Lead farmers and early adopters as agents for change
Conservation agriculture as a climate change adaptation practice to enhance productivity in Zambia

**KEY MESSAGES**

△ By acting as early adopters, lead farmers can stimulate other farmers to embrace conservation agriculture. Lead farmers can demonstrate the use of ripping technologies through farmer field schools.

△ To make climate-resilient agricultural technologies affordable for all farmers, they could be offered in both lower- and higher-priced packages; thus, farmers can upgrade if and when their financial situation improves.

**INTRODUCTION**

Climate change and its associated uncertainties increasingly threaten Zambia’s agricultural production and productivity. In the southern and central regions of Zambia, rainfall abnormalities and droughts have been observed since early 2000, with negative consequences for the production of the country’s main staple crop, maize. The Government of Zambia (GRZ) acknowledges the importance of agricultural development and food security goals and considers climate change adaptation as crucial to their achievement.

Indeed, the Zambian government, together with agricultural development partners throughout the country, widely acknowledges that climate change adaptation is a means to bolster the country’s agriculture sector against the detrimental impacts of climate change and reduce climate vulnerabilities.1 Zambia is recognized as a regional leader in conservation agriculture (CA), a set of climate change adaptation practices that have been practiced for nearly half a century in the country.2 Nevertheless, the large-scale adoption of CA practices has not yet occurred.

1 Climate-smart agriculture transforms and reorients agricultural systems to support food security under the new reality of climate change (Lipper et al., 2014).

2 Conservation agriculture is a farming system that promotes minimum soil disturbance (i.e. no tillage), maintenance of a permanent soil cover, and diversification of plant species. It enhances biodiversity and natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production (FAO, 2021).
This brief aims to provide policymakers and development partners in Zambia with information to familiarize them on how the promotion of CA amongst farmers can increase the country’s agricultural productivity. It agrees with the priority given by the country to improve capacities for large-scale CA adoption. The brief discusses lessons learned from the integration of climate change adaptation practices (and particularly CA) in cropping systems in Zambia’s Eastern Province, based on demonstration trials implemented by the Strengthening integrated adaptation planning and implementation in Southern Africa smallholder agricultural system to support food security project implemented through the Ministry of Agriculture with technical support of FAO.

**KEY FINDINGS**

**Tillage methods in eastern Zambia**

To reduce the impacts of climate variability and extreme weather events such as droughts, farmers in Zambia primarily practice minimum tillage, for a range of crops. Indigenous practices include the removal of the above-ground biomass and the digging of small planting holes using hand hoes in flatlands. Meanwhile, conventional tillage practices involve the removal of bushes or trees, after which ridges are made and crops planted. Under traditional practices, planting basins are used randomly by farmers for the conservation of both soil and moisture. Rip lines, basins, and boxed/tied ridges promote moisture retention and improve crop yields, especially in drier areas where moisture deficits are common. The soil conservation techniques that are promoted by institutions tend to be bigger, wider, and deeper and require the addition of external inputs such as herbicides, fertilizers, manure, or lime. Figure 1 shows tillage practices used during the 2017/2018 cropping season in the Mambwe and Nyimba districts of eastern Zambia.

![Figure 1. Groundnut yields across different tillage methods in eastern Zambia](Source: ZARI, 2018)
Crop yields and profitability under various tillage methods

Rip lines and tied ridges contributed to better yields compared to basins and untied ridges (see Figure for the yields of Lupande, a Zambian improved groundnut variety). This could be attributed to the ability of the method to conserve moisture during the growth period. Indeed, Hulugalle (1989) reported a greater profile water content for crops grown in tied ridges than for crops grown in untied ridges. As part of the project, the profitability analysis for Groundnuts grown under various tillage methods revealed that gross profit margins per hectare were highest for Groundnuts planted in ripped lines (50 percent), followed by Groundnuts in untied ridges (42 percent), tied ridges (41 percent) and basins (35 percent) (see Figure 2).

Figure 2: Yields of Lupande under different tillage methods

![Figure 2: Yields of Lupande under different tillage methods](image)

(Source: ZARI, 2019)

Figure 3: Gross profit margins per hectare (in percentage) for Lupande under different tillage practices

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Lead farmers’ perceptions of the use of conservation agriculture

Lead farmers in the Jumbe agricultural camp in the Mambwe district, eastern Zambia, helped carry out a group demonstration of CA through the project. The lead farmers were innovators who tried new experiments on their farms and transferred knowledge to other farmers. The lead farmers reported that they preferred animal-drawn soil rippers due to the perceived reduction of labor costs. Indeed, it reportedly took farmers two hours to rip one lima of land (0.25 ha) using animal-drawn rippers, compared to the two weeks it takes when ripping manually. However, some farmers may lack access to rippers (which reportedly cost USD 25) and/or draught animals. Water conservation techniques, including the digging of tied ridges and the construction of basins (15 cm deep, 30 cm long, and 30 cm wide, with a plant spacing of 75 to 90 cm and a spacing between basins of 70 cm), were reported to better conserve soil moisture than the previously used shallow pits. Lead farmers reported a tripling of maize yields during the 2017/18 season, from an average of 680 kg/ha (during the 2017/2018 crop season) to 2 290 kg/ha.

Promotion of conservation agriculture as a climate change adaptation practice

The field experiences show that non-lead farmers considered CA to be risky and laborious. They were reported to have poor access to labor-saving equipment and possess limited knowledge of its usage. It is therefore argued that the promotion of CA practices should be accompanied by efforts to improve farmers’ access to financing, as well as to markets for inputs and outputs. Evidence suggests that policies to promote CA technologies in Zambia should be differentiated to account for differences in the value of land and capital and
labor productivity (Branca et al., 2016) in various regions of the country. For example, the bulk of the land in Zambia is held under customary (i.e. communal) tenure, and its management is based on customary norms and principles (Hall et al., 2017). This limits possibilities for investments in new practices and technologies, such as CA. The climate change adaptation-related policies and strategies should further stimulate uptake and adoption by the farmers (Khoza, Niekerk, and Nemakonde, 2019).

POLICY OPTIONS

This policy brief shows that lead farmers were ahead in the implementation of CA practices because they could afford the technology. Meanwhile, other farmers considered CA as risky and laborious; they were found to have poor access to labor-saving technologies and/or the draught animals necessary to use (e.g. in the case of an ox-drawn ripper). This demonstrates that there is a need to increase the availability of low-cost rippers for smallholder farmers.

CA has been implemented in Zambia for decades. However, there is still a need to improve capacities at various levels including the active role of research and extension services to promote their uptake. To make CA technologies affordable for all farmers, they could be offered in both lower- and higher-priced packages; farmers can then upgrade when their financial situation improves.

REFERENCES


