Conservation agriculture: farmer adoption of new practices and technologies: evidence and lessons learnt

By Christian Thierfelder
Outline of this presentation

• Introduction

• CA and Climate-smart agriculture

• Conservation agriculture – its benefits and challenges

• Scaling and uptake

• Practical examples
The Challenges in Africa

All moderate and milder droughts in maize areas
Frequency in 12 years (2000-2011)
- Yellow: 1 - 3
- Orange: 4 - 5
- Red: 6 - 9

Source: Sonder, unpublished
What do we understand by Climate-smart Agriculture (CSA)?

- Sustainable increase in productivity
- Climate change adaptation
- Climate change mitigation

CSA
What practices could be lumped under the CSA umbrella?

- Conservation agriculture
- Agroforestry (CAWT)
- Rangeland management
- The use of drought-tolerant germplasm
- Targeted fertilizer application
- Improved cattle feeding
- ....
There is not one CSA practice.... but different and complimentary combinations of practices to achieve the greatest CSA potential in a landscape.

CA provides a good foundation for CSA!
Agroforestry

Nutrition security

Poverty alleviation

Natural resource management

Improved cook-stove

Reduced degradation & erosion

Conservation agriculture

Increased yields

Soil quality & carbon

Dietary diversity

Intercropping

Participatory approach

Market access

Increase income

Landscapes with multiple CSA options

World Agroforestry Centre

FAO

care
Why focus on Conservation Agriculture?

- CA reduces **soil and land degradation**
- CA can help to **adapt production** to climate variability and change !
- CA is more **water-, nutrient-, and energy-use-efficient**
- CA improves the **productivity of current farming systems**
CA - a flexible system...

- **Jab-planter**
- **Hoe-planter**
- **Dibble stick**
- **Basin planting**
- **AT Direct seeder**
- **Magoye ripper**
New Developments for Africa....
Maize-soybean rotation

Groundnuts under CA

Cowpeas under CA

Maize-groundnut rotation

Maize-Gliricidia intercropping

Maize under CA
Longer term maize grain yields on farmers fields in Zambia – Monze, 2006-2016

Harvest year
Maize grain yield (kg ha⁻¹)

- Conventional ploughing, maize (CPM)
- Ripline seeding, maize (RIM)
- Direct seeding, maize (DSM)
Regional yield response to CA in southern Africa from 2005-2016

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Conventional tillage yield (kg ha⁻¹)</td>
<td></td>
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<tr>
<td>Conservation agriculture treatment</td>
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<tr>
<td>Planting basins, Mozambique</td>
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<tr>
<td>Ripline seeding, Zambia</td>
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<tr>
<td>Direct seeding, Zambia</td>
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<tr>
<td>Manual direct seeding, Malawi</td>
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<tr>
<td>Manual direct seeding, intercrop., Malawi</td>
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<tr>
<td>Ripline seeding, Zimbabwe</td>
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<tr>
<td>Direct seeding Zimbabwe</td>
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Thierfelder et al. 2015a

Net benefits (in USD)

- Dibble stick Maize - Cowpea rot
- Dibble stick Maize/Cowpea intercrop
- Dibble stick Maize continuous
- Ridge & furrow Maize continuous

Mutenje et al. 2016
Mechanised Sustainable Intensification Practices Net Benefits (2012-2016)
Eastern Zambia

- Ripper Maize soybean Rotation
- Ripper Maize Sole
- CP maize sole

Net benefits (in USD)


Mutenje et al. 2016
CA in Malawi - key benefit is labour reduction

Thierfelder et al. 2015b
Some pertinent challenges ...

- **Residues**: How can we feed both livestock and crops?
- **Weeds**: If no herbicides are used
- **Lack of fertilizer**: What are the alternatives?
- **Donor driven adoption**: One-size fits-all approaches
- **(S)low adoption**: Understanding the issues
- Knowledge gaps and perceptions amongst farmers
- Lack of evidence and data taking – believe in myths
- Targeting the wrong systems to the wrong farmers
- Ignoring farmers rationale and decision making
- The need for co-development of technologies
Scaling and adoption
The linear vision of research, extension and development

Researchers conducting formal research in established institutions

Basic research

Strategic research

Applied research

Researchers

Extension agents

Technology transfer

Adoption

Knowledge flow
For CA, Multi-Agent *Innovation Systems* may be required

**Other possible players:**
- Agrochemical representatives
- Credit providers
- Output market
- Policy makers
- etc.
CIMMYT- CA extension in the past

On-farm Research Cluster approach

- Village of 100-200 households
- Good extension officer
- Vibrant and interested farmers
- Accessible site

Distance 2-3 km
Maize-groundnut system (6 farmer reps)

- CP: Maize trad. Ridge and Furrow 75cm x 25cm
- CA 1: Maize Flat planting 75cm x 25cm
- CA 2: Maize Flat planting 75cm x 25cm + Beans intercropping

- Groundnuts trad. Ridge and Furrow 75cm x 20cm
- Groundnuts Flat planting 37.5cm x 20cm
- Groundnuts Flat planting 37.5cm x 20cm
Expanding the niche – through successful scaling

- Lead farmer approach
- Demonstration and field days
- Mother and baby trials
- Innovation systems approach
- Participatory extension approaches
- Farmer-to-farmer exchange
- Farmer field schools
- ICT
1. How to get started....?

**Information:**

- Stay **informed** (Get information from experienced farmers and technicians)
- Start **small** (about 10% of the property) with all principles
- Alternatively start with some **key principles**
Stay informed – technical bulletins and guidelines
2. How to get started....?

**Preparation:**

- **Prepare** the field beforehand (get rid of compaction, unevenness, perennial weeds and acidity problems).
- Obtain the right **equipment** for seeding (and for weed control)
- Produce sufficient **ground cover**.
3. How to get started....?

**Implementation:**

- It is important to achieve good **weed control**.
- Start with a good **crop rotation** to provide nutrients, additional residues and weed control.
- If the soils are very sandy or degraded **apply extra nitrogen** fertilizers, manure or compost.
## CA Adoption trends in sub-Saharan Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Area under CA (ha)</th>
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<tbody>
<tr>
<td>Lesotho(^2)</td>
<td>10,000</td>
</tr>
<tr>
<td>Sudan(^2)</td>
<td>10,000</td>
</tr>
<tr>
<td>Madagascar(^2)</td>
<td>6,000</td>
</tr>
<tr>
<td>Ghana(^2)</td>
<td>30,000</td>
</tr>
<tr>
<td>Kenya(^2)</td>
<td>32,000</td>
</tr>
<tr>
<td>Tanzania(^2)</td>
<td>25,000</td>
</tr>
<tr>
<td>Malawi(^1)</td>
<td>65,000</td>
</tr>
<tr>
<td>Mozambique(^2)</td>
<td>152,000</td>
</tr>
<tr>
<td>Zambia(^2)</td>
<td>200,000</td>
</tr>
<tr>
<td>Zimbabwe(^1)</td>
<td>332,000</td>
</tr>
<tr>
<td>South Africa(^2)</td>
<td>368,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,230,000</strong></td>
</tr>
</tbody>
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Source: Kassam et al. 2015; \(^1\)2013 estimates; \(^2\)2009 estimates;
The Lead Farmer approach – Farmers practicing CA with TLC in Malawi

Graph showing the growth in the number of farmers practicing CA with TLC from 2006 to 2016, with a significant increase from 2014 onwards.
Reflexions and recommendations

✓ CA is leading CSA system and well adapted to southern Africa

✓ There is no quick fix or remedy that leads to 100% adoption CA in a very short time

✓ CA has to be promoted in a flexible approach – not one-size-fits all – based on good agriculture practices

✓ “Research in Development” projects can help in solving bio-physical and socio-economic constraints
Thank you for your interest!

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