



# Cultivating Sustainable Livelihoods: Socioeconomic Impacts of Conservation Agriculture in Southern Africa

REOSA Technical Brief

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Conservation agriculture holds promise for communities in southern Africa.

This technical brief is an analysis of the socioeconomic impacts of conservation agriculture in the region.

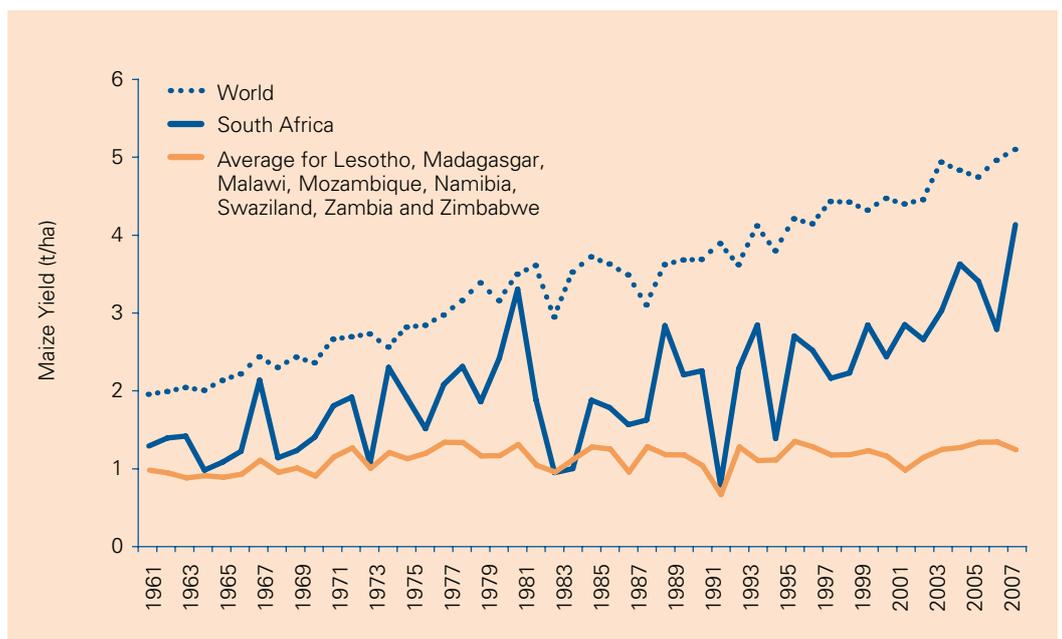


Southern Africa has high levels of food insecurity with stunting levels of more than 20% in several countries. Many countries in the region are net importers of staple food. This is partly due to low staple crop yields, with the average maize yield for the region, excluding South Africa, being around one tonne per hectare (see figure below). More than 70% of the population, and the vast majority of the poor, are engaged in smallholder rain-fed agriculture and related activities. Supporting the smallholder farmer is therefore a way to drive economic growth in the region, and help the rural poor to combat poverty. Higher farm productivity and more diversified farm produce will reduce the need to purchase supplementary foodstuffs, provide a healthier diet and offer the possibility of selling surplus for cash. Conservation Agriculture (CA) has the potential to achieve these benefits. Conservation Agriculture is a way of managing agro-ecosystems to achieve higher, sustained productivity, increased profits and food security while enhancing the environment. This is achieved through improved management and application of three key principles in conjunction with other good agronomic practices:

- Minimal soil disturbance;
- Maintenance of a permanent soil cover with mulch or cover crops;
- Practising crop associations or rotations.

Besides its many other advantages, conservation agriculture (CA) increases yields.

Trends in the yield of maize, 1961-2008



Source: <http://faostat.fao.org>



Produced in collaboration with the African Union's New Partnership for African Development (AU-NEPAD) and the African Conservation Tillage Network (ACT).



## The Smallholder Farmer

The reality for many smallholder farmers in southern Africa is that their soils have become severely depleted through generations of unsustainable farming methods including ploughing, monocropping, little or no replenishment of nutrients and burning of residues. Such practices result, ultimately, in decreased yields. Recurrent hazards such as droughts, floods and disease pandemics have reduced

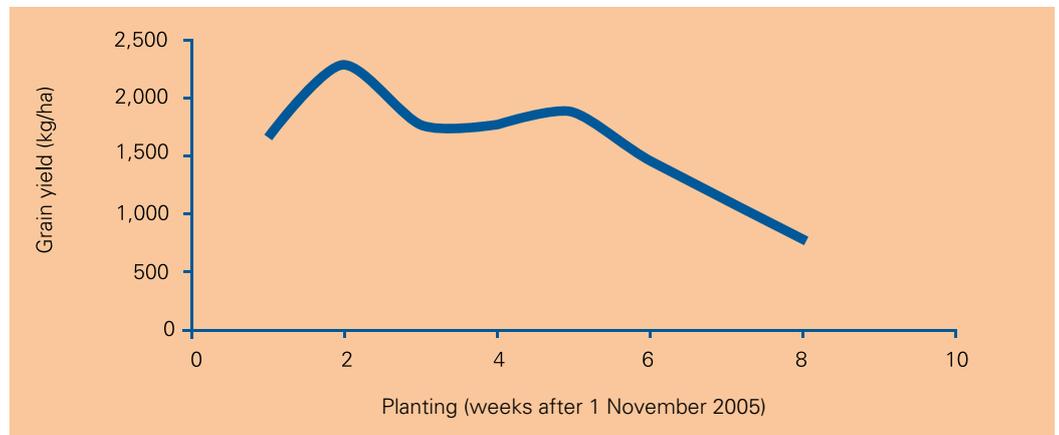
the livestock population with some households being left without draft power. The lack of draft power due to these and other socio-economic constraints is one of the reasons why a significant proportion of smallholder farmers in the region fail to plant their crops on time. Late planting is well known to result in reduced yields, as illustrated in the figure below.

### CA RESULTS IN MORE EFFICIENT USE OF RESOURCES

**Increased yields.** Improved soil fertility, improved infiltration of water, and better retention of moisture all lead to better harvests. CA allows spreading of labour requirements throughout the year, enabling timely planting. Seeds and fertilizers are placed at optimal depths and spacing for successful germination and growth.

**Reduced production costs.** Minimal or no tillage cuts the cost of labour or fuel. Increased fertility of the soil means that less fertilizer is used. No till seeders, planting basins and jab planters allow precise placement of scarce seeds, fertilizers or manure to reduce wastage. Whilst in the first years increased effort is needed to carry out weeding, this requirement reduces with time, and overall, labour requirements are reduced.

### Impacts of timing of planting on maize yield in semi-arid Zimbabwe



Adapted from Hove and Twomlow, 2007



# Positive Impacts of CA in the Region

## 1. Improved yields

CA facilitates timely planting, thereby reducing the risk of the significant yield reductions associated with late planting, a common problem, particularly in small-holder farming systems when households delay planting as they wait to hire or borrow draft power from their neighbours.

Farmers can prepare the land throughout the year because they do not need to wait for the rains as is the normal practice under conventional farming. CA therefore enables farmers to plant on time. Among other benefits, timely planting enables crops to utilize the nitrogen flush that is available in the soil at the beginning of the season.

CA can buffer farmers against the full impacts of dry spells during the crop growing season by prolonging the period in which water is available to crops. In drier regions, improved water harvesting under CA also improves availability of moisture to crops.

A food-secure family is well respected in a community. CA helps to restore social dignity among households. Production of more food at the household level reduces transportation costs of food in areas with poor infrastructure and guarantees affordable access to food for both resource-poor households and their communities.

## 2. Reduced input costs

CA improves the utilization efficiency of agricultural inputs such as manure and inorganic fertilizers, which are precisely

applied where the crop roots can readily access them. This helps reduce amounts of inorganic fertilizers applied. The elimination of ploughing and other conventional land preparation practices reduces the amount of fuel consumed by tractors in mechanized systems and hence the costs of production are lowered.

Income generated through the sale of surplus harvests is used to meet other household requirements, for example education, health services, purchasing small livestock and building houses.

## 3. Reduced labour requirements

In hand and animal draft powered CA systems, the amount of labour required to grow crops is lower than in conventional systems although the initial labour requirements can be higher, particularly during land preparation and weeding. In the medium to long term, the retained mulch and cover crops, together with the reduction in seed load through initial good weed control help suppress weed growth, so less time is spent weeding.

Where possible, the use of herbicides and animal traction CA equipment for land preparation and planting will save time. However, attention must be paid to the fact that the cost of herbicides can be high. There is also a perception that herbicides are deleterious to the soil; this can be overcome by education.

In a region where diseases such as malaria and AIDS continue to significantly compromise the quantity and quality of

labour, CA becomes a vital farming option for many households as it allows them to spread labour over a longer period, e.g. for land preparation.

## 4. Availing opportunities for off-farm income generating activities

The time saved under CA as a result of better labour management for land preparation and through reduced labour requirements for field activities enables households to engage in off-farm activities that can generate income.

For women, labour saving under CA provides opportunities for them to engage in other income generating and socio-economic activities while also sparing more time to take care of the family, and/or nursing sick members of their households.

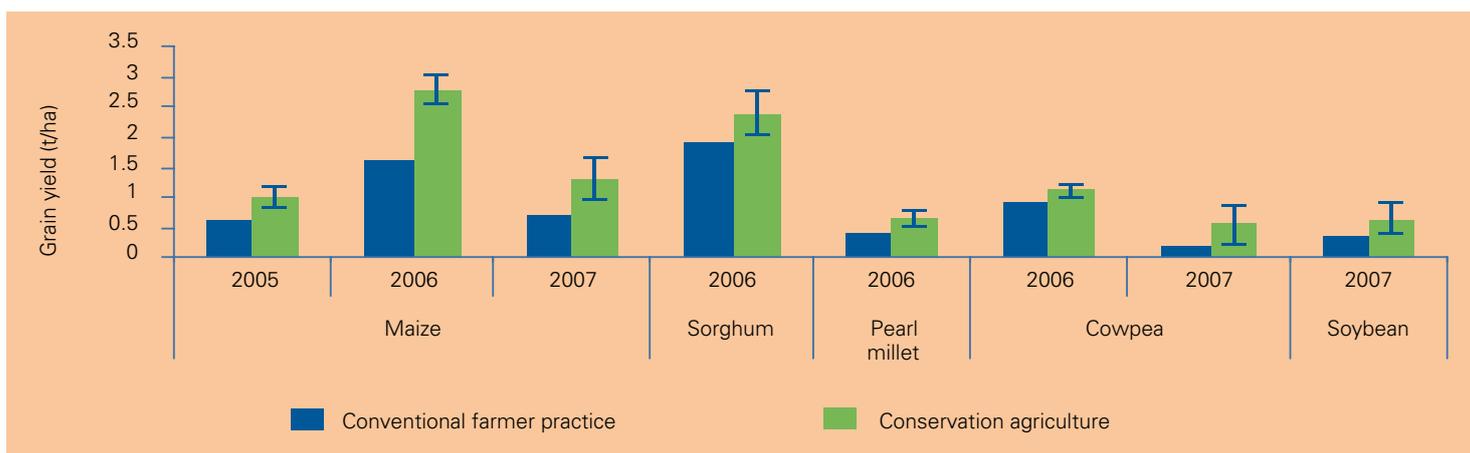
However, without ploughing, women would proportionally do more work, as traditionally they do most of the weeding.

## 5. Protection of the environment

Tillage accelerates decomposition of soil and soil surface organic matter into carbon dioxide. Reduced or zero tillage not only reduces this process, but reverses it. Besides acting as a sink for carbon dioxide and alleviating the problem of global warming, carbon sequestered by crop biomass increases soil organic matter – the primary energy source for soil fauna and microbes.

There are many financial benefits that can be derived from the promotion of a healthier environment. These include

Cereal and legume grain yield responses averaged across 13 districts in semi-arid areas in Zimbabwe, 2005-2007



Adapted from Twomlow et al., 2008

carbon trading, eco-tourism and 'green' certification.

Under CA, infiltration rates, available water holding capacity of the soil and resistance against erosion by wind and water are increased, and the soil becomes more friable and easier to work. Reduced runoff, increased water infiltration and reduced evaporation improve ground water recharge and the potential availability of this water to communities. Improved moisture retention by soils buffers crops against dry spells or mild droughts during the growing season as has been demonstrated in some countries, e.g. Malawi and Zimbabwe.

### 6. Building self-reliance among households

Many farm households suffer from a severe lack of labour and draft power. Young people move away from the farm, hunger and malnutrition combine to make people less able to work hard and more vulnerable to disease. HIV/AIDS, malaria and a range of other illnesses reduce the workforce.

Reduced drudgery and labour requirements are, on balance, a benefit under CA since little or no tillage is required, and over time less weeding is required.

CA promotes self-reliance by households, particularly those that are more vulnerable, as there is no need to wait for their neighbours to finish land preparation before they can borrow or hire draft power. The application of manual CA systems help draft power constrained households to plant on time and obtain higher yields. It should be noted, however, that savings in labour are extremely

variable, depending on which CA system is followed. The table below demonstrates this.

### 7. Stimulation of rural development and economies

Conservation agriculture has the potential to stimulate rural development through the following possible channels:

- Reduced input requirements and costs under CA will result in better cash flows and savings. These will in turn result in increased spending, stimulation of markets and growth in the local and national economy. Farmers will in turn increase spending on other family needs, e.g. pay school fees, access health services, purchase livestock and larger household goods or even build houses.
- Greater labour productivity on- and off-farm through labour savings and better labour management.
- Engagement by communities and outsiders in trade in CA input and produce markets.
- Emergence of vibrant savings and credit cooperative organizations and investors.
- CA has the potential to increase gross margins, as can be seen in the table below. As tractor use is reduced under CA, substantial savings will be made on fuel needs, resulting in significant savings of hard currency used for diesel imports. Reduced need to import staple crops, and the possibility of producing crops for export will have similar positive implications for the economy, as will increased employment opportunities.



### TO GIVE, OR NOT TO GIVE?

There is a great deal of debate about whether inputs should be given to farmers as an inducement to get them to try CA. On the one hand, giving inputs does result in experimentation and in the support of very needy families. On the other, giving of inputs may lead to only short-term gains, in that when the hand-outs stop, farmers revert to the farming methods that they are used to. Furthermore, giving inputs to only some of the members in a community, and not others, may actually disincentivize those in the community who do not receive them.

### Budget analysis for CA and conventional draft (CD) tillage practices in Zambia and Zimbabwe

Country		Zambia		Zimbabwe	
Method		CA Magoye Ripper	CD Tillage	CA Planting Basins	CD Tillage
Item	Unit	Cost	Cost	Cost	Cost
Total revenue	US\$	420.00	296.68	445.00	217
Total Inputs Costs	US\$	253.00	207.40	109.69	78.45
Total labour @ 1.00 US\$ p/day	US\$	63.00	70.00	122.23	77.33
Total variable costs		316.00	277.40	231.92	155.78
<b>Returns</b>					
Gross margin	US\$/ha	104.00	19.28	213.08	61.22
Cost per kg	US\$/kg	0.11	0.13	0.13	0.18
Returns to labour	US\$/day	2.65	1.28	2.74	1.80
Labour productivity	kg/day	47.61	30.27	14.56	11.22

Source: Haggblade, Tembo & Donovan (2004), Haggblade & Plerhoples (2010), Mazvimavi & Twomlow (2009)



# How can Farmers and Communities Reap More Benefits from CA?

In order for farmers to realize greater CA benefits, several challenges need to be addressed. These include:

## CHALLENGES

Farmers who have engaged with CA report yield increases, improved resistance to drought, reduced loss of topsoil through erosion, improved water infiltration, improved soil fertility, less reliance on hired-in ox ploughing and more timely planting. However, negative perceptions and experiences have also been reported, amongst them a lack of follow-up by extension staff, difficulty in retaining residues, an increase in weeds and difficulty in adapting to the notion that uncovered, unploughed fields will produce better results.

**Please refer to REOSA Technical Brief 03 for more information on the challenges of CA and how they may be overcome.**

### Effective weeding

One of the necessities of CA is that meticulous weeding should take place throughout the year and not only in the growing season. There has been poor adherence to this for several reasons: it is hard work, farmers do not appreciate the importance of weeding in suppressing future weed growth, labour is needed for other activities off-season, and it is avoided because households are concerned about derision from their neighbours. The benefits of winter weeding should be demonstrated to farmers.

Where affordable, herbicides have great potential to alleviate weed problems; however, farmers need to be adequately sensitized and trained on how to use them. Other approaches for reducing the weeding load, e.g. pooling labour, should be considered.

### Targeting farmers for CA expansion

NGOs are often the drivers of the change from conventional to CA practices and where this is the case, vulnerable households are usually targeted to benefit from the technology. As such households typically suffer from labour constraints and chronic illness, and/or are women and/or the elderly, their productivity is limited. CA technology is, however, applicable to all farmers. Indeed, in South Africa, which has by far the largest hectares of CA in the region, the majority of the work is on mechanized commercial

farms. For manual and animal draft powered CA systems it is also recommended to include better resourced farmers in CA programmes to improve the uptake of the technology.

### Social and cultural issues

There is a need to change the belief that ploughing is a prerequisite for planting. Farmers need to be sensitized and educated on the negative impacts of conventional farming, worsened by climate variability and change, which can be addressed to some extent through CA application. Other problems are the lack of legal title to the land and problems associated with smallholder farming, for instance the grazing of neighbours' cattle on crop stover. An effort to change cultural mindsets and amend by-laws controlling communal lands is therefore necessary.

### Improved market access

Poor access to input and output markets are a problem. There is a lack of availability of affordable CA equipment, fertilizer and herbicides and it can also be difficult to obtain seeds for recommended cover and rotation crops. Where farmers have tried to generate seeds of such plants to supply to the market, they are hampered by the lack of a proper marketing system for the seed. It is necessary to link farmers to commercial agro-dealers through developing rural outlets. If farmers cannot sell their increased production for a reasonable price it is not worth the expense and effort of growing the crops.

Markets can also be hampered by controlled prices or by infrastructural constraints.

## SUCCESSFUL LARGE SCALE CA PRACTICE

Ten years ago, Mr Willem van der Walt, a commercial farmer in Limpopo province, South Africa, converted 200 hectares of his 5,000ha farm to CA. The increased productivity and rate of return as well as improved soil properties and reduced erosion convinced Mr van der Walt to convert his whole farm to CA. His success with CA has attracted the attention of neighbours, who have also decided to pursue the CA option. Mr van der Walt says that his harvests are now more stable, as he is protected from mild droughts or dry spells due to increased rainfall infiltration and retention, and reduced evaporation from soil.

There may also be an issue of potential markets being undercut by food aid distribution.

#### Harmonized promotional approaches

Currently, there are many different agencies promoting CA, and they often recommend different methods of practise and promotion, which leads to confusion, and may also hamper the efforts of national extension services. For instance, where farmers expect to receive free inputs, as offered by some NGOs, they will not pay attention to those agencies who do not offer them. The suggestion is that national promotion agencies should regulate and harmonize extension activities. However, it is recommended that farmers and extension workers should adapt the CA practices to suit their particular farming systems, socio-economic situations and agro-ecological zones.

#### Increase the area under CA practice

To optimize the benefits of CA, especially at the community and national levels, the technology should be practised by many farmers and on a large proportion of the cultivated land.

Due to the huge benefits that can be derived from its use, CA has increased dramatically in many countries across the globe over the last few decades. The system is relatively new in southern Africa, and is in various stages of implementation and promotion in various countries. As discussed in REOSA Technical Brief 03, CA is still being practised on a very small scale in the region although the extent varies across countries.



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