



October **2018**

# POLICY BRIEF

## CONSERVATION AGRICULTURE: *CAN IT SAFEGUARD OUR SOILS?*

### Introduction

Smallholder farmers dominate the agriculture sector in Kenya. However, it is becoming more difficult for these farmers to sustain crop productivity due to infertile soils, coupled with poor farming practices and the effects of climate change. The situation is aggravated by high population pressure and less land available for cultivation. Hence, there is need for sustainable land management systems that not only enhance crop productivity but also environmental protection and climate change adaptation and mitigation.

Conservation agriculture (CA) is a farming system with the potential to enhance soil quality by

preventing losses in arable land while regenerating degraded lands<sup>1</sup>. If well adapted to local conditions, CA can enhance development of sustainable crop production systems that are resilient to the effects of climate change. It allows an increase in natural biological processes that enhance soil biodiversity which in turn contribute to better water and nutrient use efficiency by plants and to improved and sustained crop production. It counters the main drivers of soil degradation especially unsustainable human activities such as continuous tillage without adequate nutrient replenishment, deforestation and other activities that expose the soil to erosion agents.

**Smallholder farmers need sustainable farming practices that can address the problem of declining soil fertility and achieve the dual goals of enhanced food production, and adaptation and resilience to changing climatic conditions. Conservation agriculture (CA) is one such approach with a potential to enhance soil quality and crop productivity.**

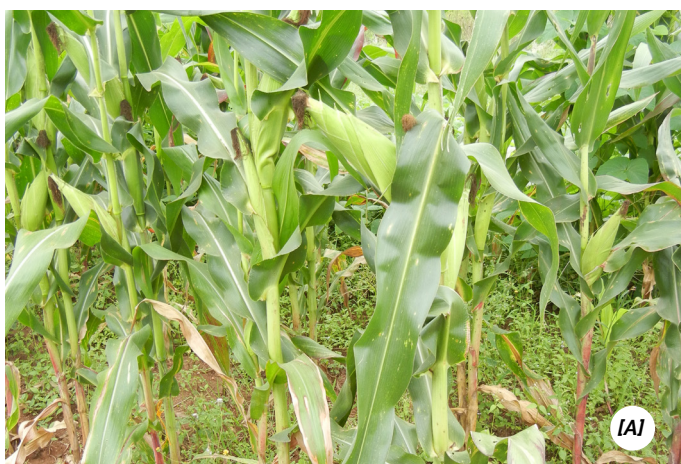
## Implementation of Conservation Agriculture

The practice of CA involves three principles or components that are applied at the same time on farmers' fields:

1. Minimum or reduced soil disturbance<sup>1</sup>: Direct seed and/or fertilizer placement into the soil using jab planters or other mechanized implements greatly reduces soil disturbance. This reduces soil erosion and preserves soil structure.
2. Soil cover by use crop residue or cover crops (with a minimum of 30% soil cover)<sup>1</sup>. Maintaining a protective layer of vegetation on the soil surface suppresses weeds, protects the soil from the impact of extreme weather patterns, helps to preserve soil moisture, and avoids compaction of the soil.

3. Crop diversification or associations (with greater than three crops in rotation)<sup>2</sup>. A well-designed crop rotation promotes good soil structure, fosters a diverse range of soil flora and fauna that contributes to nutrient cycling and improved plant nutrition, and helps to prevent pests and diseases.

The CA principles are generally applicable to a wide range of agricultural landscapes and land uses but need adaptation to fit local conditions. Specific interventions such as normal soil tillage are reduced to an absolute minimum but complimented by adequate soil cover<sup>3</sup>. Selection of crops to include in rotation systems combines cereals and legumes in such a way to enhance biological processes such as nitrogen fixation and optimal application of plant nutrients mainly mineral fertilizers or organics (Figure 1).



**Figure 1:** Conservation Agriculture Practices [A] Maize field under minimum tillage and [B] Cover crop

## Benefits of Conservation Agriculture

The benefits farmers get from conservation agriculture are due to the positive impact of reduced soil disturbance, crop rotation and enhanced soil cover combined with good agronomic practices. Improvements in soil and overall land management result in increased crop yields leading to sustainable crop production systems. The advantages of each of the components can be unique but the overall effect is more evident.

### Advantages of minimum tillage:

- Lower land preparation costs due to savings in labour, fuel and time
- Maintains soil structure, improves infiltration and conserves soil moisture
- Protects the soil against erosion by water and wind

### Advantages of permanent soil cover:

- Soil cover suppresses weeds
- Reduces the impact of raindrops on soil and protects it against erosion
- Enhances soil organic matter accumulation and nutrient cycling

### Advantages of crop rotation:

- Improves nutrient and water use efficiency at different depths
- Controls pests and diseases
- Leguminous crops fix nitrogen in the soil

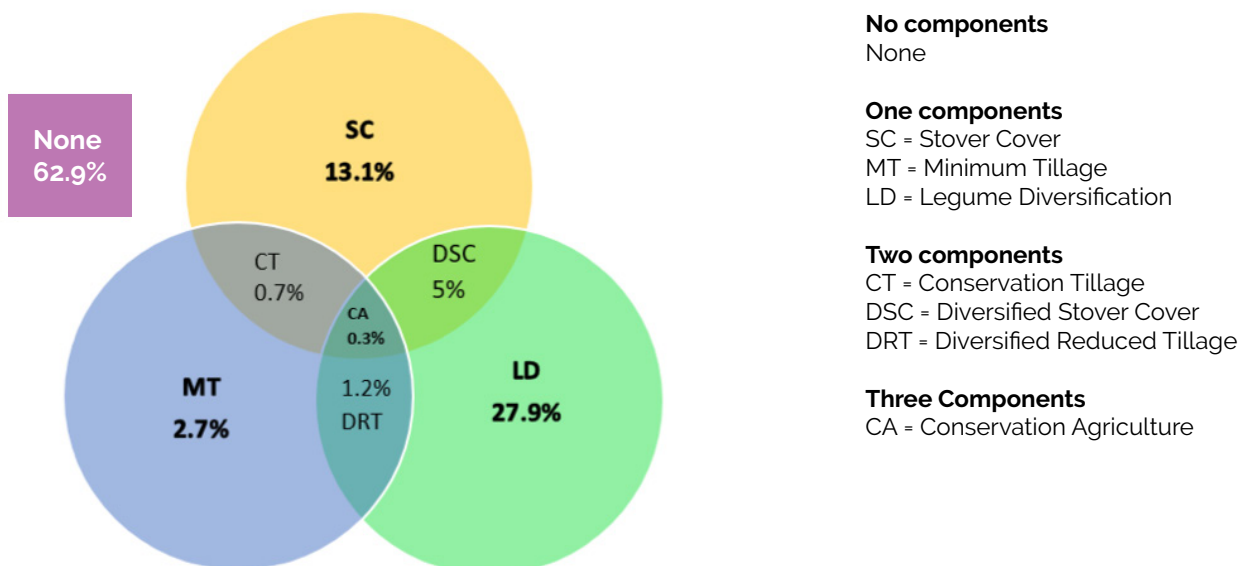
## The Farmer's Viewpoint

Most smallholder farmers operate with limited resources of land, labour and other inputs. Hence, the choices they make are informed by availability of the required resources and the perceived gain. Additionally, the farmers tend to minimize risk by practicing what they are used to "business as usual" and try to avoid unfamiliar practices or technologies. Similarly, for conservation agriculture, the farmers tend to select and implement CA components that they perceive to be most applicable to their situation.

For widespread adoption by most small-scale farmers in Kenya, conservation agriculture needs to be tailored to the local conditions within which the farmers operate. The benefits and advantages of CA have to be attractive to a broad group of farmers and be able to meet their requirements at

the household level. Specifically, farmers expect immediate improvement in crop yields and easier management of CA fields which in reality is not practical.

It is therefore, recommended that smallholder farmers be allowed the flexibility to implement CA components that are more feasible in their context. An assessment of farmers' adoption of the different components of CA in East and Southern Africa, shows remarkable differences in farmers' selection of CA technologies<sup>2</sup>. For the over 27 thousand plots data used, only 0.3% practiced a full CA system with all the 3 components being implemented at the same time. Around 7% implemented two components and 43.7% implemented only one component. In total, around 63% of the plots didn't qualify as a CA system (Figure 2).



**Figure 2:** Conservation Agriculture components as practiced by smallholder farmers in East and Southern Africa (Adopted from Brown et al., 2018)<sup>2</sup>

## Factors Enabling Uptake of Conservation agriculture

Some of the processes and developments that have led to increased utilization of CA technologies outside the African context<sup>2</sup> include:

- Realization that conventional production systems contribute to soil degradation and productivity is input intensive
- Intensification of crop production relied on economic stimulus to farmers
- Economic stimulus were met by input markets (especially herbicides and locally manufactured machinery)
- Strong perceptions that CA reduces costs of production through substitution of tillage with herbicides, timely planting and increased efficiency of input use
- Farmer driven innovation groups facilitated locally relevant participatory adaptation of CA
- Local input markets facilitate machinery development and availability and increased herbicide availability
- Government enactment of policies favourable to CA and other sustainable agriculture in general



Whereas, the African context is unique and complex, there is need to understand the farmers' decision making process at four levels (individual, household, community and institutional) and the support need

at each level to enhance adoption<sup>2</sup>. What most smallholder farmers need is an enabling socio-economic and political environment to adapt CA practices to the local conditions.

## Policy Recommendation

1. Financial investment is required in smallholder agriculture to stimulate households to expand and intensify production with a stronger market orientation. This may also promote a strong input market especially for CA machinery and herbicides.
2. Creation of strong farmer-owned institutions to provide services to smallholder farmers. The focus should be on development of structures to empower farmers to organize collective movements, collaborate with key stakeholders, and modify CA practices to their local situations.
3. Promote industries that produce conservation agriculture tools and implements. Farmers will adopt CA step-wise and eventually move towards a full CA system.

## Acknowledgments

*Preparation of this policy brief was supported by the AgriFoSe2030 programme and the International Livestock Research Institute (ILRI) with financial support from the Swedish International Development Agency (SIDA). I wish to thank Stephen Wambugu for his valuable technical input and Anne Nyamu for the excellent editorial support.*

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