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

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Climate Smart Agriculture: Global Science Conference
University of California, Davis, U.S.A
March 20 -22, 2013
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
Planting basins

Ox-drawn ripping

Mechanized ripping

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>
</tr>
</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 : χ² (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
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.
Conclusions & policy Implications

- Poor 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.msu.edu/fs2/zambia/index.htm

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