CASE STUDY 1: Conservation Agriculture in Zimbabwe

From 2005-2006, Concern Worldwide found that 133 farmers practicing conservation agriculture (CA) achieved an average maize yield of 2.8 tonnes per hectare (ranging from 1.03-4.71 tonnes per hectare) whilst conventional farmers in the same area averaged yields of just 0.8 tonnes per hectare. Other reported benefits included reduced labour time and fewer requirements for farm power that lowered input costs, leading to higher profits. Farmers who were previously receiving food aid improved their productivity so much so that they were able to sell grain to neighbouring villages. Farmers also benefited from increased incomes that allowed them to send their children to school, cover medical expenses, and rebuild their assets, such as cattle. In addition to Zimbabwe, Concern Worldwide has introduced CA—targeting mostly women farmers—in Tanzania, Zambia, and Malawi.[1]

In the Matopo area of Zimbabwe, Christian Aid also found that conservation agriculture (CA) techniques are helping farmers to increase their yields and conserve natural resources. Many farmers are single mothers or from families affected by HIV/AIDS, with small farms of 0.5ha-1ha. Trained in CA, farmers use a variety of practices and technologies such as digging planting pits, improving soil fertility with manure, mulch or legumes, and precise planting operations. By multiple cropping and rotating maize with indigenous nutrient-rich crops, the soil quality builds up over time. Crop residues are used as mulch to trap moisture in the soil, control weeds, and maintain cooler soil temperatures. Despite challenging climatic conditions over a period of 3 years, farmers reported increases in yields of sorghum, millet and maize, from an average of about 0.5 tonnes to between 3-4 tonnes per hectare.[2] Another survey in Zimbabwe compared CA with conventional farming practices under low, normal and high rainfall situations. Regardless of the level of rainfall, farmers achieved yields between 2 and 6 times of those under conventional agricultural practices whilst also benefitting from reduced labour and costs because of the lower levels of inputs required.[3]

CASE STUDY 2: Conservation Agriculture in Tanzania: the case of Mwangaza B Conservation Agriculture Farmer Field School, Rhotia Village, Karatu District, Arusha, Tanzania

In 2006, the farmers of Rhotia village in the Karatu district of Tanzania made the switch from conventional tillage farming to conservation agriculture. Similar to other smallholder farmers in Tanzania, these farmers suffered from low yields due to soil erosion, a common practice of grazing and removing all crop residues from their fields leaving them bare and vulnerable to the elements, and low use of organic or inorganic fertiliser.

Farmer Field School Tanzania. Credit, CA SARD

In 2004, the Conservation Agriculture for sustainable agriculture and rural development (CA SARD) project began to teach the farmers of Rhotia conservation agriculture (CA), a sustainable way of growing crops and managing soil health. The first phase of the project from 2004-2006 used the farmer field school (FFS) approach as a means of teaching CA to 765 farmers in 31 groups across 3 districts (Arumeru, Karatu and Bukoba). The second phase, from 2007-2010, expanded to include another 4 districts, 86 FFS groups reaching more than 3,500 farmers.

To start, CA SARD provided training on CA to extension workers, who then facilitated FFS and trained the participating farmers in how to apply CA practices. CA SARD provided start-up assistance to the FFS in the form of field equipment, 10kg of maize seed, and 8kg several CA options depending on their priority problems using different combinations of tillage and multiple cropping of pigeon pea, hyacinth bean, beans or pumpkins.

The preferred option of the Mwangaza B FFS group was maize intercropped with hyacinth bean because it generated the highest maize yields (3.75 t/ha), conserved moisture, and controlled soil erosion. The second most preferred option was maize intercropped with pigeon pea which also produced high maize yields, controlled erosion, high levels of leave droppings used for cover crops and improved soil fertility. Overall, yields under CA increased from 1.25 t/ha in 2004 to 7 t/ha by 2009. Labour requirements declined, and farmers also benefited from selling hyacinth bean and pigeon pea at a favourable rate of TSH 1,100 per kilogram (approximately US$1).

Banana FFS Tanzania. Credit, FAO

Although the introduction of CA produced significant benefits, these were met with many challenges. The use of crop residue for mulching directly competed with animal feed. With the adoption of CA, farmers stopped selling their crop residues to farmers with livestock and began to prohibit free grazing on their lands. Pastoralists who acquire 80% of their livestock feed from crop residue, especially during the dry season, suffered resulting in conflicts between the farming and pastoralist communities. Additionally, tractor and oxen providers lost significant business when farmers no longer tilled.[4]

CASE STUDY 3: A meta-analysis of conservation agriculture in sub-Saharan Africa

Conservation agriculture (CA) is widely promoted as a key solution to climate change adaptation for farmers in sub-Saharan Africa. Slow adoption of the method across the continent, however, has raised questions to its effectiveness and the value of such practices

for smallholder farmers. A meta-analysis by the Climate Change Agriculture and Food Security (CCAFS) research programme analysed 41 studies comparing CA with conventional tillage practices across a variety of agroecologies and climate conditions. Although sustainable farming practices like CA are critical to overcome the challenges of changing climates and growing populations, CA may not be the solution for all.

Conventional and conservation agriculture trial plots. Yields have greatly increased with CA.

By combining no tillage and mulching, yields will increase on average 300kg more per hectare in the first 3 years of adopting CA and even more in subsequent years compared to conventional farming. Though, yields may be lower over the long run if without combining no tillage with soil cover and crop rotation. Further, fertiliser use with CA is an important condition for success. Farmers can yield 400kg more per hectare when applying nitrogen fertiliser in excess of 100kg per hectare. As nitrogen fertiliser use is low across sub-Saharan Africa, microdosing can help farmers to fully benefit from CA. Rainfall levels matter too. Overall, rainfall above 1,000mm results in greater yields on average across the studies. However, in some cases the opposite was also true as heavy rains on mulched soils can induce waterlogging.

Despite successes in some reasons, the major reasons for limited adoption is the competition for crop residues. Mixed crop-livestock farmers use crop residues as animal fodder and poor families also use stalks from maize, sorghum or millet as cooking fuel. The returns to various uses for the crop residue must therefore be considered. Further, CA may not suit all soils. CA works better on loamy soils compared to sandy and clay soils. Lastly, crop rotation with nitrogen-fixing legumes has many benefits, but may not always be attractive to farmers if there isn't a ready market.[5]

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[2] African Smallholder Farmers Group (ASFG) (no date), *Conservation Agriculture in Zimbabwe* Available from: <http://www.asfg.org.uk/success-stories/conservation-agriculture-in-zimbabwe> [25 June 2015].

[3] Hobbs, B & Powell, S 2011, *Healthy Harvests: The benefits of sustainable agriculture in African and Asia*, A Christian Aid Report, London.

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[5] Paul-Bossuet, A 2014, 'Does conservation agriculture work for smallholders in Africa? New report highlights key points for action' 29 August 2014 *CCAFS CGIAR: News Blog.* Available from: < https://ccafs.cgiar.org/research-highlight/does-conservation-agriculture-work-smallholder-farmers-africa-new-report#.VYXGmELO900>. [20 June 2015].