



Implementing conservation agriculture under a sustainable food value chain approach in Kenya

Improving crop yields to increase smallholder farmers' incomes and boost their resilience to the impacts of climate shocks and stresses

Context

Eighty percent of the population of Kenya relies on agriculture for its livelihood. Agriculture is the backbone of the Kenyan economy, accounting directly for 26 percent of GDP and 60 percent of total export earnings. However, Kenyan farmers face major challenges, including droughts, floods, land degradation and market constraints.

Land degradation is a serious threat, particularly in medium- to high-potential agricultural areas where steep slopes are being cultivated without adequate soil conservation measures. **Conservation agriculture (CA) – a method of resource-saving crop production that has the potential to consistently achieve high yields while preserving soil health and moisture – is being promoted by the Food and Agriculture Organization of the United Nations (FAO) across Kenya to strengthen the resilience of smallholder farmers and develop sustainable food value chains (SFVC).**

Key facts



Target group

Smallholder farmers and farmer organizations



Nutrition

By prescribing crop diversity through conservation agriculture (CA) practices, it integrates multi-purpose crops that serve family and community better nutrition as well as other purposes: soil cover, pest control, fodder.



Gender

CA is an integrated approach that does not lend itself to traditional gender-based divisions of tasks. Labour division within a household is likely to change with the introduction of CA, whereby women need to be entirely involved in all aspects including land preparation, buying of tools and other inputs, and marketing.





How does conservation agriculture (CA) contribute towards the development of sustainable food value chains (SFVC) and resilient livelihoods?

Conservation agriculture (CA) is a climate-smart farming approach that aims to consistently achieve improved crop yields while:

- limiting the use of agricultural inputs;
- improving soil fertility; and
- conserving water and other natural resources.

Thus, CA safeguards the environment and helps farmers achieve profits in a sustainable manner. Water harvesting methods and production techniques that are part of CA (such as crop rotation and association and the planting of permanent cover crops) drastically reduce soil and environmental degradation and boost farmers' resilience to droughts and climatic variability.

A sustainable food value chain (SFVC) is defined as:

The full range of farms and firms and their successive coordinated value-adding activities that produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad-based benefits for society, and does not permanently deplete natural resources.

Training smallholders and agricultural service providers in CA fosters SFVCs by enabling farmers to run their holdings as enterprises, increasing production and income.

The promotion of CA under a SFVC approach involves the **examination of the actors in the value chain**, as well as their **linkages**, to improve the uptake of CA practices. Interventions aim to:

- promote and strengthen **farmer cooperatives** and help smallholders achieve **economies of scale**;
- provide better **market information to farmers**; and
- develop **market linkages** between farmers, processors and traders.

Furthermore, CA helps farmers increase their **resilience to climate shocks and stresses** by reducing soil erosion and rainfall-runoff. By improving the storage of water in the soil, CA contributes to the creation of buffers against droughts. This is particularly important in regions prone to droughts or extreme rainfall events, which are likely to become more frequent.



CA under a SFVC approach specifically addresses many challenges faced by women by tackling labour divisions, time constraints or improving market information.

Challenges

CA is not a novelty in Kenya. CA was introduced in the country four decades ago, and has been promoted by FAO ever since. Originally, CA practices were adopted by large-scale farmers only; smallholders failed to adopt such practices for a variety of reasons, including a lack of know-how and inputs (such as machinery, certified seeds or fertilizers), limited access to extension networks or services (including financial services), a low level of organization and weak market linkages. Even nowadays, smallholder farmers face a number of challenges when trying to adopt CA, such as:

Access to agricultural extension services

The declining effectiveness and availability of public extension services is impeding agricultural development in Kenya. In addition, women often struggle to attend training sessions because of the burden of household tasks.

Access to inputs and finance

Many smallholders:

- do not have access to two- or four-wheeled tractors, no-till tractor-drawn implements or reliable oxen-drawn equipment;
- prefer to use local seeds;
- are reluctant to reduce their use of herbicides; and
- lack access to micro-credit.

Access to markets

Securing market access is challenging for many smallholders. The higher yields that may result from the adoption of CA practices are of limited value if products cannot be sold at decent prices. Women smallholders frequently face gender-based constraints when trying to access markets, including:

- limited knowledge and access to market information;
- higher levels of illiteracy, coupled with lower negotiating and bargaining power; and
- time constraints, as women are often tasked with more community, family and household roles.

Land tenure

Many smallholders rely on short-term leases, which is not conducive to the adoption of CA. Indeed, during the first two to three years, CA requires a number of investments, such as the levelling of the landscape where tree cover is dense, the installation of technology to conserve soil and water resources and weed control; initial failures also bring a cost.



Under CA, crop residues are used to maintain permanent soil cover and feed livestock.

Methodological approach

The introduction of CA under a SFVC approach addresses the first three challenges mentioned above, and is therefore strongly promoted by FAO. To bring about consistently higher crop yields and thus improve livelihoods, efforts to build sustainable value chains must focus on at least one cash crop. The introduction of CA may cause changes in labour divisions and cultural behaviours related to the management of land resources. While women were traditionally responsible for ploughing, planting and weeding, men take up these responsibilities under CA, too. It is therefore recommended that a local person oversees the SFVC strategy. This person must be well-informed about cultivation practices, new agricultural tools and techniques and all relevant business aspects.

The implementation of CA under a SFVC approach requires:

The provision of adequate technical and financial support services

Both the public and the private sector must be strengthened to ensure that farmers receive adequate training (e.g. on land preparation) and have access to cover crop seeds, improved weeding equipment, etc. Training may cover topics ranging from basic agronomic practices to the use of specific CA equipment, the hiring of service providers, the formation of marketing groups and the conclusion of sales contracts.

The furthering of contract farming, to foster the creation of market linkages and improve access to finance

Farmers should be encouraged to conclude direct contracts with buyers, cutting out middlemen. In addition, measures should be taken to ensure that farmers can access finance more easily. Farmers in the Makueni and Tharaka Nithi Counties, for example, have partnered with different agricultural credit providers and with groups working with Universal Traders Sacco, a savings and credit cooperative affiliated with the Rabobank Foundation. Through these partnerships, farmers are able to obtain credit at an interest rate of 10 percent or less. The credit facility is a loop incorporating the buyer, who deducts the credit from the purchase price and refunds the microfinance agency within a week. The Rabobank Foundation initially agreed to finance loans of up to 50 percent of the contracted price, but nowadays goes as far as 100 percent.

The promotion of cash and multipurpose cover crops

Multipurpose cover crops (in monocropping or intercropping patterns) are not only a source of food or cash income for farmers, but also play an important role as soil cover, whether as life plants or as stover mulch after harvesting. Cover crops not only reduce soil erosion, but also help improve soil fertility, soil quality, water availability and biodiversity and fight weeds, pests and diseases. It is crucial to stress that while all crops can be a source of food and cash income, not all crops can provide soil covering, which is one of the main principles of CA. The multipurpose cover crop of choice varies from one region to the next. *Dolichos lablab* and green gram have proved very successful in Laikipia and Kilifi, respectively, as both provide live

soil cover, mulch and edible pulses (*Dolichos* also provides fodder material). Sorghum provides abundant long-lasting mulching material in western Kenya, as well as flour to make porridge.

Mixed farming systems combining the cultivation of crops and the keeping of dairy animals help ensure households' food security and nutrition.

The promotion of mixed farming systems and crop diversity

Combining the cultivation of crops and the keeping of dairy animals helps ensure farming households' food security and nutrition. Under CA, farmers are encouraged to use part of their crop residues to maintain permanent soil cover, and another part to feed their livestock. As such, CA plots should include a mix of crops that provide abundant forage and fodder materials such as sweet potatoes, pumpkin, *dolichos lablab*, sorghum, maize, napier grass and lucerne (as grass strips to control erosion), leguminous creepers (e.g. *Desmodium*) and multipurpose agroforestry fodder shrubs (e.g. *Leucaena*, *Calliandra calothyrsus*, *Tephrosia vogelii*, etc.).





CA safeguards the environment and helps farmers achieve profits in a sustainable manner.

Impacts

During normal weather years, the first and most obvious impact in Kenya of implementing CA under a SFVC approach is an **increase in crop yields**. For example, yields in Laikipia County increased by 30 to 40 percent. In the counties of Makueni, Meru, Tharaka Nithi, Kitui, Machakos and Laikipia, a quick random sample shows that yields for all pulses on 50 farms increased by 105 percent (from 246 to 506 kg/ha), while yields for all grains on 23 farms increased by 112 percent (from 1.1 to 2.3 tonnes/ha).

Due to the CA principles of minimum soil disturbance and tillage and permanent soil covering with crop residues, the implementation of CA **reduces the need for labour** inputs by 30 percent. In Laikipia, labour requirements were reduced by up to 40 percent under CA.

In addition, farmers who adopted CA under a SFVC approach reported an **increase in profits and better access to markets** than farmers who were not organized in groups, e.g. Farmer Field Schools (FFS). FFS allow farmers to produce, market and call on CA service providers collectively, which increases their bargaining capacity and **reduces their vulnerability to brokers and middlemen**. For example, farmers in the counties of Kitui and Tharaka Nithi collectively sold 39 tonnes of sorghum through supply contracts, while farmers in Makueni sold 131 tonnes of pigeon pea. The farmers could not have achieved this result by selling their output individually. The collective approach also **strengthened the links between smallholders and local suppliers and service providers** (such as local seed producers or tillage service providers), who were able to better plan and timely deliver their services.

CA can **help farmers adapt to changing climatic conditions and safeguard crops** when rainfall is unreliable. Crops under CA have been found to withstand elongated drought periods much better than conventionally cultivated crops, as untilled fields retain water better than tilled fields. This is of paramount importance, as Kenya has been increasingly struggling with poor crop performance during the long rain season in recent years. Under CA, crop residues are added to the soil, which is left untilled; this ensures that carbon is sequestered in the soil, turning it into a net sink of carbon. Contrarily, when the soil is tilled by ploughing, carbon is released into the atmosphere. CA can thus contribute significantly to the **fight against greenhouse gas emissions and help mitigate the impacts of climate change**.

Farmer Field Schools support CA by allowing farmers to produce, market and call on CA service providers collectively as well as promoting locally relevant, low-cost and risk-informed good practices and technologies.

Sustainability and replicability

As CA necessitates a certain level of investment of time and money, its adoption requires commitment to the principles of sustainable farming and ownership of the new practices. Furthermore, to implement CA successfully, techniques must be adapted to local conditions and changing weather patterns. Contrary to smallholders, who often find CA technologies too expensive, larger farms can reap economies of scale when implementing CA. FFS can bring smallholders together and promote locally-relevant, low-cost and risk-informed good practices, technologies and methods. FFS offer the right platform to:

- link CA practitioners who need large equipment (such as rippers or subsoilers) to mechanization service providers;
- explore ways to **minimize the use of external fertilizers**, e.g. by using organic compost instead of chemical fertilizers; and
- allow farmers to buy quality seeds from local seed producers.

Apart from training, other measures can help smallholders increase their output and income whilst following the principles of sustainable farming. Such measures include the provision of adequate services such as mechanization services, (micro)credit services and extension services, and the creation of market linkages. In Kenya, FAO's approach to CA takes these aspects into account with the development of a credit (and e-voucher) package. Additionally, a marketing e-platform for CA farmers has been established recently; the platform currently has over 42 000 registered farmers throughout the country.

CA has demonstrated to be effective at mitigating yield loss due to increased weather risk. Climate change is already disrupting normal rainfall patterns in Kenya, leading to the increased occurrence of both droughts and (flash) flooding. **CA boosts farmers' resilience to such events by improving the retention of water in the soil** (which creates a buffer against droughts) and **limiting soil erosion** (which limits the impact of heavy rains). Furthermore, CA enhances the productivity of farmland and can regenerate land left in poor conditions due to past misuse.

Testimony



Elizabeth Kahindi of Magarini (Kilifi) is a CA “Trainer of Farmers” who applies the CA approach to her own farm with remarkable results. Ms Kahindi switched from maize to green gram and cowpea, and despite poor rainfall harvested 7 500 kg, which she sold for KES 75 000. “Never in my life had I received such a huge sum of money”. The money was used for school fees and to buy three dairy cows. She now earns KES 400/day by selling milk.

By applying the principles of conservation agriculture under a sustainable food value chain approach, Elizabeth and her family have boosted their income and improved their nutritional and social status, whilst improving soil quality and fostering environmental conservation.

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Partners

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