CIMMYT

SIMLESA
Sustainable Intensification of Maize and Legume Systems for Food Security in Eastern and Southern Africa

Ministry of Agriculture, Irrigation & Water Development

Australian Government
Australian Centre for International Agricultural Research

**COUNTRY POLICY BRIEF** ENHANCING AGRICULTURAL RESILIENCE AND SUSTAINABILITY IN MALAWI

# Soil Health is Economic Health: Conservation farming improves soil fertility and boosts incomes

## Summary and key facts

**Malawi loses vital soil nutrients due to erosion on degradation of arable land impacting food production.**

**SIMLESA results have shown that conservation agriculture-based systems led to roughly a 30% increase in soil organic carbon compared to baseline practices.**

**Action to replenish soils is essential if natural resource base is to be restored and soil fertility ensured.**

**Mainstreaming Conservation Agriculture-based Sustainable Intensification practices in formal agricultural extension system can help the spread of environmentally beneficial and yield enhancing practices**

## What is the problem?

### Soil degradation, threatens food and income security in Malawi

Declining soil fertility as a result of land degradation continues to be one of the core causes of food insecurity among smallholder farm households in Malawi. On average, Malawi loses in excess of 30 kg of Nitrogen and 20 kg of Phosphorus per hectare per year through erosion on arable land. Therefore, if farmers do not adopt improved agricultural practices like Conservation Agriculture-based Sustainable Intensification (CASI), their livelihoods shall continue to be at risk.

Malawi's agricultural sector is characterized with a dualistic structure, i.e. high input/high productivity estates that comprises a small number of large-scale farmers, occupying about 60% of the fertile land and producing almost entirely for the domestic and export market. This is in comparison to a low input/low productivity smallholder sector, that is dominated by a very large number of farmers growing mainly low-yield food crops on small plots with minimal input use.

The majority of farmers are prone to varied weather shocks and hazards including floods and droughts which have risen in frequency and magnitude in recent years. Rising temperatures, deforestation and land degradation undermine the livelihoods of farming communities and exacerbate the extent of food insecurity and rural poverty. This is compounded by the increase in population which puts pressure on the natural resource base and their overreliance on rainfed agriculture. In such a situation, soil fertility replenishment options become an obvious reaction if the natural resources capital base is to be restored.

# What solutions were identified from research?

## Conservation farming methods can help stem soil degradation

In 2010, the International Maize and Wheat Improvement Center introduced the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project in Malawi to increase smallholders' food and nutrition security, and income levels by integrating sustainable intensification practices to increase productivity while simultaneously protecting th environment. The particular mix of technologies developed by SIMLESA are known as Conservation Agriculture-based Sustainable Intensification (CASI). These practices were studied in a series of on-station and on-farm trials that were spread across contrasting agro-ecologies.

Technologies tested included different conservation agriculture components based on the three principles namely reduced soil disturbance, provision of permanent soil cover and use of crop rotations/associations. The tests involved a comparison of different crop establishment techniques such as Conservation Agriculture (CA) basins versus dibble stick, rotations versus intercrops and sole crops and herbicide assisted weed control versus manual hoe weeding. Legume test crops were selected on the basis of local farmer preferences and their potential.

**Effect of Conservation Agriculture-based Sustainable Intensification systems on soil quality.** After six years of implementation of CASI based practices, soil quality changes in terms of aggregate stability were quite evident in most project sites. Soils in Kasungu district that had been under CASI were much darker in colour. Soil organic carbon analysis from Kasungu and Salima districts in 2016 suggested that the soils under CASI based rotation systems had increased from 4.8 to 6.3 kg/Mg and from 14.9 to 19.5 kg/Mg being equivalent to roughly a 30% increase in soil organic carbon from the conventional till systems for Kasungu and Salima district sites, respectively.

Consequently the use of these practices, in particular the provision of surface residue cover, helped to improve water transmission in CASI systems. Thus, across all sites, water infiltration characteristics measured by the time to pond method increased by between 60% and 90% in CASI systems relative to the conventional ridge and furrow system. These benefits also led to at least 30% increased water content and also led to maize yield increases ranging between 10% and 50% across both agro-ecologies.

Ordinarily the most common farming methods lead to surface ponding and consequently results in high runoff and soil loss leading to the observed high soil degradation in conventional cropping systems.

**CASI based practices led to**

**60-90%**

**increase in water infiltration**

**and**

**10-50%**

**increase in maize yield**

# What are the opportunities for policy action?

## Increase funding for long term research, strengthen farmer incentives for CASI adoption

The health of soil provides the basis for agricultural sustainability and resilience. Investing in soil health is thus a critical step towards sustained and improved resilience of cropping systems. Specific actions need to be taken to build farmers capacity to invest in soil health using CASI practices in particular.

### Mainstream CASI practices into Malawi's formal agricultural extension

Mainstream CASI practices into Malawi's formal agricultural extension system. This would help accelerate awareness, information flow and needed programming budgets. Focus should be on the incentives and motivations needed to encourage farmer uptake of technologies. Once these incentives and risk reducing measures are identified, they should be built into extension and private sector market development programs. Examples of such ideas include free trials or money-back guarantees for machinery. Others considerations could be insurance against crop failure conditional on adoption of CASI or other improved farming methods.

### Increased funding in long term soil research

This will enable more research on the topic to explore options for enhanced knowledge of CASI based systems among extension workers and farmers. The existing evidence base needs to be beefed up further. Continued refinement and testing under more socioeconomic, agro-ecological and policy circumstances is warranted. This can be achieved by budgeting for research activities within existing climate change programs. The point is to increase the amount of evidence available as the basis for scaling CASI to more farmers or locations.

> **Examples of market incentives needed to encourage farmer uptake of technologies include free trials or money-back guarantees for machinery**

# Why Act Now?

The absence of specific actions will lead to continued pressure on land leading to degradation and farmer vulnerability to shocks. The lack of action will only postpone the time when Malawian agriculture can start to progress towards higher productivity, better resource management and development. These actions need to be tested, tried and scaled widely as a matter of national development urgency.

## References and sources


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