INNOVATIONS IN SMALLHOLDER FARMING SYSTEMS IN ZAMBIA

By

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Presented at Cash Crop Conference
Bangkok, Thailand
29th June, 2016
Background

Agricultural productivity rates in SSA - remained low
Averaging 2.4t/ha compared to 4t/ha in other developing countries (World Bank 2013)

Zambia’s top 20th percentile Farmers, produce av. 6.3t/ha against the rest 2ton/ha

African population is growing,
Narrowing the yield gaps is an important agenda to addressed rural poverty
Can the adoption of new innovations in agriculture be an answer?
Outline

An economic overview of Zambia

Agriculture sector

Innovations adopted by a smallholder farmers

Obstacles in adopting these innovation

Conclusion
Economic Overview

- Size: 752, 612 sq.km (4.5% arable)
- Population: 14m. CSO, (60% in rural areas)
- GDP: $ 20bn; > 6% growth p.a. last 5 years
- Agriculture: contributes 20% to GDP; employs > 85% of the population
- Agriculture is considered an engine of economic growth
- Huge opportunities to produce surplus, endowment of resource
Agricultural Sector

- Dual agricultural systems
  - Commercial farmers & smallholder farm households (SHH*, >1.5million)
  - Maize main staple
    - Produced by > 80% of the SHF
    - Production estimated at 2.8 million mt in 2016
    - Maize yields average 2 Mt/ha
    - Receives government support (input and output subsidies)
- Commercial farming: Cash crops
Huge Opportunities

- 40% of fresh water resources in the SADC region
- Zambia’s Irrigation potential of 430,000 Ha
- About 156,000 Ha under irrigation
Some Innovations in Zambia

- Use of composite manure
- Irrigation technologies
- Fertilizer use
- Conservation Agriculture
- Hybrid seed
Some Innovations in Zambia

- Conservation Agriculture
- Hybrid seed
Some Innovations in Zambia

- Conservation Agriculture
Definition of CA

**CA full adoption**
- Minimum tillage
- Maintain crop residue (not burning)
- Cereal-legume crop rotation
  - For a minimum of three years

**CA partial adoption**
- Minimum tillage with either
- Cereal-legume crop rotation or
- Maintenance of crop residue (not burning)
  - For a minimum of three years

**Climate Smart Agriculture full adoption**
- Minimum tillage
- Maintain crop residue (not burning)
- Cereal-legume rotation
- Agro-forestry
Evolution of CA in Zambia

1996 CA introduced in Zambia to mitigate drought and depleted soils by commercial farmers (private)

1998 Govt embraced CA as official Policy

2012 CFU expanded support from Norwegian 2012 Ma with support from EU starts rolling CA
Conservation Agriculture Vs. Conventional Tillage

Maize Yield Differences

<table>
<thead>
<tr>
<th>Method</th>
<th>Kg/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Plots</td>
<td>2401.3</td>
</tr>
<tr>
<td>Conventional Plots</td>
<td>2081.6</td>
</tr>
<tr>
<td>Ripping</td>
<td>2376.5</td>
</tr>
<tr>
<td>Planting basins</td>
<td>2522.9</td>
</tr>
<tr>
<td>Ploughing</td>
<td>2078.7</td>
</tr>
<tr>
<td>Hand hoeing</td>
<td>1783.0</td>
</tr>
</tbody>
</table>
## Maize Profitability

### Table: Conservation Agriculture Vs. Conventional Tillage

<table>
<thead>
<tr>
<th></th>
<th>Conservation Agriculture Plots</th>
<th>Conventional Agriculture Plots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (50Kg bags/Ha)</td>
<td>48.026</td>
<td>41.632</td>
</tr>
<tr>
<td>Price (ZMW/50 Kg bag)</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Gross Revenue</td>
<td>3361.82</td>
<td>2914.24</td>
</tr>
<tr>
<td>Hired Labour</td>
<td>733.2</td>
<td>657.3</td>
</tr>
<tr>
<td>Other Costs</td>
<td>332.1</td>
<td>394.1</td>
</tr>
<tr>
<td>Total Cash Expenses</td>
<td>1065.3</td>
<td>1051.4</td>
</tr>
<tr>
<td>Family Labour</td>
<td>2385.4</td>
<td>2270.8</td>
</tr>
<tr>
<td>Total Costs (including family labour)</td>
<td>3450.7</td>
<td>3322.2</td>
</tr>
<tr>
<td><strong>Gross Margin</strong></td>
<td><strong>2296.52</strong></td>
<td><strong>1862.84</strong></td>
</tr>
<tr>
<td>Without Costing Family Labour</td>
<td>2296.52</td>
<td>1862.84</td>
</tr>
<tr>
<td>With family Labour</td>
<td>88.88</td>
<td>407.96</td>
</tr>
</tbody>
</table>
Major Challenge

Despite promotion, CA adoption rates by smallholder farmers remain low, with widespread dis-adoption.
### CA Adoption Rates by Smallholder farmers

<table>
<thead>
<tr>
<th>Agro-ecological Zones</th>
<th>Full CA adopters</th>
<th>Partial adopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>3.7</td>
<td>5.1</td>
</tr>
<tr>
<td>I</td>
<td>1.2</td>
<td>4.7</td>
</tr>
<tr>
<td>IIa</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>IIb</td>
<td>0.7</td>
<td>7.3</td>
</tr>
<tr>
<td>III</td>
<td>2.3</td>
<td>2.7</td>
</tr>
</tbody>
</table>
Factors associated with CA adoption

- Mechanical power use
- Received CA advice/information
- Access to credit
- Herbicide use
### Key reasons for CA dis-adoptions

<table>
<thead>
<tr>
<th>Reason</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of inputs/withdrawn input support</td>
<td>57</td>
</tr>
<tr>
<td>Problem of weeds/high cost/no...</td>
<td>36</td>
</tr>
<tr>
<td>Labour intensive</td>
<td>19</td>
</tr>
<tr>
<td>Poor local consultation/understanding</td>
<td>13</td>
</tr>
<tr>
<td>Poor market linkage for rotation crops</td>
<td>3</td>
</tr>
<tr>
<td>Lack of spouse support</td>
<td>3</td>
</tr>
<tr>
<td>Bush fires destroy residues</td>
<td>2</td>
</tr>
<tr>
<td>Lead farmers not leading by example</td>
<td>1</td>
</tr>
</tbody>
</table>

*Score ranges from 0 to 60.*
Zambia Situation in 2015/16 Ag. Season

- Northern parts received better rainfall than the Southern parts
- Uncertain nature of the El Nino weather – rainfall patterns improved from late January

Source: Vulnerability Assessment Committee
Pictures Areas badly hit with ElNino 2015/2016

Good crop stand for a farmer that adopted CA

Poor crop stand for a farmer that Used conventional agriculture
CA long term benefits

- Long term benefits can help justify investing public resources to promote CA

Reduction in soil erosion
Improved water retention
Improved soil fertility
Hybrid maize seed
Hybrid Maize Seed

- Zambia’s seed sector is characterized by the presence of local and international seed companies
- There are formal and informal seed systems
- Private and public sectors are involved in breeding
Hybrid maize seed

- There is high release of hybrid maize varieties:
  - Total number of hybrid maize varieties is 233.
- Increased private sector participation since liberalization
  - Since 1991, 188 varieties (81%) of the total number of varieties released are private while 45 varieties (19%) are public.
- But there is too much focus is on maize which leads to mono-cropping
## Hybrid maize seeds released in Zambia

<table>
<thead>
<tr>
<th>Period</th>
<th>Total varieties released</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1990</td>
<td>16</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>1991-2000</td>
<td>66</td>
<td>14</td>
<td>52</td>
</tr>
<tr>
<td>2001-2010</td>
<td>121</td>
<td>7</td>
<td>114</td>
</tr>
<tr>
<td>2011-2013</td>
<td>30</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>233</td>
<td>45(19%)</td>
<td>118(81%)</td>
</tr>
</tbody>
</table>

Source of data: Seed Control and Certification Institute, Zambia

- There are about 20 formal private seed companies and over 40 community based NGOs involved in seed
- Government through the Zambia Agricultural Research institute (ZARI) is also involved in breeding
Hybrid maize seed use at 62%
Recycled hybrid seed at 2.3%
Local maize seed use at 40%
OPV maize seed at 0.1%
Reasons for relatively high adoption

- Strong policy framework for the seed sector
  - Resulted in more private companies entering the market
  - Export of seed to neighbouring countries
  - Strong enforcement through the SCCI
- Private sector has been involved in research and promoting the use of hybrid
Yield of Maize kg/ha (2014/15)

- Hybrid maize
- OPV maize
- Local maize

Yield Kgs per hectare planted
Conclusion

- Agricultural innovations can play a role in improving productivity and profitability
- Private and public vital for innovation adoption, but the private sector has to take a lead
  - Eg Maize seed industry
- Adoption of some of these innovations is hampered by various challenges
Thank You

For more information see our websites at:

http://www.iapri.org.zm/

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