IAPRI/FSRP’s Work Related to Climate Change and Climate Smart Agriculture in Zambia

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Food Security Research Project (FSRP)

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Outline


Activity 1: Productivity Impact of Conservation Farming on Smallholder Cotton Farmers in Zambia

- **Status:** Completed, available on 

- **Objectives:** To Evaluate impact of CF on asset-poor households

- **Key findings:** Low input -hand hoe CF basins confer gains in;
  - Ha cultivated of more than 40% (1.0-1.5ha)
  - Crop income of more than 140%
  - Hand-hoe CF found to confer more benefits when combined with herbicides

- CF could be a vehicle to raise both income and productivity of resource poor farmers
### Hand-hoe CF gains over Conventional Farming

<table>
<thead>
<tr>
<th></th>
<th>High - Input Hand Hoe</th>
<th>Low - Input Hand Hoe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conventional Farming</td>
<td>Conservation Farming</td>
</tr>
<tr>
<td>Ha cultivated</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Crop yields (kg/ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maize</td>
<td>2,200</td>
<td>3,000</td>
</tr>
<tr>
<td>cotton</td>
<td>800</td>
<td>1,150</td>
</tr>
<tr>
<td>Crop income (US $)</td>
<td>203</td>
<td>495</td>
</tr>
<tr>
<td>Input cost</td>
<td>81</td>
<td>61</td>
</tr>
<tr>
<td>Labor inputs (days)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>peak</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>225</td>
</tr>
</tbody>
</table>

Source: Haggblade, S. S, Kabwe and C, Plerhoples (2011)
Activity 2: Household Cooking Energy Choices in Zambia and Implications on Deforestation

- **Status:** On going

- **Objectives:**
  - To assess determinants of cooking energy choices in Zambia
  - To quantify charcoal & firewood consumption and estimate implications on deforestation

- **Key preliminary findings:**
  - Multiple energy sources common among urban hhs but firewood most prevalent in rural areas
  - Population increase, use of inefficient braziers will increase demand for charcoal /firewood
    - This has implications on deforestation, forest degradation, GHG emissions & reduces Co2 sequestration potential
Percent of households using different sources of fuel for cooking

- Rural:
  - Firewood: 80.48%
  - Charcoal: 17.15%
  - Electricity: 2.27%

- Urban:
  - Firewood: 6.18%
  - Charcoal: 52.18%
  - Electricity: 41.40%

- Total:
  - Firewood: 50.29%
  - Charcoal: 31.38%
  - Electricity: 18.17%

Source: LCMS, 2010
Percent households using different main sources of cooking energy by province, 2010

Source: LCMS, 2010

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Activity 3: Contribution of Non-Timber Forest Products, Firewood and Charcoal to Rural Household Income

- **Status:** Initial phase completed, available on [http://www.aec.msu.edu/fs2/zambia/index.htm](http://www.aec.msu.edu/fs2/zambia/index.htm)

- **Objectives:**
  - To assess the levels of dependency of rural hhs on NFTP (includes charcoal and firewood) as sources of food and as sources of income
  - To estimate the implications of firewood and charcoal dependency on deforestation and forest degradation

- **Key findings:**
  - High reliance on NTFP (incl. charcoal/firewood) for income (34% overall)
  - Poor hhs more dependent on NTFP (incl. charcoal/firewood) as a sources of income (49%)
Key findings cont.

• Other NTFP (mushroom, caterpillars & wild honey) have potential to significantly contribute to hhs income & subsequently reduce reliance on charcoal/firewood as sources of forest income.

• Rainfall shocks increase hhs’ reliance on NTFPs—thus NTFPs play a safety net role during seasons with crop failure.
Activity 4: Improved Modelling of Household Food Security Decision Making and Investments Given Climate Change Uncertainty

- **Status:** On going

- **Objective**
  - Impact of climate change on crop yield and household welfare and recommend national and farm level adaptation strategies

- **Activities:**
  - Historical spatial temporal analysis of rainfall patterns using weather station data
  - Projection of future climate scenarios and their impacts on crop yield and output
  - Use of focus groups to guide the design and interpretation of findings and building recommendations

- **Status:** Preliminary findings

- **Objectives:**
  - To Examine trends in use of planting basins and ripping between 2008 and 2011
  - To determine factors which influence use of planting basins and ripping
  - To determine the influence of rainfall shock variables on farmers decisions to use planting basins and ripping

- **Key findings:**
Trends in use of Minimum Tillage practices among smallholder farmers by year from 2008-2011

Source: CFS, 2008-2011
Use of Minimum Tillage practices in Zambia and in the four CF intense provinces by year from 2008-2011

Source: CFS, 2008-2011

Weighted number of smallholder farmers

- Minimum tillage
- Minimum tillage in 4 provs

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum tillage</th>
<th>Minimum tillage in 4 provs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>24,186</td>
<td>15,893</td>
</tr>
<tr>
<td>2009</td>
<td>32,699</td>
<td>21,278</td>
</tr>
<tr>
<td>2010</td>
<td>49,221</td>
<td>28,142</td>
</tr>
<tr>
<td>2011</td>
<td>43,373</td>
<td>27,595</td>
</tr>
</tbody>
</table>
Key findings cont.

- Focus Group Discussion (FGD) results suggest that institutional factors explain much of the changes in MT use;
- Provision of material handouts included
  - Agro-inputs such as hybrid seed, fertilizer, food stuffs (cooking oil, beans, MAHEU! etc)
- Poor selection criteria of project beneficiaries
- Poor exit strategies by CF projects
- Lack of fully qualified technical staff
- All the above impinge on sustainability of CF interventions
Probit regression results of factors that influenced use of planting basins and ripping by smallholder farmers between 2008 and 2011

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Use of basins</th>
<th></th>
<th>Use of ripping</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>APE (%)</td>
<td>Pval</td>
<td>APE (%)</td>
<td>Pval</td>
</tr>
<tr>
<td></td>
<td>Use of basins</td>
<td></td>
<td>Use of ripping</td>
<td></td>
</tr>
<tr>
<td>Male headed household (=1)</td>
<td>0.09</td>
<td>0.66</td>
<td>0.29**</td>
<td>0.02</td>
</tr>
<tr>
<td>Age of household head (years)</td>
<td>0.01*</td>
<td>0.08</td>
<td>-0.00</td>
<td>0.68</td>
</tr>
<tr>
<td>Land Access (ha)</td>
<td>-0.54**</td>
<td>0.05</td>
<td>0.28**</td>
<td>0.01</td>
</tr>
<tr>
<td>Rain stress (# 20 day periods)</td>
<td>0.10</td>
<td>0.25</td>
<td>0.05</td>
<td>0.38</td>
</tr>
<tr>
<td>Postv. rain deviation (mm)</td>
<td>-0.15</td>
<td>0.87</td>
<td>-2.29***</td>
<td>0.00</td>
</tr>
<tr>
<td>Negtv. rain deviation (mm)</td>
<td>3.42**</td>
<td>0.04</td>
<td>1.14</td>
<td>0.20</td>
</tr>
<tr>
<td>cfu in district (=1)</td>
<td>0.09</td>
<td>0.70</td>
<td>0.53***</td>
<td>0.00</td>
</tr>
<tr>
<td>Cattle disease outbreak (=1)</td>
<td>-</td>
<td>-</td>
<td>-0.43***</td>
<td>0.00</td>
</tr>
<tr>
<td>d2009 (= 1 if year is 2009)</td>
<td>0.66**</td>
<td>0.03</td>
<td>0.01</td>
<td>0.96</td>
</tr>
<tr>
<td>d2010 (= 1 if year is 2010)</td>
<td>1.40***</td>
<td>0.00</td>
<td>0.64***</td>
<td>0.00</td>
</tr>
<tr>
<td>d2011 (= 1 if year is 2011)</td>
<td>1.68***</td>
<td>0.00</td>
<td>0.0020</td>
<td>0.23</td>
</tr>
</tbody>
</table>

**Joint Provincial Significance tests**: P val < 0.01

APE = Average Partial Effects in percentage points

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Empirical results discussions

- Male headed hhs are 0.3 percentage points more likely to use ripping

- Incidences of floods increase likelihood of farmers using CF basins by 3.4 percentage points
  - These results suggest linkages between rainfall variability and conservation farming in Zambia
    - More support is needed to ZMD to enable the institution increase on the number of MET stations and precision of their data capturing

- Other important determinants include
  - size of land accessed by hhs
  - being in districts where CFU operates
  - being in districts that had cattle diseases over the last decade
Conclusions and Way forward

- Generally available CF studies are incomparable because they are based on small sub-samples.

- There is need to initiate a national wide CF panel study or at least strengthening CF sections in existing national surveys such as CFS/PHS to form a solid baseline for CSA activities.

- More research needed to explain linkages between demand for charcoal/firewood and deforestation, loss of Co2 sequestration potential → implications for climate change.
Conclusions and Way forward cont.

- Development of value chains for NTFPs and other IGAs can reduce households’ reliance on income from charcoal/firewood

- deforestation and related implications on climate change

- Given empirical findings; There is potential for CSA to succeed because farmers are already familiar with CF technologies as long as the institutional challenges are addressed
Thank you!!

For more information, visit
http://www.aec.msu.edu/fs2/zambia/index.htm

Or
www.iapri.org.zm

And take a tour of our research directories!!!!!!!