00</td>
<td>***</td>
</tr>
<tr>
<td>Tillage</td>
<td>-140</td>
<td>217</td>
<td>-0.64</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Manure Use</td>
<td>113</td>
<td>216</td>
<td>0.52</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>Hybrid</td>
<td>260</td>
<td>277</td>
<td>0.94</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Coarse soil type</td>
<td>-390</td>
<td>146</td>
<td>-2.67</td>
<td>0.01</td>
<td>***</td>
</tr>
<tr>
<td>Planting days late</td>
<td>-18</td>
<td>6</td>
<td>-3.04</td>
<td>0.00</td>
<td>***</td>
</tr>
<tr>
<td>Nitrogen X Tillage</td>
<td>9</td>
<td>4</td>
<td>2.29</td>
<td>0.02</td>
<td>***</td>
</tr>
<tr>
<td>Used the ripper at least 2 out of past 3 years</td>
<td>50</td>
<td>144</td>
<td>0.35</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>Namwala District</td>
<td>1155</td>
<td>372</td>
<td>3.11</td>
<td>0.00</td>
<td>***</td>
</tr>
<tr>
<td>constant</td>
<td>1006</td>
<td>314</td>
<td>3.21</td>
<td>0.00</td>
<td>**</td>
</tr>
</tbody>
</table>
Maize Regression Highlights

- Smaller plots => higher yields
- Nitrogen application => higher yields
- Combination of ripping and nitrogen application=>maize yield
- Coarse soils => lower yields
- Namwala => higher yields

Association of Tillage System on cotton yield

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Coefficient</th>
<th>Robust Std Error</th>
<th>Robust t-stat</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot Size</td>
<td>-93</td>
<td>19</td>
<td>-4.79</td>
<td>0.00</td>
<td>***</td>
</tr>
<tr>
<td>Chemical application</td>
<td>424</td>
<td>176</td>
<td>2.41</td>
<td>0.02</td>
<td>***</td>
</tr>
<tr>
<td>Chemical application squared</td>
<td>-150</td>
<td>57</td>
<td>-2.62</td>
<td>0.01</td>
<td>***</td>
</tr>
<tr>
<td>Tillage</td>
<td>-160</td>
<td>184</td>
<td>-0.87</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td>Coarse soil type</td>
<td>-69</td>
<td>61</td>
<td>-1.13</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Planting days late</td>
<td>-1</td>
<td>2</td>
<td>-0.49</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>Chemical appl. X Tillage</td>
<td>244</td>
<td>169</td>
<td>1.44</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Used the ripper at least 2 out of past 3 years</td>
<td>84</td>
<td>67</td>
<td>1.26</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>Eastern Province</td>
<td>125</td>
<td>73</td>
<td>1.72</td>
<td>0.09</td>
<td>*</td>
</tr>
<tr>
<td>constant</td>
<td>542</td>
<td>134</td>
<td>4.04</td>
<td>0.00</td>
<td>***</td>
</tr>
</tbody>
</table>
Cotton Regression Highlights

- Smaller plots => higher yields
- Higher chemical application => higher yields
- No significant effect of tillage on yields
  - No direct effect
  - No interaction effect
- Eastern Province => higher yield

Profitability Results

- Net Income/ha = Gross Income/ha – Total Cost/ha
Profitability: Income

- Gross Income = Yield * Output price
  - Yield was determined using Eastern Province observed average ripping yield as the base
  - Then adjusted the yield using regression coefficients
  - Output price for maize: average between FRA maize prices and AMIC prices (January to December 2005)
  - Output price for cotton: average price across Cargill, Continental and Dunavant

Profitability: Costs

- Cost = f (input cost, labour cost and capital cost)
  - Input cost: seed, fertilizer, manure, chemical packets
  - Labour cost: average cost per ha for different farm activities
  - Capital cost: purchase cost of magoye ripper and mouldboard plough considering depreciation
Net Income per hectare: Maize

Source: FSRP/GART Magoye ripper survey 2005

**Maize Profitability Highlights**

- Ripped fields had higher Net Profit than Ploughed fields in Eastern Province by more than half
  - Fertilizer efficiency use
  - Water harvesting
  - Timely planting
  - Ease management

- Ripped fields had relatively higher Net Profit than Ploughed fields in Southern Province
  - Fertilizer efficiency use
  - Ease management (small plots)
Cotton Profitability Highlights

- Ripped fields had relatively higher yield than ploughed field in Eastern Province
  - Ease management (smaller plots)
  - Higher chemical application

Source: FSRP/GART Magoye ripper survey 2005
Key results

- Efficient application of fertilizer and water harvesting are associated with the ripper
- Timely planting is associated with the ripper
- The Ripper did not have significant effect on the cotton yield, however,
  - Smaller plots are associated with higher cotton yield
  - Number of chemical packets is also associated with higher cotton yield
- Net Income from Ripped fields for both maize and cotton was higher than Net Income from ploughed fields

Implications/Recommendations

- The results from the ripper study look promising however the following should be noted:
  - More extension to farmers on how and when to use the technology is needed
    - Time of land preparation and planting are critical when using this technology
  - Need to evaluate the strength of the tine in relation to the soil type
  - Enhance public private partnership to ensure access to spare parts (tine, bolts, wings)
  - Improve access to animals and services (distribution campaigns, etc.)
  - Continue collaborative work with private sector in spreading the technology eg. Cargill Cotton, Continental, Dunavant
  - The study is based on farmer observation (Not on-farm trials)
Thank you