Wetting Africa's appetite:

Conservation Agriculture is turning rainfall into higher crop yields — and catching on

Source: ICRAF.

In Africa, an estimated 200 million people are severely undernourished (1). To feed the continent's growing population, agricultural productivity will need to double in the coming decades — a statistic that has leaders calling for 'Africa's Green Revolution' (1). Such a transformation of the agricultural sector will have to boost crop yields, while ensuring the sustainability of soil, crops and water resources (1, 2). Despite the potential for Conservation Agriculture (CA) to meet these goals, the approach has not been widely adopted in Africa (2). RELMA-supported studies have developed a new CA that is tailored to the African context — where agriculture is largely rainfed — thus supporting adoption and implementation across the continent (2, 3).

INSIDE:

African-style CA

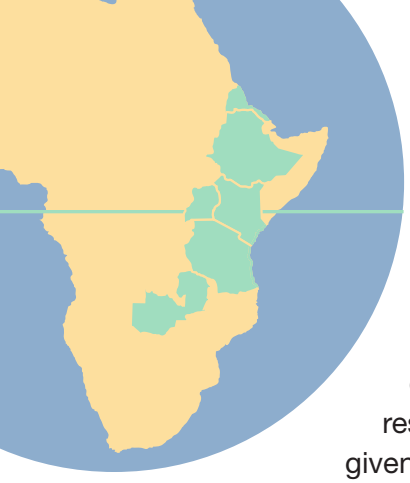
RELMA and its partners have developed a new African-style CA aimed at increasing water use efficiency — rather than maintaining soil cover — and applying fertilizers to counteract soil nutrient depletion.

Fostering adoption

Experiences in southern and eastern Africa have revealed a simple formula to promote CA adoption in Africa: combine African-style CA with farmer education and training.

RELMA

The Regional Land Management Unit (RELMA) was closed in 2006. The third issue in a four-part review series, this leaflet examines RELMA's involvement in promoting Conservation Agriculture (CA) in eastern and southern Africa. CA activities will be continued by the Land and People Theme of the World Agroforestry Centre (ICRAF).



The Challenge:

Conservation Agriculture (CA) has the potential to boost crop yields, while securing the sustainability of soil, crops and water resources— the prescription given for a green revolution in Africa (2, 5). But early experiences across the region have researchers re-thinking CA — and the colour of revolution.

> *We need a blue revolution where more food is produced per unit water — i.e. more crop per drop.*
>
> *~ Kofi Annan, Former UN Secretary General Millenium Declaration, 2000*

Traditionally a three-prong approach to farming, CA involves: maintaining permanent soil cover (at least 30% mulch cover), practicing non-tillage methods to reduce soil disturbance, and implementing crop rotations that introduce nitrogen-fixing leguminous species to help restore soil fertility (6, 2).

CA originated — and has been most successful — in sub-humid to humid regions of North America, Latin America and select areas in Asia, where water is not a limiting factor in crop production (1, 2).

The realities in Sub-Saharan Africa are quite different. Water is a limiting factor. Large tracts of land are classified as arid and semi-arid, with distinct dry seasons lasting 7-9 months. Millions of farmers work small plots and depend on rain-fed agricultural systems without irrigation, leaving them vulnerable to climatic variability (1, 2).

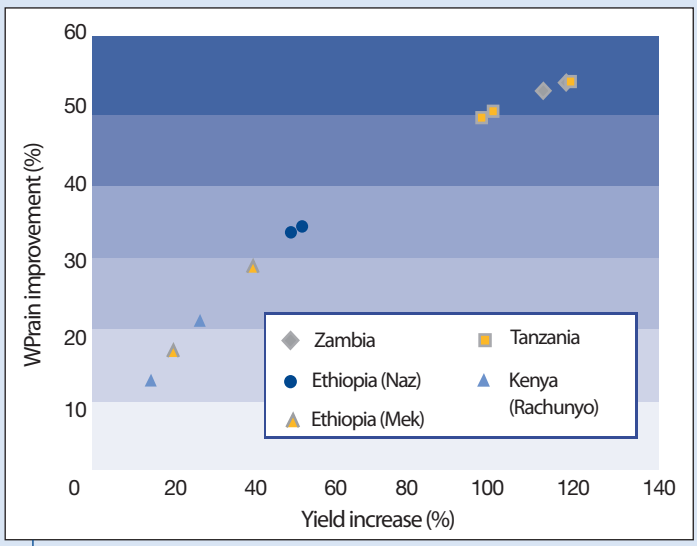
Often nutrient depleted, soils — already desiccated by the hot, dry climate — are left exposed to the effects of weather, erosion and deforestation. The intensive rainfall typical of the short rainy seasons can be particularly damaging, leading to soil crust formation and high run-off rates (2, 3).

Traditional CA is poorly suited to these conditions, particularly the provision for permanent soil cover. Seasonal rains leave little time for growing mulch or nitrogen-fixing species (2). Mulch shortages are worsened by the frequent coupling of agriculture with livestock rearing, which creates competing demands for crop residues, which are used for fodder, fiber, fuelwood and construction — rather than as mulch for covering soils (2).

To be effective in water scarce Sub-Saharan Africa, CA needs to be re-defined to support a 'blue revolution' where water is managed to boost the productivity and the sustainability the agricultural sector.

African-style CA

Researchers from RELMA and its partners* trialed a pared down version of CA in 4 countries (Ethiopia, Kenya, Tanzania and Zambia) and found that the yields of staple crops — mainly maize and tef — increased (2).



Source: Rockstrom et al, 2006.

As water productivity (WPrain) increases, crop yields rise.

What's done differently?
- Drop the mulch requirement
- Focus on non-tillage methods
- Promote efficient use of organic fertilizers

How does it work?
- More rainfall is directed to crops
- Nutrient-poor soils are enriched

The largest gains in water productivity were achieved in dry areas, marking CA as an important tool for mitigating the impacts of climate change (2).

** This reasearch was performed between 1999 and 2003, in cooperation with the Stockholm Environment Institute (SEI), the Kenya Network for the Dissemination of Agricultural Technologies (KENDAT), the Tanzania Department of Agriculture, and the Kenya Agricultural Research Institute (KARI).*

Fostering adoption:

Despite the demonstrated potential for the new African-style CA to sustainably boost crop yields, the approach has not been widely adopted in Africa (2). Recent case studies provide insight into the steps that must be taken to support CA uptake.

Zambia

Adaptation to suit local circumstances helped CA to take hold in Zambia, which achieved a 10% adoption rate — one of the highest in Africa — representing 70,000-100,000 smallholder farmers (3).

RELMA had teamed up with ACT, FAO and CIRAD to promote traditional 3-step CA (with an emphasis on non-tillage) in the semi-arid provinces in the south of the country.

However, only 25% of participating farmers implemented all 3 of the traditional CA measures (3). As observed in eastern Africa, the least popular — and most often ignored — provision was the use of mulch to provide minimum soil coverage (3).

Still, the adapted CA resulted in higher maize yields, an increase again linked to water harvesting benefits and precise input management, as well as early planting (3).

Labour declined with the advent of new tools for soil ripping. While the introduction of a locally developed, low-cost herbicide ('Zamwipe') helped to decrease the burden of weeding (3).

Another important component of the successful CA adoption in Zambia was the distribution — either free or on credit — of input packages comprising seeds, fertilizer and lime (3).

However, researchers warned that farmers had a tendancy to attribute higher yields solely to additional inputs. Capacity building efforts are needed to educate farmers on the synergies between CA and external inputs (3).

Eastern Africa

Researchers in eastern Africa found lack of awareness about the benefits of CA affected farmers' willingness to commit to the new practices. To tackle this challenge, the study involved farmers in every step from project design through to implementation, and maintained close ties with national extension services providers (2).

Extension services were also singled out as the best pathway to reach rural smallholder farmers during a recent RELMA-sponsored Stakeholders Workshop on Improved Land Management in the Lake Victoria Basin (LVB), held 14-16 February 2007. Farmers and extension workers alike prioritized awareness building exercises to share out CA knowledge that they felt was currently concentrated at higher policy levels.

In the LVB, uptake of CA technologies is highest amongst wealthier farmers and commercial producers (7). Partly attributable to stronger risk aversion on the part of the poor, this trend could be dampened by financial support to lessen costs associated with adoption.

Zambia benefited from a clear and coherent national-level policy framework to support the adoption of CA — a provision lacking in the riparian nations bordering Lake Victoria (3, 7). In addition to national-level policies, the LVB will require cross-border policies and implementation to be most effective.


Source:FAO

New equipment, such as the jap planter, minimizes soil disturbance and decreases labour requirements.

The way forward:

To gain a foot-hold in Africa, Conservation Agriculture (CA) needs to evolve to suit the biophysical and socio-economic realities of Sub-Saharan Africa. This includes being flexible on soil cover requirements and emphasizing the role of water harvesting in hot, dry climes — a function that can be supported by additional water harvesting efforts.

The prospects are promising. Working definitions of African-style CA have been trialed, and shown to increase agricultural productivity and incomes, while preserving soils and water resources.

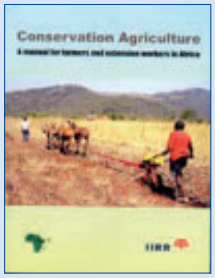
While not possible in arid and semi-arid regions, areas that enjoy higher annual rainfall — like the LVB — can support the integration of select agroforestry measures into CA. One possible example is the rotation planting of nitrogen-fixing tree species such as *Calliandra calothyrus* and *Sesbania sesban* to meet soil fertility requirements.

Technologies will need to be bolstered by capacity building and training, that pull together diverse stakeholders in the agricultural sector to provide farmers with the science, policy and financial support they require to integrate the new techniques into their agricultural practices.

African-style CA can engender a much-needed 'African Blue Revolution' capable of sustainably boosting crop yields through efficient use of water resources, even in times of climatic instability.

3rd World Congress on CA

Many African CA experiences were shared at the 3rd World Congress on Conservation Agriculture, held 3-7 October 2005 in Nairobi, Kenya. This major gathering brought together numerous stakeholders in agriculture and rural development to examine the prospects for improving CA adoption and impact across SSA. The meeting was also a critical step in galvanizing the first clear commitments to CA on the part of African governments. Following the Congress, the International Institute of Rural Reconstruction (IIRR) published a comprehensive extension manual for Conservation Agriculture in Africa. For more information, visit: www.iirr.org/bookstore/index.php?product_id54



The Congress was organized by African Conservation Tillage Network (ACT), Ministry of Agriculture of Republic of Kenya and the Kenya Conservation Tillage Initiative (KCTI) in association with the New Partnership for Africa's Development (NEPAD) and with the support of a host of partners, including RELMA, FAO, GTZ, CIMMYT, SADC, NEPAD, KCTI and CAAPAS.

References:

1 Millenium Development Goals Technical Support Centre, Nairobi (Kenya). December 2004. Africa's Green Revolution: A Call to Action. The Proceedings of the July 5th, 2004 High-level Seminar, covened by the Government of Ethiopia and the United Nations Millenium Project, in Addis Ababa, Ethiopia.

2 Rockstrom, J, Kaumbutho, P, Mwalley, J, Nzabi, AW, Temesgen, M, Mawenya, L, Barron, J, Mutua, J, and S Damgaard-Larsen. 2006. Conservation Farming Strategies in East and Southern Africa: A Regional Analysis of Yields and Rainwater Productivity from On-farm Action Research. Soil & Tillage Research (In Press).

3 Baudron, F, Mwanza, HM, Triomphe, B, Bwalya, M, and D Gumbo. 2006. Challenges for the adoption of Conservation Agriculture by smallholders in semi-arid Zambia. Online: www.relma.org.

4 Stockholm Environment Institute (SEI). 2005. Sustainable pathways to attain the Millennium Development Goals — assessing the role of water, energy and sanitation. Research report prepared for the UN World Summit, 14 September 2005, New York City. Online: www.sei.se/mdg.htm.

5 Conway, G. 1997. The doubly green revolution: food for all in the 21st century. London: Penguin Books.

6 Food and Agricultural Organization of the United Nations (FAO). Conservation Agriculture: Profitable and Sustainable. Brochure.

7 Bahiigwa, G, Massawe, S, Notenbaert, A, Kaitibe, S, Sang, J, and C Ong. 2006. ILRI-ICRAF Joint Project Report: Potential Impacts of Conservation Agriculture in the Lake Victoria Basin (LVB). Online: www.relma.org

Sida

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

RELMA

RELMA was made possible with the generous support of the Swedish International Development Agency (Sida).

Authors: Rachel Rumley and Chin Ong
Design: John Gikang'a and Rachel Rumley
For more information:
Maimbo Mabanga Malesu (M.Malesu@cgiar.org)