Conservation Agriculture - a Viable Option for Smallholder farmers in Zambia?

By Christian Thierfelder
Outline of this presentation

- Introduction
- Conservation agriculture – its benefits and challenges
- CA and Climate-smart agriculture
- Extension of CA and its adoption
- Gaps and needs
The Challenges in Africa

Source: Sonder, unpublished
Projected change in agriculture productivity, 2080

Source: Hugo Ahlenius, UNEP/GRID-Arendal.
Why focus on Conservation Agriculture?

- CA reduces **soil and land degradation**
- CA can help to **adapt** 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
- AT Direct seeder
- Dibble stick
- Hoe-planter
- Basin planting
- Magoye ripper
New Developments for Africa....
CIMMYT’s Research Focus in Southern Africa

- Is conservation agriculture (CA) a more profitable, viable and sustainable system than conventional agriculture?
- What are the biophysical challenges to productive CA systems and how can they be overcome?
- How climate-smart is CA in the context of southern Africa?
- What socio-economic factors and circumstances affect the adoption and outscaling of CA systems in southern Africa?
Some research evidence....
First rains ....

Conventional tillage

Conservation agriculture
In season....

Conventional ridge tillage

Conservation agriculture
Infiltration is crucial in CA systems!

- Henderson, Zimbabwe
- Monze, Zambia
- Chitedze, Malawi
- Sussundenga, Mozambique
Soil moisture, 0-60cm, Monze FTC, 2011/2012

Rainfall (mm d⁻¹)

Available soil moisture (mm)

Date

Yield gain  DSM: 27%
DSMC: 53%

Direct seeding, maize (DS-M)
Direct seeding, maize-cotton (DS-MC)
Conventional ploughing, maize (CP-M)
Rainfall 2011/2012
CA performance on replicated on-farm trials – Monze 2005-2016
Average maize grain yield (kg ha\(^{-1}\)) on CA fields in 7 target communities of Eastern Zambia in 2014/2015
Regional yield response to CA in southern Africa from 2005-2015

Thierfelder et al. 2015a

Chipata

Lundazi

Net – Benefits $/ha

Seasons

2012/13 2013/14 2014/15 2015/16

Conventional Ridge & Furrow
Dibble stick sole Maize
Dibble stick maize cowpea intercrop
Dibble stick maize soybean rotation

Mutenje et al. 2016 unpublished

Lundazi

Sinda

Seasons

Net-Benefits $/ha


Conventional Ridge & Furrow
Ripper Sole Maize
Ripper Maize- Soybean Rotation

Mutenje et al. 2016 unpublished
Adoption patterns in Eastern Zambia between 2010/11 and 2015/16

Mutenje et al. 2016 unpublished
El Nino response potential

- CA responds better to seasonal dry-spells leading to yield benefits of 30-60%
- Combined use of drought-tolerant maize with CA can improve the performance of maize by more than 80%
- CA can improve incomes by 40-100% under drought
El Niño season 2015/2016....
Reduced yield variability under conservation agriculture

Ngwira et al. 2014
Is Conservation Agriculture really “climate-smart”?
If it is so good – why are not all farmers adopting conservation agriculture?
Challenges still persist....

- **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
What are the Gaps and Needs for the coming years?

- What is the climate-smart agriculture **potential of CA** at a larger scale (4p1000)
- The need for more **system’s research**
- Mechanization!
- What **kind of CA** is actually adopted (quality assessment) - why is it disadopted?
- How can we overcome **barriers** to adoption?
More Gaps and Needs....!

- What are the socio-economic impacts of CA on **livelihoods, nutrition and gender**
- How can **farmer-decision-making** be better understood
- **Targeting of CA** (e.g. to different farmers, farm types, agro-ecologies)?
- **Research on Scaling** – how can we increase the uptake beyond small plot levels?
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
Reflexions and recommendations

- There is no **quick fix or remedy** that leads to 100% adoption.
- 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.
CA is definitely better than the “status quo” - expanding its niche requires flexibility!
Thank you for your interest!