changing farming for a changing climate

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INFORMATION BRIEF:

Assessing the contributions of conservation agriculture to building resilience to drought

This information brief highlights key findings in the Vuna report "Assessing the contributions of conservation agriculture to building resilience to drought" by Kizito Mazvimavi (February 2017). Online: http://www.vuna-africa.com

Key Points

- Conservation agriculture (CA) has been widely promoted as a climate smart agricultural technology.
- Experimental trials generally indicate that CA improves resilience to rising temperatures and variable rainfall.
- Survey evidence collected in Zambia and Zimbabwe indicates that the CA techniques commonly applied by smallholders do not improve crop productivity in the event of drought.
- Even when drought occurs, crop productivity appears to be limited more by low soil fertility than by low soil water content.
- Efforts to promote wider adoption of better early-maturing crop varieties, and at least small doses of fertiliser, are more likely than CA to contribute to drought resilience.

Introduction

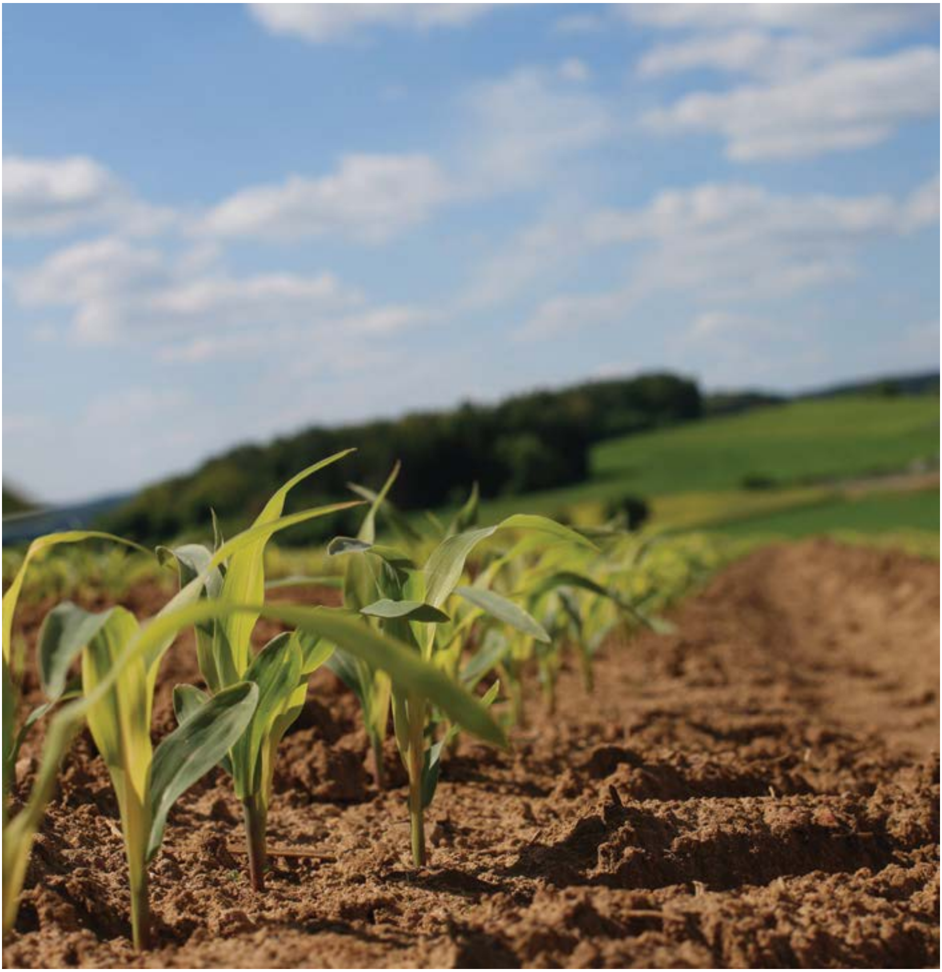
Conservation agriculture (CA) has been promoted as a way of improving both agricultural productivity and resilience to drought (Mafongoya et al., 2016). CA generally combines three practices: (1) reduced or minimal soil disturbance, (2) maintenance of soil surface cover through retention of mulch, and (3) crop diversification through rotations and intercropping (Giller et al., 2009; FAO, 2012).

CA has been widely adopted around the world, especially in farming systems that are more mechanised and more highly commercial than those in most of Eastern and Southern Africa. South America has the largest area under CA, and adoption is also significant in the United

States and Australia. The main drivers of adoption in these regions are savings in crop production time, labour, and fuel, coupled with soil protection.

CA has been widely promoted in Sub-Saharan Africa (SSA), but with much lower levels of adoption (Vuna, 2016). Most smallholder farms in the SSA are not mechanised, which means CA does not realise savings in fuel. The requirement of crop residue mulching conflicts with the use of these residues for feeding livestock. Crop rotation is hampered by limited availability of legume seed and farmer preference for growing larger areas of staple cereals. Minimum tillage is associated with increased weed pressure that farmers find difficult to address, because herbicides are either unavailable or expensive, and manual weeding strains the labour supply.

Partly as a consequence of these constraints, farmers in SSA have commonly adopted components of CA rather than the full package. As a result, it is difficult to quantify true rates of adoption or the payoffs to CA alone. This makes the evaluation of the contributions of CA to farm resilience in the event of drought much more difficult.



A literature survey reviewed evidence from formal experimental plot trials, as well as evidence derived from household surveys of practice under farmer management (Vuna, 2016). This literature, especially that pertaining to SSA, suggests that CA offers improved resilience to drought. Gains are recognised even if only a portion of the CA package is adopted. Improvements are especially evident when CA is adopted in conjunction with increased use of fertiliser.

It is important to recognise, however, that there is very little data measuring the benefits of CA under non-experimental conditions. Data drawn from formal experiments or from closely managed on-farm trials may reveal different results from the much more variable results of farmer practice. There is a need to measure and understand the contributions of CA to building resilience to drought under the management of smallholder farmers in real-world, non-experimental conditions.

Survey results

The El Niño drought of 2015/16[1] in Southern Africa provided an opportunity to begin to fill this information gap. Researchers interviewed a total of 681 smallholder farmers in drought-affected regions of Zambia and Zimbabwe; 416 had adopted CA and 265 had not. The survey, which targeted maize farmers, was implemented post-harvest and collected data on socio-demographics, plot-level information on CA, measured inputs, soil type, and other agronomic practices. The practices and productivity of CA adopters were compared with those of neighbouring farmers who experienced the same drought but applied different agricultural technologies.

Only 38 percent of the adopters in Zambia, and 25 percent in Zimbabwe applied all three CA practices (minimum tillage, mulch, and crop rotation). For the purposes of this survey, farmers who practiced minimum tillage alone—and not necessarily mulch and/or crop rotation as well—were considered to have adopted CA. This reflects the way CA is most commonly practiced by smallholders in SSA. In effect, what farmers and nongovernmental organisations identify as CA is commonly different from the technology being tested in formal agronomic trials.

> **CA practices made no meaningful contribution to building resilience to drought.**

The results show that during the study period CA had a positive impact on yields only in Zambia. In both Zambia and Zimbabwe, CA practices made no meaningful contribution to building resilience to drought. CA is positively correlated with yields, but this improvement largely reflects the linkage of CA with the use of certified maize seed and fertiliser. It was the use of improved inputs in combination with CA—and not CA as a standalone technology—that contributed to higher yields despite the low rainfall received in 2015/16. This suggests that low soil fertility is more constraining than low soil water content, even in the event of drought.

Conclusions

Enormous amounts of money have been invested in promoting CA over the past two decades, with limited benefits. This study helps explain

1 Planting was completed in 2015, and the harvest in 2016.

why. The promotion of CA, as this technology is commonly applied by smallholder farmers in ESA, will not build resilience to drought.

Although CA has advantages for long-term productivity improvement, the low rates of adoption suggest that many farmers do not find these techniques practical or profitable: Minimum tillage makes weed control more difficult; crop residues are more valuable when fed to livestock than when left in the field; and crop rotation can be expensive and difficult to maintain, especially on smaller landholdings.

Even more important, the study revealed that even in drier areas, low soil fertility appears to be a more binding constraint than limited soil water.

Based on these findings, CSA programmes should focus on promoting adoption of improved seed (especially of earlier-maturing varieties) and fertiliser (especially nitrogen-based top dressings). CA promotion appears to be a vector by which these improved farm management practices are being transmitted to farmers in low-rainfall areas. However, promoting fertiliser and certified seed directly, rather than as part of CA, may be a more efficient and effective way to improve crop yields in drought-prone areas.

References

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