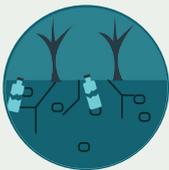


Conservation farming boosts production and resilience in maize agriculture systems

Summary and key facts



Degraded soils and poor farming methods lead to low production and vulnerability of smallholder farming systems in Kenya.



A paradigm shift based on Conservation Agriculture-based Sustainable Intensification (CASI) has been tested and found effective to improve production and climate-resilience.



CASI practices can reduce labor costs by up to 56%. Potential net annual financial returns are estimated as \$1,500/ha using CASI methods compared to \$900/ha using conventional methods.



Adoption of successful CASI practices remains low. Greater investment in extension and farmer education is needed. Building stronger links of CASI science and society can increase awareness of the benefits and drive adoption.

What is the problem?

Aggressive tillage leads to soil degradation and limits maize yield potential

Degraded soils are a key driver of food insecurity and poverty in Kenya. Soils are being depleted of the vital nutrients needed for healthy maize plant growth. Without healthy soil the production of maize crops suffer. The poor soil health is mainly due to poor and unsustainable land management practices, such as monocropping. Most smallholders use

manual labor and aggressive tillage methods for most farm operations, which disturb the soil resulting in soil erosion and loss of plant nutrients. The use of manual labor causes excessive drudgery, especially to women who produce 60–80% of food and discourages the involvement of youth in agriculture.

What solutions were identified from research?

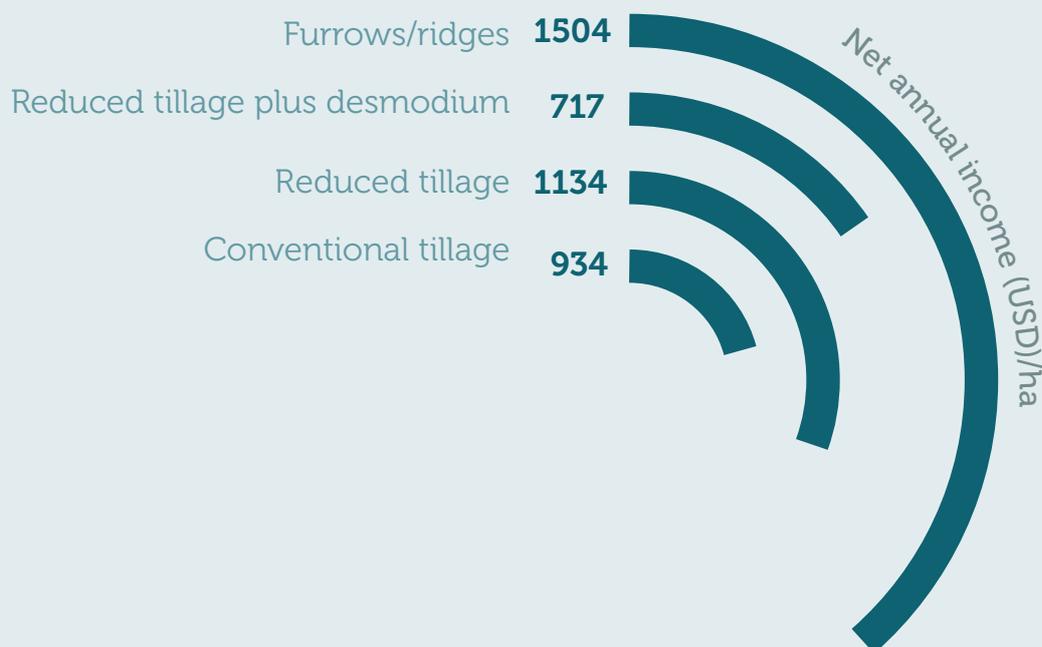
Conservation Agriculture-based Sustainable Intensification practices can improve maize yields, reduce farmer drudgery

In 2010, collaborative research under the Sustainable Intensification of Maize-Legume Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project was launched in Kenya. Multidisciplinary researchers from the Kenya Agricultural and Livestock Research Organization (KALRO), the International Maize and Wheat Improvement Center (CIMMYT) and other international collaborating institutions sought to understand how smallholder farming systems in Kenya can be more productive, profitable and sustainable while safeguarding the environment in an equitable manner. The project sought to increase smallholder productivity and resilience through Conservation Agriculture-based Sustainable Intensification (CASI).

SIMLESA researchers and participating farmers trialed CASI practices in different agroecologies, identifying a package of practices based on reduced tillage, crop residue retention/ mulching and crop rotation/ intercropping while promoting good agricultural practices such as use of improved seed.

Evidence gained from research activities showed locally-appropriate CASI practices can increase maize yields by maximizing limited resources, hence providing resilience to climate shocks, such as rising temperatures and erratic rainfall. SIMLESA national scientists in collaboration with the ministry of agriculture, tested several modalities that can be used to scale out CASI technologies.

Average net income from CASI practices and conventional practices



CASI practices improved the income of smallholder farmers on SIMLESA project sites. The results showed that intercropping maize and beans under CASI yielded US\$ 7 for every dollar invested compared with US\$ 4 for every dollar under conventional methods.

The results also indicated that more than 80% of the labor associated with conventional tillage farming is attributable to land preparation and weed control. Under CASI, zero

or reduced tillage practices significantly reduced the labor burden. Upon shifting from conventional methods to conservation agriculture, the labor costs reduced by 56% – from US\$ 418.25 to US\$182.50 per/ha. These labor savings can potentially have important health and economic benefits. For labor constrained farmers, especially women; who provide labor for housed care in addition to providing large amounts of agricultural activities. Women provide 60-80% of agricultural labor going by many current estimates.

What are the opportunities for policy action?

Invest in knowledge systems and farmer education

Studies conducted under the project show that investing in CASI brought better farm yields, labor savings and high returns on investments. These results point to important opportunities for policy action.



Link the science to society: Invest in long term research and knowledge systems

CASI's positive impacts on yield, financial returns and labor savings provide an opportunity to improve food security and livelihoods if farmers adopt on a wide scale. The basic principles underpinning CASI remain novel and require continued study. At the policy level more work needs to be done on how to achieve successful integration of CASI in smallholder farming systems. Moreover, the current evidence base needs to be built up in time and

scale. Knowledge management systems are needed to gather, curate, analyze, synthesize and communicate the scientific findings. More importantly show their relevance and how they solve farmers' problems and those of society. Continued refinement and testing under more socioeconomic, agroecological and policy circumstances is warranted.



Invest in farmer education through national networks of CASI demonstrations

The benefits of CASI should be farmer centered as the basis of achieving social goals. Therefore, the promotion and implementation must present the evidence in ways that farmers can objectively observe and understand. An important opportunity is to exploit the national and regional networks created by SIMLESA and similar projects to continue the public-private

partnerships for running networks of large and visible demonstration sites. This will help build farmers technical capacity. Mainstreaming CASI in agricultural curricula in schools and mid-level agricultural colleges will institutionalize CASI concepts and practices and raise the capacity of extension staff and other value chains actors.

Why act now?

The emerging and existing challenges facing Kenya's food systems require urgent and fundamental interventions. Resource depletion, population pressures, climatic and economic changes require fundamental paradigm shifts in production systems. Moving away from non-conserving

practices is crucial. The adoption at scale of conservation farming practices and its derivatives can help in moving Kenya's maize production systems towards sustainable intensification.

References and sources

1. Nkonge, C., Micheni, A., Ayaga, G., Odendo, M., Ndinya, C., Rono B. and Murithi, C. (2019). Enhancing resilience and sustainability on african farms: key findings and recommendations for Kenya. SIMLESA project country synthesis report. CIMMYT/KALRO. El Batan/Nairobi.

Please also visit us at:

www.simlesa.cimmyt.org for more publications and data on Kenya and other SIMLESA program countries

Acknowledgements

Financed by the Australian Centre for International Agricultural Research (ACIAR), SIMLESA program was led by the International Maize and Wheat Improvement Center (CIMMYT) in collaboration with Kenya Agricultural and Livestock Research Organization (KALRO), numerous partners, including national agricultural research institutes in Ethiopia, Malawi, Mozambique, Rwanda, Tanzania and Uganda in collaboration with other CGIAR centers. Other regional and international partners include Queensland Alliance for Agriculture and Food Innovation (QAAFI) of the University of Queensland, Australia and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), among others.

For further enquiries please contact

Charles Nkonge, SIMLESA Kenya Country Coordinator
Email: charles.nkonge@kalro.org/charlesnkonge@gmail.com phone +254 020 722327936

Martins Odendo, SIMLESA Coordinator for Social Sciences
Email: odendos@yahoo.com

Bernard Rono, Social Scientists
Email: Bernard.Rono@kalro.org

Alfred Micheni, SIMLESA Coordinator for Agronomy.
Email: Alfred.Micheni@kalro.org/alfredmicheni@yahoo.com

George Ayaga, SIMLESA Coordinator for Scaling
Email: ayagag@yahoo.com

Virginia Wangari, Communications Officer, KALRO
Email: wangarindungu123@gmail.com

Catherine Muriithi, Seed Systems Specialist
Email: muriithicatherine16@gmail.com

Christine Ndinya, Coordinator Seed Systems
Email: christinendinya@yahoo.com