SPONSORED BY THE

Federal Ministry of Education and Research

POLICY BRIEF

SASSCAL
Southern African Science Service Centre for Climate Change and Adaptive Land Management
WWW.SASSCAL.ORG

Issue 2 / March 2023

Promoting Full Conservation Agriculture for Improved Crop yield in Zambia

Bringing together Scientific Evidence and Policy insights

Full Conservation Agriculture is the combination of soil management principles of Soil Cover, Crop Rotation and Zero Tillage. The benefits seen in full conservation farming are: economical-early crop planting, time saving and less labor requirement; agronomical-increased organic matter, improved soil structure, improved water and nutrient use efficiency, increased and sustained crop production, reduction in erosion, reduced greenhouse emission and biodiversity increment.

KEY MESSAGES

- There is need to strengthen the adoption of Full Conservation Agriculture Technologies among small holder farmers by ensuring that those who access government farmer input support and food security programs also practice Full Conservation Agriculture.
- Practicing a single principle of conservation agriculture does not result in desired crop productivity, climate change adaptation, and mitigation.
- Soil conservation-based land management approaches such as Climate Smart Agriculture (CSA) should be promoted as a vehicle to promote Full Conservation Agriculture.
- There is need to intensify farmers outreach activities in promoting Full Conservation Agricultural practices and reduce on Extension Officer-Famer Ratio for effective deliverance and monitoring of extension services.

INTRODUCTION

The agriculture sector is the mainstay of Zambia's rural economy and thereby, the country's most significant sector. One of the major tasks of the current time is to ensure food and nutrition security to meet the needs of Zambia's growing population in a sustainable manner. To achieve this daunting task, there is a need to promote sustainable agriculture practices that contribute to the restoration of degraded soils and conservation of the biological diversity in light of climate stresses and shocks. Zambia's more than 1.5 million smallholder farmers produce about 80 Percent of domestic supply of food. However, they are tremendously vulnerable to climate stresses and shocks (CIAT; World Bank, 2017). Consequently, there is need not only to understand climate change effects but also to adapt current agricultural systems to these changes and their adaptation to regional soil fertility. According to the United Nations' Food and Agriculture Organization (FAO, 2022) a Full Conservation Agriculture is the combination of three soil management principles: Soil cover, Crop Rotation and Zero Tillage. Conservation agriculture has become a global driving concept in

supporting environmental protection, sustainable land-use management, and climate change adaptation and mitigation. Although Zambia has been considered as one of the leaders in promoting Conservation Agriculture in Sub-Saharan Africa, adoption of the practice by smallholders has been generally low and characterized by partial adoption (selective application of its principles) which in turn does not effectively support productivity, climate change adaptation, and mitigation (Aslihan et al., 2013).

METHODOLOGY

This policy brief is based on the findings of SASSCAL Task 157 under the SASSCAL 1.0 Research Call that was conducted between 2014-2017 based on three (3) years of on farm trials of maize rotated with soyabeans in Mkushi at Musakamba camp in agro ecological region III and another site was based in Kafue at Mungu camp in agro ecological region II. The experimental layout in this study used the two sites was an "omission plot" approach. Land portions measuring 50 m × 15 m were secured for each experimental site. Loose soil samples were collected from the proposed experimental sites for the purpose of determining the baseline soil physical and chemical characteristics of the soils. Maize and soybeans were used as test crops. The treatments used comprised Full-CA principles (Rotation, Zero-tillage, Soil cover) vs. conventional agricultural practices (farmer practice) and also improved fallow with sunnhemp, all arranged in a Randomized Complete Block Design (RCBD). Periodically, check ups on the responses of the treatments were undertaken and soil sampling done to monitor microbial development and measure treatment effects and also analyze organic matter build up and microbial biomass in sampled treatment plots.

RESULTS

- The results in three years period show that the crop yields were higher in the Full Conservation Agriculture plot in comparison to other treatment plots as shown in Figure 1 for the sites in Mkushi and Kafue.
- ***Practicing a single principle of conservation agriculture does not result in desired improvement in crop yields.*** Whereas each conservation principle has its own contribution, this contribution is not significant when the principle is applied in isolation.

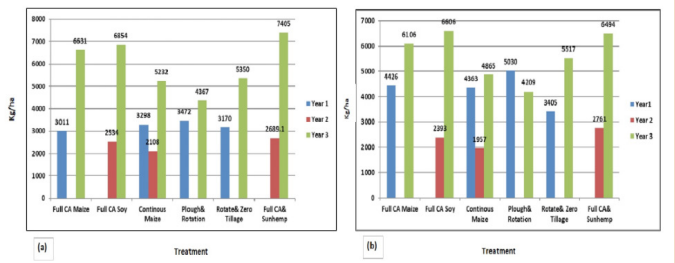

Fig 1. Maize yield obtained for each treatment in each of the three years of the trial (a) Mkushi and (b) Kafue Sites (Source SASSCAL Task 157)

- Comparatively, generally in absolute terms Mkushi had greater yield than Kafue site as shown in Table 1. These differences could be attributed to differences agro-ecological region characteristics. ***But what is certain is that in both regions, Full Conservation agriculture performed much better than other treatments.***
- When Full-CA was combined with other soil heath building practices like the ***incorporation of green manures, it greater yields as*** shown in Table 1.

- It was also observed that levels of ***organic matter content were highest in plots where Full Conservation agriculture was applied.*** This also shows that when all the CA principles are applied, there is a positive synergy that results in soil improvement there by resulting in more agricultural productivity.

Table 1: Average yield data for 3 years in Mkushi and Kafue (Source SASSCAL Task 157)

Treatments	District	
	Mkushi	Kafue
	Yield (Kg/ha)	Yield (Kg/ha)
FULL CA (All the 3 components)	6631	6106
Soil cover &Minimum tillage (No rotation)	5232	4865
Conventional tillage, Rotation &soil cover (No Zero Tillage)	4367	4209
Rotation & minimum tillage (No soil cover)	5350	5517
FULL CA (All the 3 components)+ Green manure)	7405	6606

Note: Green manure (sun hemp or Crotalaria juncea was planted and cut and left to decompose).

"Practicing Full Conservation Agriculture (Soil Cover, Crop Rotation and Zero Tillage) results in improved crop yield"

CONCLUSION

Practicing Full Conservation Agriculture has the potential of improving crop yields, promoting food security and resilience to climate stresses and shocks among small holder farmers in Zambia. Consequently, the need to continue promoting agricultural practices that promotes farming systems that are resilient to the effects of climate change.

CALL-TO-ACTION

- There is need for government through the Ministry of Agriculture and Ministry of Community Development and Social Services to promote and accelerate the adoption of Full Conservation Agriculture by ensuring that those who access government farmer input support and food security programs also practice Full Conservation Agriculture. This should be accompanied by robust monitoring.
- There is need for The Ministry of Agriculture through the Zambia Agricultural Research Institute (ZARI) to develop innovative Full Conservation Agriculture farming training materials for farmers.
- The success of conservation agriculture is also highly dependent on changing the mindset of small-scale farmers. Consequently, the Ministry of Agriculture should ensure that extension services continue promoting the adoption of Full-CA through farmer trainings, sensitization and practically showcasing the benefits. The extension officer-famer ratio should also be reduced to ensure effective deliverance of extension services.
- The Ministry of Agriculture to promote the implementation of conservation agricultural practices, diversification, intercropping as part of farming production systems that are resilient to the effects of climate stresses and shocks. This can ride on the government Comprehensive Agriculture Support Program (CASP) initiative which offers opportunity for smallholder farmers to diversify their farming.

Acknowledgement: Southern African Science Service Center for Climate Change and Adaptive Land Management (SASSCAL) is grateful for the financial funding by The Germany Ministry of Education and Research (BMBF) for supporting Project Task 157 research work through SASSCAL Research Portfolio 1.0. Project Sub-Grant Number 01LG1201M. Thanks, are also due to the entire SASSCAL Task 157 Project Team for research activities and the Zambia Agricultural Research Center (ZARI) for hosting the project.

References

Aslihan, A., McCarthy, N., Lipper, I., Asfaw S., & Cattaneo, A. (2013). Adoption and intensity of adoption of conservation farming practices in Zambia. ESA Working paper 13-01.

CIAT; World Bank, (2017). Climate-Smart Agriculture in Zambia. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT), Washington, D.C

FAO, (2022). Conservation Agriculture. Retrieved July 25, from https://www.fao.org/conservation-agriculture/en/

Authors: Chomba, I. Chomba, Dr. Nguni Dickson, Dr. Martin Mbewe, Geoffrey Siulemba, and Morris Manyika