

FINAL REPORT

An assessment of the adoption of conservation agriculture in annual crop-livestock systems in South Africa

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- The National level enumerators who assisted with data collection.
- The local key informants in each of the Magisterial Districts for the provision of CA adoption data among producers.
- GEOTERRAIMAGE for the provision of data on cropping areas (area (ha) and crop type) under annual crop-livestock systems.

EXECUTIVE SUMMARY

This study found that CA is applied on 1 607 081 ha comprising 25% of the total area under commercial annual crop-livestock systems in South Africa. This is a significant increase from any other figure used in the past, by far the biggest in Africa and 12th on the list of all countries in the world. Areas with high adoption rates were found in the Western Cape, KwaZulu-Natal, North West, Mpumalanga, Limpopo and Gauteng Provinces. The Western Cape has a 51% adoption of CA comprising 804 866 hectares, the North West Province with 37% and 330 464 hectares, Mpumalanga Province with 24% and 205 598 hectares, Free State Province with 3.35 % and 73 519 hectares, KwaZulu-Natal Province with 38% and 62 957 hectares, Eastern Cape Province with 2% and 3 194 ha, Limpopo Province with 27% and 68 834 hectares, Gauteng Province with 33% and 57 649 hectares.

CA areas under semi-commercial and smallholder systems occupy 13 556 ha during the 2020/2021 season. These farmers face various unique challenges with a general lack of resources to carry out their farming and even more so for starting new practices, such as CA. A continuous, concentrated and improved effort is necessary to support and empower this category of farmers with CA as it will be crucial for their sustainability.

CA farmer pioneers and innovators, together with their structures, played a key role in the adoption and spread of CA in South Africa. Other factors that played a key role are local CA equipment manufacturers promoting equipment as part of the whole CA system, local study groups and awareness events, local research initiatives where farmers, researchers and other key stakeholders collaborate, international success stories and cross-visits, international pioneer CA farmers, prominent international and local CA scientist, local service providers and agribusiness.

The existing CA farmer-led structures (e.g., clubs and groups) created by farmers and other stakeholders that successfully spread the adoption of CA in the various regions in South Africa as assessed in this study, should be supported and used as ideal platforms to implement, strengthen and scale out/up CA initiatives to other farmers, stakeholders and regions.

The telephonic survey method followed in this study yielded an acceptable quantity (amount) and quality (accuracy) of data on CA adoption on Magisterial District, provincial and national levels across South Africa, which made it possible to formulate applicable conclusions and recommendations on the extent, nature and potential best strategies of CA adoption in the country.

The telephonic survey method followed in this study managed to reach all the areas cultivated with annual crop-livestock systems and yielded results with acceptable accuracy, depth and spread. The strength and ultimate success of the survey heavily relied on access to key informants in the various Magisterial Districts across the country. Supporting data from GEOTERRAIMAGE was essential to calculate adoption rates and portray results in a spatial context. Future studies of this nature could benefit from new technology, such as remote sensing techniques.

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1. BACKGROUND

Harmful soil degradation processes are part of many environmental problems caused by conventional tillage (CT) and unsustainable agricultural practices. These practices are continuing unabated under many crop-livestock agricultural systems in South Africa and poses a major threat to the sustainability of agriculture, food production and national security (Borrelli *et al.*, 2017). Impacts can be severe, not only through soil erosion and fertility loss (Le Roux *et al.*, 2008), but through a conspicuous number of off-site effects (e.g., sedimentation, siltation and eutrophication of water ways or enhanced flooding). In addition, the impact of bare (fallow) soil on climate through the loss of soil carbon and erosion-induced changes in soil carbon cycling remains an increasing threat. Sustainable governance of soil has therefore become a topic of fundamental importance in South Africa.

Rising input and overhead costs as well as sliding real prices of commodities (e.g., maize) put the economic viability and profitability of maize-based cropping systems under severe pressure resulting in many farmers being affected by the cost squeeze and having financial difficulties, even in high potential regions, such as the Mpumalanga Highveld. A study done by De Wit *et al.* (2015) confirms this trend but shows an exceptionally large monetary benefit of adopting CA in maize-based systems of South Africa. The outcomes of this study demonstrated that the transition from CT to CA systems has the potential of not only reducing costs, increasing yields, increasing net farm income, but also ecological benefits as well. This is through lower greenhouse gas (GHG) emissions, lower input use and increased carbon sequestration. Maize farmers should therefore be encouraged to adopt CA systems to improve the profitability of their farms. **It is therefore of utmost importance that maize production on the remaining crop production land be intensified in a sustainable manner.**

Consequently, as an effective strategy to stop and reverse this trend, the adoption and implementation of CA principles and practices has been identified as the way forward by most relevant global and local policies, Programmes and institutions (De Wit *et al.*, 2015). South Africa has, in fact, a favourable national policy environment supporting the promotion of CA among farmers and other actors. The following agricultural and other international, national and regional (SADC) policies and Programmes, especially the recent policy initiatives developed and adopted during this last decade, aid in the creation of this policy environment:

- The national CA policy (DAFF, 2017) - the key government initiative that “addresses the urgent need to adapt conventional farming systems which are compromising agricultural production and resulting in alarming natural resource degradation”
- National Development Plan (NDP)
- LandCare Programme which focuses on community-based land resource management through the promotion of sustainable land use practices
- National Water Act (NWA)
- National white paper on Climate Change and Climate-smart Agriculture
- South Africa National Environmental Management Act (NEMA) and
- Conservation of Agricultural Resources Act (CARA) 43 of 1983
- United Nations Conventions:
 - UN Framework to Combat Climate Change (UNFCCC)
 - UN Convention on Biological Diversity (UNCBD)
 - UN Convention to Combat Desertification (UNCCD)

What is more, in the mostly semi-arid, sub-tropical climate of the summer rainfall areas in South Africa, as well as the Mediterranean Western Cape Province, water is limiting crop yield, where, according to Pittelkow *et al.* (2015), no-till grain yields often equal or exceed yields of conventional tillage practices.

According to Kassam *et al.* (2018) the area under CA in South Africa was 368 000 ha in 2008/09 and 439 000 ha in 2015/16; no scientific or formal surveys were used to produce these results. The first formal national CA adoption survey in South Africa was done in 2015 and published by Findlater *et al.* (2019). The survey followed an online web-based technique targeting a database of commercial grain producers with email access in the country (provided by Grain SA). Results from Findlater *et al.* (2019) were much higher than those of Kassam *et al.* (2018) and are compared with results from this study in Section 4 below.

Pioneer CA farmers were leading the transformation of cultivation systems towards CA in KZN and Western Cape since the 1980's and were later (from the 1990's) starting to work in partnership with researchers and manufacturers (Goddard *et al.*, 2020). According to Smith *et al.* (2021) and Strauss *et al.* (2021) a percentage of commercial farmers in the Highveld summer rainfall area of South Africa spontaneously converted their farming systems to CA without any support or influence of formal research studies in their regions. Some CA Programmes and projects started around 2013 joining these farmer-led initiatives (i.e., by commercial and smallholder farmers), such as the CA Farmer Innovation Programme funded by The Maize Trust. Government Programmes such as the LandCare Programme increasingly channelled funding for CA implementation through the Provincial structures.

A proper assessment of CA adoption in South Africa was needed to fill the data gaps and clear up the uncertainty around the status quo, trends and spread of CA in the country. This data is needed for strategic recommendations and interventions in future to ensure improvement in the management of the natural agricultural resources.

2. AIM AND OBJECTIVES (TERMS OF REFERENCE)

The study was supported by the project 'Strengthening Coordination, Scaling Up and Governance of Conservation Agriculture in Southern Africa (SUCASA)' funded by the Norwegian Agency for Development Cooperation (NORAD) and the FAO with the support of the Department of Agriculture, Land Reform and Rural Development (DALRRD) and the Provincial Departments responsible for Agriculture. It contributes to the realization of the Comprehensive Africa Agriculture Development Programme ex-Pillar 4 (CAADP-XP4) expressed by the African Heads of State Malabo Declaration of 2014, to get 25 million farmers to adopt climate resilient approaches in Africa by 2025. It contributes to local Government led initiatives such as the LandCare Programme. The CA Expert (Consultant) worked closely with the National Project Consultant and FAO South Africa office. Furthermore, the expert worked with the National CA Task Force (NCATF) Chairperson designated by the Department of Agriculture, Land Reform and Rural Development, the Provincial Departments of Agriculture and the National Project Consultant to fulfil in the following aim and objectives as stipulated in the Terms of Reference (ToR):

2.1. The aim of the study was:

To gather updated data and evidence on progress pertaining to the adoption of Conservation Agriculture within the annual cropping systems farming communities in South Africa.

2.2. The objectives of the study were:

1. Conducting a survey to assess the current extent of progress on the adoption of Conservation Agriculture in South Africa.

Inclusive of:

- a) database on the spatial footprint (ha and locality) of the extent conservation agriculture within South Africa as well as the applicable principle (s) of adoption
 - b) database of all stakeholders involved in CA in the country inclusive of their role and contribution
2. Analyse the status quo of Conservation Agriculture in the country supported by recommendations on options for improvement.
 3. Collect data, analyse and develop the study report.

3. RESEARCH METHOD

The research applied used a survey approach based on one-on-one telephonic interviews. This approach was the most appropriate under the existing context due to limitations of other methodologies given the movement and travel restrictions placed by the COVID 19 pandemic outbreak.

A telephonic survey was conducted to assess the area (hectares) under CA under annual grain cropping systems in South Africa taking the following steps:

- a) Identify the most suitable *spatial unit* that could be used to effectively collect and display data on the adoption of CA in South Africa. A *Magisterial District* was identified as the most practical and smallest spatial map unit for this purpose, since: a) they are used by the National Crop Estimates Committee (NCEC) to capture data on cropping areas (data on area (ha) and crop type under annual crop-livestock systems, which was provided by GEOTERRAIMAGE (<https://geoterraimage.com/>), and b) local key informants used in the collection of data are the most familiar with practices applied by farmers on this level (this unit is not too big or not too small for this purpose and there are no smaller or larger units suitable for this kind of assessment). The magisterial district boundaries do not necessarily align with the current Local and District Municipalities. In some instances, the magisterial boundaries also overlap between Provinces.
- b) Select several *enumerators* to assist with data collection from the key informants in the various Provinces of South Africa. These enumerators all have technical local research experience and are involved in local CA Programmes and/or projects. The employment of the selected enumerators is shown in Table 1.

Table 1: The employment of the selected enumerators in different Provinces, South Africa

Name	Affiliation	Region or Province
Dr Hendrik Smith	Independent Researcher	Mpumalanga, Limpopo, Gauteng, Northern Cape, KwaZulu-Natal (northern districts), Smallholders
Dr Jaap Knot	Independent Researcher	Eastern, central, and northern Free State, KwaZulu-Natal (Midlands), Eastern Cape
Dr Andre Nel	Independent Researcher	North West, western Free State, western Gauteng
Conservation Agriculture Western Cape (CAWC), i.e. Dr Johann Strauss and Mr Peter Greeff.	Various stakeholders in the Western Cape	Western Cape

The entire study was conducted in the months of February, March, and April 2021.

- c) Identify local *key informants* for each of the Magisterial Districts or broader regions (comprising several districts) who have a good knowledge of the use (adoption) of different farming systems by farmers in the districts. Most of the key informers were prominent (leader) farmers in the region, or technical advisors from agri-businesses and the Provincial Departments of Agriculture (LandCare units).

To reduce the risk of response bias in the survey, the following principles were followed: i) use key informants from a broad base of people who have nothing to win or lose from the results, ii) use the following clearly phrased question: “What is your most accurate estimate of hectares under CA for CA farmers in the district”, iii) aim for a confidence level of at least 70%, iv) when confidence level was not met in a specific district or regions, two or three key informants were used to fill all the knowledge gaps on CA adoption.

Access to good *key informants* from a broad base of people across the South African grain industry was a strategic strength of this research method and one of the main reasons why it was selected in the context of this study. Key informants used occupied key positions in structures such as Grain SA, CA clubs and study groups, Provincial and district Programmes such as LandCare, and provision of essential services and inputs such as extension and agricultural production inputs such as seed. All these key informants had a deep knowledge and relationship with the farming community in the district.

In the Western Cape, a two-prong approach was followed by first circulating questionnaires among the farmers’ structures of Grain SA and the CAWC, and secondly filling the gaps on a district level using the Delphi survey technique with key stakeholders or informants. The Delphi survey is a group facilitation technique, which is an iterative multistage process, designed to transform opinion into group consensus.

In the Northern Cape, a ‘blanket’ approach was followed to assess CA adoption after the feedback from key informants on cropping practices used by irrigation farmers in all the districts along the Orange River showed that “all farmers follow a specific system in this region”. Although no-till or strip tillage practices are used with certain crops, severe soil disturbance and residue burning are also part of the dominant system with some of the rotation crops, which disqualifies it from the definition of CA used in this assessment.

- d) Conduct a *telephonic survey* (by the enumerators) to collect the CA adoption figures per Magisterial District. (This was not done in the Northern Cape – see description of alternative approach followed above). The minimum data needed was the most accurate estimate of the area under CA (in hectares) and the percentage (%) it comprises of the total cropping area, per Magisterial District, per Province and for the country.

The CA definition used was:

No-till planting (either disc or tine No till planter) + crop residues (>30% soil cover) + at least 2 crops or more in rotation (strip till or any other tillage does not qualify)

- e) Identify *key stakeholders* who play a significant role in the adoption of CA in South Africa, especially those working with farmers. The table below was used for that purpose. To comply with the *Protection of Personal Information (POPI) Act* (<https://popia.co.za/>), no personal or private contact information were published in this report; only contact information in the public domain was published if and where available.

Key stakeholder (Institution, Group or Person)	Primary roles and functions	Potential resource contributions	Geographic area of influence	Contact details	Website
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- f) Manage the data collected in the telephonic surveys and aggregate it on a Magisterial District, Provincial and national level. Both the area (hectares) and percentage of CA adoption, calculated as a percentage of the total number of ha under annual crop production per Magisterial District, are displayed on a spatial and tabular format.
- g) Analyse and discuss the survey results on a Provincial level alluding to significant CA adoption stories, patterns and trends observed on a district level. Spatial data (hectares under annual crop-livestock systems) provided by GEOTERRAIMAGE was key in the success of this step. GEOTERRAIMAGE is a member of the National Crop Estimate consortium and specializes in spatial land use data collection and analyses using remote sensing. The following classes were used to display the adoption results (in %) per magisterial district spatially:
- Class 1: 0% adoption
 - Class 2: 1-5%
 - Class 3: 5,1-15%
 - Class 4: 16-25%
 - Class 5: 26-50%
 - Class 6: >50%
- h) Make conclusions and strategic recommendations gleaned from the survey results and analyses, that are relevant and informative for a range of stakeholders involved with CA in South Africa.

4. RESULTS AND DISCUSSION

4.1. Key informants in different districts or broader regions

Table 2 below shows all the key informants used across South Africa to collect data on CA adoption and use per Province and on Magisterial District level.

Table 2: Key informants used to collect data on CA adoption and use per Province and on Magisterial District level

Province	Key informers and affiliations	Magisterial Districts
Mpumalanga	Ryk Pretorius (Grain SA)	Ermelo, Amersfoort, Volksrust
	Bafana Mahlangu (PDA)	Semi-commercial & Smallholders
	Danie Bester (CA Farmer)	Balfour
	Nicol de Vos (CA Farmer)	Hoëveldrif
	Tommie Olckers (farm manager, Schoeman farming)	Delmas
	Freddie Steyn (Barenburg)	Entire Province
	Joe Coetzer (farm manager, H2)	Middelburg, Emalahleni
	Vilhelm Erichson (CA Farmer)	Middelburg

	Dawie Jacobs (Pannar seed)	Lydenburg
	Johan Scheepers (Stoffberg study group)	Stoffberg
	Hannes Botha (CA Farmer)	Carolina
	Fanus Stapelberg (CA Farmer)	Piet Retief
	Wynand Nieuwenhuizen (Farmers AgriCare)	Piet Retief
KwaZulu-Natal (KZN)	Egon Zunckel (CA Farmer, KZN No-till Club chairman), Bruce Shepherd (CA Farmer).	Bergville, Winterton, Estcourt
	Johan du Plessis (CA Farmer)	Dundee, Dannhauser, Glencoe
	Ralf Kuzel (CA Farmer, Grain SA)	Paulpietersburg
	Richard Findlay (KZN No-till Club secretary)	Providing names of key informers for KZN
	Hendrik Jacobs (CA Farmer)	Newcastle
	Dale van Aardweg (CA Farmer)	Klipriver, Ladysmith
	Gunther Muhle (farmer)	Utrecht
	Jacques Odendaal (farmer)	Vryheid
	Rick Mingay (Swartberg farmers association), Phillip Mortlock (Pioneer), Miles Williamson (farmer)	Underberg, Impendle, Mt Currie / Kokstad
	Steve Morris (CA Farmer), James Berning (CA farmer), Oric Pretorius (contractor), Howick no-till club	Lions River, Mooiriver, Howick
	Steve Stamp (contractor), Lloyd Roberts (contractor)	Umvoti, Greytown
North West	Louwrens Rudolph (Ottosdal Landini & No-till Club)	Entire Province
	Arno van Vuuren (NWK)	Lichtenburg, Coligny
Free State	Louwrens Rudolph (Ottosdal Landini & No-till Club)	Western Free State
	Francois Fouche (CA farmer), Tommy Jordaan (CA farmer), Lemont van Tonder (CA farmer), Hansie van Staden (ex-NT farmer Boesmanskop)	Zastron, Wepener, Boesmanskop, Dewetsdorp
	Koos Odendaal (farmer), Dr Trotsky (veterinarian)	Rouxville
	Jeff Johnson (AGT seed), Nant Yzel (CA farmer, Novon Protecta), Herman Enslin (CA farmer)	Thaba Nchu, Excelsior, Marquard, Senekal, Lindley, Heilbron, Winburg

	Chris Bender (CA farmer), Hennie Vermooten (CA farmer), Fridle von Maltiz (CA farmer)	Ladybrand, Clocolan, Ficksburg
	Chris Bender (CA farmer), Natus van Niekerk (input supplier), Jaco Breytenbach (Grain SA & farmer)	Bethlehem, Fouriesburg, Witsieshoek/ Clarens
	Paul Corver (CA farmer), Danie Slabbert (CA farmer)	Harrismith, Reitz
	Izak Dreyer (CA farmer), Pieter Maree (VKB silo manager), Jacques van Zyl (VKB agronomist), Willem Cilliers (Farmer)	Vrede, Ascent
	PW Loggenberg (CA farmer), Jan Erasmus (CA farmer) Wynn Dedwith (Valtrac), Hennie de Bruin (CA farmer), Jaap van der Westhuizen (CA farmer)	Koppies
	Cobus van Coller (CA farmer)	Viljoenskroon, Kroonstad and Bothaville
	Wynn Dedwith (CA farmer)	Parys and Vredefort
	Jaco Minnaar (CA farmer)	Henneman, Kroonstad and Ventersburg
	Petrus van Staden (Senwes)	Hertzogville, Hoopstrad, Bultfontein, Wesselsbron, Odendaalsrus, Welkom, Theunissen, Brandfort.
Gauteng	Louwrens Rudolph (Ottosdal Landini & No-till Club)	Randfontein, Krugersdorp, Oberholzer, Vereeniging
	Carel Kriek (CA Farmer)	Heidelberg
	Danie Bester (CA Farmer)	Nigel
	Herklaas Willemse (Losberg study group)	Vanderbijlpark, Vereeniging
	Cocky Mkoka (CA Farmer)	Vanderbijlpark
	Johan Pistorius (CA Farmer, Nigel study group)	Nigel
Limpopo	Willem van der Walt (CA Farmer)	Bela-Bela / Settlers
	Leonard Venter (CA Farmer, Chair Cotton SA)	Mokopane / Modimolle-Mookgophong
	Louw Pieterse (AECI)	Mokopane / Modimolle-Mookgophong
	Nico Swart (Koedoeskop cotton mill)	Thabazimbi
Eastern Cape	Paul Collett (CA Farmer)	Cradock (Inxuba Yethemba)
	Lood de Jager (CA Farmer), Matt Philips (farmer)	Hofmeyer

	Koos Odendaal (farmer), Dr Trotsky (veterinarian)	Aliwal-North
	Jannie Zwiegers (CA Farmer), Wikus Vorster (contractor)	Steynsburg
	Robert Rawlins	Matatiele
Northern Cape	Bertie Coetzee (CA Farmer); Hein Mulke (farmer); Dup Haarhoff (GWK)	Entire region
Western Cape	Johann Strauss (secretary Conservation Agriculture WC)	Entire region
	Peter Greeff (Independent Agronomist)	Entire region
	Casper Nel (Agri Business)	Overberg
	Gerco Nel (Agri business)	Swartland
	Pieter Blom (Agri business)	Southern Cape
Government supported CA projects	Anneliza Collet, Klaas Mampholo (DALRRD, LandCare)	National level, data from Provinces

4.2. CA adoption trends, factors and distribution in South Africa

4.2.1. Summary of CA adoption data on a national level

Table 3 below shows the distribution of CA per Province (in hectare) under commercial farming and the percentage (%) it comprises of the total area cultivated by annual crop-livestock systems in South Africa as assessed in this study, compared with results from a survey done in 2015 by Findlater *et al.* (2019). This study found that CA is applied on 1 607 081 ha comprising 25% of the total area under commercial annual crop-livestock systems. This is a significant increase from any other figure used in the past.

In 2015 the Findlater web-based survey involved 441 respondents, or 9% of the farmers in the Grain SA database across the country and produced only results on the percentage (%) adoption of CA principles, but nothing on the spread of the area under CA in hectares. Furthermore, the response in certain Provinces was very low (i.e., Eastern Cape, Northern Cape, Limpopo and even KZN) with no indication of the spatial distribution within the Provinces, e.g., on a district level. This implies that there could most probably be an overprediction in certain areas, and an underprediction in other areas. The telephone survey followed in this study was therefore deemed more accurate than the web-based study by Findlater as it certainly covered all the annual crop-livestock cultivated areas, and it did so with more depth and accuracy. However, it was still deemed relevant to have a comparison of adoption data produced in the two surveys done in 2015 and 2021. To have a like for like comparison (compare apples with apples), the same CA definition was used for both data sets and the percentage adoption data derived in 2015 was converted into hectares, which was now made possible with the availability of data provided by GEOTERRAIMAGE.

It must be emphasized that most other annual crop-livestock farming systems in South Africa that did not qualify under the CA definition used in this study, are evolving and do follow various other conservation tillage practices, such as the double cropping system (maize and wheat) in the irrigation areas of the Northern Cape, the Rip-on-Row system in the north west Free State, and strip-tillage

systems followed by many farmers. These systems and their adoption (expressed in hectares and %) are not indicated in Table 3 and Figure 1.

Table 3: Summary of the distribution of CA by 2015 and 2021

PROVINCE	TOTAL ANNUAL CROP AREA (HA) ¹	AREA UNDER CA IN 2021 (HA) ²	AREA UNDER CA IN 2015 (HA) ³	CA ADOPTION IN 2021 (%) ⁴	CA ADOPTION IN 2015 (%) ³
Western Cape	1 569 277	804 866	564 940	51%	36%
North West	890 437	330 464	142 470	37%	16%
Mpumalanga	850 484	205 598	314 679	24%	37%
Free State	2 196 986	73 520	175 759	3%	8%
KwaZulu-Natal	164 620	62 956	82 310	38%	50%
Limpopo	255 866	68 834	63 967	27%	25%
Gauteng	173 435	57 649	116 202	33%	67%
Eastern Cape	160 307	3 194	0	2%	0%
Northern Cape ⁵	69 498	0	7 645	0%	11%
TOTAL	6 330 910	1 607 081	1 467 971	25%	23%

¹ Data provided by GEOTERRAIMAGE

² Data collected in this study

³ Results adapted from Findlater *et al.* (2019)

⁴ Data analysed by DALRRD–LSM

⁵ Total area under irrigated double-cropping conservation tillage system; doesn't qualify for CA

Figure 1 shows the spatial distribution of CA adoption in South Africa in 2021. Areas with higher adoption rates are clearly visible, especially in areas of the Western Cape, KwaZulu-Natal, North West, Mpumalanga and Limpopo Provinces. Ancillary data from this study (in tables and maps) per Province and Magisterial District are shown in **Appendix 1**.

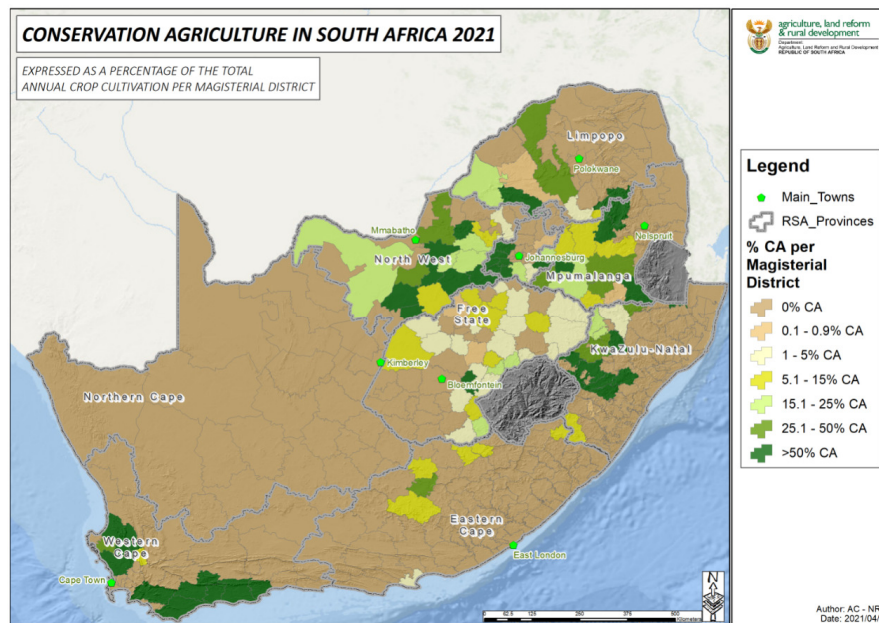


Figure 1: The spatial distribution of CA adoption in South Africa in 2021 expressed as a percentage of the total cultivated area under annual crop-livestock systems

4.2.2. Summary of CA adoption data on a Provincial and Magisterial District level

The sections below provide a summary of the CA adaption data per Province, showing the districts with significant adoption rates, as well as factors that influenced the adoption rate in the specific Province, as collected during this study.

4.2.2.1. Western Cape Province

The Western Cape has a 51% adoption of CA comprising 804 866 hectares.

Several Magisterial Districts show significant adoption levels such as Bredasdorp (124 290 ha or 76%), Caledon (28 549 ha, or 71%), Heidelberg WC (76 605 ha, or 77%), Hopefield (13 819 ha, or 45%), Moorreesburg (78 403 ha, or 76%), Riversdale (68 906 ha, or 69%) and Swellendam (116 536 ha, or 78%).

The following factors played a key role in the high CA adoption rate in the Western Cape Province:

- Local pioneer CA farmers (e.g., Jack Human -Heidelberg, Francois and Pieter Eksteen - Piketberg),
- local CA equipment manufacturers (e.g., Equalizer, X-Farm, Piket and Rovic Leers),
- local study groups and awareness events (e.g., Conservation Agriculture Western Cape -annual CA conference since 2012, green and brown tours annually),
- local research projects with Western Cape Department of Agriculture (e.g., Long-term trials at Langgewens and Tygerhoek Research Farms and on-farm trials with producers in Riversdale and Swellendam since 1996 – Dr Johann Strauss, Prof M Hardy),
- local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)
- international success stories and cross-visits (e.g., to Argentina, Brazil, Australia and North America),
- international CA scientists (e.g., Rolf Derpsch - Paraguay, Barry Fischer – USA, Ken Flower - Australia),
- local support to semi-commercial and smallholder farmers (e.g., LandCare, Western Cape Department of Agriculture Farmer support and Development).
- LandCare funding support to Western Cape forum and research projects.

4.2.2.2. North West Province

The North West Province has a 37% adoption of CA comprising 330 464 hectares among commercial farmers.

Several Magisterial Districts show significant adoption levels such as Lichtenburg (97 225 ha, or 50%), Schweizer-Renecke (75 900 ha, or 70%), Delareyville (47 997 ha, or 40%), Klerksdorp (20 000 ha, or 75%), Wolmaranstad (16 600, or 13%), Vryburg (13 600, or 21%), Koster (11 600, or 22%), Ventersdorp (14 600 ha, 22%), Coligny (9 568 ha, 18%), Bloemhof (3 600 ha, or 83%), Marico (3 574, or 38%), and Potchefstroom (13 200 ha, or 61%).

The following factors played a key role in the CA adoption rate in the North West Province:

- Local pioneer CA farmers (e.g., Hannes Otto (Ottosdal)),
- Local CA equipment manufacturers (e.g., Ottosdal Landini / Equalizer),
- Local study groups and awareness events (e.g., Ottosdal No-till Club and annual CA conference),

- Local research projects with farmers (e.g., CA Farmer Innovation Programme funded by The Maize Trust that started a CA project in 2013),
- International success stories and cross-visits (e.g., to Argentina),
- Local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, LandCare national conferences and policy developments, etc.)
- International pioneer CA farmers (e.g., Gabe Brown),
- International CA scientist (e.g., Ray Archuleta, Rolf Derpsch, Christine Jones),
- Local support to semi-commercial and smallholder farmers (e.g., by ARC / The Maize Trust and landcare),
- Local service providers and agribusiness (e.g., SGS).
- CA provincial forums and study groups
- Provision of CA no till planters and equipment's by LandCare
- Drought funding support on building resilience by upscaling CA
- Dedicated CA funding under LandCare programme

4.2.2.3. Mpumalanga Province

The Mpumalanga Province has a 24% adoption of CA comprising 205 598 hectares.

Several Magisterial Districts show significant adoption levels such as Ermelo (37 250 ha, or 35%), Hoëveldrif (26 600 ha, or 79%), Belfast / Stoffberg (12 120 ha, or 50%), Standerton (23 810 ha, or 16%), Bethal (17 600 ha, or 22%), Balfour (18 480 ha, or 28%), Lydenburg (10 750 ha, or 76%) and Piet Retief (15 128 ha, or 91%).

The following factors played a key role in the CA adoption rate in the Mpumalanga Province:

- Local pioneer CA farmers (e.g., Andre de Villiers (Hoëveldrif), Jan Grey (Ermelo), Danie Bester & Richard Dannhauser (Balfour, Nigel)),
- International success stories and cross-visits (e.g., to and from Argentina),
- International pioneer CA farmers (e.g., Gabe Brown, international CA scientist (e.g., Elain Ingham, Ray Archuleta, Allan Savory),
- Local CA scientist (e.g., John Fair, Karl Koch),
- Local CA equipment manufacturers (e.g., FarmQuip, Xfarm, Equalizer),
- Local study groups (e.g., Stoffberg, Piet Retief study groups, KZN No-till Club),
- Local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)
- Local support to semi-commercial and smallholder farmers (e.g., by Grain SA and LandCare),
- Local service providers and agribusiness (e.g., Barenbrug, Farmers AgriCare, Pannar seed).
- CA provincial forums and study groups
- Provision of CA no-till planters and equipment's by LandCare
- Drought funding support on building resilience by upscaling CA
- Dedicated CA funding under LandCare programme

4.2.2.4. Free State Province

The Free State Province has a 3.35 % adoption of CA comprising 73 519 hectares under commercial farming.

The Free State Province has the biggest area under annual crop-livestock systems in South Africa (2 196 986 ha), dominated by maize-based systems. Although the Province has an overall exceptionally low adoption rate, a few Magisterial Districts show encouraging upward trends in adoption rates, such as Viljoenskroon (ha 12 270, or 12%), Clocolan (6 056 ha, or 19%), Ficksburg (5 995 ha, or 19%), Marquard (3 050 ha, or 8%), Harrismith (6 500 ha, or 12%), Reitz (4 940 ha, 5%), Vrede (3 960 ha, or 4.2%), Koppies (6 560 ha, 13%) and Kroonstad (4 000 ha, or 5%).

The following factors played a key role in the CA adoption rate in the Free State Province:

- Local pioneer CA farmers (e.g., Cobus van Coller (Viljoenskroon), Danie Slabbert (Reitz), Izak Dreyer (Vrede)),
- Local study groups (e.g., Riemland (Reitz), Ascent (Vrede) and Maluti (Clocolan, Ficksburg) study groups, KZN No-till Club),
- Local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)
- CA provincial forums and study groups
- Provision of CA no-till planters and equipment's by LandCare
- Drought funding support on building resilience by upscaling CA
- Dedicated CA funding under LandCare programme

4.2.2.5. KwaZulu-Natal Province

The KwaZulu-Natal Province has a 38% adoption of CA comprising 62 957 hectares under commercial farmers.

Several Magisterial Districts show significant adoption levels such as Estcourt / Winterton (18 000 ha, 78%), Bergville (14 000 ha, 56%), Paulpietersburg (4 000 ha, or 45%), Dundee (3 400 ha, or 60%), Lions River (5 800 ha, or 89%), Moorivier (4 737 ha, or 70%), Newcastle (3000 ha, or 25%), and Umvoti / Greytown (3 452 ha, or 60%)

The following factors played a key role in the high CA adoption rate in the KwaZulu-Natal Province:

- Local pioneer CA farmers (e.g., Anthony Muirhead (Winterton), Egon Zunckle (Bergville)),
- Local study groups and awareness events (e.g., KwaZulu-Natal No-till Club and annual CA conference),
- Local research projects with farmers (e.g., Cedara research personnel working with no-till farmers since 1980's),
- Local CA equipment manufacturers,
- Local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)
- International success stories and cross-visits (e.g., to USA),
- International pioneer CA farmers on internet (e.g., Gabe Brown),
- International CA scientist (e.g., Ray Archuleta, Richard Teague),
- Local service providers and agribusiness (e.g., Farmers AgriCare).
- Dedicated CA funding under LandCare programme

- Local support to semi-commercial and smallholder farmers (e.g., by Grain SA, CA FIP / The Maize Trust and LandCare).
- CA provincial forums and study groups
- Provision of CA no-till planters and equipment's by LandCare
- Drought funding support on building resilience by upscaling CA

4.2.2.6. Eastern Cape Province

The Eastern Cape Province has a 2% adoption of CA with 3 194 ha under commercial farmers.

Most of the Eastern Cape's annual cropland of 160 307 ha falls under communal land with only 345 ha under CA. CA adoption under commercial farming is primarily done under irrigation systems in the Cradock and Hoffmeyer districts.

4.2.2.7. Northern Cape Province

The Northern Cape Province has a 0 % adoption of CA as defined in this study, but the total area is planted under a unique conservation tillage system. Practically all the annual crop farmers in the Northern Cape are dependent on irrigation from the Orange and Vaal river irrigation schemes and follow a double cropping system with maize and wheat. All the farmers either use no-till or strip-till to plant their maize but do some form of tillage and residue burning as part of the wheat practice, disqualifying them from CA as defined in this study. The area under this form of conservation tillage (CT) is estimated at around 69 498 ha. Further, more detailed studies are necessary to investigate the elements and extent of CA and CT systems in the unique context.

4.2.2.8. Limpopo Province

The Limpopo Province has a 27% adoption of CA comprising 68 834 hectares under commercial farmers.

A few Magisterial Districts show significant adoption levels such as Bela-Bela (30 900 ha, or 78%), Mokopane (30 117 ha, or 44%), and Thabizimbi (7 430 ha, or 18%).

The following factors played a key role in the CA adoption rate in the Limpopo Province:

- Local pioneer CA farmers (e.g., Willem van der Walt (Bela-Bela)),
- local CA equipment manufacturers (e.g., Willem van der Walt / Walt Estate supplying no-till planters),
- local service providers and agribusiness (e.g., Louw Pieterse, AECI, Mokopane, Roedtan).
- local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)

4.2.2.9. Gauteng Province

The Gauteng Province has a 33% adoption of CA comprising 57 649 hectares under commercial farmers.

A few Magisterial Districts show significant adoption levels such as Nigel (17 300 ha, or 70%), Krugersdorp (4 000 ha, 83%), Oberholzer (2 500 ha, or 61%), Westonaria (2 500 ha, or 86%) and Vanderbijlpark (12 459 ha, or 70%)

The following factors played a key role in the CA adoption rate in the Gauteng Province:

- Local pioneer CA farmers (e.g., Danie Bester, Tony da Costa),
- local CA equipment manufacturers (e.g., Xfarm, DBX, Ottosdal Landini / Equalizer),
- local study groups (e.g., in Nigel).
- local awareness and information through popular agricultural magazines and TV channels (e.g., *Landbouweekblad*, *SA Grain*, *Farmers Weekly*, *Veeplaas*, *Landbouweekliks*, etc.)

4.3. CA stakeholder analyses results

Appendix 2 included a stakeholder matrix with the key stakeholders identified during this study. The list and range of stakeholders involved in CA is dynamic in nature and needs to be continually updated.

5. CONCLUSIONS

This study was conducted to assess and update the area and percentage of land under conservation agriculture, which was needed to fill the data gap on the adoption and spread of CA in South Africa.

The telephonic survey method followed in this study yielded an acceptable quantity (amount) and quality (accuracy) of data on CA adoption on Magisterial District, Provincial and national levels across South Africa, which made it possible to formulate applicable conclusions and recommendations on the extent, nature and potential best strategies of CA adoption in the country.

The strength and ultimate success of the survey heavily relied on access to *key informants* in the various Magisterial Districts across the country. Most of the key informants used were prominent (leader) farmers in the region, or technical advisors from agri-businesses and the Provincial Departments of Agriculture (LandCare units). The use of Magisterial Districts as smallest spatial data unit proved to be the correct decision as data was collected smoothly through the key informants.

A range of key stakeholders were identified, as well as their roles, functions, and potential contributions. However, the scope of this study limited the identification of all possible and potential stakeholders, due to the sheer number of these stakeholders in the country, as well as the dynamic nature of the local stakeholder environment. Every year there are new stakeholders appearing on the scene, and old ones falling away.

The data analyses on percentage adoption would not be possible without the support of GEOTERRAIMAGE who provided the area (hectares) under annual crop-livestock systems per Magisterial District allowing the calculation of the percentage adoption per district and displaying it in a spatial format.

The total area of CA under annual crop-livestock systems in South Africa (1 607 081 ha) shows a sharp increase from the previous estimates by Kassam *et al.* (2018) and Findlater *et al.* (2019). The area under CA in South Africa is currently by far the largest of all the countries on the African continent and puts the country 12th on the list of all countries in the world.

The Province with the highest CA adoption in the country is the Western Cape (804 866 ha, 51%). The adoption of CA in KwaZulu-Natal is 38% (62 957 ha), somewhat lower than expected with some areas having a fairly high adoption, but some areas with low or zero adoption.

Other Provinces with unexpected high levels of CA adoption are the North West Province (330 464 ha, or 37%), the Mpumalanga Province (205 598 ha, or 24%), the Limpopo Province (68 834 ha, or 27%) and the Gauteng Province (57 649 ha, or 33%).

The Free State Province has the largest area under annual crop-livestock systems in South Africa, but with a very low CA adoption of 3.35 % (73 519 ha). Various factors affected the low adoption rate, ranging from very sandy and dry conditions in the western parts, to a lack of pioneer farmers and key influencers in some of the more suitable eastern parts of the Free State Province (e.g., the high potential Bethlehem district with 0% adoption).

Other Provinces with low adoption levels are Eastern Cape and Northern Cape. The Eastern Cape has some areas with very favourable conditions (climate and soils) for applying CA but has a large portion of arable land in those areas under traditional communal land use that makes any change or transformation of farming systems much more difficult.

The annual cropping system in the Northern Cape Province primarily lies next to the Orange and Vaal rivers and depends on irrigation. The dominant cropping system is a maize-wheat double cropping system where almost all the maize is planted with a no-till or strip-till planter, but the following wheat practice involves significant tillage and burning of residues, which disqualifies it from the CA definition used in this study. However, this system is seen as a 'conservation tillage' system being adapted for those unique conditions and cover an area of around 69 498 ha.

A large portion of annual crop-livestock farmers who did not qualify under the CA definition used in this study do, however, follow various conservation tillage or reduced tillage systems, such as strip-tillage, vertical tillage, Rip-on-Row (sandy soils), etc. In fact, a very small percentage of farmers in South Africa still apply full tillage systems, that include a full range of tractor drawn implements used before and after planting, such as moldboard ploughs, discs, chisels, rippers, rotary tillers, tine cultivators, disc harrows, etc. In a full tillage system, weeding is done through a combination of mechanical and chemical control practices.

By far the largest portion of arable land transformed to CA was under commercial farms (1 607 081 ha, or 99%). Apart from commercial farmers in the Western Cape and KwaZulu-Natal who have had fruitful collaboration and support from departmental and private R&D resources, most commercial CA farmers in the summer rainfall crop production areas spontaneously adopted CA practices without support from formal R&D initiatives. From 2013 CA research initiatives, such as the CA Farmer Innovation Programme funded by The Maize Trust and implemented through Grain SA / ASSET Research, started to implement participatory systems research projects with commercial and smallholder farmers, aiming to strengthen the farmer-led process already underway.

CA areas under semi-commercial and smallholder systems were only assessed for the 2020/2021 season, which occupy an area of 13 556 ha, primarily supported by the National LandCare Programme, The Maize Trust (e.g. through the CA FIP) and by Grain SA (which is also financially supported by The Maize Trust, among other funders). A continuous, concentrated and improved effort is necessary to support, empower and monitor this category of farmers and their (dis)adoption of CA as it will be crucial for their sustainability.

The following factors played a key role in areas (districts and Provinces) with high CA adoption rates among commercial farmers, listed from high to lower influence:

- Local pioneer CA farmers, or 'other' CA farmers,
- Local CA equipment manufacturers promoting equipment as part of the whole CA system,
- Local study groups and awareness events,
- Local research initiatives (programmes and/or projects) where farmers, researchers and other key stakeholders collaborate,
- International success stories and cross-visits (e.g., to Argentina, USA, Australia),
- International pioneer CA farmers on internet (e.g., Gabe Brown),
- International CA scientist (e.g., Ray Archuleta),
- Local service providers and agribusiness.

- Dedicated CA funding under LandCare programme
- Local support to semi-commercial and smallholder farmers (e.g., by Mahlathini Development Foundation, ARC, with funding from The Maize Trust and LandCare),
- CA provincial forums and study groups
- Provision of CA no-till planters and equipment's by LandCare
- Drought funding support on building resilience by upscaling CA

As also described by Smith *et al.* (2021), the following underlying problems were seen as the main factors leading to low CA adoption rates in certain areas and Provinces:

- Lack of awareness, knowledge and understanding of environmental problems, such as soil erosion, loss of biodiversity and climate change.
- Lack of knowledge and understanding of the nature and function of natural resources (ecology), especially soils.
- Ignorance of appropriate solutions to address these issues (e.g. CA principles and practices).
- Unique and challenging environmental conditions, specifically a combination of sandy soils and a semi-arid climate in the western summer rainfall cropping areas.
- Lack of appropriate CA equipment, such as no-till planters and sprayers. Smallholder farmers are also constrained by the unavailability of tractors and the lack of training on calibration of CA no-till implement.
- Resistance by individuals and institutions in various spheres of the agricultural sector, such as agribusiness, academics, researchers and farmers, of which some have vested interests in agribusinesses (e.g., the sale of implements, fertilisers, etc.), or are influenced by individuals in the academic, farming, or agribusiness circles.
- A lack of appropriate research and extension support due to diminishing capacity and poor training at tertiary level.
- Inappropriate research and development (R&D) approaches. Most researchers and extension officers still follow linear R&D approaches with a low effectiveness and poor impact on farmer level; this is especially critical working with smallholder farmers, who need much more support. Success stories of appropriate farmer–research interaction and approaches were found among commercial farmers in the Western Cape and KwaZulu-Natal Provinces, as well as smallholders working with certain practitioners, e.g., Mahlathini Development Foundation in the KwaZulu-Natal Province, which is clearly reflected by higher adoption rates and sustainability in these areas or projects.

6. RECOMMENDATIONS

The existing CA farmer-led structures (e.g., clubs and groups) created by farmers and other stakeholders (e.g., LandCare, CA FIP, etc.) that successfully spread the adoption of CA in the various regions in South Africa as assessed in this study, should be supported and used as ideal platforms to implement, strengthen and scale out/up CA initiatives to other farmers, stakeholders and regions.

CA farmer pioneers and innovators, together with their structures, played a key role in the adoption and spread of CA in South Africa. These individuals and institutions should be acknowledged, rewarded and used as key innovators and champions in their own right. One way to achieve this outcome, is by putting farmers in the center of (new) CA initiatives, following a full participatory systems approach as a minimum requirement.

Smallholder and (new / emerging / new era) semi-commercial farmers face various unique challenges and generally a severe lack of resources to carry out their farming. What was observed in this context, is that the introduction of CA into their farming system requires the design, introduction, and facilitation of a reasonably complex innovation process that have system-wide implications, such as specialised knowledge and skills of the implementers. Where this approach was followed for at least 4 or 5 years, a reasonably high adoption rate, self-sustained by around 20% of them occurs. Without this approach a very low adoption rate occurs and almost nobody will be able to self-sustain their CA system without continuous support through technical assistance, production inputs and implements.

The list of CA stakeholders is by far not complete due to its dynamic and endless nature. It is recommended that the list should be continuously updated on different levels of the stakeholder hierarchy. A stakeholder analyses should also be part of any CA initiative implemented on any level.

The telephonic survey method followed in this study managed to reach all the areas cultivated with annual crop-livestock systems and yielded results with acceptable accuracy, depth and spread. The support of data from GEOTERRAIMAGE was essential to calculate adoption rates and portray results in a spatial context. It is recommended that an effective CA monitoring system across all levels be formulated, designed, funded and implemented. Remote sensing techniques such as those applied by GEOTERRAIMAGE should be investigated in future for the monitoring of land use and management practices (change or adoption), such as CA.

Formulate and launch dedicated funding streams for CA from the public (e.g., LandCare programme) and private sector.

Employ relevant capacity building programmes for extension officers on appropriate CA approaches and technologies.

CA land degradation neutrality targets of 6 million to be part of Minister and Department's strategic outputs.

Initiate transformative projects across the value chain to improve CA upscaling e.g., CA mechanization, incentives and market access for CA products.

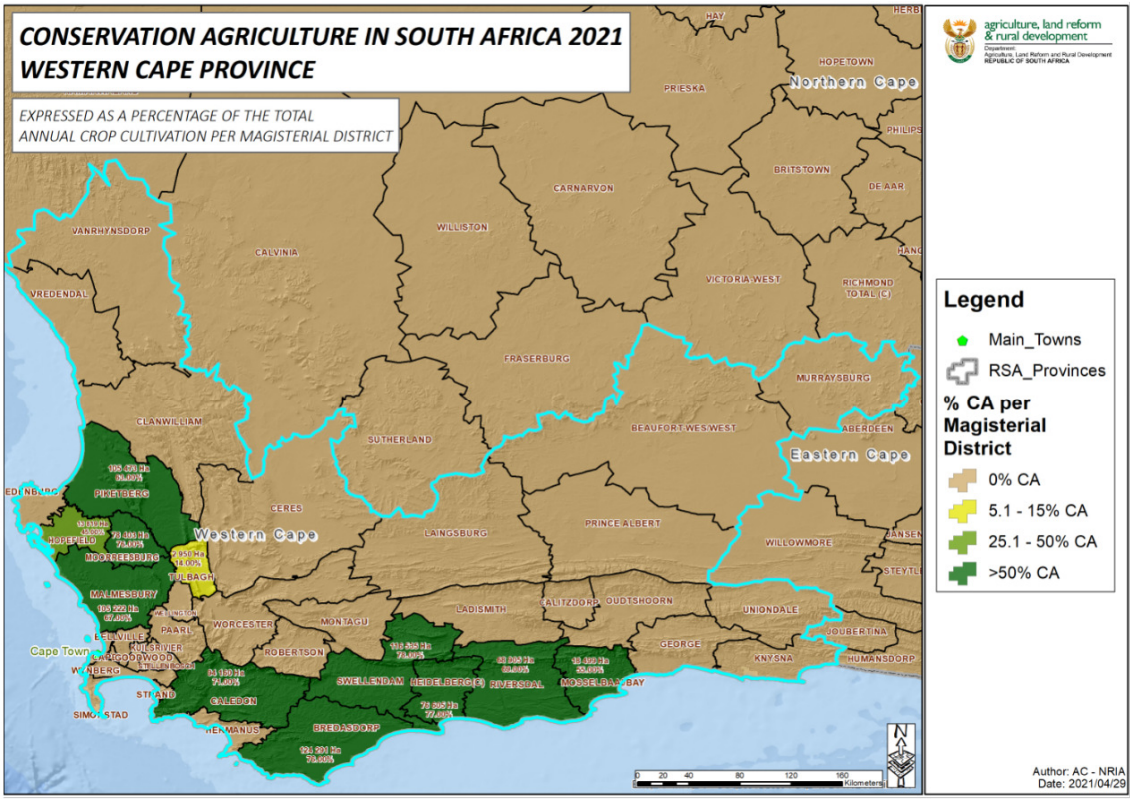
7. REFERENCES

- Borrelli, P., Robinson, D.A., Fleischer, L.R., Lugato, E., Ballabio, C., Alewell, C., Meusburger, K., Modugno, S., Schütt, B., Ferro, V. and Bagarello, V., Van Oost, K., Montanarella, L. and Panagos, P. (2017) 'An assessment of the global impact of 21st century land use change on soil erosion', *Nature Communications* 8: 2013.
- De Wit, M.P., Blignaut, J.N., Knot, J., Midgley, S., Drimie, S., Crookes, D.J., and Nkambule N.P. (2015) Sustainable farming as a viable option for enhanced food and nutritional security and a sustainable productive resource base. Synthesis report. Green Economy Research Report, Green Fund, Development Bank of Southern Africa, Midrand.
- Findlater, K.M., Kandlikar, M. and Satterfield, T. (2019) 'Misunderstanding conservation agriculture: Challenges in promoting, monitoring and evaluating sustainable farming' *Environmental Science and Policy* 100, 47–54.
- Goddard, T., Basch, G., Derpsch, R., Hongwen, L., Jin, H., Karabayev, M., Kassam, A., Moriya, K., Peiretti, R., Smith, H.J. (2020) 'Institutional and policy support for Conservation Agriculture uptake' *In: Kassam, A. (ed.), Advances in Conservation Agriculture Volume 1: Systems and Science*, Burleigh Dodds Science Publishing, Cambridge, UK, 2020, (ISBN: 978 1 78676 264 1; www.bdspublishing.com)

- Kassam, A., Friedrich, T. and Derpsch, R. (2018) 'Global spread of Conservation Agriculture', *International Journal of Environmental Studies*. <https://doi.org/10.1080/00207233.2018.1494927>
- Le Roux J.J., Morgenthal T.L., Malherbe J., Pretorius D.J. and Sumner P.D. (2008) 'Water erosion prediction at a national scale for South Africa', *Water SA* 34, 305–314.
- Pittlekow, C.M, Linqvist, B.A., Lundy, M.E., Xingiang, L., Van Groenigen, K.J., Lee, J., Van Gestel, N., Six, J., Venterea R.T. and Van Kessel, K. (2015) 'When does no-till yield more? A global meta-analysis', *Field Crops Research* 183, 156-168.
- Smith, HJ, Trytsman, G, Nel, AA, Strauss JA, Kruger, E, Mampholo, RK, Van Coller, JN, Otto, H, Steyn, JG, Dreyer, ID, Slabbert, D, Findlay, R Zunckel, E and Visser, L., 2021. From theory to practice – key lessons in the adoption of Conservation Agriculture in South Africa. *In: Kassam, A. (ed.), Advances in Conservation Agriculture Volume 3: Adoption and Spread*, Burleigh Dodds Science Publishing, Cambridge, UK, 2020.
- Strauss, J.A., Swanepoel, P.A., Laker, M.C. and Smith, H.J. (2021) CA (no-till based) in rainfed annual crop production in South Africa. *South African Journal of Plant and Soil*.

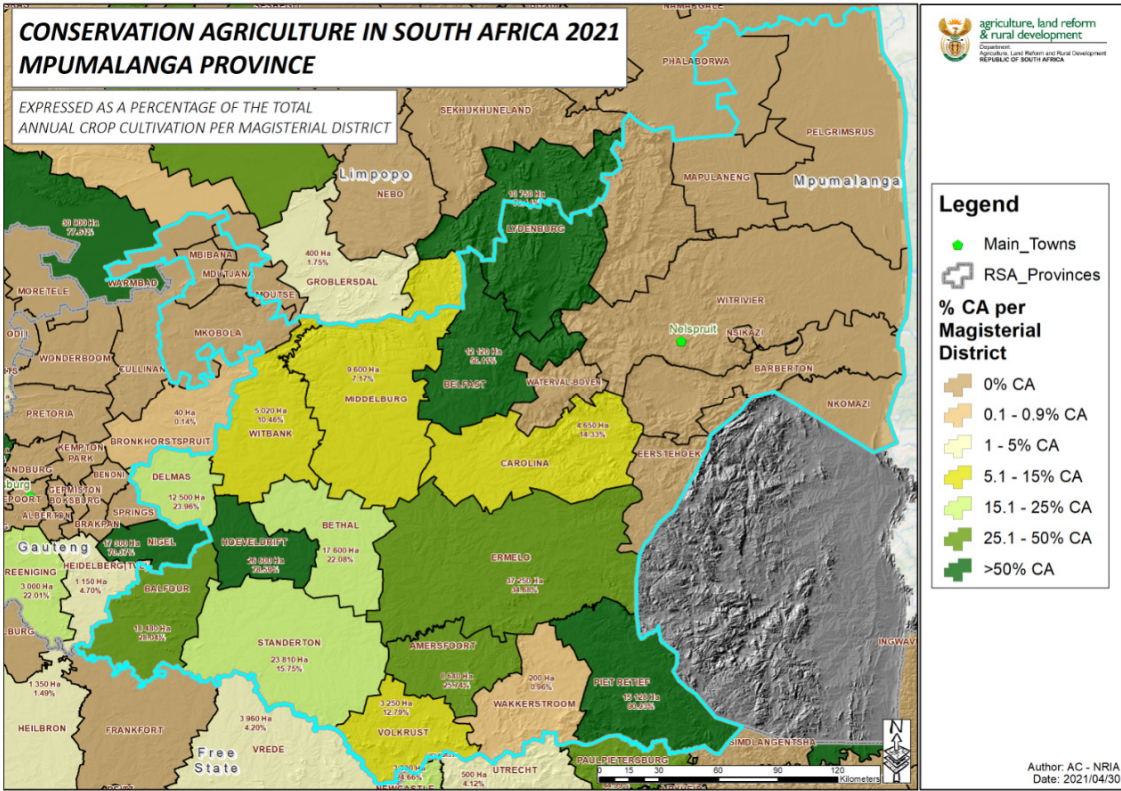
APPENDIX 1: Tables and maps of area (ha) and percentage (%) adoption of conservation agriculture per Province and Magisterial District in South Africa.

WESTERN CAPE MAGISTERIAL DISTRICTS	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
BEAUFORT-WES/WEST	3 995	0	0%
BELLVILLE	11 566	0	0%
BREDASDORP	163 541	124 291	76%
CALEDON	132 620	94 160	71%
CALITZDORP	5 132	0	0%
CAPE	35	0	0%
CERES	38 510	0	0%
CLANWILLIAM	51 531	0	0%
GEORGE	41 024	0	0%
HEIDELBERG WC	99 488	76 605	77%
HERMANUS	6 940	0	0%
HOPEFIELD	30 710	13 819	45%
KNYSNA	6 458	0	0%
KUILSRIVIER	905	0	0%
LADISMITH	5 044	0	0%
LAINGSBURG	3 924	0	0%
MALMESBURY	157 048	105 222	67%
MONTAGU	12 014	0	0%
MOORREESBURG	103 162	78 403	76%
MOSSELBAAI/BAY	33 635	18 499	55%
MURRAYSBURG	3 252	0	0%
ODTSHOORN	20 191	0	0%
PAARL	16 620	0	0%
PIKETBERG	167 418	105 473	63%
PRINCE ALBERT	2 616	0	0%
RIVERSDAL	99 863	68 906	69%
ROBERTSON	7 066	0	0%
SIMONSTAD	0	0	0%
SOMERSET-WES/WEST	1 148	0	0%
STELLENBOSCH	4 096	0	0%
STRAND	3	0	0%
SWELLENBAM	149 405	116 536	78%
TULBAGH	21 072	2 950	14%
UNIONDALE	21 031	0	0%
VANRHYNSDORP	33 991	0	0%
VREDENBURG	29 091	0	0%
VREDENDAL	53 087	0	0%
WELLINGTON	15 113	0	0%
WORCESTER	15 657	0	0%
WYNBERG	1 277	0	0%
TOTAL:	1 569 277	804 866	51%



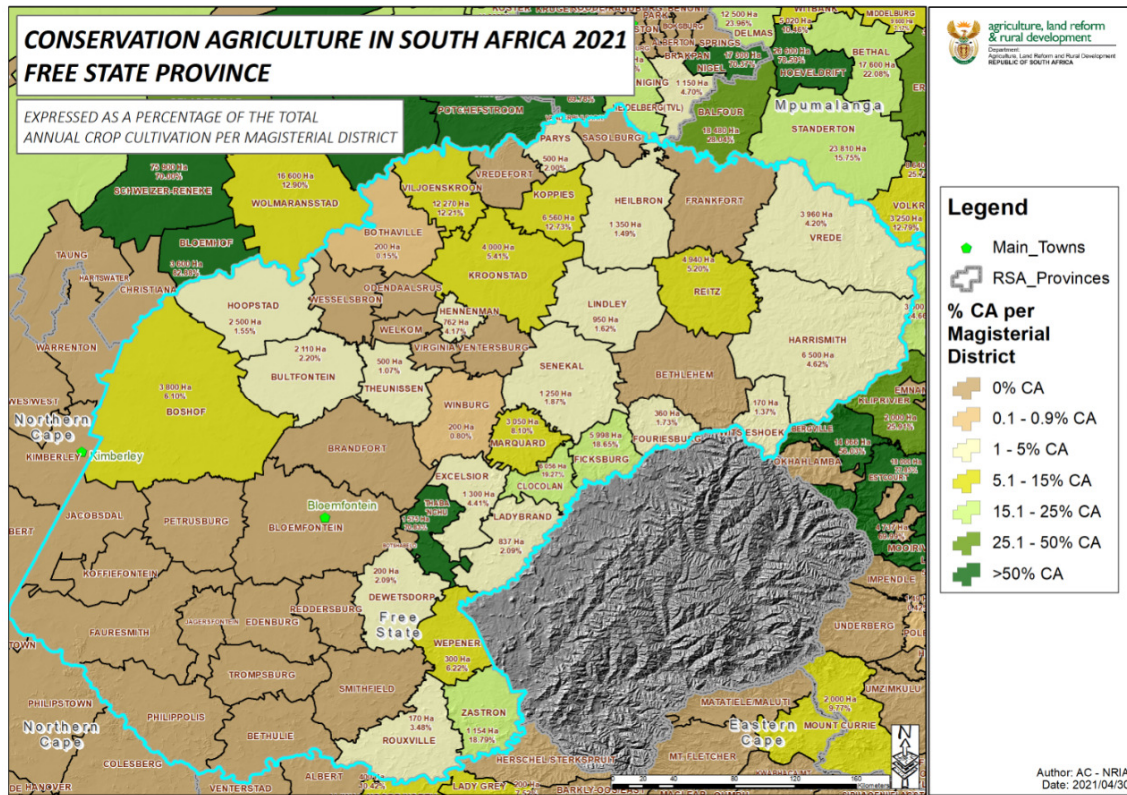
NORTH WEST MAGISTERIAL DISTRICTS	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
BAFOKENG	184	0	0%
BLOEMHOF	4 344	3 600	83%
BRITS	24 423	1 000	4%
CHRISTIANA	6 097	0	0%
COLOGNY	53 118	9 568	18%
DELAREYVILLE	119 327	47 997	40%
DITSOBOTLA	93	0	0%
GANYESA	424	0	0%
KLERKSDORP	26 666	20 000	75%
KOSTER	52 102	11 600	22%
LEHURUTSHE	330	0	0%
LICHTENBURG	192 902	97 225	50%
MADIKWE	3	0	0%
MANKWE	22	0	0%
MARICO	9 524	3 574	38%
MOLOPO	81	0	0%
MORETELE	0	0	0%
OBERHOLZER	0	0	0%
ODI I	216	0	0%
ODI II	2	0	0%
POTCHEFSTROOM	21 630	13 200	61%
RANDFONTEIN	0	0	0%
RUSTENBURG	7 038	1 000	14%
SCHWEIZER-RENEKE	108 431	75 900	70%
SWARTRUGGENS	1 268	1 000	79%
TAUNG	2 448	0	0%
VENTERSDORP	66 279	14 600	22%
VRYBURG	64 769	13 600	21%
WOLMARANSSTAD	128 717	16 600	13%
TOTAL:	890 437	330 464	37%

MPUMALANGA MAGISTERIAL DISTRICT	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
AMERSFOORT	33 564	8 640	26%
BALFOUR	65 903	18 480	28%
BARBERTON	784	0	0%
BELFAST	24 187	12 120	50%
BETHAL	79 715	17 600	22%
CAROLINA	32 452	4 650	14%
DELMAS	52 165	12 500	24%
EERSTEHOEK	1	0	0%
ERMELO	107 425	37 250	35%
HOVELDRIFT	33 846	26 600	79%
LYDENBURG	14 119	10 750	76%
MAPULANENG	117	0	0%
MBIBANA	243	0	0%
MIDDELBURG MP	133 815	9 600	7%
MKOBOLA	5 873	0	0%
MORETELE	63	0	0%
NKOMAZI	0	0	0%
NSIKAZI	0	0	0%
PELGRIMSRUS	271	0	0%
PIET RETIEF	16 637	15 128	91%
STANDERTON	151 191	23 810	16%
VOLKRUST	25 409	3 250	13%
WAKKERSTROOM	20 941	200	1%
WATERVAL-BOVEN	485	0	0%
WITBANK	48 014	5 020	10%
WITRIVIER	3 263	0	0%
TOTAL:	850 484	205 598	24%



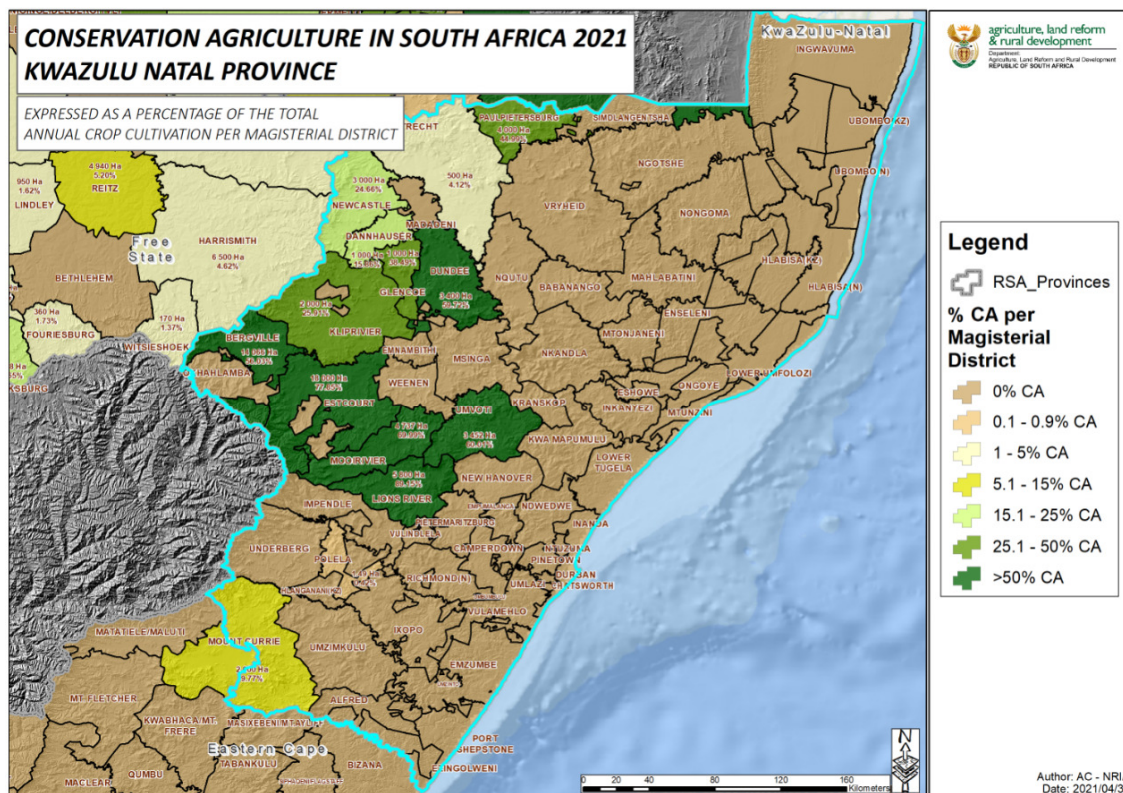
FREE STATE MAGISTERIAL DISTRICTS	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
BETHLEHEM	120 569	0	0%
BETHULIE	800	0	0%
BLOEMFONTEIN	65 083	0	0%
BOSHOF	62 258	3 800	6%
BOTHAVILLE	137 550	200	0%
BOTSHABELO	17	0	0%
BRANDFORT	33 074	0	0%
BULTFONTEIN	95 858	2 110	2%
CLOCOLAN	31 427	6 056	19%
DEWETSDORP	9 566	200	2%
EDENBURG	2 163	0	0%
EXCELSIOR	29 505	1 300	4%
FAURESMITH	13 452	0	0%
FICKSBURG	32 152	5 995	19%
FOURIESBURG	20 810	360	2%
FRANKFORT	94 311	0	0%
HARRISMITH	140 702	6 500	5%
HEILBRON	90 682	1 350	1%
HENNEMAN	18 289	762	4%
HOOPSTAD	161 630	2 500	2%
JACOBSDAL	13 791	0	0%
JAGERSFONTEIN	223	0	0%
KOFFIEFONTEIN	2 447	0	0%
KOPPIES	51 517	6 560	13%
KROONSTAD	73 909	4 001	5%
LADYBRAND	40 126	837	2%
LINDLEY	58 780	950	2%
MARQUARD	37 646	3 050	8%
ODENDAALSRUS	26 883	0	0%
PARYS	25 043	500	2%
PETRUSBURG	39 511	0	0%
PHILIPOLIS	1 380	0	0%
REDDERSBURG	4 354	0	0%
REITZ	95 067	4 940	5%
ROUXVILLE	4 887	170	3%
SASOLBURG	28 364	0	0%
SENEKAL	66 868	1 250	2%
SMITHFIELD	6 435	0	0%
THABA'NCHU	2 224	1 575	71%
THEUNISSEN	46 723	500	1%
TROMPSBURG	1 363	0	0%
VENTERSBURG	16 536	0	0%
VILJOENSKROON	100 514	12 270	12%
VIRGINIA	13 389	0	0%

VREDE	94 220	3 960	4%
VREDEFORT	20 574	0	0%
WELKOM	16 784	0	0%
WEPENER	4 825	300	6%
WESSELSBRON	99 051	0	0%
WINBURG	25 081	200	1%
WITSIESHOEK	12 432	170	1%
ZASTRON	6 142	1 154	19%
TOTAL:	2 196 986	73 520	3%



KWAZULU-NATAL MAGISTERIAL DISTRICT	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
ALFRED	23	0	0%
BABANANGO	21	0	0%
BERGVILLE	25 107	14 066	56%
CAMPERDOWN	0	0	0%
DANNHAUSER	6 306	1 000	16%
DUNDEE	5 694	3 400	60%
DURBAN	0	0	0%
EMNAMBITHI	4	0	0%
EMPUMALANGA	0	0	0%
EMZUMBE	0	0	0%
ENSELENI	0	0	0%
ESHOWE	0	0	0%
ESTCOURT	23 122	18 000	78%
EZINGOLWENI	0	0	0%
GLENCOE	2 598	1 000	38%
HLABISA(KZ)	0	0	0%
HLABISA(N)	12	0	0%
HLANGANANI(KZ)	0	0	0%
IMPENDLE	878	0	0%
INANDA	0	0	0%
INGWAVUMA	0	0	0%
INKANYEZI	0	0	0%
IXOPO	2 602	0	0%
KLIPRIVIER	7 718	2 000	26%
KRANSKOP	521	0	0%
KWA MAPUMULU	0	0	0%
LIONS RIVER	6 506	5 800	89%
LOWER TUGELA	0	0	0%
LOWER UMFOLOZI	0	0	0%
MADADENI	0	0	0%
MAHLABATINI	0	0	0%
MOOIRIVIER	6 768	4 737	70%
MOUNT CURRIE	20 477	2 000	10%
MSINGA	38	0	0%
MTONJANENI	0	0	0%
MTUNZINI	0	0	0%
NDWEDWE	0	0	0%
NEW HANOVER	21	0	0%
NEWCASTLE	12 164	3 000	25%
NGOTSHE	33	0	0%
NKANDLA	0	0	0%
NQUTU	29	0	0%
OKHAHLAMBA	0	0	0%
ONGOYE	0	0	0%

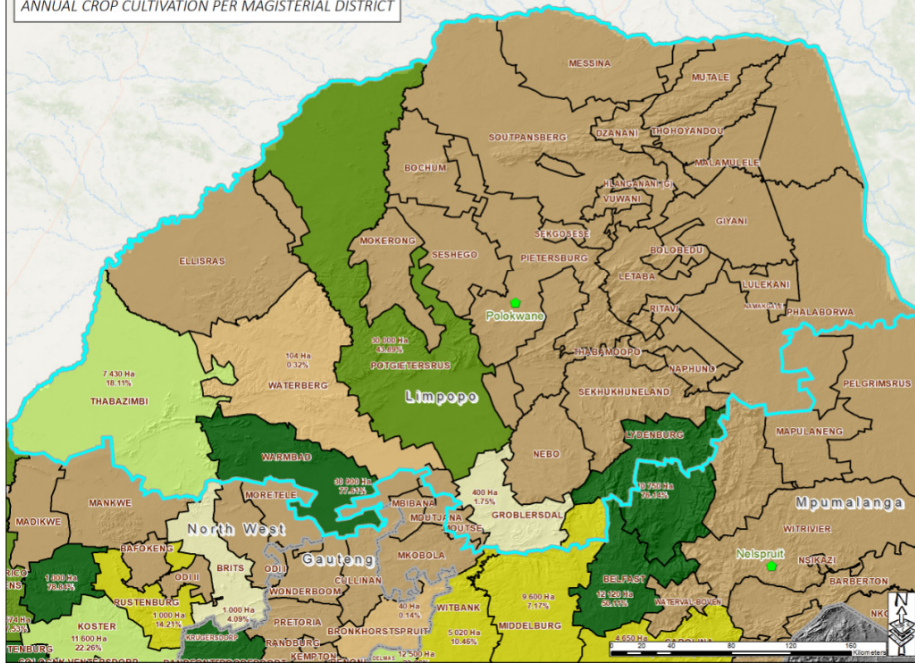
PAULPIETERSBURG	8 891	4 000	45%
PIET RETIEF	0	0	0%
PIETERMARITZBURG	307	0	0%
PINETOWN	0	0	0%
POLELA	351	1	0%
PORT SHEPSTONE	0	0	0%
RICHMOND KZN	864	0	0%
SIMDLANGENTSHA	0	0	0%
UBOMBO(KZ)	0	0	0%
UBOMBO(N)	0	0	0%
UMBUMBULU	0	0	0%
UMVOTI	5 753	3 452	60%
UMZIMKULU	1	0	0%
UMZINTO	0	0	0%
UNDERBERG	7 671	0	0%
UTRECHT	12 131	500	4%
VOLKSRUST	2	0	0%
VRYHEID	7 511	0	0%
VULAMEHLO	0	0	0%
WEENEN	498	0	0%
TOTAL:	164 620	62 956	38%



LIMPOPO MAGISTERIAL DISTRICTS	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
BOCHUM	612	0	0%
BOLOBEDU	14	0	0%
DZANANI	1 182	0	0%
LEPALALE	4 152	0	0%
GIYANI	14	0	0%
GROBLERSDAL	22 825	400	2%
HLANGANANI (G)	0	0	0%
LETABA	4 363	0	0%
LULEKANI	200	0	0%
LYDENBURG	6 037	0	0%
MALAMULELE	151	0	0%
MESSINA	4 002	0	0%
MIDDELBURG	0	0	0%
MIDDELBURG MP	6 401	0	0%
MOKERONG	322	0	0%
MOUTSE	34	0	0%
MUTALE	487	0	0%
NAMAKGALE	4	0	0%
NAPHUNO	62	0	0%
NEBO	652	0	0%
PHALABORWA	1 738	0	0%
POLOKWANE	10 095	0	0%
MOKOPANE	68 351	30 000	44%
RITAVI	0	0	0%
SEKGOSESE	0	0	0%
SEKHUKHUNELAND	144	0	0%
SESHEGO	217	0	0%
SOUTPANSBERG	9 955	0	0%
THABAMOPOO	383	0	0%
THABAZIMBI	41 032	7 430	18%
THOHOYANDOU	10	0	0%
VUWANI	28	0	0%
BELA-BELA	39 816	30 900	78%
WATERBERG	32 584	104	0%
TOTAL:	255 866	68 834	27%

CONSERVATION AGRICULTURE IN SOUTH AFRICA 2021 LIMPOPO PROVINCE

EXPRESSED AS A PERCENTAGE OF THE TOTAL ANNUAL CROP CULTIVATION PER MAGISTERIAL DISTRICT



Legend

- Main_Towns
- RSA_Provinces

% CA per Magisterial District

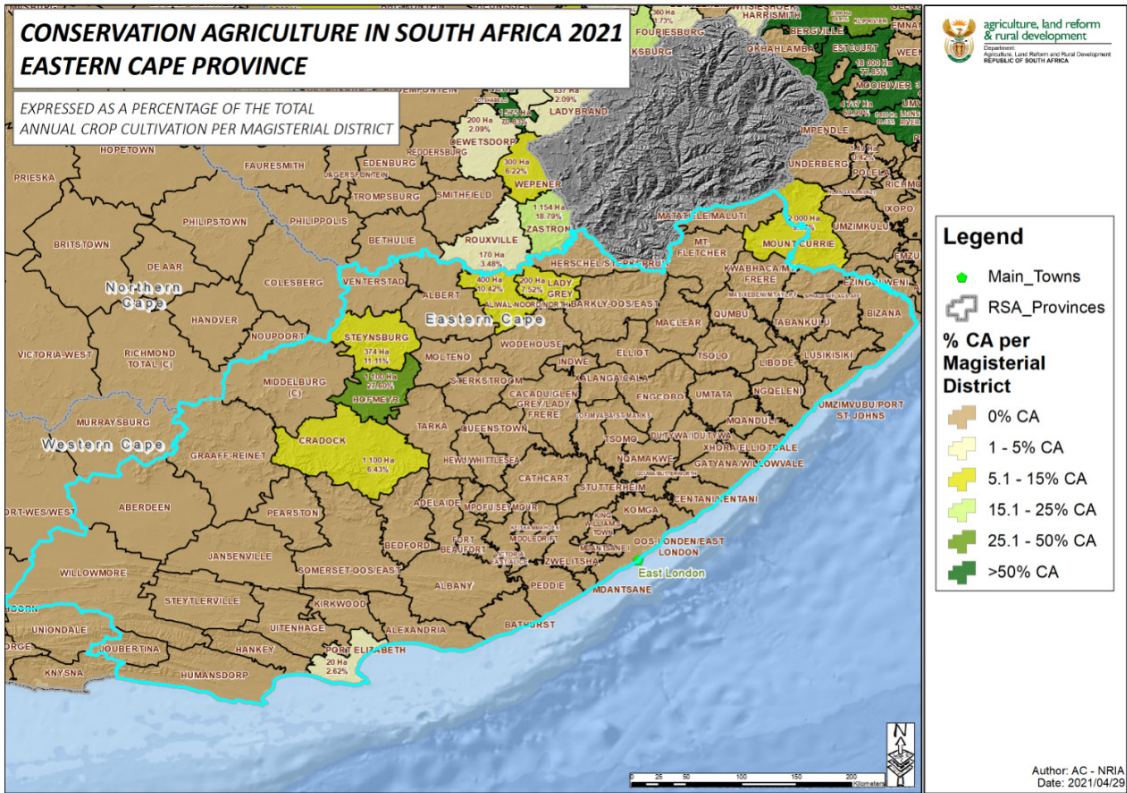
- 0% CA
- 0.1 - 0.9% CA
- 1 - 5% CA
- 5.1 - 15% CA
- 15.1 - 25% CA
- 25.1 - 50% CA
- >50% CA

Author: AC - NRIA
Date: 2021/04/30

GAUTENG MAGISTERIAL DISTRICT	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
ALBERTON	59	0	0%
BENONI	4 086	0	0%
BOKSBURG	282	0	0%
BRAKPAN	1 017	0	0%
BRONKHORSTSPRUIT	27 824	40	0%
CULLINAN	2 614	0	0%
DELMAS	160	0	0%
GERMISTON	293	0	0%
HEIDELBERG GP	24 450	1 150	5%
JOHANNESBURG	238	0	0%
KEMPTON PARK	5 688	0	0%
KRUGERSDORP	4 841	4 000	83%
MKOBOLA	1 040	0	0%
NIGEL	24 584	17 300	70%
OBERHOLZER	4 131	2 500	61%
ODI I	2	0	0%
POTCHEFSTROOM	9 956	0	0%
PRETORIA	1 694	0	0%
RANDBURG	0	0	0%
RANDFONTEIN	17 750	14 700	83%
ROODEPOORT	66	0	0%
SPRINGS	6 786	0	0%
VANDERBIJLPARK	17 855	12 459	70%
VEREENIGING	13 632	3 000	22%
WESTONARIA	2 919	2 500	86%
WONDERBOOM	1 466	0	0%
TOTAL:	173 435	57 649	33%

EASTERN CAPE MAGISTERIAL DISTRICT	Total Annual Cultivation (ha)	CA Areas 2021 (ha)	% CA per area cultivated
ABERDEEN	6 001	0	0%
ADELAIDE	816	0	0%
ALBANY	1 530	0	0%
ALBERT	3 658	0	0%
ALEXANDRIA	169	0	0%
ALIWAL-NORTH	3 838	400	10%
BARKLY-EAST	1 908	0	0%
BATHURST	23	0	0%
BEDFORD	5 933	0	0%
BIZANA	0	0	0%
CACADU/ GLEN GREY/ LADY FRERE	103	0	0%
CATHCART	1 013	0	0%
COFIMVABA/ ST. MARKS	285	0	0%
CRADOCK	17 102	1 100	6%
DUTYWA/IDUTYWA	0	0	0%
ELLIOT	6 265	0	0%
ENGCOBO	0	0	0%
FORT BEAUFORT	290	0	0%
GCUWA/ BUTTERWORTH	4	0	0%
GRAAFF-REINET	10 562	0	0%
HANKEY	2 223	0	0%
HERSCHEL/ STERKSPRUIT	26	0	0%
HEWU/WHITTLESEA	423	0	0%
HOFMEYR	3 985	1 100	28%
HUMANSDORP	4 884	0	0%
INDWE	1 322	0	0%
JANSENVILLE	2 079	0	0%
JOUBERTINA	3 557	0	0%
KEISKAMMAHOEK	100	0	0%
KING WILLIAM'S TOWN	58	0	0%
KIRKWOOD	2 008	0	0%
KOMGA	59	0	0%
KWABHACA/MT. FRERE	0	0	0%
LADY GREY	2 660	200	8%
LIBODE	2	0	0%
LUSIKISIKI	0	0	0%
MACLEAR	9 220	0	0%
MATATIELE/MALUTI	286	0	0%
MDANTSANE	3	0	0%
MDANTSANE I	0	0	0%
MIDDELBURG EC	10 152	0	0%
MIDDLEDRIFT	171	0	0%
MOLTENO	4 060	0	0%

MOUNT CURRIE	7 275	0	0%
MPOFU/SEYMOUR	54	0	0%
MQANDULI	0	0	0%
MT. FLETCHER	7	0	0%
NGQELENI	0	0	0%
NQAMAKWE	0	0	0%
EAST LONDON	17	0	0%
PEARSTON	2 100	0	0%
PEDDIE	0	0	0%
PORT ELIZABETH	763	20	3%
QUEENSTOWN	2 950	0	0%
QUMBU	0	0	0%
SOMERSET EAST	14 434	0	0%
STERKSTROOM	1 476	0	0%
STEYNSBURG	3 366	374	11%
STEYTLERVILLE	2 076	0	0%
STUTTERHEIM	116	0	0%
TARKA	3 397	0	0%
TSOLO	72	0	0%
TSOMO	0	0	0%
UITENHAGE	2 275	0	0%
UMTATA	6	0	0%
UMZIMVUBU/ PORT ST. JOHNS	0	0	0%
VENTERSTAD	699	0	0%
VICTORIA EAST/ALICE	317	0	0%
WILLOWMORE	5 723	0	0%
WODEHOUSE	6 407	0	0%
XALANGA/CALA	3	0	0%
ZWELITSHA	0	0	0%
TOTAL:	160 307	3 194	2%



APPENDIX 2: Stakeholder matrix in conservation agriculture, South Africa

Key stakeholder (Institution, Group or Person)	Primary roles and functions	Potential resource contributions	Geographic area of influence	Contact info
<i>CA Farmer groups, institutions and initiatives</i>				
CA Farmer Innovation Programme (funded by The Maize Trust and implemented by ASSET Research)	Farmer-centred systems research on CA	On-farm, participatory systems research on CA	National	https://assetresearch.org.za
Western Cape CA	Serve as a forum where producers, researchers and related industries can discuss conservation agriculture matters.	Facilitation of farmer – researcher interaction and awareness.	Western Cape	+2721 808 5479 butchstr@gmail.com https://blwk.co.za/
KwaZulu-Natal No-till Club	Actively promote and facilitate environmentally friendly, economically sustainable conservation farming, for the benefit of all	Annual CA conference and other awareness activities	KwaZulu-Natal, national	http://notillclub.com/
Regenerative Agriculture Association of South Africa	A nonprofit, education and advocacy organization that is working to stop the catastrophic consequences of Industrial Agriculture by facilitating farmers and consumers in transitioning to Regenerative Agriculture.	Their goal is to redirect South African agriculture toward regenerative methods that rebuild our soils, reduce input costs, protect and enhance the natural environment, mitigate climate change, produce nutrient dense healthy foods, promote biodiversity, animal welfare and economic justice to farmers and farm workers.	National	andrew@regenagsa.org.za 082 570 3764 https://www.regenagsa.org.za/
Grain SA	Grain Farmer Development and support in SA	Sustainability of grain industry in SA services	National	https://www.grainsa.co.za/
Stoffberg study group	Sharing info and knowledge	Land, equipment, on-farm trials	Belfast district (Emakhazeni), Mpumalanga	

Losberg study group	Sharing info and knowledge	Land, equipment, on-farm trials	Southern Gauteng	
Banke study group	Sharing info and knowledge	Land, equipment, on-farm trials and demonstrations	Middelburg, Mpumalanga	
Ottosdal No-till Club	On-farm systems research on CA	On-farm CA trials, farmers days, reports, videos	North West Province	https://assetresearch.org.za
Maluti study group	On-farm systems research on CA	On-farm CA trials, farmers days, reports, videos	Eastern Free State	https://assetresearch.org.za
Mpumalanga Highveld study group	On-farm systems research on CA	On-farm CA trials, farmers days, reports, videos	Mpumalanga Highveld	https://assetresearch.org.za
Research and Development in CA (private sector)				
ASSET Research	Design, implement, coordinate, and facilitate CA and environmental restoration research programmes & projects	Technical and administrative CA R&D services	National, SADC	Smith.hendrik@gmail.com https://assetresearch.org.za/conservation-agriculture/
Mahlathini Development Foundation	Design and implement innovative projects and Programmes which promote collaborative, pro-poor agricultural innovation, working in partnership with other organizations and communities.	Work at the cutting edge of development methodology and process - integrating learning (training), research and implementation into new models and processes emphasizing synergy and integration	National	(+27) 82 873 2289 info@mahlathini.org https://mahlathini.org/
Institute of Natural Resources	Develop cutting edge solutions to support the resolution of natural resource challenges.	Provide advice to practitioners, researchers and policy makers; we integrate effort; we build the capacity of graduate professionals to operate effectively in the workplace; and we advocate an environmentally secure future for all.	National	+27 (0)33 346 0796 info@inr.org.za https://www.inr.org.za/
IntegraGroup	Group of companies supporting CA initiatives, projects, value chains, investments	Technical, economic and financial services	National, SADC	(014) 523 3713 info@integrafood.co.za https://www.integrafood.co.za/
Academic and training / education institutions involved with CA				

University of Stellenbosch, Agronomy	Training and research services	Academic mentorship in CA studies	Mostly Western Cape, but also national	https://agric.sun.ac.za/
University of Fort Hare	Training and research services	Academic mentorship in CA studies	Eastern Cape	https://www.ufh.ac.za/faculties/science/
University of Venda	Training and research services	Academic mentorship in CA studies	Limpopo	https://www.univen.ac.za/
University of Limpopo	Training and research services	Academic mentorship in CA studies	Limpopo	https://www.ul.ac.za/
University of Free State	Training and research services	Academic mentorship in CA studies	Free State	https://www.ufs.ac.za/natagri
University of Pretoria	Training and research services	Academic mentorship in CA studies	National	https://www.up.ac.za/faculty-of-natural-agricultural-sciences
University of KwaZulu-Natal	Training and research services	Academic mentorship in CA studies	KwaZulu-Natal	https://caes.ukzn.ac.za/
University of Zululand	Training and research services	Academic mentorship in CA studies	KwaZulu-Natal	http://www.unizulu.ac.za/
North West University	Training and research services	Academic mentorship in CA studies	North West, national	http://natural-sciences.nwu.ac.za/agricultural-sciences/crop-sciences
Cedara College of Agriculture	Provider of relevant and accessible agricultural education and training	Produce competent individuals for the agricultural sector through quality, effective and accessible academic and practical agricultural training	KwaZulu-Natal	https://www.kzndard.gov.za/colleges/cedara-college-of-agriculture
Elsenburg College of Agriculture	Promote sound, integrated managerial and skills training in agriculture with advanced specialisation in area specific fields of excellence.	Training Programmes are offered at Higher Education and Training (HET) and Further Education and Training (FET) level	Western Cape, national	https://www.elsenburg.com/services-and-Programmes/elsenburg-agricultural-training-institute
Reitz Agriculture Academy	Provide CA training on school level	Develop CA curriculum and train grade 10, 11 & 12	National	https://www.reitzlandbouakademie.co.za/
Government Departments, semi-state institutions and Programmes				
National LandCare Programme, Department of Agriculture, Land Reform and Rural Development and	Community-based support for CA among smallholders	Funding for smallholder CA implementation and development	National	https://www.dalrrd.gov.za/Branches/Agricultural-Production-Health-Food-Safety/LUSM/Documents/LandCare-Guidelines

Provincial Departments of Agriculture				
Western Cape Department of Agriculture	Provides a wide range of development, research and support services to the agricultural community in the Western Cape.	CA research at on-farm research stations at Langgewens, Riversdale and Tygerhoek.	Western Cape	https://www.westerncape.gov.za/dept/agriculture
KwaZulu-Natal Department of Agriculture and Rural Development	Provides a wide range of development, research and support services to the agricultural community in the KwaZulu-Natal Province.	CA research, extension and analytical services	KwaZulu-Natal	https://www.kzndard.gov.za/
Agricultural Research Council	CA R&D	Technical CA R&D services in various natural science disciplines	National	http://www.arc.agric.za/Pages/Home.aspx
Seed companies				
SANSOR	Support 118-member seed companies in various ways: from maintaining local and international seed certification standards, to ensuring that seed is produced, multiplied and marketed according to legislated standards and systems.	Invest considerable resources in researching, understanding and providing solutions for current seed industry issues, to the benefit of our members.	National	+2712-472 9500 https://www.sansor.org/ (see a list of all seed companies in South Africa)
Barenbrug	Cover crops and livestock integration	Cover crop seeds and advice	National	+2721-9791303 www.barenbrug.co.za
Agricol	Cover crops and livestock integration	Cover crop seeds and advice	National	https://www.agricol.co.za/
AGT Seed	Cover crops and livestock integration	Cover crop seeds and advice	National	(+27) 033 346 0639 info@agtcovercrops.co.za https://www.agtcovercrops.co.za/
K2 seed	Cover crops and livestock integration	Cover crop seeds and advice	National	https://seedmarketing.co.za/index.php
Integrated soil fertility and pest management				
realIPM	Integrated Pest and Soil Health Management	Advice, biological services & products		https://realipm.co.za/
MBFI	Integrated Pest and Soil Health Management	Advice, biological services, products		https://mbfi.co.za/

AECI (Nulandis)	Integrated Pest and Soil Health Management	Advice, biological services, products		https://www.aeciworld.com/agrihealth
Rhino Agrivantage	Rhino AgriVantage supply agricultural growers of all sizes with real time and relevant advice to improve their yield and quality in a sustainable manner.	Rhino AgriVantage use the latest technology to diagnose the problem and monitor the implementation of the plant nutrition plan.	National, Africa	+27 82 582 2838 gavino@rhinoagriculture.co.za http://rhinoagrivantage.co.za/
Makarios Agri	We assess and develop plant and soil nutritional programs to achieve cost-effective spending. We provide prescription blends, tailor-made for specific soil and plant applications over a wide range of crops. These blends are mostly fish emulsion based.	We also provide general and task specific microbial products for a wide variety of applications including pathogen and insect control. We also assist with commercial and on-farm composting. We specialize in reduction of inorganic fertilizer inputs by means of revolutionary concepts and applications.	National, SADC	+27 82 805 8420 fritz@makariosagri.co.za
CA Equipment manufacturers and services				
The South African Agricultural Machinery Association (SAAMA)	The official body representing new agricultural machinery manufacturers, importers, and builders.	Serves as a combined forum for the interests of agricultural machinery industry in SA	National	https://www.saama.co.za/ (see a list of all equipment manufacturing companies in South Africa)
FarmQuip SA	Manufacturing, CA Implements	CA Implements and systems	National	+27 (013) 007 1351 farmquipsa@gmail.com https://www.farmquipsa.com
Piket No-till Planters	Manufacturing, CA Implements	CA Implements and systems	National	https://www.piket.co.za/
Xfarm (DBX no-till planter, Rinus Willemse)	CA no-till planter	CA Implements	National	www.xfarm.co.za
Valtra	Manufacturing, CA Implements	CA Implements and systems	National	http://valtrac.co.za/
Equalizer CA equipment	Manufacturing, CA Implements	CA Implements and systems	National	https://equalizer.co.za/
Ottosdal Landini	Manufacturing, CA Implements	CA Implements and systems	Western Highveld (North West,	https://ottosdallandini.co.za/home

			NW Free State, West Gauteng)	
Eden Equip	Manufacturing of small-scale CA Implements	Small-scale CA implements and systems	National, SADC	08220728201213 https://eden-equip.co.za/ info@eden-equip.co.za
Afritrac	Manufacturing of small-scale CA Implements	Small-scale CA implements and systems	National, SADC	016 421 5184 http://afritrac.co.za/
Backsaver Farmer Equipment	Manufacturing of small-scale CA Implements	Small-scale CA implements and systems	National, SADC	073 454 4111 www.backsaver.co.za
Intrac Trading	Manufacturing of small-scale CA Implements	Small-scale CA implements and systems	National, SADC	016 365 5799 intrac [at] cyberserv.co.za
South African Network of Animal Traction (SANAT)				040 602 2125 http://www.atnesa.org/ ; www.dalrrd.gov.za
Analytical and technical field support services relevant for CA				
Agrisol	Precision grid soil nutrient sampling, leaf analyses, soil physical mapping, satellite imaging.	Cutting edge development will ensure that the farmer has continuous access to a single platform, that instantly connects him with all the relevant products and services he might need, already tailored to his specific needs.	National	admin@agrisol.co.za (018) - 297 8516 / 063 694 9828 https://agrisol.co.za/
Soil Health Support Centre	The Soil Health Support Centre provide services that include basic to advanced soil health tests.	The Soil Health Support Centre is closely associated with experienced diagnostic laboratories to find solutions for problem soils.	National, Africa	info@soilhealthlab.co.za 021-875 8160 www.soilhealthlab.co.za
SGS	Provides specialised soil information services, such as soil surveys and analyses	Spatial and soil analytical information supported by expert advice on problems and solutions.	National, Africa	https://www.sgs.co.za/en/agriculture-food
Nvirotek			National	

Cedara soil lab	The Sub-Directorate delivers an accurate, reliable and cost-effective laboratory service.	This lab has a major impact on agricultural production as the soil test results that are generated, are correlated to fertilizer and lime requirements.	KwaZulu-Natal	https://www.kzndard.gov.za/analytical-laboratory-services
ARC Soil, Climate and Water (Analytical services)	Various services on the sustainable use of soil.	Soil & water analytical and management services	National	http://www.arc.agric.za/arc-iscw/Pages/Analytical-Services.aspx
ARC Plant Health and Protection (Diagnostic services)	Focusses on ecologically sound management strategies and promotes the use of advantageous organisms to strengthen agricultural production in a sustainable way, through research, technology development and technology transfer.	Provides state-of-the-art diagnostic services for agricultural pests, plant diseases and invasive plants.	National	https://www.arc.agric.za/arc-ppri/Documents/Services/PHP-Diagnostic%20Services.pdf
ARC Small Grain (Analytical services)	Reliable soil analysis data essential for planning an effective fertilization Programme and soil health strategies.	Advice and services on regular sampling and analyses of fields to timeously identify problems, such as soil acidification.	National	058-307 3501 http://www.arc.agric.za/arc-sgi/Pages/Production%20Systems/Soil-laboratory.aspx
GEOTERRAIMAGE	Provides integrated geospatial solution to support clients with state-of-the-art solutions and cross-industry insights	Geospatial information to assess the adoption and patterns of different land management practices and uses, such as CA	National, Africa	marketing@geoterraimage.com https://geoterraimage.com/about-us/
Funding, financial and investment institutions involved with CA				
The Maize Trust	Providing financial support for organisations conducting market and production related research, market information and transformation initiatives focussed on the South African maize industry	Has granted a portion of its funds to research, development, and information Programmes on CA. The CA Farmer Innovation Programme is the most prominent.	National	012 807 3958 l-lopation@mweb.co.za http://maizetrust.co.za/
The Winter Cereal Trust	The provision of market information, laboratory services and financial support to research projects for winter cereals.	Has granted a portion of its funds to research, development, and information Programmes on CA	National	https://www.wintercerealtrust.co.za/
Restore Africa Fund	Invest in climate-smart, conservation & regenerative agriculture	Comprise an ecosystem of companies and shareholders. When investing in regenerative agriculture, they apply the	National, Africa	anika@restore-africa.com https://www.restore-africa.com/contact-us

		highest standards of financial governance and management. To ensure the efficiency of all the relevant sectors, experts from agriculture through to asset management are involved when dealing with a specific project.		
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