WWF BUSINESS CASE ZA 2018

Investing in soil

Emerging climate-smart business opportunities

Supported by:

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A snapshot of the opportunity

Taking conservation agriculture (CA) to scale as a climate change mitigation and adaptation initiative, has multiple co-benefits for farmers, the environment, and society at large.

The case for investment

- Over time, conservation agriculture (CA) reduces production costs and may result in higher and more reliable yields.
- CA reduces water usage, water and wind erosion, and improves soil health, all of which ultimately save costs.

The offtake market

- Grain South Africa represents 18 000 grain farmers, of which just over 8 000 are commercial farmers.
- Only 15% to 20% of commercial grain farmers and 5% of smallholder farmers have adopted CA. There is considerable scope to scale-up CA.

Socio-economic benefits

- In changing climate conditions, CA can support greater resilience on farms and in food security.
- Greater farm resilience might lead to less tenuous jobs and a more robust grain sector.
- Skills levels may increase.

Climate change benefits

- CA reduces diesel usage, and also leads to carbon sequestration in the soil.
- The carbon sequestration impact of reduced tillage on 20% of South Africa's cultivated areas is about 1,2 million tonnes (t) CO_2e.
- Adopting CA across 20% of wheat production alone would result in a saving of some 90 000 tCO_2e per annum from:
  - Diesel reduction: 80 042 tCO_2e
  - Carbon sequestration: 9 800 tCO_2e.

Why adopt conservation agriculture as a climate change mitigation measure?

South Africa must build an agricultural sector that is resilient in the face of climate change. Sustainable crop production at sufficient volumes is critical for food security and employment. CA is a globally recognised management practice that serves as an effective climate change mitigation measure: it uses less energy and the soil sequesters or stores carbon. CA also conserves and improves the natural resources of soil and water, contributing to farm profitability.[1]

While some early adoption of CA has occurred amongst commercial farmers in South Africa, far more can be done to mainstream this. The grain sector is used in this paper to illustrate the potential of CA as it has the best available CA data of all the agricultural sectors.

What is conservation agriculture?

CA is a farming system on the continuum towards a more sustainable form of agriculture.[2] It is based on three principles:

Principle 1: Minimal mechanical soil disturbance with no or reduced tillage. Reduced tillage is tillage that leaves a minimum of 30% of biomass on the soil surface after planting.

Principle 2: Permanent soil cover and maximum diversity in selection of crops, using rotation and cover crops.

Principle 3: All year round organic cover on soil, using living plants and/or plant residues.

No or reduced tillage is often used as a proxy for CA as it provides the best data.

PHOTO: WWF SA

Sustainability gradient between conventional tillage and organic conservation agriculture[3]

STAGE	1	2	3	4	5	6	7
	Conventional tillage	Minimum/reduces tillage	Conventional no-tillage (NT): direct seeding equipment using tines	Conventional zero-tillage (ZT): direct seeding equipment using discs	CA_{HEI} (High External Inputs): NT or ZT using **high** quantities of external artificial inputs – fertilisers, herbicides, pesticides	CA_{LEI} (Low External Inputs): NT or ZT using **low** quantities of external artificial inputs – fertilisers, herbicides, pesticides	Organic CA: NT or ZT using **no** quantities of external artificial inputs – fertilisers, herbicides, pesticides
TYPE OF FARMING SYSTEM			Production system lacks adequate soil cover and sound crop rotations. **High** use of external inputs.	Production system lacks adequate soil cover and sound crop rotations. **High** use of external inputs.	Production system has adequate soil cover and sound crop rotations.	Production system has adequate soil cover and sound crop rotations.	Production system has adequate soil cover and sound crop rotations.

PHOTO: SHUTTERSTOCK.COM

Global developments in conservation agriculture

The adoption of CA and its principles is increasingly well-supported by global institutions dealing with agriculture and food transitions. The Food and Agriculture Organisation (FAO) recognises that CA demonstrates the following: savings in carbon emissions, machinery and energy costs; improvements in soil organic matter and biotic activity; less erosion; more water available for crops; and drought resilience.[4]

In terms of the global uptake of CA:

- Only 7% of the world's arable land is under CA because many countries lack an enabling environment for CA adoption.[5]
- It is estimated that 180 million hectares worldwide are under no-tillage based on the CA principle of minimum soil disturbance, and this practice is growing fast.

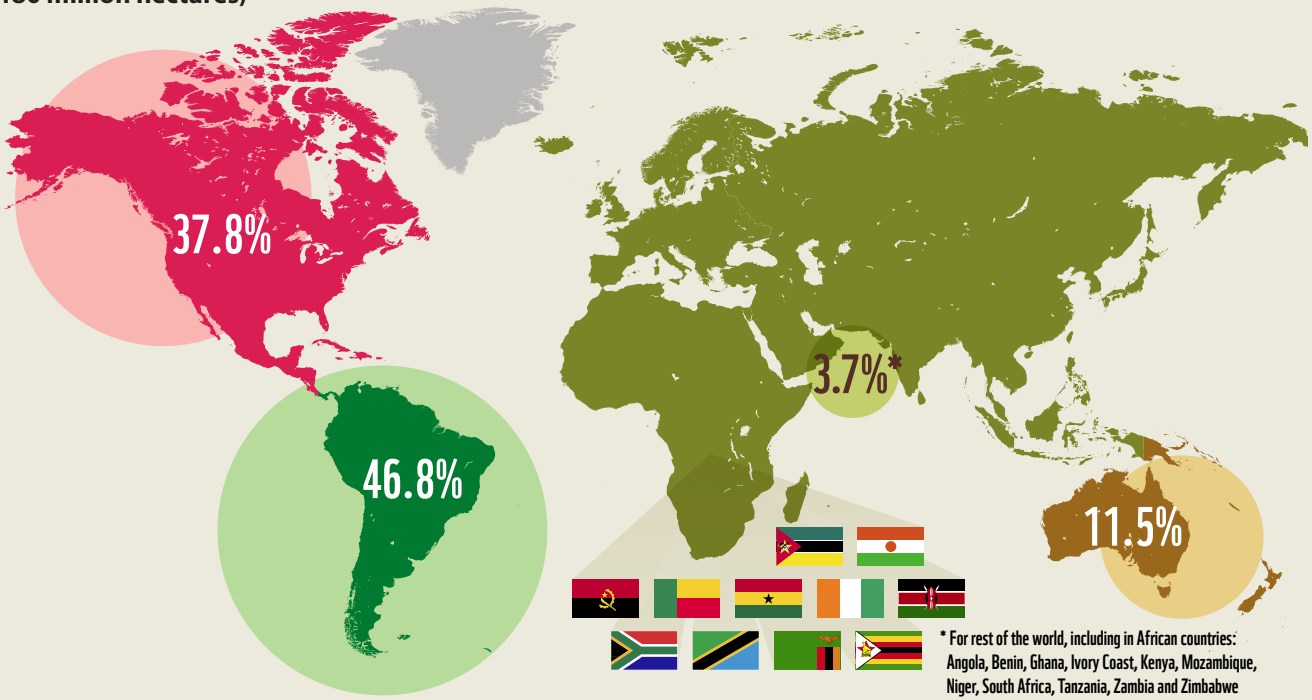
ARABLE LAND

land under temporary crops and land that is fallow

CROPLAND

land under crops only

Percentage of global arable land (i.e. land under temporary crops and land that is fallow) under no-tillage (180 million hectares)[6]



Cropland area (i.e. land under crops only) taken up by conservation agriculture from 2008/09 to 2015/16[7]

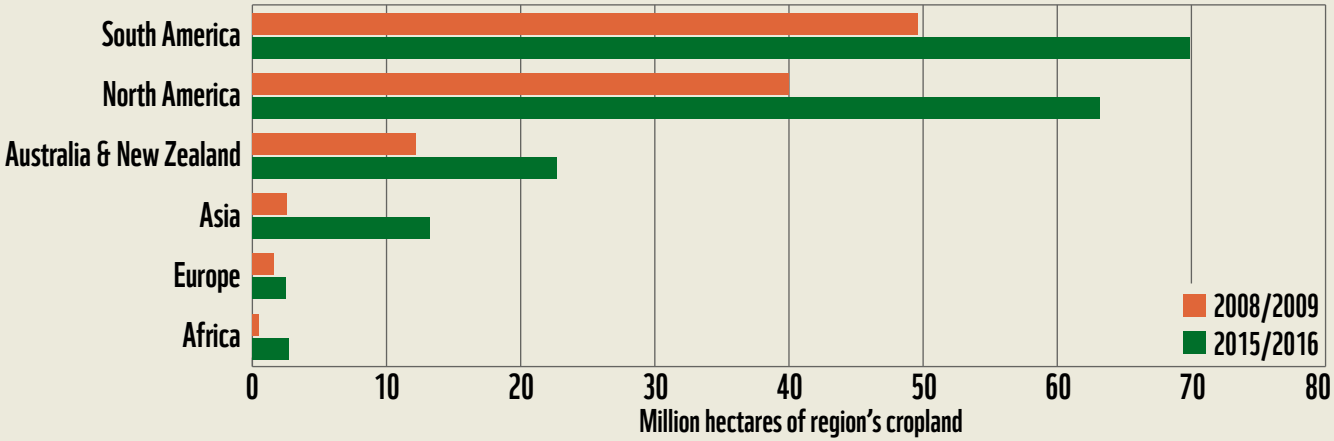


PHOTO: EDEN-EQUIPCO.ZA

South African agricultural practices and conservation agriculture

South Africa has a dualist agriculture sector differentiated according to commercial farms and subsistence/ smallholder farms. Each group is characterised by key features of distinct farmer typologies.[8]

In terms of CA adoption, although subsistence and smallholder farmers might already practise reduced tillage, because of the costs of purchasing specialised machinery for CA, it is more commonly practised by commercial farmers.

For the most part in South Africa, the application of CA means **reduced tillage or conservation tillage and not no-tillage**. In 2004, 35% of the total hectares in South Africa were under conservation tillage and 9% were under no-tillage.[9]

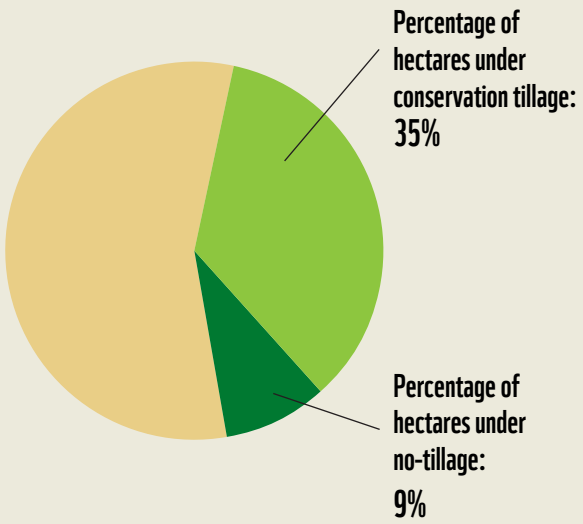
How farmers are described and segmented

South African public and private institutions use various criteria and metrics to describe and segment commercial and smallholder farmers. These include, for example, annual turnover, asset base, and land size.

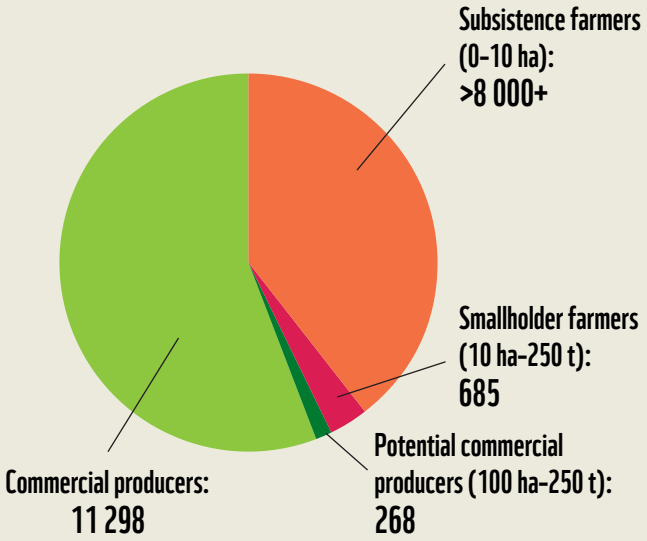
Typology of South African farmers in 2014[10]

Farmers	Numbers	Key features
Top 20% of large-scale commercial farmers on private land; almost all are white.	7 000	Sophisticated, specialised, capital-intensive farmers, producing for export or for agri-processing and large retailers; produce bulk of produce, perhaps as much as 80%.
Medium- to large-scale commercial farmers on private land; almost all are white.	9 000	Some farmers succeed, some struggle, some are unable to earn a living from farming alone.
Small- to medium-scale commercial farmers on private land; mostly white, some black.	19 000	Many cannot survive from farming alone; includes hobby farmers.
Small-scale black capitalist farmers in communal areas and in land reform contexts.	5 000–10 000	Many farmers earn an income from off-farm activities and businesses in addition to farming.
Market-oriented black smallholder farmers in communal areas and land reform contexts, supplying tight value chains (e.g. under contract).	5 000–10 000	Many grow fresh produce under irrigation, others are livestock producers, and a few engage in dryland cropping.
Market-oriented black smallholder farmers in communal areas and land reform contexts, supplying loose value chains.	200 000–250 000	Many grow fresh produce under irrigation, and others are livestock producers. Few depend wholly on farming.
Subsistence-oriented smallholder farmers growing food for themselves, and selling occasionally.	2 million–2.5 million	

Percentage of conservation tillage and no-tillage in South Africa, 2004[11]



South African farmers represented by Grain South Africa, 2017[12]

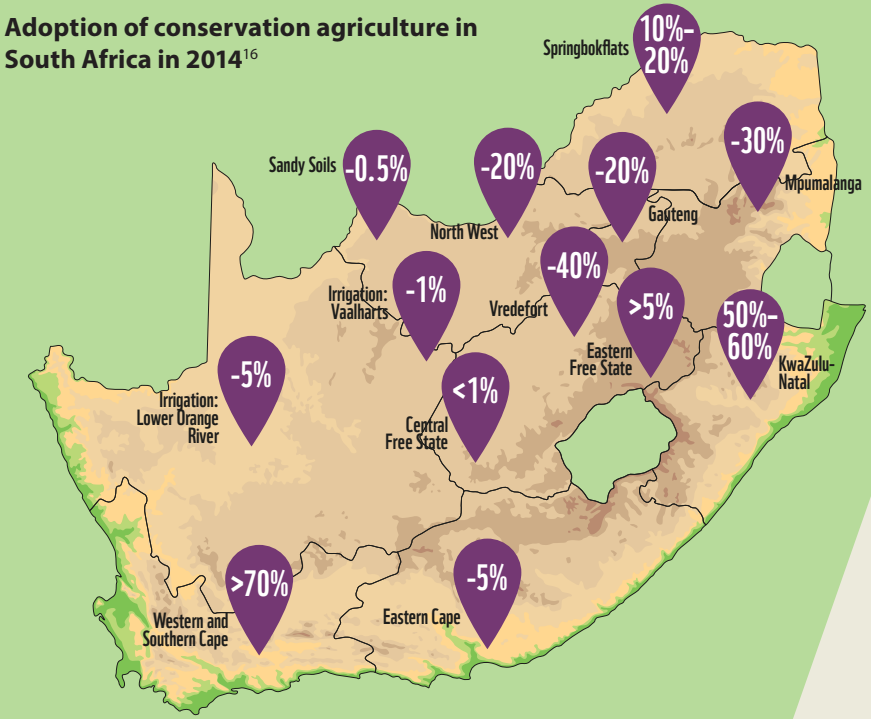


> *"...with South African crop farmers' tenuous position due to low grain prices and escalating input cost (sic), I believe they should seriously consider CA practices – it's the only way to go!"*
>
> Hannes Otto, North West[13]

Adoption of conservation agriculture by South African commercial grain farmers

- The grain sector has the best available data and research on CA adoption, as well as on its agronomic, financial and Soil Organic Carbon (SOC) benefits.
- Across grain producing areas, about 15% to 20% of commercial farmers have adopted CA.[14]
- Levels of CA adoption vary considerably across provinces. CA is increasing amongst grain farmers particularly on wheat farms in Western Cape and maize farms across the country.[15]
- The grain commodity organisation, Grain South Africa represents over 8 000 subsistence farmers, 685 smallholder farmers, and just over 11 000 commercial grain farmers.

Adoption of conservation agriculture in South Africa in 2014[16]



SOIL ORGANIC CARBON (SOC)

the carbon left in the soil after partial decomposition of any material produced by living organisms. It is a key element of the global carbon cycle through atmosphere, vegetation, soil, rivers, and the ocean

Economic characteristics of the grain sector

In the 2016/2017 production season, field crops contributed 25.8%, or R70,5 billion, to the total gross value of agriculture production of R273 billion.[17]

- Income from **maize** amounted to close to R30 billion – a record year with a maize production of more than 16 million tonnes.
  - Maize is the most important grain crop in South Africa.
  - It is the major feed grain and the staple food of the majority of the South African population.
- In terms of value of production, **wheat** contributed approximately R7 billion.[18] Wheat is the fourth most important field crop produced in South Africa.
- South Africa's silo industry has approximately 17 million tonnes of bulk storage capacity, with 85% owned by 17 grain handling companies.

Policy and regulatory environment on conservation agriculture

The Department of Agriculture, Forestry and Fishing (DAFF) *2017 Draft Conservation Agriculture Policy* identifies five policy support measures to promote CA adoption:[19]

- Improve resource allocation in investment in public-private sector farm centre innovation training facilities.
- Improve Extension Officer training.

- Offer more financial incentives.
- Focus on women in agriculture – as female farmers typically have less access to resources.
- Invest in research and development, strengthen regulatory tools, and provide more innovative approaches to farmers in communally-owned land.

The 2015 South African National Terrestrial Carbon Sinks Assessment cites the adoption of reduced tillage, based on the CA principle of minimum soil disturbance as an example of a practice that balances two policy objectives:

- To promote rapid agriculture job growth by providing emerging farmers with additional revenue sources
- To reduce the impact of land-use change on carbon stocks.[20]

Two recent innovative finance instruments have the potential to support CA adoption in South Africa:

- The Banking Association of South Africa and its commercial bank members are working with DAFF on a blended finance instrument which will include promoting natural resource management. This may incentivise CA adoption.
- A recently approved European Investment Bank Credit Line to the Land Bank includes a portion of credit earmarked for climate-smart agriculture, which is a potential source of concessional finance for CA adoption.[21]

Business News

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Helping farmers prepare for impact of climate change

The European Investment Bank has approved a R740 million loan facility to the Land Bank which will be used to help farmers prepare for the impact of climate change. This loan has come at the perfect time, as farmers in the Western Cape are battling to cope with the worst drought in more than a century.

The Land Bank says that there is a 12-year repayment period on the loan, but that the terms and conditions are very favourable. The funds will be directed to those projects which focus on climate change mitigation and adaptation and have a minimum lifespan of two years.

Industry associations, farmer initiatives and conservation agriculture support

- Grain South Africa, the grain commodity organisation, provides support on CA to its members, and hosts CA promotion days for small-scale farmers.
- The No-Tillage Club in KwaZulu-Natal is an active association of farmers. It produces newsletters, hosts an annual conference, and conducts educational and outreach activities.
- Conservation Agriculture Western Cape is a forum of 185 paying members including producers, researchers and related sectors, aimed at knowledge sharing to advance CA.

Size of the opportunity

Significant potential exists to increase the uptake of CA practices amongst grain farmers. At present only 15% to 20% of commercial grain farmers have adopted CA; and only 5% of smallholder grain farmers. Increasing this baseline to 40% of commercial farmers; and 20% of smallholder farmers by 2030 could dramatically improve the resilience of these farmers and their crop production.[22]

This 12-year period from 2018–2030 is taken to link to the climate commitments of South Africa (by 2030) as well as to the 12-year repayment term of the concessional finance facility recently announced for climate-smart agriculture by the Land Bank.

"I urge all smallholder farmers interested in CA to join study groups where they can share and learn. Study groups can also serve as centralised points for the purchase and delivery of CA crop production inputs."

Jurie Mentz, Grain SA[23]

Barriers to conservation agriculture uptake

The main barriers to the adoption of CA are lack of knowledge on its methods, mindset, inadequate policy incentives, and lack of availability of appropriate machinery and suitable herbicides to facilitate adequate weed management.[24]

Lack of knowledge and data

- CA is knowledge-intensive and complex to learn and implement.
- Very little information is available at an aggregated national level. While many examples exist on CA in practice, little comparative data-based analysis has been published to empirically establish the benefits of CA.

Mindset and awareness

- Farmers are cautious about moving away from what they know.
- While there are associations that support CA adoption, more work needs to be done to educate and assist farmers.

Policies and regulatory environment

- There is a draft policy on CA in place, but more actual implementation of support is required in practice.
- Policy uncertainty about land expropriation and access to water are likely to limit farmers' interest in investing in new production methods.

Costs of specialist machinery

- Tractors may be partly or totally done away with in CA, but other specialist equipment is required, such as a special seed planter and an effective chemical sprayer.
- In most cases existing equipment needs modification, or new machinery must be purchased.
- The capital cost of new machinery can be too onerous for farmers, particularly smallholder farmers.
- Good extension services need to align with the financial support required to transition from conventional agriculture to CA.

Costs of transition from conventional to conservation agriculture

- Typically it takes at least five to seven years for the transition to CA on farms, and during this time profit margins and yields can be adversely affected. Despite long-term crop yield benefits, many farmers are unable to carry potential financial losses or reduced profitability during the transitional period.
- Cost of trials and experimentation are also at the farmers' expense.[25]

Site specificity

- Farming enterprises differ with regards to soil type, climate and other resources, and this variability impacts on the performance of CA and challenges generalisations about it.

Barriers to adoption of conservation agriculture in South Africa

Commercial farmers[26]	Small-scale farmers[27]
• Lack of suitable planter for local conditions. • Lack of knowledge about implementing all three CA principles, including minimum soil disturbance, soil cover and crop rotation. • Delay between investment and financial return from improved yields with payback period of up to seven years is challenging, as limited financial support available. • Lack of enabling policy environment even though a draft national CA policy is in place. • High cost of imported equipment with some progress made through increasing local production.	• Lack of start-up capital to purchase appropriate CA equipment. • Potential risk of decline in yields at early stages of CA conversion. • Challenging to obtain adequate soil cover particularly under dryland production conditions. • Lack of knowledge and experience. • In many cases the high level of chemical use in early stages of CA can be costly.

> *"...Farmers must approach individuals such as mentors and Extension Officers for advice. It is essential that farmers obtain sufficient knowledge and understanding before making decisions."*
>
> Reggie Mchunu, agronomist with Pannar Seed[28]

Drivers of conservation agriculture uptake

The main drivers of a transition to CA from conventional agriculture are financial.

Reduced capital and operating costs = improved profit margins

- The CA principle of minimum soil disturbance removes the need to purchase machinery such as tractors – typically a costly investment for farmers.
- Linked to this are reduced fuel and servicing/ maintenance requirements, reducing operating costs.

Improved and/or more predictable yields linked to healthier soils

- While yields might not always be greater, they can be more consistent.
- The CA principle of minimum soil disturbance preserves the natural ecology and nutrient cycle, including improved soil carbon. This can manifest in improved yields over time, as soil health improves.

Greater resilience

- Water needs are significantly reduced.
- Fertiliser requirements are reduced.
- The soil retains more water, there is less water runoff, and erosion management improves.

Customised finance

- The increasing availability of climate-smart finance for agriculture will assist with the transition to CA from conventional agriculture.

Policy/regulatory and service extension support

- The new draft policy on CA should, in time, lead to linked support in extension services.
- In time, the introduction of carbon budgets and carbon taxes in South Africa will further incentivise a move to climate-smart agriculture, including CA.

80%

adoption of CA in winter rainfall grain regions in Western Cape

Characteristics of adoption of conservation agriculture amongst grain farmers in South Africa[29]

Characteristics	Small-scale farmers	Commercial farmers
Adoption rate	• Less than 5%.	• Approximately 15%–20%.
Adoption drivers	• Increase in crop yields and food diversity. • Reduction in production costs largely due to lower mechanisation costs. • Immediate increase in disposable income.	• Financial benefits. • Positive impact on water-use efficiency. • Reduction of water runoff and soil erosion. • Positive environmental impacts.
Adoption patterns	• Mostly older persons, pensioners and mostly women, which is synonymous with the profile of small-scale farmers. • More women in CA than conventional systems where men are responsible for ploughing and land preparation.	• More success in winter rainfall grain regions in Western Cape with 80% adoption. • In higher summer rainfall areas of KwaZulu-Natal, adoption rates vary between 60% and 70%. • Adoption in drier and sandier North West Province is 20%. • Adoption in Free State is still very low, at less than 20%. • More interest in CA is emerging in higher rainfall regions in Mpumalanga, in last decade.
Adoption of specific practices	• Little difference from certain traditional farming methods. • Where CA practices have significant financial requirements, small-scale farmers struggle to access finance and payback periods are too long.	• Approximately 40% that practise CA do crop rotation with three or more crops, 10% do monoculture, and 50% use two crops. • Annual cover crops used by 20% and 25% use perennial ley crops. • No-till planters are used by 36% of farmers, and 13% use disc planters.

Motivation for conservation agriculture adoption in South Africa[30]

Conventional farming methods are under pressure:

- There are increasing input costs and lower gross margins.
- Soil quality and soil ecosystem service decline and gradual collapse means that competitive yields are not achievable without inorganic fertiliser use.
- There is a need for increasing resilience and sustainability, with pressure from climate change impacts on weather patterns, water regimes, biodiversity and ecosystem services.

Growing support for conservation agriculture:

- Local platforms – such as associations – have raised awareness and knowledge and encouraged the self-organisation of farmers, scientists and agri-businesses to use and promote more sustainable agricultural practices.
- CA can enable agriculture to generate and contribute to social capital in society as a whole and to rural communities in particular. This can help to rebuild the status and image of farming which has been significantly damaged by the negative environmental footprint and poor socio-economic conditions associated with it. CA can secure long-term sustainability in response to both economic and climate change challenges.
- Major buyers of grains can help with the move to CA amongst farmers through supplier development. For example, South African Breweries (SAB), now part of the global AB InBEV, supports the 'Better Barley, Better Beer' programme, which was developed in conjunction with WWF. The programme involves 26 barley farmers around the country learning invaluable skills about sustainable farming practices, such as water reduction, soil health and the restoration of their farming ecosystems.[31]

Difference in input costs

There are key differences between the input costs of fuel, labour, chemicals, machinery service and repairs for conventional and no-tillage farming. Reduced-tillage needs less tractors, so there are less fuel and maintenance costs, but more herbicides might be required.

Case studies: financial impacts of implementing conservation agriculture

A number of studies conducted at a farm level between 2004 and 2018 show the overall positive impact of CA over time, but that specific farm level impacts may vary.

Yield

- On-farm trials near Reitz in the Free State show that no-tillage does not necessarily deliver higher yields, but may lead to more **consistent yields** during drought conditions. The benefits of minimum-tillage are only achieved after eight to ten years with yield reduction observed from Year 1 to Year 5, and **yield increase from Year 5**.[32]
- Another study found the yields in CA declined initially and only recovered after five years[33] when average crop yields were reported to **increase by as much as 34.21%**.

Production costs

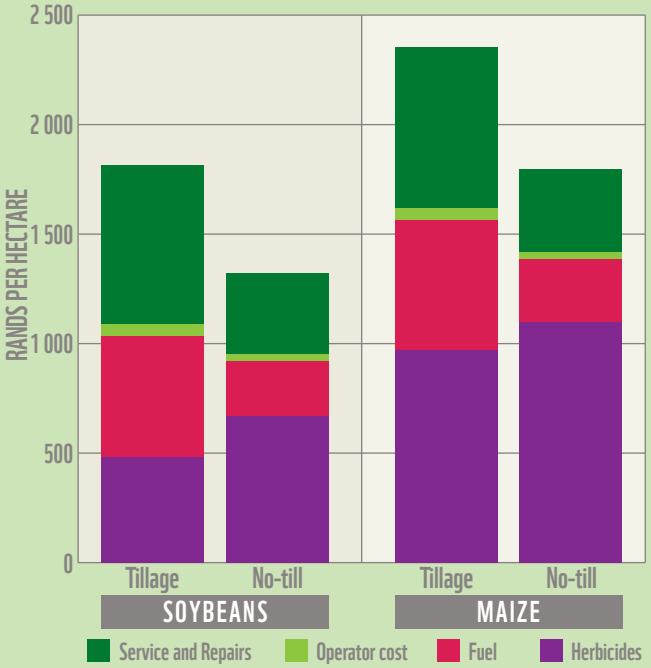
The studies all confirmed lower production costs associated with CA compared to conventional agriculture:

- **Average variable cost was 12% lower** for CA compared to conventional agriculture, taken across a number of farms in the North West Province.[34]
- Lower total variable cost for no-tillage versus conventional tillage was **around 10% lower at a farm** in the Free State.[35]

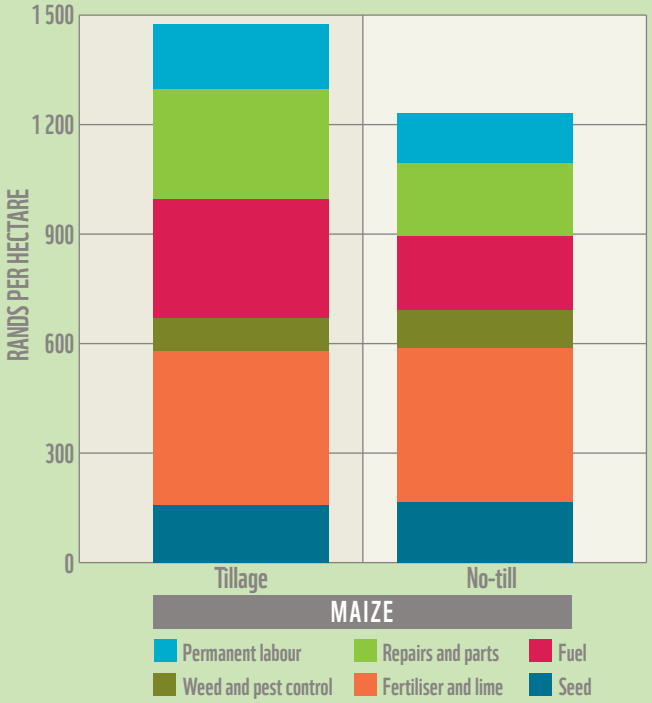
Comparison of Net Present Value (NPV) and Internal Rate of Return (IRR) for conventional and reduced-tillage in Eastern Free State[38]

	CONVENTIONAL TILLAGE			NO-TILLAGE		
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6
CROP	Maize	Soybeans	Soybeans-Maize Rotation	Maize	Soybeans	Soybeans-Maize Rotation
NPV at 10 years	-924 677	- 1 653 095	-1 294 913	1 873 220	1 068 627	1 464 266
Payback period in years	12	15	13	6	7	6
Real IRR at 10 years	1.3%	-3.8%	-1.2%	28.5%	19.2%	23.4%
Real IRR at 20 years	13.8%	10.5%	12.1%	33.7%	26.5%	29.6%

Comparison of select variable costs for tillage versus no-tillage in Eastern Free State[36]



Comparison of select variable costs for tillage versus no/reduced tillage on North West farms[37]



Net Present Value (NPV) and Internal Rates of Return (IRR)

- Reduced-tillage outperforms conventional tillage by a large margin due to lower initial capital outlay than for conventional tillage machinery, leading to lower input costs.
- None of the conventional tillage scenarios are able to pay for themselves after ten years, demonstrated by negative Net Present Value (NPV) at Year 10, while the payback period for reduced-tillage is significantly faster than conventional tillage at Years 6 to 7.

The case studies highlight the need to collate, monitor and evaluate time series farm level agronomic and financial data for CA in South Africa. Most of the available data is for research farms, with less data available for privately-owned farms. Ensuring data is shared on an open access platform could also support the wider availability of information on the performance of CA.

Greenhouse gas (GHG) mitigation potential

South Africa's *2015 National Terrestrial Carbon Sink Assessment* identifies reducing tillage, based on the CA principle of minimum soil disturbance, as one of eight prominent land-use based climate change mitigation activities.[39]

South African food is produced in a highly complex and diverse ecological landscape with large variations particularly in terms of soil properties, resulting in high production risks.[40] Soils hold different amounts of Soil Organic Carbon (SOC) depending on geology, climatic conditions, land-use and management.[41] CA has the potential to mitigate climate change by sequestering organic carbon in soil **and** by having direct GHG benefits through reduced use of diesel from less tractor use.

Data and research on the climate mitigation potential of CA is in its infancy – and far more is required to scale-up adoption. However, South Africa's Mitigation, Reporting and Verification Strategy developed by Department of Environmental Affairs (DEA) provides a baseline towards 2050 for agriculture, forestry and other land-use sectors (AFOLU). It also provides guidance for GHG reduction and links this to proposals on carbon taxes.[42] In this regard, AFOLU sectors will be exempt from direct carbon taxes during the first phase from 2020 to 2022. However, they will be taxed indirectly for energy and fuel-use.

So what is all the fuss about SOC?

- South African SOC levels range from 0.2% in very sandy soils to 2.5% in clay soils, depending on annual rainfall.
- There are higher levels of SOC for no-tillage compared to conventional agriculture. [43]
- Reduced tillage adoption of 20% of South Africa's potential cultivated areas based on CA minimum soil disturbance principle leads to improved SOC amounting to total of 1,2 million tCO^2e.[44]

Climate mitigation potential of conservation agriculture in wheat

The wheat sector is presented to illustrate the estimated potential GHG savings from CA practices because plausible and comparative average diesel consumption figures are available for conventional agriculture versus CA for wheat across the country.[45] This case study assumes a conservative 20% CA adoption across the wheat sector in South Africa.

Wheat in South Africa[46]

Wheat is mainly planted between mid-April and mid-June in the winter rainfall area, and between mid-May and the end of July in the summer rainfall area. Most of the wheat produced in South Africa is bread wheat. The estimated area planted to wheat for the 2017 season is 491 600 ha, with about two-thirds occurring in the Western Cape. Wheat irrigation includes the Free State and Northern Cape provinces.

GHG savings from reduced diesel-use:

- The diesel consumption was computed by the five-year production average (to accommodate fluctuations from recent drought conditions), with average consumption in litres per hectare.
- The total GHG emissions were computed by multiplying the Intergovernmental Panel for Climate Change (IPCC) 2016 diesel effective emission co-efficient (kg per terajoules – TJ) with total diesel emissions.
- From the reduction in diesel consumption alone, adoption of CA across 20% of total wheat production areas leads to carbon emissions of 251 033 tonnes compared to 331 075 tonnes for conventional agriculture, **a GHG saving of 80 042 tonnes**.

About CO_2e

To enable us to compare the warming effect of the 17 different greenhouse gases (GHGs), they are converted to a common basis called carbon dioxide equivalent – CO_2e – expressed as 'carbon emissions' for short.

GHG savings from carbon sequestration from conservation agriculture adoption:

- Our calculations use a net sequestration rate of 0,1 tonnes of CO_2e per hectare a year.[47]
- Applying this to 20% of the total wheat production area (or 98 560 hectares) in South Africa would achieve **a saving of 9 800 tCO_2e tonnes per annum**.

Total GHG savings from conservation agriculture adoption in 20% of wheat

- Together, GHG savings from carbon sequestration and reduced diesel-use, amount to some 90 000 tCO_2e per annum.
- Wheat represents a significantly smaller number of hectares under production than does maize. **This 90 000 tCO_2e savings is a fraction of what could be achieved should CA practices be adopted for 40% of all grains.**

GHG savings from reduced diesel use in conservation agriculture wheat production[48]

Region	Main production system	Five-year production average '000 hectares	Diesel consumption (litres per hectare)				CO_2 emissions (tonnes) from diesel consumption Diesel effective emission CO_2e factor (kg/TJ) = 74 100	
			Conventional agriculture		Conservation agriculture		Conventional agriculture	Conservation agriculture
			Litres per hectare	Total litres	Litres per hectare	Total litres	Total emissions	Total emissions
Western Cape	Dryland	315,80	42	13 263,6	34	10 737,2		
Northern Cape	Irrigation	37,80	60	2 268,0	36	1 360,8		
Free State	Dryland	85,90	42	3 607,8	34	2 920,6		
Eastern Cape	Irrigation	2,94	60	176,4	36	105,84		
KwaZulu-Natal	Irrigation	6,96	60	417,6	36	250,56		
Mpumalanga	Irrigation	3,56	60	213,6	36	128,16		
Limpopo	Irrigation	23,90	60	1 434	36	860,4		
Gauteng	Irrigation	0,58	60	34,8	36	20,88		
North West	Irrigation	15,40	60	924	36	554,4		
Total		**492,84**		**22 339,8**		**16 938,24**		
Adoption of 20%		98,56		4 467,96		3 387,77	331 075 836	251 033 757

Socio-economic benefits

Agriculture in South Africa is experiencing a number of domestic and global pressures including fluctuating global agricultural commodity prices, a volatile currency, policy uncertainty and water scarcity, which may lead to job losses in certain areas and industries. Increased temperature, changes in rainfall patterns and extreme weather events also challenge farming.

In the face of these pressures, CA can provide more stable yields and greater farm resilience in times of droughts and other climate events, improving job retention. CA should be viewed as a long-term investment strategy to maintain viable jobs, and to progress workers to more skilled, highly paid jobs.

Action points

Government departments and policy-makers

- Provide an enabling environment by clarifying likely approaches towards land expropriation and water allocations.
- Finalise and implement the draft policy on CA and climate-smart agriculture.
- Support smallholder farmers to adopt CA methods to improve soil health, yields, and resilience.

Farmers

- Embrace rigorous science-based and experimental approaches towards CA adoption by tapping into existing local organisations, study groups, and neighbouring champion farmers.

Finance, investment and insurance

- Partner with the public and private sector to scale-up the packages of blended concessional finance and to provide access to technical advisory services that support and mentor CA adoption.

Research and tertiary academic institutions

- Develop more farmer-led research initiatives to demonstrate CA application.
- Put in place an open access database for farmers to access information on agronomic, financial and climate change mitigation benefits.[49]

Unions

- Work with industry and government to better understand where and how to protect farmworkers in the face of shifts in agricultural practices. With social partners, establish a Just Transition Taskforce to help protect workers in the transition to a low-carbon and climate resilient economy.
- Advocate for smallholder farmers' access to science, inputs, finance and support services, to allow them to fully adopt CA practices, improving yields, supporting rural economies, and improving food security in the process.

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The climate change mitigation debate in South Africa needs to move from improving efficiency within a projection of the existing economy, to innovation and options beyond the constraints of the current dispensation and structure of the economy. It may take step changes in the development path to achieve mitigation adequate to South Africa domestic and international commitments, and to maximise economic development and social wellbeing. Business models presently unconsidered may be waiting in the wings.

The 'Low-carbon development frameworks in South Africa' project seeks to deepen understanding of, and reveal opportunities for, transitions to a low-carbon economy. It facilitates and develops contributions at the intersection of climate change mitigation, economic development and socio-economic dimensions, across immediate, medium and long-term horizons.

Working variously with government, business and labour, the project reaches from providing input to emerging government mitigation policies and measures; through investigating the business and socio-economic case for selected mitigation initiatives which hold growth potential in energy, transport, industry, waste, and land use; to analysing potential future economic trajectories and the systemic opportunities offered by these.

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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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WWF's Policy and Futures Unit undertakes enquiry into the possibility of a new economy that advances a sustainable future. The unit convenes, investigates, demonstrates and articulates for policy-makers, industry and other players the importance of lateral and long term systemic thinking. The work of the unit is oriented towards solutions for the future of food, water, power and transport, against the backdrop of climate change, urbanisation and regional dynamics. The overarching aim is to promote and support a managed transition to a resilient future for South Africa's people and environment. The organisation also focuses on natural resources in the areas of marine, freshwater, land, species and agriculture.

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