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Research in northern Mozambique confirms that, compared to conventional practices, conservation agriculture contributes to: accumulation of soil organic matter; higher infiltration rates of water from the surface into the soil; and higher yields.

## Conservation agriculture builds long-term resilience to climate shocks

Eighty percent of Mozambique's small-scale farmers depend on rain-fed, subsistence-based farming practices. Much-needed agricultural extension services and inputs such as fertilizers, pesticides and improved plant varieties are difficult to access. Increasingly, climate change and variability, and related sudden-onset shocks, are threatening farmers' livelihoods, agricultural productivity and food security. In Nampula province, poor soils; limited access to water, infrastructure and transport; reduced fish stocks; and shortened fishing and farming seasons leave these communities in a highly vulnerable situation.

Since 2010, the CARE-WWF Alliance has been promoting **conservation agriculture** with smallholders in Nampula – with a special focus on women farmers – program in the *Primeiras e Segundas* archipelago, an environmentally protected area that permits subsistence use. Conservation agriculture focuses on protecting and building soil fertility and introducing a wider diversity of crop varieties. The

three main principles are: minimum tillage; permanent organic soil cover; and crop rotation and/or diversification.

### Conservation vs. convention

Through the proven methodology of farmer field schools (FFS), the Alliance builds farmers' capacity to sustainably produce sufficient food to satisfy their own consumption needs in the face of a decreasing soil base and increasingly erratic rainfall patterns. In 2014–15, the Alliance hired an external consultant to conduct trials on eight FFS demonstration plots in Angoche and Moma districts of Nampula, where conservation agriculture had been practiced for more than three years. The study was commissioned to compare conservation agriculture and traditional practices, specifically to test cassava yields and water infiltration.

These trials confirmed that conservation agriculture practices lead to the accumulation of soil organic matter. There is a higher infiltration rate of water from the surface into the soil profile compared with soils where conventional practices were applied.



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Also, under conservation agriculture practices, improved varieties of cassava out-produced both local varieties and the improved varieties grown under conventional practice. Moreover, cassava yields and water infiltration rates were higher where conservation agriculture methods had been practiced continuously for a longer period of time, suggesting that *the effects accumulate positively over successive seasons*.

### Learning as a group

Implementation of conservation agriculture can be difficult, as some of the practices contradict conventional methods that have been handed down from one generation to the next for many years. Given the power of cultural norms, the CARE-WWF Alliance relies on the farmer field school approach, done in partnership with the National Association for Rural Extension.

The idea behind the FFS approach is to gather groups of people with a common interest to study the “how and why” of a specific agricultural approach. The “schools” actually center on a field, which is used as a learning space where facilitators and farmers design, set up, monitor and evaluate different agricultural practices. This creates a safe environment for farmers to collectively learn and adapt practices to local conditions for adoption on their own fields nearby. It also can serve as an entry point for further group formation, such as village savings clubs, farmer associations and producers’ cooperatives.

### Methodology

In 2014, the Alliance and FFS members set up eight trials to compare the improved variety of cassava (Nziva) in conservation agriculture plots, adjacent to conventional practice plots. In all eight FFS demonstration plots, conservation agriculture had been practiced for more than three years using green manure/cover crops intercropped with cassava. In parallel, trials were set up in which eight individual farmers practicing conservation agriculture with local varieties of cassava were compared



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with eight other farmers practicing conventional methods with the same local varieties of cassava. Trials were split equally between Angoche and Moma districts for both FFS (four trials per district) and individual farmers (eight trials per district).

In 2015, the Alliance also conducted a series of infiltration tests in Angoche and Moma districts. These tests were conducted on FFS and local farmer plots in four communities in each district (eight communities total). Following data collection, infiltration rates were determined by dividing the amount of water used in the tests by the time it took for the water to completely infiltrate the soil surface.

### Findings

The side-by-side comparisons of fields showed clearly that the improved Nziva cassava variety grown under consistent conservation agriculture methods yielded more edible roots than the three other trials, and water infiltration rates were consistently higher. The data also suggests that the longer conservation agriculture is practiced, the greater the soil’s water infiltration rates.

### Moving forward

The goal of the CARE-WWF Alliance is to give farmers *the knowledge and skills* to change their agricultural practices quickly enough to build and preserve overall soil health, so that the same plot is productive enough to feed that farmer’s household year in and year out, supplying them with a sufficient livelihood without doing ecological damage. But the transmission of abstract ideas is far more complex than the delivery of a handful of seeds.

Studies make it clear that the Alliance should continue to promote conservation agriculture in conjunction with promotion of improved, disease-resistant varieties of cassava. Conservation agriculture also can improve the soil’s resiliency to withstand heavy rains and hold moisture better during extreme dry spells. Substantial challenges need to be addressed, including logistics – how to more efficiently disseminate improved inputs like cassava cuttings and legume seeds – and the power of cultural norms. The farmer field schools will continue to be a safe and highly effective learning environment, as smallholders adopt a new way of providing for their families while protecting the environment.

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