Perceptions of Climate Change and Determinants of Minimum Tillage Use by Smallholder Farmers in Zambia

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Presentation outline

- Introduction
- Objectives
- Data
- Methods
- Results & Discussions
- Conclusions & policy implications
Introduction

Zambia’s land = 752,612 sq. Km
Introduction

- 13 million people—40% urban & 60% rural (CSO, 2010)
- Agriculture is the main source of livelihood
  - Employs over 75% of labor force
- Smallholder farmers make up more than 80% of total farmers, rain-fed
- Reliance on rain-fed agric. makes sector vulnerable to climatic changes (CC)
- Minimum tillage (min. till) practices promoted as one of the adaptation strategies
- Min. till reduces soil degradation, improves water retention & enables early planting
Min. Till = planting basins & ripping in the context of this study

Source: CFU
Introduction continued

- Important to examine national trends in usage & understand determinants to promote up-scaling of min. till
- Varying adoption/use rates reported—mostly case studies or snap shots
- 20,000-60,000 in 2001/2 (Haggblade and Tembo, 2003)
- 7.5% in 2003/4 seasons (Donovan & Kabwe, 2005)
- Socio-economic and ecological factors identified to be influencing adoption
- Little attention to farmers’ perceptions of CC & its role in min. till use
  - Case study by Nyanga et al. (2011) show low perception of conservation agriculture use as an adaptation
Introduction continued

- Analysis using national data & over a longer time horizon necessary
- Need to better understand farmers’ perceptions of CC & determinants of min. till use
Objectives

- To examine trends in use of planting basins and ripping between 2008 and 2011
- To determine factors influencing use of planting basins and ripping
- To assess farmers’ perception of climate change and how this affects use of min. till
Methods

- To examine trends in use of planting basins and ripping between 2008 and 2011
  - descriptive

- To determine factors influencing use of planting basins and ripping
  - Probit model

- To assess farmers’ perception of climate change and how this affects use of min. till
  - FGDs & key informant interviews
Data

- Nationally representative crop forecast survey data collected from 2008 – 2011, with a total of 50,296 households over the 4 years
- District level rainfall data from 1996-2012 from Zambia Meteorological Department
  - FGDs in 8 districts representing 3 main Agro Ecological Zones (AEZ) — 114 farmers interviewed
  - Key informant interviews with C.F project staff, extension officers and researchers
Data

- CFS collected data using semi structured questionnaire
- Data collected include:
  - Demographics
  - Landholding
  - Field size
  - Main tillage method used in each field
Results & Discussion
Trends in use of Minimum Tillage practices among smallholder farmers by year from 2008-2011

Source: Authors' computations from MAL/CSO Crop Forecast Survey, 2008-2011
Results & discussions cont.

- Use rate trends increasing for both planting basins and ripping till 2010
  - Increased donor support to C.F initiatives might have contributed to the upward trend to 2011
  - C.F projects phasing out in 2010 might have contributed to decline between 2010 & 2011—unsustainable project models
Determinants of use of planting basins and ripping from 2008 - 2011

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Planting basins</th>
<th>Ripping</th>
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</thead>
<tbody>
<tr>
<td>Male headed household (=1)</td>
<td>0.09</td>
<td>0.29***</td>
</tr>
<tr>
<td>Age of household head (years)</td>
<td>0.01*</td>
<td>0.00</td>
</tr>
<tr>
<td>Land access (ha)</td>
<td>-0.54**</td>
<td>0.28***</td>
</tr>
<tr>
<td>Rain stress (# 20 day periods)</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Positive rain deviation (mm)</td>
<td>-0.15</td>
<td>-2.29***</td>
</tr>
<tr>
<td>Negative rain deviation (mm)</td>
<td>3.42**</td>
<td>1.14</td>
</tr>
<tr>
<td>CFU in district (=1)</td>
<td>0.09</td>
<td>0.53***</td>
</tr>
<tr>
<td>Cattle disease outbreak (=1)</td>
<td>n/a</td>
<td>-0.43***</td>
</tr>
<tr>
<td>2009 (= 1 if year is 2009)</td>
<td>0.66**</td>
<td>0.01</td>
</tr>
<tr>
<td>2010 (= 1 if year is 2010)</td>
<td>1.40***</td>
<td>0.64***</td>
</tr>
<tr>
<td>2011 (= 1 if year is 2011)</td>
<td>1.68***</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Joint Provincial Significance test : $\chi^2 (8); P val < 0.01$

*, **, *** significant at 10%, 5% and 1%, respectively
Farmers’ perception based on Focus Group Discussions (FGDs)

- 82% perceived a reduction in rainfall over the last 20 years
- Farmers further indicated that;
  - season onset is later & offset is earlier, with increased intra-season droughts mid season (Jan-Feb)
- Farmers’ main response strategy;
  - 68% min. till across all AEZ
- 80% of farmers talked to in AEZ I & II use min. till as response to rainfall shocks
  - Because they improve yields even with low precipitation
- Farmers’ perceptions of CC plays a role in decision to use min. till
Farmers’ perception based on FGDs

- But why the low levels of use rate?
- FGDs & key informants pointed out:
  - **poor institutional settings**
    - the culture of giving handouts by projects, bias in selection of project beneficiaries & poor exit strategies
  - **high initial labor intensity for planting basins & cattle diseases affecting ripping**
Conclusions & policy Implications

- From FGDs it is evident that other than yield improvements, min.till indirectly used by farmers as an adaptation.
- Empirical evidence → Incidences of drought increase likelihood of using basins.
- Min. till has potential to be used as a response to CC.
- Despite common perception of min.till being effective data shows;
  - Marginal rise in number using ripping and planting basins from 2008-2011.
  - Decline in use rate in some years.
Bad institutional settings contributing to low use rates

Efforts promoting C.F need to improve on targeting and implementation model (avoid handouts)
- Adopt market-led intervention models (such as CFU’s) and provide technical assistance only

There is potential for CSA to succeed because farmers are already familiar with CF technologies

Improve collection and dissemination of rainfall information
THANK YOU!
IAPRI WEBSITE/ADDRESS

- http://www.iapri.org.zm/
- Or
- http://www.aec.msue.edu/fs2/zambia/index.htm

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