Agriculture

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2017
Market Intelligence Report

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GreenCape

GreenCape

GreenCape is a non-profit organisation that drives the widespread adoption of economically viable green economy solutions from the Western Cape. Our vision is for South Africa to be the green economic hub of Africa.

We work with businesses, investors, academia and government to help unlock the investment and employment potential of green technologies and services, and to support a transition to a resilient green economy.

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APAP	Agricultural Policy Action Plan
ARC	Agricultural Research Council
CA	Conservation agriculture
CAGR	Compound Annual Growth Rate
CCC	Confronting Climate Change
CEA	Controlled Environment Agriculture
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DoE	Department of Energy
dti	Department of Trade and Industry
EE	Energy efficiency
EIA	Environmental Impact Assessment
EnMS	Energy management systems
ESO	Energy systems optimisation
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Co-operation)
Ha	Hectares
IEE	Industrial Energy Efficiency
IGDP	Integrated Growth and Development Path
IPP	Independent Power Producers
kW	Kilowatt
kWh	Kilowatt-hour
kWp	Kilowatt peak
LED	Light-emitting diode
NBI	National Business Initiative
NCPC	National Cleaner Production Centre
NDP	National Development Plan
NERSA	National Energy Regulator of South Africa
NWA	National Water Act
NWRS2	National Water Resource Strategy 2nd Edition

PA	Precision agriculture
PQRS	Power Quality and Renewable Services
PSEE	Private Sector Energy Efficiency
PV	Photovoltaic
R&D	Research and Development
RE	Renewable energy
ROI	Return on investment
SA	South Africa
SPIS	Solar powered irrigation system
SSEG	Small scale embedded generation
Stats SA	Statistics South Africa
USA	United States of America
VSD	Variable speed drives
WC	Western Cape
WCDoA	Western Cape Department of Agriculture
WE	Water efficiency
WSA	Water Services Act
WWF	World Wide Fund for Nature
ZAR	South African Rand

Executive summary

This agriculture sector market intelligence report highlights opportunities for greening primary agriculture production. It is written for investors, specifically farmers, agribusinesses, manufacturers and service providers. Its focus areas are conservation agriculture, controlled environment agriculture and precision agriculture, with a strong emphasis on renewable energy, energy efficiency and water efficiency.

There are strong drivers for the uptake of green technologies (green tech) and sustainable agricultural practices in South Africa's agriculture sector. They include:

- **rising input costs** for energy (particularly electricity and diesel), fertiliser and pesticides
- **limited natural resources** (particularly arable land and water) that are primarily affected by climate and farming practices
- **detrimental environmental effects** associated with conventional (i.e. traditional) inputs and practices, specifically pollution and soil degradation, leading to lower production yields, loss of arable land and reduced resilience
- **climate change**, forcing the sector to adopt more sustainable practices to increase its resilience.

Other drivers make it economically feasible for farmers to adopt green tech, especially those that improve resource efficiencies. In turn, this creates opportunities for green tech businesses in agriculture. The drivers include:

- **growing consumer demand for sustainable products** (especially from international export markets such as the European Union)
- **declining costs of new technologies**
- **tax and financial incentives.**

In the course of our engagement with stakeholders in the agricultural and other green economy sectors, a number of opportunities in energy, water and other inputs have been identified. These include:

- **Alternative renewable energy sources and energy efficiency technologies**, which are becoming increasingly affordable and necessary due to rising energy costs. Opportunities for farming operations include solar photovoltaics (PV) for packhouses and irrigation systems.
- **Water efficiency technologies for irrigation**, particularly through the use of precision agriculture techniques, to address water scarcity and save electricity used to pump water.
- **Conservation agriculture practices**, which decrease the use of agro-chemical and fertiliser inputs, improves soil health and structure, and thus increases water retention. A key opportunity for agri-businesses is locally manufactured machinery, as the sector is still dominated by imported machinery often not well suited for SA's soil conditions.
- **Controlled environment agriculture**, including low-tech protective infrastructure (e.g. netting) to mitigate production losses, and higher-tech integrated systems (e.g. hydroponic systems) to increase yields and resource efficiencies.

This MIR also considers emerging trends in the agricultural sector and future opportunities that may result from them. Key trends are:

- **Increasing water constraints** that will continue to drive interest and investment in water efficient technologies, energy-efficient pumping systems and resource-efficient agriculture practices (e.g. conservation agriculture).
- **The increasing uptake of controlled environment agriculture**, particularly for **high-value export commodities**, and its role in growing urban agriculture.
- **The growing importance of big data and related analytical services**, in addition to green tech.
- A **growing awareness** of the **impact of climate change on agriculture** and the need for a coordinated response across the value chain.
- The need for **partnerships** in **finance** and **services**.

General barriers to the uptake of green technologies and sustainability measures in SA agriculture include:

- a **lack of awareness** of the importance and benefits of sustainable production and how to go about realising it
- **regulatory hurdles**, e.g. lengthy timeliness for Environmental Impact Assessments (EIAs) and the registration of new products
- **insufficient support** for farmers to access information and advice on best practice
- a **weak exchange rate** and **low profit margins**, which make imported technologies too expensive for farmers
- a **lack of funding** for research and development (R&D).

Furthermore, increasing support is available from government, industry and financiers for farmers and other investors interested in sustainable agriculture and the green economy.

Although the agriculture sector faces significant economic and environmental challenges, particularly with respect to climate change, several opportunities and viable solutions are available. These are highlighted throughout the report.

There is significant potential for the uptake of green technologies and related services in agriculture.

© Image courtesy of Jana Jordaan

1 – Introduction and purpose

This market intelligence report has been compiled by GreenCape's Agriculture Sector Desk. It is written for farmers, agribusinesses, manufacturers and service providers in the areas of conservation agriculture, precision agriculture and controlled environment agriculture, with a strong focus on renewable energy, energy efficiency and water efficiency.

GreenCape's Agriculture Sector Desk[1] was established in 2014 in partnership with the Western Cape Department of Agriculture (WCDoA). This was motivated by:

- the current (and growing) significance of agriculture and agri-processing in the Western Cape (WC)
- the potential impact of climate change and resource constraints (particularly water)
- associated green investment and market opportunities
- the need for credible and readily accessible information for farmers.

The Agriculture Sector Desk aims to support the development of sustainable and competitive agricultural value chains through the uptake of green tech, systems and processes. This is done by raising awareness of the benefits of green tech and practices for farmers (i.e. driving demand), and highlighting opportunities for green tech and services from manufacturers and providers (i.e. supporting supply). Two primary sources are provided:

- **The GreenAgri portal** (www.greenagri.org.za), which was launched in September 2015. The website focuses on sustainable agriculture and provides curated and trustworthy information to farmers and other agriculture stakeholders.
- An annual **agriculture market intelligence report** (MIR), which provides an overview of key green tech investment opportunities to improve the sustainability of the agriculture sector.

The 2017 agriculture MIR focuses on updating key issues and opportunities identified in the first MIR (published in March 2016[2]), as well as highlighting new opportunities related to technologies and practices that increase production efficiency (i.e. producing more with fewer inputs) and benefit the environment, primarily by:

- conserving resources;
- reducing negative impacts such as pollution; and
- increasing resilience to climate change.

Although the MIR focuses mostly on primary agriculture production (depicted in the first block in Figure 1), agricultural production is a highly integrated system. Investment opportunities can be found throughout the value chain (Boye 2012).

[1] For more information on the ASD, contact us or visit GreenCape's website: www.greencape.co.za
[2] All previous MIRs can be found on the GreenCape website: www.greencape.co.za

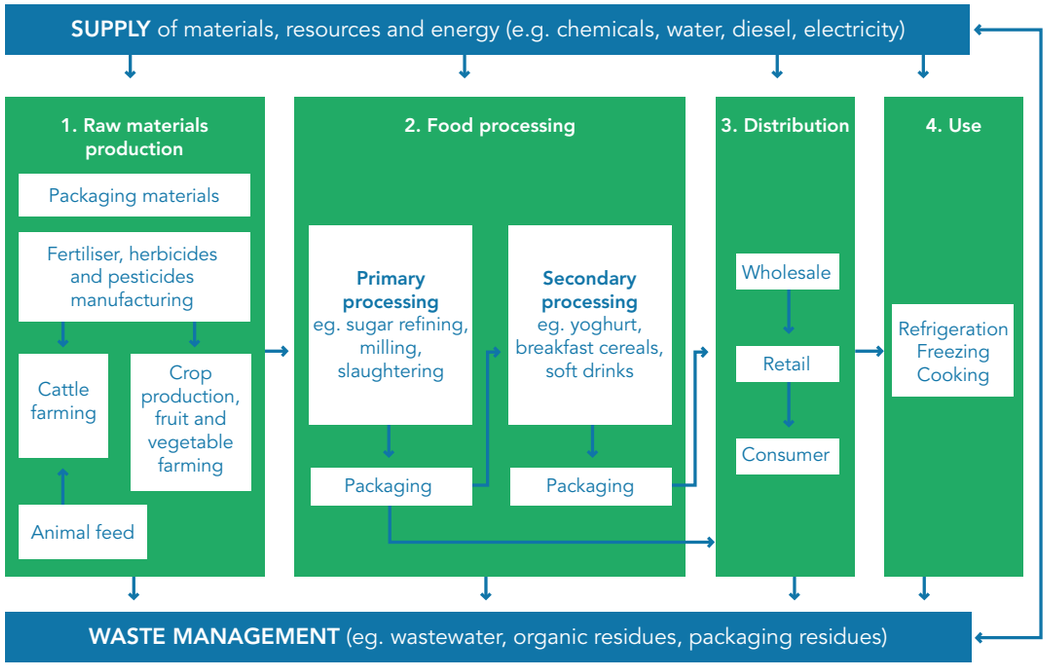

Figure 1: The agricultural production value chain

This MIR contains a **sector overview** (Section 2), which provides a provincial and national economic overview of agriculture with a focus on macro-economic trends and key players. This is followed by an overview of **policies and regulations** (Section 3) that guide and affect the agriculture sector. Key **opportunities and barriers** are highlighted, followed by emerging trends within sustainable agriculture (Section 4). The final sections outline various **finance and investment incentives** (Section 5), present the case for the **WC as a potential green tech hub** for Africa (Section 6), and explains **GreenCape's work within the green economy** (Section 7).

2 – Sector overview

This section focuses on the South African and Western Cape agricultural context. It provides an overview of the macro-economic trends, key players, and drivers of green tech and practices in agriculture that stimulate investment.

2.1. Physical geography and climate

SA is a semi-arid country with an annual average rainfall of 464 mm. In terms of its physical geography, the country has a range of geomorphological settings, resulting in a great variety of soil and climate conditions. Climatic regions in SA include mediterranean, subtropical and semidesert regions, enabling the production of a wide range of agricultural commodities. Suitable soil-climate conditions for rain-fed crops occur in only 12% of the country, making water one of the key constraints to growing the sector (WWF 2010).

For a detailed overview of SA's physical geography and production of commodities, see GreenCape's 2016 Agriculture MIR[3]. For a more detailed analysis of production areas and climate change trends in the WC, please see the range of publications[4] developed by the **SmartAgri Project** for farmers, policymakers, agricultural organisations and researchers. These include the SmartAgri Plan[5], the Status Quo Review of Climate Change and Agriculture in the Western Cape Province[6], SmartAgri briefs[7] and SmartAgri case studies[8].

2.2. Economic overview

This section provides an overview of the agricultural economy in SA and the WC, with a focus on the sector's economic contribution, value of commodities and production trends. For a more detailed overview, please refer to the 2016 Agriculture MIR[9].

2.2.1. South African agriculture

South Africa's primary agriculture sector contributed R66.7 billion[10] (2%) to SA's Gross Domestic Product (GDP) at the end of the second quarter of 2016 (Stats SA 2016). It is also important for the country's food security. If the entire agricultural value chain is taken into account, the sector's contribution amounts to almost 12% of GDP (DAFF 2013a).

The primary agriculture sector plays a critical role as an employer, accounting for approximately 7% of formal employment in 2013, of which a significant share is unskilled labour (DAFF 2013b). Elementary workers make up 77% of the agricultural workforce. Of those, 22% are considered unskilled. In addition to commercial-scale production, small-holder and subsistence farmers make further economic contributions, although these are harder to quantify.

[3] https://goo.gl/jKdLN9
[4] All SmartAgri reports can be located on the GreenAgri website: www.greenagri.org.za
[5] https://goo.gl/Fw45Xk
[6] https://goo.gl/FR7MwP
[7] There are 16 SmartAgri briefs provided for various regions and commodities. URL: https://goo.gl/odxllB
[8] There are six SmartAgri case studies: FruitLook, Conservation Agriculture, Small Holder Farming, Disaster and Risk Management, Peri-Urban Agriculture and Renewable Energy. URL: https://goo.gl/vPLRzL
[9] https://goo.gl/jKdLN9
[10] Constant 2010 prices, seasonally adjusted and annualised.

Drought conditions

The drought, economy and political unrest have influenced the performance of the agriculture sector. The agriculture, forestry and fishing industry has contracted for six consecutive quarters – from quarter one in 2015 to quarter two in 2016 (Stats SA 2016). According to experts, water is the key limiting factor for agricultural growth, even more so in times of drought. This drives the uptake of water-efficiency technologies, which is discussed in more detail in Section 4.

Water is the key limiting factor for agricultural growth.

In 2015, SA experienced its worst drought on record since 1904. The impact of the drought was felt nationwide and has resulted in a maize shortage, the country's top staple crop. This resulted in SA having to import maize to meet local demand for both food and feed. The effects of a drought often have a delayed impact on the livestock sector. It typically comes under pressure later when feed prices increase.

The low rainfall and high temperatures in August and September 2015 had a serious impact on crops in the province. About 200 000 tonnes of wheat were lost in the Swartland area while 230 ha potatoes were destroyed by heatwaves in the Sandveld area. The fruit industry suffered losses of about R720 million due to effects on fruit size, i.e. production of smaller fruit (Roux 2016).

2.2.2. Western Cape agriculture

Agriculture is a very important part of the WC economy. The province dominates much of SA's agricultural export production and provides high-value products such as wine grapes and fruit (e.g. apples). These export markets are a key driver of sustainable agricultural practices, particularly with international regulations requiring more environmentally friendly practices. For example, there is growing pressure to adhere to integrated production methods requiring minimum residue levels of certain chemicals. This is primarily due to increasing awareness of the detrimental effects to food safety of agri-chemicals and due to customer demand.

In addition to the contribution of primary agriculture, agri-processing[11] adds further value and has been identified as a key growth sector for the WC. Currently, the agri-processing sector contributes R12 billion in goods and services to WC's economy and accounts for 79 000 formal jobs in the province (State of the Province Address 2015).

2.2.3. Supporting environment

National support: Agri-parks

A project to support agricultural growth is the national establishment of agri-parks, led by the Department of Rural Development and Land Reform (DRD&LR) in collaboration with the Department of Agriculture, Forestry and Fisheries (DAFF). An agri-park is a networked innovation system of agri-production, processing, logistics, marketing and training and extension services. As a network, it enables a market-driven combination and integration of various agricultural activities and rural transformation services.

Export markets are a key driver of sustainable agricultural practices.

[11] Agri-processing can be defined as processing the raw material or transforming products that originate from agriculture.

There will be one park per district municipality altogether 44 agri-parks in SA, with the primary focus on the processing of agricultural products. The WC is set to have five parks, one each in the Central Karoo, Cape Winelands, Eden, Overberg and the West Coast Districts. The agri-parks will comprise three distinct but interrelated components:

- **Farmer Support Unit:** Focusing on primary production and extension services, including mechanisation.
- **Agri Hub:** Focusing on processing, packaging, logistics, equipment rentals, innovation and training.
- **Rural Urban Market Centre:** Creating a market place inside the parks for customers to buy produce.

Government will support the agri-parks for 10 years to ensure economic sustainability. The parks will be farmer owned. The initiative aims to strengthen partnerships between government and private-sector stakeholders to ensure greater access to production and services, i.e. water, energy and transport, while creating new markets and developing existing ones to strengthen and expand value chains in line with the Agriculture Policy Action Plan (APAP)[12]. For more information see this link[13].

Project Khulisa

Project Khulisa, which runs until 2019, is an economic development initiative that falls under the Western Cape Provincial Strategic Goal 1. In the first phase of Project Khulisa, the WC is focusing on opportunities for economic growth and job creation in three key sectors: tourism, agriprocessing, and oil and gas.

Under Project Khulisa, the province aims to create an enabling environment for private sector investment and grow the agri-processing sector through new infrastructure projects, better regulation, and promoting and supporting provincial products locally and abroad.

The three focus initiatives are:

- increasing exports of wine and brandy to high growth markets such as China and Angola;
- improving local capacity to process agricultural produce; and
- capturing a larger share of the global halal market.

For more information on Project Khulisa, see this link[14].

Halal park

At provincial level, the Western Cape Government recognises the demand for halal products globally, and is consequently investigating setting up a halal park initiative under Project Khulisa. Most of the elements of the halal value chain are already present in the WC, e.g. halal certification bodies, primary producers, abattoirs, food processing companies, specialist food services and catering, logistics and distribution, and more recently specialised lab testing. This makes the province ideal for establishing an exporting hub. Project Khulisa is currently analysing the market and value chain, as well as examining industry benchmarks for best practice. For more information, see this link[15].

Agri-parks will receive ten years of government support to ensure sustainability.

[12] APAP aligns itself with the New Growth Path (NGP), the National Development Plan (NDP) and Industrial Policy Action Plan (IPAP). APAP seeks to assist in the achievement of Outcome 4: Decent Employment through Inclusive Growth, and Outcome: Comprehensive Rural Development and Food Security. It seeks to translate the high-level responses offered by the Integrated Growth and Development Plan (IGDP) into tangible, concrete steps. Download the full document at https://goo.gl/9iJ145.

[13] https://goo.gl/sJ4Hh6

[14] https://goo.gl/koRnrW

[15] https://goo.gl/M82tyY

2.3. Key players

Key players in the agriculture sector can be divided into five broad categories: producers, research / academia, input suppliers, industry associations and labour organisations. SA's national agriculture department, DAFF, governs the whole industry.

- **Producers/farmers** produce commodities and in most cases do their own harvesting, storage and transport.
- **Research institutions** like universities investigate all aspects of the value chain.
- **Input suppliers** produce inputs such as fertiliser, seeds, pesticides, packaging and machinery. Suppliers of green tech, such as conservation agriculture (CA) equipment and solar PV manufacturers, also belong to this category.
- **Industry associations** are involved in all aspects of the value chain. They support farmers and provide them with reliable and relevant information regarding regulations, logistics, cultivar development, etc. They also do or support research in various fields, including soil, water, production practices and cultivars.
- **Labour organisations** provide support for employees in the agricultural sector by assisting them in attaining the best possible financial and social position in all employment opportunities along the entire value chain. There are quite a few special commodity labour organisations, including grain producers, wool growers, poultry producers and vegetable and fruit producers.

Table 1 shows a simplified value chain with key role players involved. A detailed list of role players can be found in the appendices.

Table 1: Key role players in agriculture

R&D	Inputs	Production	Harvesting	Storage	Transport	Processing	Wholesale, retail and exports	Waste
Government								
		Producer						
Research institutions								
Input suppliers								
Industry associations								
Labour organisations								

2.4. Drivers of green tech and practices in agriculture

A range of factors drive a transition to sustainable production in SA agriculture. These include water scarcity and climate change, deteriorating soil health, high cost of energy (and other inputs), and growing food demand. These are coupled with consumer awareness about pesticide residues, ecosystem degradation and pollution.

2.4.1. Climate change and water availability

While agricultural production in SA contributes a relatively small percentage (5%) of the country's greenhouse gas emissions (GHG), compared to other sectors such as the energy sector and industrial processes (Partridge et al. 2014), it is the sector most directly affected by climate change impacts.

Climate change is likely to result in a reduction of surface water availability, shifts in the seasonality of rainfall and runoff, growing irrigation demands and an increase in the magnitude and frequency of flood events. Climate change impacts, specifically declining rainfall coupled with an increase in the number of hot days (>35°C), can add a minimum of 10% to current water requirements for crops and livestock. It causes heat stress that can influence, among other factors, fruit quality and the reproduction efficiency of animals.

In the case of the WC, climate models predict a slow onset drying trend, with declines and more variability in rainfall (SmartAgri 2016). The Swartland area provides evidence of this trend. As one of the largest grain producing areas in the country, the Swartland has experienced year-on-year declines in rainfall and has just experienced one of the driest winters in the past 75 years. Such climatic consequences affect the productivity of local farms and the surrounding rural economy. It exerts pressure on farmers to operate more sustainably, particularly as insurance for extreme weather events is increasingly unaffordable for them.

In addition to climate change impacts, water will become even scarcer because of population growth, urbanisation and industrialisation. It is estimated that the WC will experience water-related constraints to development as early as 2019 (Department of Water Affairs 2011). Figure 2 shows water withdrawals (in km^3) in 2014 and 2035 in the current path scenario[16] (Hedden 2016). SA is already using 98% of its water resources available for extraction and demand is set to increase.

As mentioned, in 2015 SA suffered the worst drought on record since 1904. This has severely affected the agriculture sector. The risk posed by climate change is a significant driver of the greening of agriculture. It forces the sector to adopt more resilient practices and technologies that conserve water and improve soil health, e.g. for better water retention and improved yields. Surveillance technologies such as the use of drones that assist the farmer to respond quicker to problem situations are seeing an increase in uptake. Furthermore, water efficiency becomes key in sustaining agricultural production. Specific opportunities to these resilient practices and technologies will be elaborated on in Section 4.

Climate change is a driver of sustainable practices in agriculture. The sector is directly affected by climate change impacts with models predicting a drying trend and greater rainfall variability in the WC.

[16] In this scenario, every intervention aimed at increasing supply and reducing demand is successfully implemented on time.

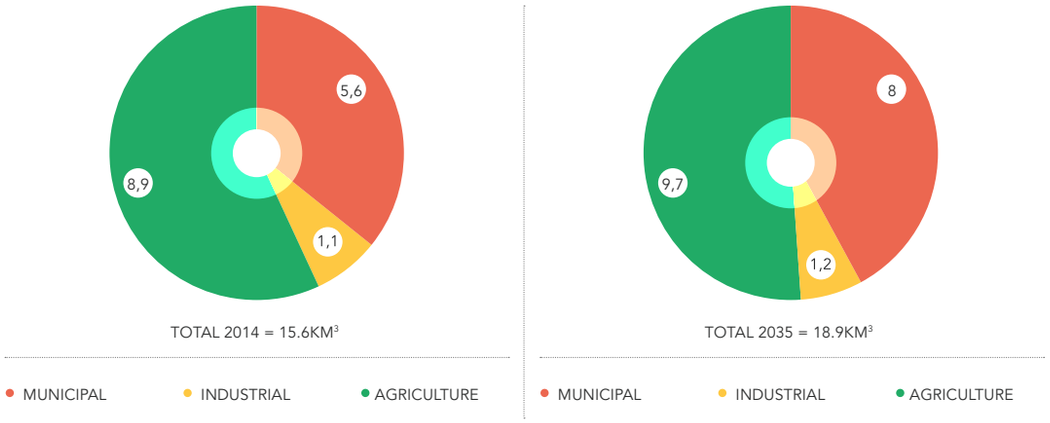

Figure 2: Water withdrawals in km³ in 2014 and in 2035 using the current path scenario

2.4.2. Environmental degradation

Conventional farming methods are increasingly seen as unsustainable, prompting farmers to revert to systems that mimic nature. This is mostly due to the negative impact of these conventional practices on natural resources and the environment, as indicated below:

- **Conventional farming** causes water pollution that destroys beneficial organisms both above and below ground.
- **Monoculture** depletes soil health by mining soils without putting any nutrition back into the soil. It also causes herbicide and pesticide resistance.
- **Tillage**, which is a conventional farming method, is the leading cause of soil degradation (WWF 2010). According to the UN Food and Agriculture Organisation (FAO), one third of global farmland is degraded (FAO 2014).
- **Leaving soil bare** exposes it to erosion, especially the topsoil where most plant nutrients and beneficial organisms are found.
- **Fossil fuel** burning, as in coal-fired electricity generation and diesel, emits carbon dioxide (CO_2) that contributes to climate change and air pollution.

Possible solutions with added benefits of greater profitability and resilience to climate change are presented as opportunities in Section 4.

2.4.3. Market pressure and limited resources

A number of other pressures and constraints contribute to the need for sustainable agriculture. These include:

- rising costs and demand for agricultural inputs: fertiliser, pesticides, water and energy (mostly diesel and electricity)
- energy shortages and rising energy costs
- population growth
- availability of arable land
- consumer demand for sustainably produced products.


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3 – Policies and regulations

With a complex agricultural sector and many commodities produced in the Western Cape, there is a range of policies and regulations that directly and indirectly relate to agriculture.

Many of these have specific relevance to the sustainability of the sector as they aim to protect natural resources such as land and water. They are relevant to farmers and suppliers of green tech or green services within the agriculture sector.

3.1. Agriculture

DAFF and the Department of Environmental Affairs[17] (DEA) are primarily responsible for legislation related to the agricultural sector. A number of acts and policy documents address the conservation of agricultural resources while promoting economic and social development. These are summarised in Table 2 below.

3.2. Water

Water and its efficient use are key focus areas in the agricultural sector. Water legislation is highly relevant to farmers and suppliers of green tech or green services for the agricultural sector. Table 3 provides an overview of the acts regulating the water sector (Department of Water Affairs 2013).

Table 2: Selected acts and plans relevant to the agricultural sector

Name	Selected
The Conservation of Agricultural Resources Act 43 of 1983	▪ Controlling use of natural agricultural resources ▪ Conservation of soil ▪ Conservation of water sources ▪ Combating weeds and invader plants
The National Development Plan 2030 (NDP 2012)	▪ Elimination of poverty ▪ Reduction of inequality ▪ Highlighting the importance of initiatives that link agriculture to the green economy
The Agriculture Integrated Growth and Development Plan (IGDP 2012)	▪ Equitable, productive, competitive, profitable and sustainable agriculture, forestry and fisheries sectors ▪ Emphasises that the sector needs to benefit all South Africans
The Agricultural Policy Action Plan (APAP 2014)	▪ A programmatic response to key policy documents, including the National Development Plan (NDP) and the New Growth Path (NGP)
The Medium Strategic Framework (MTSF 2014-2019)	▪ Outcome 4 – Decent Employment through Inclusive Growth ▪ Outcome 7 – Comprehensive Rural Development and Food Security ▪ Outcome 10 – Environmental Assets and Natural Resources Protected and Continually Enhanced
Strategic Plan for the Department of Agriculture, Forestry and Fisheries (DAFF 2013)	▪ Providing an effective framework to address various challenges facing the sectors ▪ Setting targets for the departmental programmes from 2012 to 2017 ▪ Building a leading, dynamic, united, prosperous and people-centred sector
The Spatial Planning and Land Use Management Act (SPLUMA 2013)	▪ Provides for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic ▪ Provides for the sustainable and efficient use of land ▪ Redresses the imbalances of the past and ensures equity in the application of spatial development planning and land use management systems
National Environmental Management Act (NEMA 1998)	▪ NEMA is the overarching legislative framework for environmental governance ▪ Core values are reflected through the following principles: – Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably – Development must be environmentally, socially and economically sustainable
National Environmental Management Biodiversity Act (NEMBA 2004)	▪ Provides for the management and conservation of the biodiversity within the framework of NEMA ▪ National protection of species and ecosystems that warrant national protection ▪ Sustainable use of indigenous biological resources ▪ Fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources ▪ Establishment and functions of a South African National Biodiversity Institute

[17] DEA is specifically involved in environmental impact assessments (EIAs), natural resource protection (e.g. wetlands) and legislation on invasive species.

Table 3: Water sector regulations relevant to the agricultural sector

Name	Selected
National Water Act (NWA, Act 36 of 1998)	Redefines water rights in SA to stimulate inclusive growth
Water Services Act (WSA, Act 108 of 1997)	Defines the role of the Department of Water Affairs as a regulator; the role of water boards as bulk providers, and the role of municipalities as service providers
The National Water Resource Strategy 2 (NWRS2 2013)	Assists in the implementation of the NWA whilst protecting, developing and controlling water resources in a sustainable and equitable manner

3.2.1. Water use verification

The water use verification process aims to ensure lawful use of water by commercial users and supports SA's objective to rationally and equitably manage our limited water resources.

The process was initiated in 2016 in the Berg River and Olifants River catchment areas and ensures that:

- commercial water use aligns with water use licences, and
- water use and water needs per commodity, soil type and climate will be identified and efficiently implemented.

As water becomes less readily available and water use is more strictly regulated, the impact of the water use verification process is significant. It will put greater responsibility on farmers and land owners to implement water-efficient technologies and practices.

GreenCape's Water MIR[18] provides more information on water governance issues and investment opportunities in the water sector.

Uncertainty in the sector over land rights and fears of unconstitutional land expropriation. Although there is some uncertainty in the WC, reallocation of farm land only occurs once land has been put on sale by existing farmers and bought by the government.

[18] GreenCape's Water MIR can be found on the GreenCape website: www.greencape.co.za

3.3. Land reform

The White Paper on South African Land Policy (Department of Land Affairs 1997) addresses the injustices and land inequalities that came about during pre-colonial and colonial rule and apartheid. This has had some implications for investors, particularly regarding uncertainty in the sector over land rights and fears of unconstitutional land expropriation. Although there is some uncertainty in the WC, reallocation of farm land only occurs once land has been put on sale by existing farmers and bought by the government.

There are several support strategies in place to prevent broader implications (such as agricultural and economic losses) when arable production land is given to inexperienced farmers without training.

New land owners receive support in the form of infrastructure, inputs, extension services and training. In the case where land is bought by investors, conveyances occur between investors and The Department of Rural Development and Land Reform. During the conveyance process the status of claims on the land is identified for the investor.

3.4. Carbon tax

The South African Government has committed to reducing GHG emissions by 34% by 2020 and 42% by 2025 (National Climate Change Response Policy 2011). Part of the strategy to drive this is enforcing a carbon tax. The tax will be implemented through a phase-in approach. The initial implementation timeframe of Phase 1 was from 2015 to 2020. Although the start date has been delayed twice, first to 2016 and then to 2017, the end date of Phase 1 has not changed. The current Phase 1 period is now set for 2017 to 2020.

Primary agriculture will mostly be exempted from the carbon tax during the first phase; however, this will be reassessed for Phase 2 (from 2020). Nevertheless, primary agriculture will be affected indirectly through increased input costs, particularly electricity, fertilisers and pesticides, as well as petroleum (Partridge 2016). This will force farmers to look for ways to reduce inputs and change to alternative inputs and/or practices. To help encourage good carbon usage practice, numerous discounts can be obtained, decreasing the tax rate paid[19].

Primary agriculture will mostly be exempted from the carbon tax during the first phase.

[19] Part II (pp. 14-18) of The Draft Carbon Tax Bill covers details on allowances.
The Draft Explanatory Memorandum for the Carbon Tax Bill dated 2 November 2015 further provides examples of how the allowances work.


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4 – Opportunities and barriers

This section provides an in-depth focus on the key opportunity areas and trends identified in the agricultural sector this year.

These opportunities were highlighted through engagement with an array of agricultural stakeholders and through interaction with other green economy sectors.

The opportunities have largely been influenced by the recent drought and the drive towards improved water efficiency in agriculture. There are opportunities for farmers in terms of decreased costs and increased revenue, and for suppliers of green tech and agribusinesses in terms of increased demand for products and services.

The following are key opportunities:

- **Alternative energy sources and energy efficiency (EE) technologies,** which are becoming increasingly affordable and necessary due to rising energy costs. Opportunities covered in the MIR include solar PV for farming operations, specifically for packhouses, as well as solar powered irrigation systems (SPIS).
- **Water use efficiency technologies in irrigation** to address water scarcity and reduce the amount of electricity required to pump water. This MIR focuses specifically on **precision agriculture (PA)** in terms of driving water efficiency.
- **Conservation agriculture (CA)**, an alternative farming practice with multiple economic and environmental benefits.
- **Controlled environment agriculture (CEA) technologies**, which enable producers to be more resilient to climate change and improve their resource efficiency.

Before discussing these opportunities in more detail, it is important to briefly consider some general barriers to the uptake of green tech and sustainability in SA agriculture. These include:

- **A lack of awareness** of the importance and benefits of sustainable production, and what is available, specifically in terms of advice and technologies.
- **Seasonal production of commodities**, which impacts the return on investment and payback period.
- **Lack of support for farmers** to help them access relevant information and advice on best practice.
- **Regulatory hurdles**, e.g. complicated processes and delays in carrying out EIAs.
- **Weak exchange rate and low profit margins** result in imported technologies being too expensive for farmers.
- **A lack of funding for R&D**. As an international benchmark, R&D expenditure as a percentage of GDP should be 1%, but is currently <0.8% in SA. Moreover, the performance of R&D expenditure is much higher for businesses than government (i.e. R&D funding is spent to better effect by business compared to government).

The lack of awareness and support for farmers is being addressed in part through GreenCape information platforms, specifically the MIR and GreenAgri portal, and through assistance provided by the Agriculture Sector Desk. The barriers related to the specific opportunities are discussed in the relevant sections below.

4.1. Energy efficiency in the Western Cape agricultural sector

The agriculture and food sector is responsible for 30% of global energy consumption (FAO 2011). In agricultural production there are: (a) indirect energy inputs in the form of fertilisers and pesticides; and (b) direct inputs, including diesel for tractors or energy for operating irrigation systems. Figure 3 (Energypedia 2016) shows the areas for potential energy efficiency (EE) measures (in blue) along the agricultural value chain (in green) and the various energy users (in red).

In the context of rising electricity costs, EE has become increasingly important for agriculture. There is a strong business case for investment in EE. As such, EE services and measures in the province offer opportunities for farmers as well as service providers and manufacturers of green tech.

For farmers and agri-processors the opportunities include undertaking an EE audit and implementing alternative management practices and green tech. For manufacturers and green tech providers, the opportunity includes providing relevant and cost-effective EE services and technologies.

The case for energy efficiency investments is strong, offering opportunities for farmers, manufacturers and service providers.

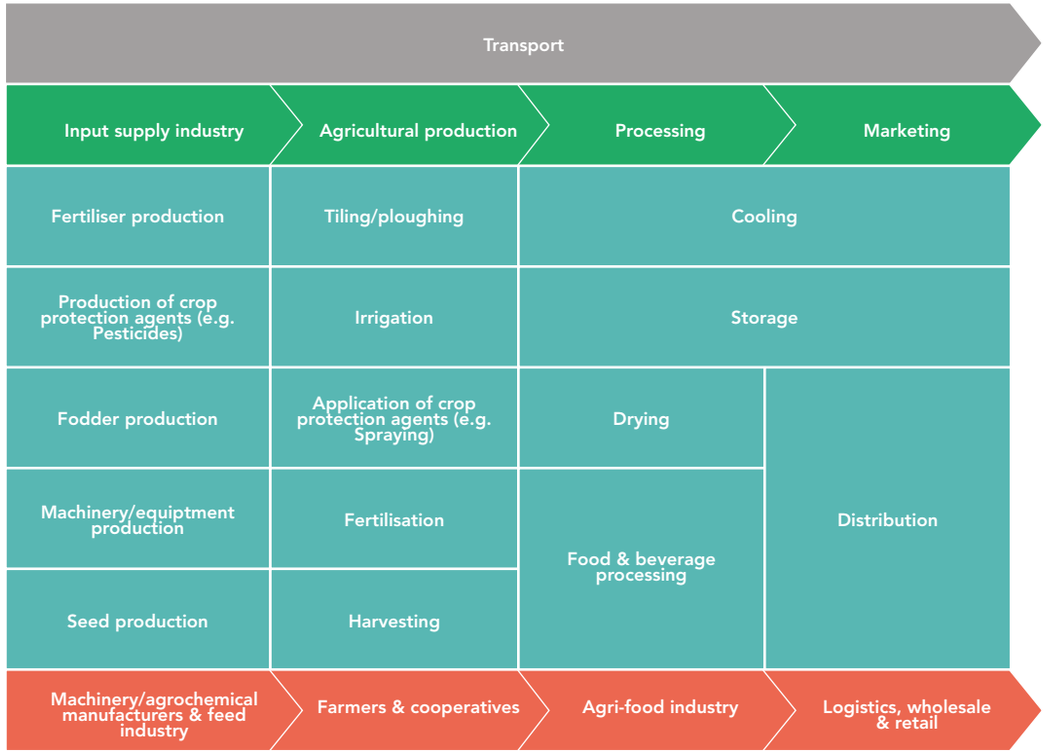

Figure 3: Energy use along an agricultural value chain

4.1.1. Market size and overview

The known market size for EE investments on fruit farms, packhouses and cold stores and other agriprocessing facilities is ~R2.4 million[20] (CCC 2013; NCPC 2014). The estimated minimum market for SA agriculture and agriprocessing sector is ~R33.4 million[21] (CCC 2013; NCPC 2014).

4.1.2. Opportunities in agri-production and processing

Although many agricultural facilities have already implemented certain EE measures, there is significant potential for growth in the rate of uptake within the sector. According to Bundschuh and Chen (2014), improvements to technical elements and operation of modern refrigeration systems have the potential to reduce energy consumption by 15 to 40%.

Key intervention areas are on-farm activities, packhouses and cold stores and cellars, which are significant users of energy. Irrigation is an important opportunity area. With rising temperatures and evaporation rates, demand for irrigation is expected to grow by ~30% (WWF 2016). This could have huge cost implications for farmers, particularly those using inefficient motors for pumping water. Improved EE in pumping systems is almost always due to the technology (i.e. not behaviour) and improvements can be <100% in some systems[22]. Table 4 below shows the main EE options and opportunities in on-farm activities, cold storage and cellars and packhouses.

Table 4: The main energy efficiency options and opportunities in on-farm activities, cold storage and cellars and packhouses

Site/location	Energy efficiency options
On-farm activities	▪ Variable speed drives for irrigation pumps ▪ Correct pump capacity and pressure ▪ Drip irrigation ▪ Electronic management systems
Cold storage/ cellars	▪ Building design ▪ Continuous maintenance ▪ Correct type and amount of vapours used ▪ Proper insulation ▪ Temperature regulating paints ▪ Electronic management systems
Packhouse	▪ Shorter distance to packhouse ▪ Conveyors instead of water to move fruit ▪ LED lighting ▪ Proper building design, e.g. natural ventilation ▪ Temperature regulating paints ▪ Electronic management systems

[20] The market size is based on relevant case studies published by: (a) the National Cleaner Production Centre's (NCPC) Industrial Energy Efficiency (IEE) Project; and (b) Confronting Climate Change (CCC).
[21] Assuming a conservative ~10% conversion by the leaders within the sector by 2015.
[22] From Koos Bouwer – energy consultant.

Improvements to technical elements and operation of modern refrigeration systems have the potential to reduce energy consumption by 15 to 40%.

Motors and pumps

Motors account for around 70% of SA's agricultural electricity consumption (Eskom 2016). This is largely due to reliance on older and less efficient motors to drive irrigation pumps, cool broiler houses and cold stores, and to heat and cool greenhouses. Older motors are expensive to run and maintain, affecting the profitability and competitiveness of farms.

Most farmers believe that energy-efficient motors are unaffordable compared to less efficient models. Although more efficient motors are around 60% more expensive than less efficient motors, the energy savings achieved over the 20-year life span of the motor should motivate farmers to upgrade (Eskom 2016). As European standards on the effectiveness of low-voltage AC motors have been tightened, it is expected that local markets will be flooded with less efficient models at cheap prices.

A sample of 140 irrigation pumps has shown an average energy saving potential of 28%, which can be linked to the condition of the pumps. This also equates to a potential carbon footprint and electricity cost reduction of 28% (CCC 2013).

Variable speed drives[23]

EE technologies, like those outlined, can provide co-benefits in terms of improved water efficiency and return on investment. This has been demonstrated with variable speed drives (VSD) on dairy farms. As dairy farms increasingly shift toward intensive grazing practices (to increase profit margins), more individual fields need to be irrigated. However, as pumps are generally located in specific sites, the pumping rate of water can vary greatly. This leads to loss of electrical energy as the flow and pressure is not regulated. Implementation of VSD allows for control of water flow and pressure, saving unused electrical energy and making irrigation pumping more efficient. Furthermore, VSD for intensive grazing becomes increasingly feasible due to year-round irrigation for feed, shortening the payback period for the investment.

Energy audits

Energy efficiency (EE) requires commitment, analysis, development of action plans and continuous monitoring and improvement. There is a growing market and need for energy audits, which can provide important information about energy consumption. The correct data and information will allow producers to better manage energy consumption and to make decisions about technical/technological changes. As all farms are different, significant energy savings are possible if farmers consider the advice of an independent third party energy expert[24] before investing in equipment. There will be a complementary role for the uptake of renewable energy (RE) systems through energy audits, which allow for the identification of RE opportunities and upgrading of infrastructure or systems.

There is a growing need for energy audits to provide farmers with information on energy consumption.

[23] Note: Although there is a strong business case for VSDs in agriculture, savings through VSD are situation-specific.
[24] GreenCape has an Energy Sector Desk that can provide free information and contact details.

4.1.3. Opportunities for green tech manufacturers and service providers

As highlighted, the estimated minimum market for EE in SA agriculture and agriprocessing is ~R33.4 million. This is a conservative estimate with significant contributions derived from wineries, as well as fruit farms, packhouses and cold stores. In terms of size, the market for EE services and technologies in the province is significant, totalling 22 574 agriculture sector facilities. The breakdown of the number of facilities is provided in Table 5 (WCDoA 2013).

Specific opportunities in wineries and packhouses are discussed below, followed by a case study from Durbanville Hills Winery to illustrate their successful EE interventions.

Energy efficiency in the wine sector

Cold stores and cooling systems are the largest users of energy in the fruit sector. As illustrated in the Figure 4 (NBI et al. 2015), refrigeration constitutes the largest portion of energy use along the process flow of a wine cellar. Rising temperatures will increase dependence on cold storage, which will increase demand for EE services and technology (WWF 2016).

Table 5: Number of agriculture sector facilities in the Western Cape

Type	No.	Type	No.	Type	No.
Abattoirs (red meat)	55	Chicken hatcheries	2	Homestead (labour)	13 860
Abattoirs (white meat)	25	Cool chain facilities	21	Packhouses	613
Agri-processing plants	261	Dairies	760	Piggeries	75
Chicken batteries	57	Fruit packers	44	Silos (commercial)	44
Chicken broilers	170	Fruit cool chains	29	Tunnels	853
Chicken layers	140	Homestead	5565		

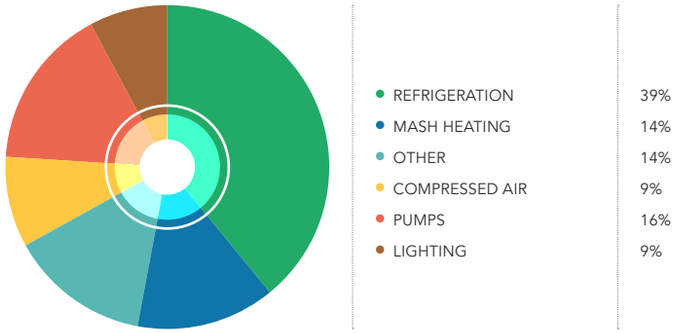

Figure 4: Energy consumption of a typical wine cellar

The South African Wine Sector Energy Efficiency Guideline of 2015 provides an in-depth analysis of the energy use within the sector, including performance benchmarks, energy savings measures and industry best practice (available on the GreenAgri website[25]). EE can be achieved in cold rooms through improved temperature regulation. This can be achieved through simple changes in practices, such as fitting improved door seals, or implementing more complex electronic systems to regulate temperatures.

Energy efficiency in packhouses

Packhouses have great potential to improve efficiency. It has been noted that the 'best performing packhouses use around 15kWh of electricity per ton of fruit packed, while others use three times as much' (Bouwer 2016). This is achieved through various EE activities, from energy management to technological changes.

As highlighted in the 2016 MIR, natural ventilation enabled and supported by good building and roofing designs can lead to significant energy savings. The design of a new building is an important consideration because windows and doors that seal properly contribute significantly to EE. For this reason, GreenCape compiled a green building materials catalogue to assist business owners with a list of building materials that are energy efficient. This catalogue is available on the GreenCape website.

Best performing packhouses use around 15kWh of electricity per ton of fruit packed, while others use three times as much.

[25] https://goo.gl/TWk6dC

Case study: Energy efficiency benefits for wine estates

In 2012, Durbanville Hills wine estate in the Western Cape undertook an energy audit through the Industrial Energy Efficiency (IEE) project. Initially the wine estate wanted to install solar PV as a means of cost saving. However, due to the cost of solar PV, the estate undertook an energy audit and implemented alternative energy efficiency recommendations instead.

According to the National Cleaner Production Centre South Africa (NCPC) team, who conducted the audit, it included a walk-through and survey of the winery, an energy consumption analysis and the performance of various systems and costs analyses. The audit team identified energy-saving opportunities and a report for action and implementation (NCPC 2014). The staff were introduced to energy management systems (EnMS) and energy systems optimisation (ESO).

The wine estate is similar to other small wineries, in that energy usage varies during the harvesting and wine-making seasons and storage season.

The main energy users during the harvesting and wine-making season include refrigeration, the chilled water plant and the compression plant. In addition, stalk removal, filtration, blending and moving wine between tanks also consume a lot of energy.

The initiatives the NCPC recommended and developed for the Durbanville Hills winery included:

- automatically switching off cooler pumps when empty (they were previously regulated manually)
- sequencing the three ammonia plant compressors depending on loads
- setting the geysers to run at off-peak
- installing pressure control systems on water circulation pumps
- installing energy saving bulbs, light sculptures and automated lighting, and
- re-setting the compressed air pressure set-points.

The interventions undertaken by Durbanville Hills, together with the costs and savings, are shown in Table 6 (NCPC 2014) below.

In the last three years Durbanville Hills have implemented six energy-saving projects with an investment of R300 000. Had the process been repeated in a similar manner for 10%[26] of all 564[27] wine cellars in the WC, the market is estimated to be worth R16.9 million.

Table 6: Energy saving opportunities

Intervention	Capital cost (R)	Energy savings (kWh/annum)	Savings (R)	Estimated payback period (years)	GHG emission reduction (Kg CO_2 / year)
Demand management	R 71 000	0	R 71 000	Immediate	0
Chilled water plant	R 150 000	R 198 000	R154 000	1 year	R 178 000
Lighting	R 50 000	R 110 000	R 86 000	0.5 year	R 99 000
Compressed air system	R 0	R 40 000	R 31 000	Immediate	R 36 000

[26] Assuming CCC participants are industry leaders and 10% of the wineries have already installed energy efficiency systems, as outlined in NCPC and CCC case studies; it seems reasonable given CCC coverage of the industry and the fact that CCC write case studies on their members.
[27] Total number of wine cellars provided in the CCC report.

4.1.4. Barriers to uptake

Although there has been an uptake in the number of audits performed in the sector, suggested solutions are not always implemented. Although uptake is situation specific many of the barriers are highlighted amongst the general barriers. Additional barriers to implementation include increased expenditure as a result of additional infrastructure needs. Furthermore, farmers are implementing technology with little to no consultation and/or lack of technical knowledge around best use. The result is technology that does not deliver energy efficient results as anticipated. In other instances, farmers are conducting audits but fail to implement the recommendations due to cost constraints. Despite these barriers, agriculture has seen significant uptake in EE technology and systems, and is predicted to see increasing investment in this area.

4.2. Solar PV in the Western Cape's agricultural sector

SA has seen an increase in the uptake of solar energy in agriculture and other sectors. This was driven in part by electricity shortages in 2015. Although load shedding was temporary and appears to have been addressed by Eskom, there are industries such as dairy that are severely affected by power outages. They require absolute certainty regarding electricity supply. For these sectors, renewable energy might be a cheaper and more reliable option.

There is a strong business case for investment in renewable energy, specifically solar PV for packhouses. It offers opportunities for agri-producers and processors and for manufacturers and service providers associated with solar PV systems. For agri-producers and processors, the opportunity includes replacing expensive electricity with relatively cheap energy. For manufacturers and service providers linked to solar PV (e.g. installers and companies providing performance-based electricity supply contracts[28]), the opportunity includes providing cost-effective solar PV systems and energy services.

4.2.1. Market size and overview

Based on total investments in solar PV in the agricultural sector, the current market size ranges between R97.8 million (if systems are smaller than 10 kWp) and R150 million (if systems are larger than 100 kWp)[29].

4.2.2. Opportunities in agri-production and processing

Renewable energy solutions, including solar energy, is becoming increasingly competitive compared to conventional energy sources. Some farmers are benefiting financially through partnering with Independent Power Producers (IPPs) in land rental agreements.

Implementation of solar PV is increasingly making financial sense for investors, especially for fruit packhouses and cold stores. This is primarily due to: (a) the relative cost of solar PV systems; and (b) the ability to connect and feed into the grid, as discussed below.

Relative cost of solar PV systems

Figure 5 illustrates the decreasing cost of solar PV in relation to energy costs when provided with electricity from Eskom and municipalities (results may vary depending on different tariff rates within municipalities). Through analysis of the simplified comparison, solar PV systems may provide cheaper electricity by 2020.

The current market for solar PV in agriculture is R150 million and set to grow.

[28] Energy Service Companies (ESCos) provide innovative performance-based supply contracts.
[29] Based on 6000 kWp (Wagner 2016) at R16 300 to R25 000 cost per kWp of solar PV; cost savings based on Eskom Ruraflex tariffs.

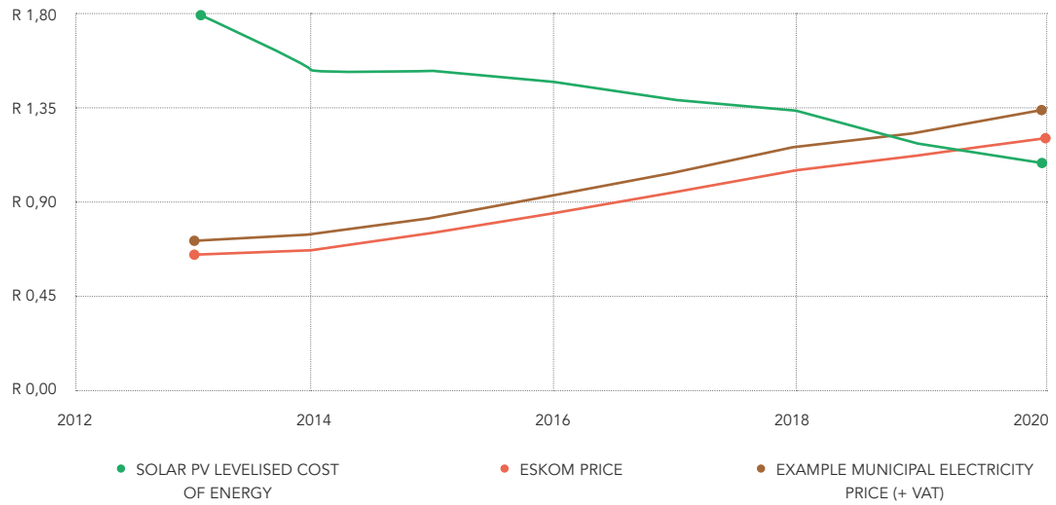

Figure 5: Expected price of electricity provided by a >100 kWp solar PV system

Ability to connect and feed into the grid

Enabling producers to feed back into the grid overcomes the obstacle of seasonality of commodities, as the energy load profile matches solar PV generation and increases return on investment. However, what is important is that the real value of solar PV is not derived from selling excess electricity to the grid, but rather from replacing expensive electricity with one's own generated electricity.

This has been shown in fruit cold stores and packhouses; solar PV installations on four fruit cold stores and packhouses in the WC report a 6% to 15% reduction in electricity costs, with a payback period of approximately six years (Janse van Vuuren 2016).

Solar PV installations on four fruit cold stores and packhouses in the Western Cape report a 6 to 15% reduction in electricity costs.

To determine the feasibility of the opportunity, it is important to identify if and when one can feed into the grid. Figure 6 (Janse van Vuuren 2016) and Table 7 provide information on where and when feed-in is possible in the WC. The table lists 13 municipalities that allow small-scale embedded generation (SSEG) to feed back into the grid, have NERSA-approved tariffs and are designing their own relevant rules, regulations and by-laws. For further information, consult the Energy Sector Desk at GreenCape or refer to the Energy Services MIR.

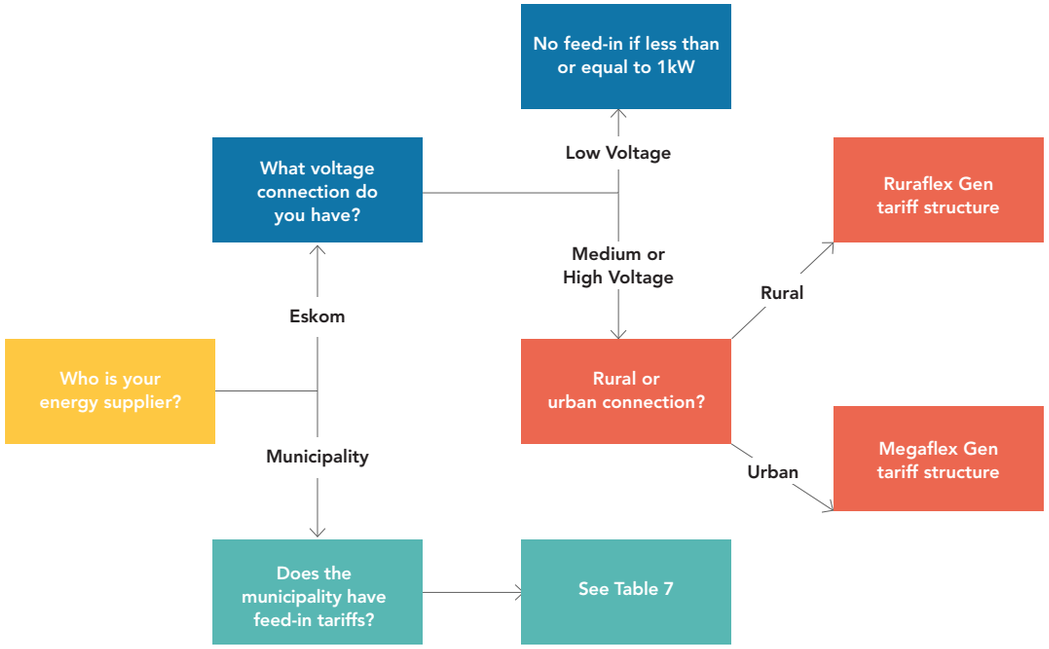

Figure 6: Available options for the sale of excess electricity

Table 7: Western Cape municipalities that allow small scale embedded generation to feed back into the grid

No.	Municipality	Allow SSEG	SSEG tariffs	SSEG policies
1	Beaufort West	Yes	Yes	In progress
2	Bergrivier	Yes	No	In progress
3	City of Cape Town	Yes	Yes	Yes
4	Drakenstein	Yes	Yes	Yes
5	George	Yes	Yes	Yes
6	Mossel Bay	Yes	Yes	Yes
7	Oudtshoorn	Yes	In progress	In progress
8	Overstrand	Yes	Yes	In progress
9	Stellenbosch	Yes	Yes	Yes
10	Swartland	Yes	Yes	Yes
11	Theewaterskloof	Yes	Yes	Yes
12	Langeberg	Yes	Tariff consultant appointed	Yes
13	Breede Valley	Yes	In progress	No

Business case: Installing solar PV on fruit packhouses

According to the World Wide Fund for Nature (WWF), the predicted higher frequency of hotter days will result in increased need for cooling to ensure the quality of agricultural produce. This will lead to increased reliance on efficient operations in packhouses, as well as an increased dependence on cold store rooms (WWF 2016). It is expected that Western Cape farmers can spend up to R1 million per month on packhouse cooling (WWF 2016).

A growing awareness of these impacts has shifted the focus towards energy efficiency in the WC agriculture sector. This is particularly true for the fruit and wine sectors, which have seen a notable uptake of solar PV of ~6000 kW (Wagner 2016).

Solar PV on packhouses could result in 15% savings on electricity costs

GreenCape published a business case for solar PV on fruit packhouses in 2016[30]. The business case looked at the financial feasibility of solar PV on an apple packhouse using industry averages. It showed that solar PV on packhouses could result in 15% savings on electricity costs (Janse van Vuuren 2016).

The business case highlighted that solar PV on packhouses makes sense for the following reasons:

- Packhouse cooling and other intensive energy needs are highest during the day, strengthening the business case for solar PV generated energy.
- The business case is further supported by solar PV acting as an insulator, absorbing heat and reducing the need for cooling.
- Some solar PV installations providing electricity for cooling have reported reductions of up to 80% in monthly electricity costs.

The key insights are that:

- economies of scale are important, with favourable returns identified in all scenarios for a large (500 kWp) system;
- access to favourable financing and loan terms is a key issue determining the feasibility of smaller systems; and
- the opportunity for financing solutions by innovative performance-based contracting plays a significant role in the uptake of solar PV.

The complete business case for solar PV on packhouses is available on the GreenCape website.

[30] The business case can be found on the GreenCape website. For more information, contact Pieter Janse van Vuuren: pieter@greencape.co.za.

4.2.3. Opportunities for green tech manufacturers and service providers

Solar PV capacity generated in SA nearly doubled between 2015 and 2016, with 94 300 kWp generated (83k systems) in 2016 compared to 44 000 kWp the previous year (PQRS 2016). Of the 83 000 systems installed, the SA agriculture sector has installed 56 solar PV systems, of which 36 installations have been in the WC (Wagner 2016). Four case studies of solar PV on fruit cold stores show installations ranging from 420 kWp to 986 kWp, covering surface areas ranging from 2 744 m^2 to 3 800 m^2 (Janse van Vuuren 2016).

Keeping in mind the size of the agriculture sector, there is large untapped potential for the uptake of solar PV. For example, the potential market for solar PV installed on WC packhouses is estimated to be R1 billion (60 MWp)[31]. Growing evidence of the financial feasibility for solar PV on packhouses is discussed in the case study.

4.2.4. Barriers to uptake

In addition to the general barriers highlighted at the start of the section, specifically the high capital costs associated with purchasing and installing the systems and the long return on investment[32] period, other barriers to the uptake of solar PV are:

- **Farm buildings with asbestos roofing material.** Many of the older packhouses have asbestos roofing that has to be replaced to install solar PV. These additional costs make installation financially unfeasible for some farmers.
- **Little knowledge about the technology and its benefits.** Farmers lack knowledge about solar PV and few have been shown its benefits. Farmers tend to react only after witnessing the successes achieved by other farmers who have implemented the system. This means that industry usually has to develop trust with farmers first and encourage uptake of technology by influential farmers in the region. GreenCape's initial interactions with farmers indicate a limited understanding of the opportunities and costs associated with RE.

Although capital cost constraints may limit uptake, this is increasingly being overcome by increased access to grid feed-in and the use of innovative performance-based contracting through leased solutions. These contracts are undertaken in two ways, either through: (a) the sale of energy; or (b) energy saved. However, this is currently only possible with a full generation licence from NERSA and the DoE.

© Image courtesy of GreenCape

[31] Based on installation of 500 kWp systems, for 20% of Western Cape's >600 packhouses, using the average cost price of solar PV installations (in line with solar PV installations currently found on packhouses).

[32] According to an industry consultant, the payback period for solar PV is approximately seven to eight years. Although this is feasible, many farmers choose to rather invest in alternative opportunities with shorter paybacks.

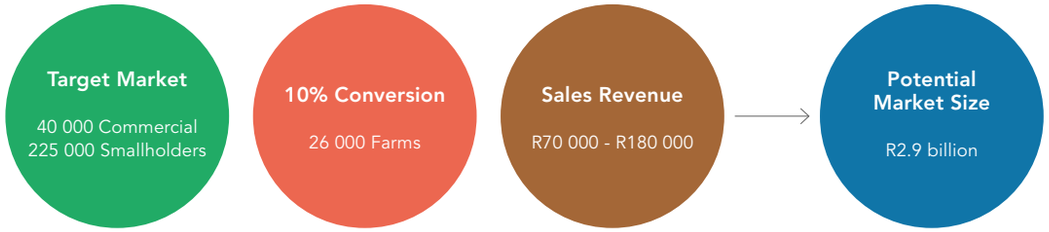

Figure 7: Potential market size for solar irrigation in SA

4.3. Solar powered irrigation systems

Southern Africa has high solar radiation and potential for solar energy. There is opportunity for solar irrigation pumping systems (SPIS) for both small-scale and commercial agriculture, particularly in rural areas that lack infrastructure. There are also opportunities for export of SPIS to the rest of Africa. This opportunity is discussed in detail below.

4.3.1. Market size and overview

Of the 12 million hectares of arable land in SA, 1.2 million is under irrigation, with an estimated maximum of 2 000 ha[33] under solar powered irrigation (FAO 2015). The potential market size for SA is R2.9 billion[34] (see Figure 7).

This was calculated assuming:

- An average cost of R125 000 for an SPIS system[35]
- A 10% conversion of systems within both commercial and smallholder farms. This was confirmed to be reasonable by the SA industry[36].

4.3.2. Opportunities in agri-production and processing

For farmers, SPIS benefits include:

- decreased costs and improved competitiveness for farmers over the longer term, taking into account increasing electricity and diesel prices and the decreasing cost of solar systems;
- lower carbon emissions in comparison to conventional diesel or grid-linked systems;
- improved energy security.

The feasibility of converting to SPIS will be highly site-specific and the type of solar pump (i.e. submerged, above ground or floating) will depend on the water source. The design of the system depends on the volume of water that has to travel over distance (velocity). It can also result in increased water efficiency if a farmer switches from a less water-efficient irrigation system such as sprinklers, to a more efficient system such as drip irrigation.

Importantly, the business case is strengthened with year-round irrigation requirements, as this shortens the payback period. Examples of such cases are intensive cattle farming and catchments that serve as a water resource for various farmers.

[33] This is the estimated area under SPIS from the FAO market assessment in 2015.
[34] Note that this market size may be overestimated as the local production of these systems is increasing and driving down the total cost per system.
[35] Calculated using the exchange rate ZAR:US$ = 14.866:1 (average ZAR:US$ from Jan to Oct 2016). FAO study values were converted to ZAR giving sales revenue of R70 000 to R180 000 per system. Smallholders will need smaller systems than commercial farmers, causing the variation in price.
[36] According to system designers sustainable.co.za and Microcare.

4.3.3. Opportunities for green tech manufacturers and service providers

Suppliers have confirmed an increase in demand for solar pumps for irrigation. They suggest that there is an opportunity for SA to become a hub for the manufacturing and export of SPIS to Africa, particularly as incentives from European buyers for certified 'green' production can provide a margin for investment in renewables within agriculture supply chains. However, the local market for SPIS is relatively small and the technology is considered expensive, with a return on investment of approximately 10 years or more.

A key opportunity lies in areas where there is a lack of access to the national electricity grid, as this drives demand for an alternative. As a result, local suppliers are primarily exporting their pump systems to neighbouring countries, specifically Zambia, as these countries have several areas with limited access to electricity.

A clear business case for solar irrigation technology and its financial benefits to farmers has not been conducted for SA agriculture (FAO 2015). This was confirmed by local SPIS suppliers and other irrigation-related stakeholders (specifically the Irrigation Board of SA). They emphasised the need for information on the relative costs and benefits of alternative pumping systems (including SPIS) in comparison to traditional systems (specifically diesel-fuelled pumps). This suggests an opportunity for green tech businesses to demonstrate the feasibility of SPIS and convince farmers of its viability. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is developing a study to examine the business case for solar irrigation. Once completed, this should be publicly available on Energypedia[37].

4.3.4. Barriers to uptake

In addition to the general barriers previously highlighted, a specific barrier to the uptake of SPIS is fear/risk of loss of components by theft. Furthermore, when using SPIS there may be a mismatch in some cases between peak electricity supply and demand. To minimise evaporation, farmers often irrigate when there is least solar radiation, i.e. in the late afternoon, evening and early morning.

This suggests:

- SPIS may be better suited for gravity flow irrigation systems, i.e. pumping water to catchments when there is high solar radiation, particularly in areas where there is limited infrastructure and low off-peak electricity tariffs are not available to farmers.
- SPIS may require battery storage for other types of irrigation systems. Although battery costs are falling, and are predicted to continue to fall, the additional cost of batteries would impact the feasibility of the business case. As a result, farmers are most likely to use electricity from the grid in times when they cannot use their solar system.

4.4. Conservation agriculture

CA is a viable alternative to conventional agriculture. Furthermore, there are significant long-term benefits associated with CA, particularly with respect to climate change mitigation and improved resource productivity. The key differences between the systems are highlighted in Table 8.

The market for solar-powered irrigation systems is worth R2.9 billion.

[37] The link to Energypedia can be found here: https://energypedia.info/wiki/Main_Page

Table 8: Key differences in conventional and conservation agriculture practices

Key principles	Conventional practices	Conservation practices
Tillage	▪ Includes a **sequence of soil tillage**, such as ploughing and harrowing, mainly for seedbed preparation and weed control. ▪ Worldwide, two thirds of arable farm land are degraded, with conventional tillage being the number one cause. ▪ Long-term tillage destroys soil structure and contributes to a reduction in fertility and organic matter levels. This results in a need for higher levels of chemical fertiliser, the production of which has high fossil fuel inputs with associated financial and environmental costs. Chemical fertilisers also pollute water resources.	▪ **Minimum mechanical soil disturbance** achieved by practising no-till, zero-till or direct seeding. ▪ The degree of tillage is determined by the technology available, soil characteristics and type of crops being produced. ▪ The benefits include reduced fuel inputs, and increased organic matter retention and water holding capacity. It also results in a reduction of chemical fertiliser use.
Rotation	▪ **Monoculture**, which depletes soil health as the same nutrients are continuously taken out of the soil. ▪ This results in increased need for chemical fertilisers. Increased use of pesticides is also needed as pests become resistant to certain chemicals.Chemical pesticides pollute water resources and kill more than the targeted species which results in a loss of beneficial organisms	▪ **Diverse rotation of crops** ▪ Benefits include fewer diseases, a lower weed burden and greater soil fertility, resulting in a reduction of chemical fertiliser and pesticide use. Having higher soil organic matter and using nitrogen-fixing crops (legumes) in rotation result in lower fertiliser requirements.
Residues	▪ **Residue is burned or tilled back into the soil.** ▪ Not keeping residues to cover farming soil increases erosion of soils and water evaporation from the soil. This becomes a crucial factor in sustaining our farming soils in SA, where there is high solar radiation and water scarcity.	▪ **Permanent organic soil cover.** ▪ This protects the soil from erosion, decreases evaporation from soil and feeds soil biota.

4.4.1. Market size and overview

Uptake of conservation agriculture (CA) is increasing in SA, primarily among grain farmers – specifically wheat in the WC and maize across the country. According to Blignaut et al. (2014), 35% of SA's arable land was under some sort of reduced tillage and nearly 9% was under no tillage in 2004. Data presented at the Third World Congress on Conservation Agriculture in Nairobi in 2005 showed an area of 300 000 ha under no tillage in SA. According to experts, that area grew to 368 000 ha by 2010, which is a 13% growth in five years.

Despite this growth, there is still significant potential for uptake of CA in SA. Figure 8 suggests SA had less than 5% of arable land under CA in 2011 (Knott 2014). Uptake of CA in SA lags behind several countries, such as Brazil and Australia (uptake of more than 30%) and Argentina (uptake of more than 60%).

The WC has the highest adoption rate of CA (see Figure 9). The use of CA in the WC's grain production areas has grown from less than 5% in 2000 to about 60% in 2010 (ARC 2014).

What makes the province more successful than others? Two factors are thought to be critical:

- A supportive environment (delivered through institutions such as the ARC and WCDoA).
- Local development of robust no-till planters suitable for the stony soils of the region.

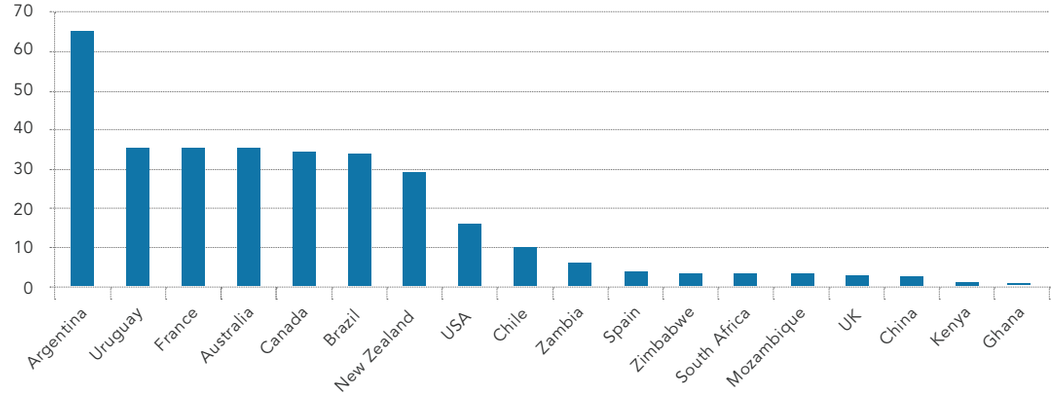

Figure 8: Percentage of arable land under conservation agriculture in 2011

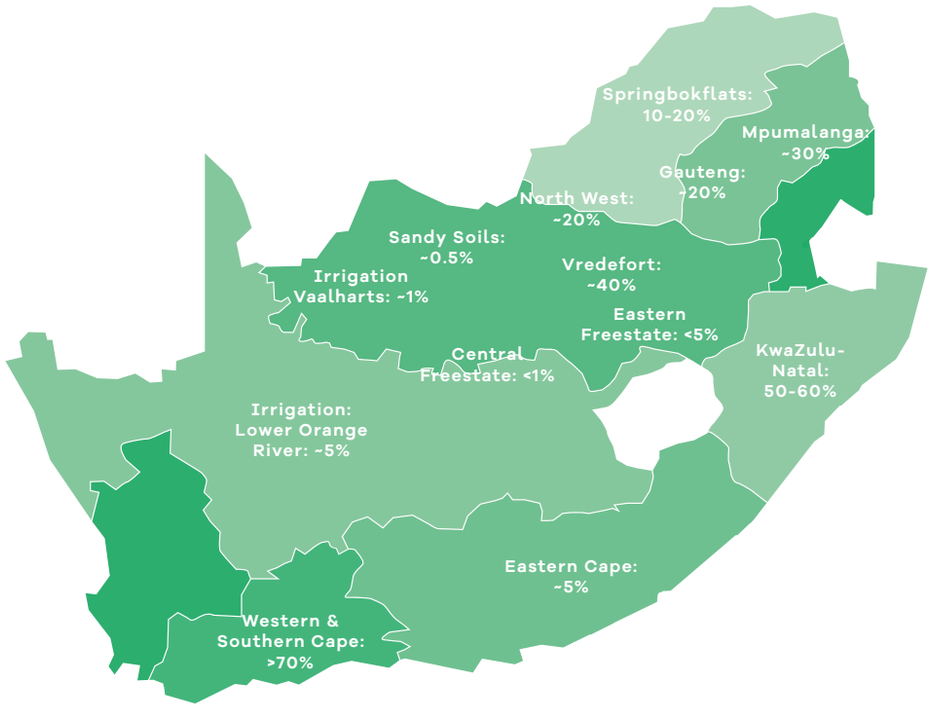

Figure 9: Adoption of conservation agriculture across South Africa in 2014

4.4.2. Opportunities in agri-production and processing

Many farmers recognise that CA is a viable alternative to conventional agriculture with its benefits of water efficiency, higher yields and cost savings through reduced use of chemicals. It is already being practised by as many as 70% of grain producers in the province.

The grain industry is in distress, especially in the Western Cape, and the benefits seen after adoption of CA can help farmers to remain economically viable. The recent drought has diminished wheat yields by 22%. Farmers who practise CA have reported fewer losses than those who practise conventional agriculture. CA improves the water holding capacity for soil, resulting in greater water efficiency. When it does rain, these soils can retain water for longer, which is particularly beneficial in times of drought.

4.4.3. Opportunities for green tech manufacturers and service providers

Key opportunities for green tech manufacturers and service providers include:

- increased sales and revenue from CA machinery;
- local manufacture of machinery;
- equipment for smallholder farmers; and
- export of CA machinery to Africa.

Farmers who practise CA have reported fewer losses than those who practise conventional agriculture.

Investment in new machinery

Converting to conservation-based practices requires an investment in new machinery such as no-till planters. In turn it creates an opportunity to increase sales and revenue for manufacturers and suppliers. The current market size for no-till planting machinery in SA is estimated at R114 million[38]. Growth of the industry through a 10% sales increase is expected to have a potential market size of R1.14 billion[39].

Local production of machinery

Most CA machinery is imported, primarily from Brazil. This machinery has to be adjusted for harsher SA soil conditions. Consequently, there is an opportunity for local manufacturing of suitable machinery to achieve desirable and more beneficial levels of tillage. A number of no-till disc planters have been specifically designed for SA soils. These have shown promising returns for yields in field trials on the research farms of the WCDoA and on commercial farms.

No-till equipment for smallholder farmers

CA is mostly practised by commercial farmers in SA. Local production of CA machinery has driven prices down and increased adoption of CA practices. The uptake by smallholder farmers has been low due to a lack of awareness, a non-supportive policy environment, and a lack of cost-effective and suitable CA machinery for smallholders (e.g. small no-till planters).

However, commodity associations such as GrainSA are actively working with smallholder farmers to create awareness and develop skills in the field of CA. Furthermore, government is creating an enabling environment to drive the uptake of CA by smallholders, specifically by: (a) prioritising funding in agriculture for smallholder and emerging farmers; and (b) developing a national policy[40] to make CA the preferred production method (and support the uptake of CA). This supports the drive to increase the manufacture of local no-till equipment suitable for smallholders.

African export market for no-till machinery

SA has also started to export its CA-specific machinery to other African countries. While support for CA is still low, countries in the region are at various stages of incorporating CA into their national development programmes and relevant policies. To help promote and coordinate CA, twelve countries in the region have identified a CA Focal Point, i.e. Angola, Botswana, Lesotho, Madagascar, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The majority of these countries have proceeded to establish National Conservation Agriculture Task Forces (NCATFs) to lead the CA agenda.

The SA market for no-till planting machinery is potentially worth R1.14 billion with opportunities for local manufacturing.

[38] Based on lowest tier revenue in sales of no-till planters (600 000), current ha under conservation (2 099 700) and average commercial grain farm (900 ha).
[39] Note that this will be an underestimate.
[40] DAFF has set up various task groups across SA in 2015 to discuss the development of a national policy to support CA (i.e. make CA the preferred production method in agriculture). A policy has been drafted, facilitated by the ARC, and has been handed over to DAFF. An incumbent has recently been appointed to evaluate the implementation of the policy.

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4.4.4. Barriers to uptake

In addition to the general barriers identified, including a long return on investment and the high cost of imported equipment, other key barriers in the uptake of CA include:

- A lack of knowledge regarding the importance of implementing all three aspects (minimum tillage, rotation and permanent soil cover) of CA.
- A lack of suitable planters for local conditions (e.g. rocky soils), especially in the Western Cape.
- A delay between investment and realisation of financial return through improved yields. This is particularly challenging as there is little financial support available, with a relatively long return on investment of approximately six years.
- High cost of imported equipment (although local production is now addressing this barrier to some extent).
- Currently no supporting policy environment (although this is being addressed).

Conservation agriculture and economic growth: A case study from Brazil

CA was born in South America, more specifically Brazil and Argentina. It was the farmers themselves who drove the practice. To understand what this sustainable practice can mean for a country's economy, the case of Brazil's CA is discussed below.

It took Brazil 20 years to adopt the first million hectares under no-till (see Figure 10).

The adoption rate has grown to 25.5 million hectares today. Worldwide, it is estimated that no-tillage technology has expanded at an average rate of six million ha per year in the last ten years. By adopting the no-tillage system, Brazil increased its grain production by 67.2 million tons in 15 years. Assuming conservative average prices of US$ 150/t, it amounts to additional revenue of about 10 billion dollars (Derpsch 2013).

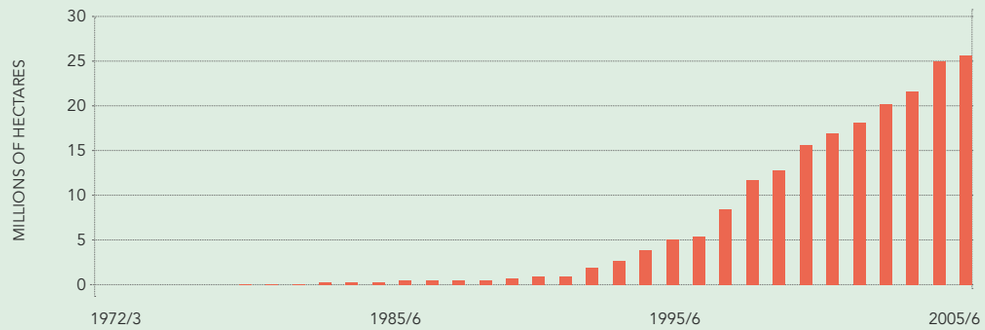

Figure 10: Adoption of no-till in Brazil between 1972 and 2006

4.5. Irrigation efficiency

The Department of Water Affairs and Sanitation (DWS) have started their water use validation and verification process to confirm lawful water use by farmers. They have also indicated that no further water allocations will be given to this sector. With rising electricity prices and decreased water availability, water efficiency (WE) for irrigation will become critical. Furthermore, improved WE addresses the detrimental effects of over-irrigation (e.g. increased salinity and topsoil losses) and provides a measure of risk mitigation in terms of natural disasters (specifically droughts) and climate change. PA, and drip irrigation in particular, are high impact technologies for irrigation efficiency as discussed below.

4.5.1. Precision agriculture

PA[41], also known as satellite farming or site-specific crop management, is a way of farming as efficiently as possible in terms of the use of irrigation water, fertiliser and pesticides. Producers apply exactly what is required for crop production by monitoring certain variables (e.g. albedo[42], leaf-area index and vegetation index) on their farms through remote sensing technology[43]. Potential cost savings achieved through PA are significant, making farming more profitable and competitive.

Market size and overview

The global PA market is estimated to grow at a Compound Annual Growth Rate (CAGR) of 13% from 2015 to 2022 to reach more than $6.43 billion (R95.59 billion) by 2022. Farmers, especially in developing countries, are becoming increasingly aware of the benefits and growing necessity of using tools that help them manage their resources more efficiently. A conservative estimate of 10% savings in water consumption through PA[44] will result in estimated annual savings of R125 million in SA. Current total benefits (cost savings and increased revenue) for WC fruit farmers using PA is estimated at R64 million to R390 million per annum[45].

Opportunities in agri-production and processing

PA can assist farmers to optimise production inputs. Savings can be realised through PA tools such as FruitLook, an online tool where WC fruit and grape growers can access satellite-based information on their own crop growth and water use. This service is currently free to use for farmers in the region covered by the satellite. FruitLook is currently accessible through the GreenAgri website[46].

[41] PA involves observation, impact assessment and timely strategic response to fine-scale variation in causative components of an agricultural production process. This farming management concept is based on observing and measuring spatial and temporal characteristics of a number of crop variables. The goal of PA is to have a management strategy that results in optimisation of returns on inputs, while preserving resources.

[42] The albedo of a surface determines how much sunlight will be absorbed and warm the surface compared to another surface that reflects most of the light and does not change temperature.

[43] Remote sensing is the scanning of the earth by satellite or high-flying aircraft to obtain detailed information.

[44] FruitLook users reported 10-40% savings, with the majority achieving >10% savings.

[45] From the Agri MIR FruitLook case study (pg 38): Total benefits (assuming increased revenue by 10% from improved yields and cost savings from decreased water, fertiliser, chemicals and fuel inputs) for wine grapes, table grapes and deciduous fruit is R4 130/ha, R23 590/ha and R25 160/ha. From the FruitLook summary report (201415): 15 608 ha is probably the relevant area when it comes to describing the impact of FruitLook. This is only 9.6% of the fruit area covered by FruitLook. Current market: 15 608 ha x R4 130/ha cost savings (minimum seen for wine grapes) = R64.4 million (minimum); 15,608 ha x R25 160/ha cost savings (maximum seen for deciduous fruit) = R392.7 million (maximum).

The potential financial benefit associated with the use of FruitLook for fruit and wine grapes is provided following in Table 9. The future purchasing cost of FruitLook is R150/ha, which is relatively low in comparison to the potential financial gains.

Other than savings on input costs, farmers will also operate more sustainably in environmental terms. They will apply less of the harmful products such as chemical pesticides that pollute water sources and kill beneficial organisms. By not over-irrigating they will prevent the buildup of salts in the soil and soil logging, making soil healthier and optimising production.

Furthermore, farmers can reduce water usage by changing to more water-efficient technologies. For example, farmers have saved up to 30% by switching to drip irrigation (Kriel 2016). The following case study provides some of the benefits of drip irrigation systems.

Case study: Netafim ultra-low-flow drip irrigation

Netafim is an Israeli company and the world leader in smart-drip and micro-irrigation solutions. They have recently introduced ultra-low-flow drip irrigation that supplies water at extremely low rates to the root zone of plants. This benefits sandy and stony soils often found in SA. These drippers can deliver water at a rate of less than 0.7l/hour (traditional drippers provide water at a rate of 1.6l/hour) and are currently being tested in SA.

With traditional drippers (1.6l/hour) water still tends to run off or miss the active root zone. It also runs the risk of saturating the subsoil, which can lead to anaerobic conditions that could be detrimental to root development, destroy beneficial soil organisms, and create a favourable environment for the development of diseases such as root rot. The low-flow system moves away from irrigation that merely wets the soil, to looking at the amount of water that is available for uptake by the plant and the water demand of the plant during different stages of development.

Table 9: Potential revenue and cost savings associated with the application of precision agriculture

Commodity	Financial benefit per hectare
Wine grapes	R4 130
Table grapes	R23 590
Deciduous fruit	R25 160

[46] https://goo.gl/aPq5xk

Opportunities for green tech manufacturers and service providers

There is an opportunity to supply water-efficient irrigation technology to farmers. Drip irrigation is well established in SA, with more than 100 million meters of dripper lines sold every year. The opportunity lies in innovative drip irrigation systems that are suited for more soils and provide greater cost savings for farmers in terms of energy and water usage.

Providers of PA technologies, such as FruitLook and on-farm drones, have suggested that farmers seek data analysis services to establish a production management plan, rather than purchasing or using PA technologies themselves. This creates a market opportunity for such service providers.

Barriers to uptake

The adoption of PA in SA has been slow, mostly due to the price of remote sensing technologies. However, the emergence of new technologies such as drones have driven down costs significantly (for market opportunities in drone technologies, see the 2016 Agriculture MIR). A lack of knowledge and skills are also barriers, although this is addressed in some respect by out-sourcing data analysis and management.

With respect to drip irrigation there are specific barriers:

- Effectiveness is dependent on soil types (i.e. most effective within sand and clay soils).
- It depends on extremely clean water, as the system is sensitive to clogging.
- Micro-sprinklers, while not as water efficient as drip irrigation, have a better cooling effect on orchards. This becomes important in hotter regions across SA.

4.6. Controlled environment agriculture (CEA)

The Western Cape has seen a steady increase in the uptake and use of CEA in both rural and urban spaces. CEA involves controlling the growing environment of a crop or animal through the use of technology, to create optimal growing conditions throughout the lifecycle. Production of crops and aquatic or terrestrial animals in CEA range from low-tech (e.g. protective infrastructure) to high-tech (e.g. computerised systems). CEA systems, particularly high-tech systems, could be a key component to "greening" the food supply chain – especially when coupled with green tech and when considering externalities and inefficiencies associated with conventional food production.

© Image courtesy of GreenCape

4.6.1. Market size and overview

There has been an 8% uptake in CEA technology globally[47].

The uptake of CEA has largely been seen in the production of high-value soft and stone fruit, citrus, berries, leafy and other above-ground vegetables, and flower production for both local and export markets. Market pressure for high-quality produce and ensuring sustainability of supply is playing a key role in driving a transition towards CEA practices. Uptake of CEA by existing farmers is driven largely by mitigation of risk, while uptake of CEA by new entrants is driven by a desire to produce high-value produce for export.

Various types of CEA are practised in the WC, ranging from netting cover and tunnels to more technical hydroponic systems. The current baseline market estimate for the WC is valued at R28 million (for low-tech CEA) to R600 million (hightech CEA)[48], with growth predicted to be ~15% per annum. CEA has been implemented mostly in rural areas, with existing farmers transferring to undercover farming, e.g. plastic tunnel-based systems. In contrast, the uptake of CEA in urban areas has been fairly slow, with CEA focusing on high-value leafy vegetables and micro herbs for local markets. The future of urban farming, and consequent investment in CEA, is discussed further under the heading, Emerging Trends (Section 4.7).

The market for CEA in the Western Cape is valued at R600 million with 15% growth per annum predicted.

4.6.2. Opportunities in agri-production and processing

Advancements in CEA technologies such as hydroponics have created several opportunities for farmers. These include:

- resilience to changing climatic conditions
- decreased risk of production losses (particularly important in terms of insurance)
- improved resource efficiency
- application of little to no pesticides
- substantial increase in water efficiency, e.g. high-tech systems such as aeroponics use 5% of the water used in normal growing conditions
- production of high-quality produce and 'out of season' crops
- higher productivity, i.e. higher production volume per square meter compared to traditional farming practices
- potential to increase agri-processing output, a key sector highlighted by both provincial and national government for improved job creation and economic growth.

Many producers are unable to access insurance due to increased risks associated with production. To mitigate these risks, many farmers are implementing CEA technology, particularly low-tech CEA infrastructure such as netting. This provides better guarantees against production losses caused by freak weather events such as hail storms (WWF 2016). CEA technology has also been used in production of animal feed. Modular units are used on site for production of fresh animal feed. This provides an opportunity for farmers in drought-stricken areas to increase resilience against drought conditions.

Return on investment for more advanced CEA systems is between three and five years[49], primarily due to high capital costs. New lease and profit sharing models have increased the appetite for investment in this technology.

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[47] From Martin von Holdt – CEA consultant.

[48] Baseline estimate of market size for low-tech CEA (e.g. netting) = 140 ha from 2 companies x R200 000/ha = R28 million market.
Baseline estimate for market size for high-tech CEA (e.g. hydroponic systems) = 60 ha from 2 companies x R10 million/ha (technical infrastructure) = R600 million market.

[49] CEA systems are site and commodity specific, with selection of materials and technologies determined by, for instance, climatic conditions.

4.6.3. Opportunities for green tech manufacturers and service providers

There are several short and longer term opportunities in CEA, specifically: (a) local manufacture of CEA components and systems; (b) increasing private and equity finance; and (c) increased demand for specialised skills.

Local manufacture of CEA components and systems

Most of the higher tech systems are imported from Israel, the Netherlands and France. Even local companies import most of the CEA components due to the foreign advances made in technology and the quality of components. This opens opportunities for import substitution, which could stimulate local manufacture and thus job creation.

Most product components (e.g. pumps, pipes, lighting, growth medium, computerised management systems and even complete hydroponic systems provided in container units) are currently imported. The cost of the systems ranges greatly from low-tech to high-tech. Low-tech netting costs are ~R20/m^2 while more advanced CEA systems range between R200/m^2 and R700/m^2.

Furthermore, uptake of CEA may have positive knock-on effects, particularly for other local green tech industries, as CEA often requires LED lighting, renewable energy and water recycling or filtration.

Private investment and equity finance

There has been an increase in urban CEA initiatives and private investment in the WC. For example, in August 2016 a local company, Aqua Vegetables[50], launched the first hydroponic-based indoor farm in Cape Town. They were privately financed and are growing high-value leafy produce, with the aim to yield 10 000 to 14 000 heads of lettuce per month.

In terms of foreign investment, Chinese equity investors are interested in financing hydroponic indoor farming systems. There is already interest in importing small modular indoor farming systems (i.e. turn-key modified shipping containers) from the Netherlands. These indoor farming systems will: (a) primarily target the nursery stage of viticulture and aim to accelerate the production of wine to meet increasing market demand, specifically in China; and (b) potentially supply local produce to retailers.

Investments have specifically focused on hydroponic technology, with an increasing focus on aeroponic technology, i.e. spraying the plant's roots with a nutrient-rich solution without the use of soil or an aggregate medium. In addition, there is increased interest in risk-sharing business models and opportunities to lease high-tech CEA infrastructure.

Rising demand for specialised skills

The lack of specialised skills in high-tech CEA systems has created new opportunities in the WC. It has led to the delivery of services by small groups of specialists in the region, as well as phasing in approaches to technology such as hydroponics. Furthermore, local research institutions are developing courses focused on more technical CEA aspects such as hydroponics, and are doing more market research in this space.

4.6.4. Barriers to uptake

In addition to the general barriers identified, including high capital costs for specialised lighting and climate-controlled systems, other key barriers in the uptake of CEA are highlighted below.

- Retailers are often unwilling to enter into supply contracts until quantity and quality can be demonstrated.
- Producers are legally prohibited to label produce as organic when grown in non-soil growth mediums i.e. unable to enter the organic market.

[50] http://aquavegetables.co.za/

The following are barriers specific to urban agriculture and CEA uptake:

- **Zoning regulations** that limit agricultural production to specified zones in the urban edge.
- **Retrofitting of existing buildings is costly**, often unpractical and not economically feasible, especially where the buildings have not been designed for agriculture practices.
- **There is limited financial feasibility** – often because of higher capital costs related to urban land.
- **No overarching umbrella body**: Most urban agriculture initiatives in Cape Town focus on community empowerment, and all organisations operate on their own model with no overarching umbrella body. This decreases the potential for the industry to obtain funding and economies of scale in terms of marketing and lobbying functions, and has hindered understanding of the commercial opportunities for urban agriculture.

4.7. Emerging trends

The section discusses the above opportunities in relation to one another. It also considers potential longer term opportunities (5+ years) in the context of a shifting economic landscape.

4.7.1. Investment in green tech and practices

There is a movement looking at solutions that mimic nature (i.e. 'natural' solutions) as conventional agriculture is not sustainable. Farmers will need to use green tech and services to adapt to and mitigate resource scarcities. They will typically invest if it can:

- increase their profits, e.g. increase production, reduce costs and/or increase quality / selling price; or
- mitigate risks, e.g. improve water security and guaranteed production.

Water as a driver for investment

The National Development Plan's aim for 500 000 ha of new agricultural production is considered unrealistic due to current water availability, with studies estimating potential for only 180 000 hectares. As a result, increased agricultural production will have to be unlocked through: (a) on-farm water efficiency gains; (b) investment in irrigation scheme infrastructure; and/or (c) groundwater extraction.

Although the Western Cape Government is investing in increased water provision through expanding the storage capacity of the Brandvlei and Clanwilliam dams, it is still not clear how the surplus water will be allocated. Furthermore, the irrigation sector is seeing an increase in regulation as is evident through DWS's Water Validation and Verification process. With SA's severe water constraints, any increases in allocation of water for irrigation seem unlikely.

Limited access to additional water will drive demand for green tech and green practices. Now and in future farmers will need to invest to avoid long-term losses and to expand production. This results in opportunities for:

- improved **energy efficiency in irrigation**, as it provides several benefits in terms of improved water efficiency, energy cost savings and return on investment, and
- more **resource-efficient farming practices**, specifically those under CA and PA.

It is likely that CA and PA markets and technologies will keep growing, as farmers in especially the grain and irrigated crop sectors will need these technologies and practices to stay profitable and to mitigate climate risks. Farming techniques such as CA have proven to be beneficial to farmers in drought-stricken areas.

Also, the biggest benefits of practising PA are improvements in energy and water efficiency in irrigation, with water savings of up to 40% reported.

This is important from a sector perspective, as experts believe water saved through water efficiency will be used for expanded production (i.e. increased investment). This is supported by the water authorities, which have stated that water 'surpluses' gained through becoming more water efficient will still be allocated to the water users, giving them the ability to expand.

Investments in energy efficiency and renewable energy

There is still huge potential for the uptake of EE and RE within the sector. An increase in the uptake of EE is predicted for the next ten years, particularly in energy constrained agriculture regions such as Ceres, where expansion of agri-processing is hampered by energy availability and cost. Increased EE and provision of alternative energy, e.g. solar energy, could unlock investment in new infrastructure in this area, particularly if there is expanded production due to increased water availability, potentially through improved pumping efficiencies.

Key markets for exports

Although a focus on low carbon and sustainable production will continue to be important for high-value export commodities such as fruit and wine, there will most likely be major growth in the emerging African and Asian markets in comparison to mature markets in the EU and USA. As a result, key drivers for sustainability may be focused primarily on resource scarcity and improved quality (real or perceived) at a cost-competitive price, rather than consumer pressure from export markets.

4.7.2. The future of controlled environment agriculture

Uptake of low- and high-tech CEA is expected within rural, peri-urban and urban areas. Uptake is expected to be more rapid in rural areas, particularly low-tech protective infrastructure on established deciduous fruit and stone fruit farms, such as netting over orchards, and for expanded production and investment in high-value niche products, e.g. plastic tunnels and hydroponic systems for berries and cut flowers.

Uptake of CEA will be vital for the high-value export industries to expand and remain competitive. This is mostly driven by our limited resources, particularly water, and the ability of CEA to reduce production losses and mitigate shifting climate patterns. Farming more efficiently will allow us to compete globally where the uptake of CEA for fruit and vegetable production takes place on a much larger scale. It may put the WC in a unique position to supply to growing markets in Africa.

Commercial CEA in urban areas is expected to be a longer-term opportunity. The uptake of CEA in urban areas is likely to influence and alter existing land zoning regulations in the cities, enabling agriculture in new spaces. While retrofitting established buildings for CEA is currently expensive, there may be opportunities for urban agriculture in newly built infrastructure, depending on the market appetite from the property sector. Finally, due to the capital cost of high-tech CEA systems and cost of urban land, an increase in lease and profit sharing models is expected to occur, as well as an increased demand for appropriate skills and expertise to support the industry.

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CEA is a major opportunity with rapid uptake expected in rural areas. New infrastructure for urban agriculture will grow with lease and profit sharing models. In turn, there will be a growing demand for supportive skills and expertise.

© Image courtesy of GreenCape

4.7.3. The growing importance of services

Big data on water, land use, fertiliser, pesticide and herbicide applications is playing an increasingly important role in agriculture production to achieve input resource efficiency. Farmers are showing more interest in knowledge-based services rather than infrastructure, e.g. data analysis from remote sensing applications such as FruitLook, system monitoring and feedback on technical performance of systems via access to mobile applications, and short-term rentals of machinery, e.g. ozone-based post-harvest sanitation systems. However, trust in services is very much relationship-based. Business models targeting farmer subscriptions to services have reported unwillingness to purchase the service beyond a year-by-year basis, i.e. farmers are unwilling to commit to a five-year contract. The fact that farmers do not own their data has also been highlighted as an issue.

4.7.4. Partnerships

In terms of climate change, a seminar by the World Wide Fund for Nature (WWF) has concluded that farmers cannot bear the burden of climate adaptation and mitigation alone. Climate change will have impacts beyond agriculture. The whole value chain needs to work together to mitigate such impacts. For example, lower water quality results in lower food quality, which in turn increases the need for food processing. Also, hotter days occurring more frequently will increase the need for cold storage and, therefore, energy.

These scenarios provide motivation for a co-ordinated response and a need for partnerships. This is particularly true in the current economic environment.

The drought has put severe financial strain on farmers and this may make investment in sustainable technologies challenging for the next few years. As a result, there is a need for finance for sustainable agriculture, either through public finance models or collaboration between the private and public sector.

One example of the potential for collaboration between the private and public sector is the agri-park initiative. This may provide an attractive opportunity for investment, particularly if the expected agri-processing incentives are made available through the dti. However, there is currently a lack of clarity regarding opportunities for private investors. It remains to be seen how this will develop in the next year.

In addition to straightforward financing, there appears to be a demand for improved or alternative business models linked to the provision of green tech and water- and energy-related services. For example, agriculture producers have concerns about the lack of guarantees for green tech, particularly new systems. Consequently, shared risk is required. This indicates potential growth in the involvement of third-party ownership and service delivery models that operate through performance-based contracts. Information on funding and incentives is provided in the next section.

5 – Funding and incentives

A range of funding solutions are either focused on, or available to, green tech manufacturers and service companies, as well as those who use such services. These cover Development Finance Institutions (DFI), local public and private sector financiers and investors, and a considerable range of tax incentives.

According to the KPMG Green Tax Index (GTI), South Africa ranks 13th out of 21 countries to use tax as an incentive to drive the green growth agenda (ahead of Australia, Singapore and Finland). Investors and suppliers can benefit from understanding the various incentive and funding options available to them, as well as understanding those available to their customers or clients, as these can influence the viability and attractiveness of their products and projects.

GreenCape has identified a wide variety of funding solutions contributing towards greening of the economy. Agriculture-specific funding and incentives have been highlighted below followed by more general funding and incentive offerings.

5.1. Agriculture funding and incentives

Table 10 outlines sources of funding and incentives relevant to agriculture.

5.1.1. Bank finance

Banks are increasingly recognising the long-term and mitigation benefits of EE, RE and CA in their risk models and are indicating an increased willingness to provide funding for agriculture. This may be particularly beneficial in terms of assisting farmers in the six-year transition gap for grain and other farmers looking to convert from conventional systems and practices.

WWF has specifically identified commercial bank offerings for EE and RE within agriculture. This is summarised in Table 11 (Engel 2015). For other funding and incentives related to EE and RE, refer to the 2017 Energy Services MIR available on the GreenCape website[51].

5.2. General funding solutions and incentives

Table 12 demonstrates a wide variety of funding solutions. It is not exhaustive, is indicative of more green-focused funds or incentives available, and provide potential leads or starting points to explore various options. Further to those below, the full range of government investment incentives can be found at www.investmentincentives.co.za.

Note: The links below are clickable in the electronic version of this MIR, which is available on our website. For further funding and incentives, please download the SA Business Funding Directory for 2016 / 2017 on the GreenCape website.

[51] https://goo.gl/gblkTl

Table 10: Agriculture funding and incentives

Funding / incentive	Description	Link to source
Multiple sources	In January 2016, the WCDoA published the 'Sources of Finance for Agricultural Businesses' booklet identifying a range of finance institutions, banks, companies and agencies focusing on the agriculture sector.	Available at GreenAgri[52]
Nedbank Fair Share 2030	Nedbank introduced "Fair Share 2030" in 2015 to help farmers invest in RE technologies and EE projects. The goal is to match repayment terms to savings in electricity costs over the medium term, thus allowing the farmer to have shorter payback periods. The loan also offers a 7% rebate to farmers who qualify (Hancock, 2015). Through Fair Share 2030, Nedbank can specifically assist with: (a) development of financing structures for purchasing of solar PV; and (b) third-party ownership solutions for energy users not wanting to buy systems outright.	More information is available at GreenAgri[53]
The Food Securities Fund (Equity Finance)	A new fund that supports responsible agricultural practices in emerging markets has recently been launched. The Food Securities Fund provides a credit channel for agricultural producers committed to sustainable environmental and social practices. In particular, the fund will seek to benefit smallholder farmers in emerging and developing countries that operate to industry best practices.	See the press release[54]

[52] https://goo.gl/vr4Rn8
[53] https://goo.gl/vr4Rn8
[54] https://goo.gl/XBBRC1

Table 11: List of commercial bank offerings to agriculture

Commercial Banks	Details
Nedbank	Concessional finance for energy efficiency with no limit on project size
Absa	Rebate of up to 7% of loan amount with loan amount of R10 million to R100 million
First National Bank	Energy efficiency loans with a 7-to 10-year payback period and a 3-month "holiday"
Standard Bank	Financed as asset finance, structured deals and unsecured lending
Land Bank	Mortgage loan of 10 years
Investec	Clean energy finance over 3-year period funded by European Investment Bank
Sasfin	Asset finance offered at preferential rates funded by World Bank

Table 12: List of general funding solutions and incentives

Entity Name	Opportunity overview	Product	Website
	Commercial Bank		
GroFin	Financing and supporting small and growing businesses across Africa and the Middle East.	Loan	https://goo.gl/liynqq
Investec	Power & Infrastructure Finance: Arranger and underwriter of debt for projects. Selectively develops and take equity in projects.	Loan Equity	https://goo.gl/CC4JJa
Old Mutual	IDEAS fund: Invests in commercially viable developmental projects in SADC.	Equity	https://goo.gl/UUl6nh
Nedbank	Responsible lending that rejects transactions that do not meet the required- sustainability standards, and includes guidance to enable compliance.	Loan	www.nedbank.co.za

Nedbank / WWF	The Green Trust supports programmes with a strong community-based conservation focus in multiple areas, including climate change.	Grant	https://goo.gl/DMSiHA
SCF Capital Solutions	Unsecured working capital based on invoice or supply contracts. R250k - R5m is offered with interest rates of 2-3% per month.	Loan	http://www.scfcap.com
Development Finance Institutions			
German Investment Corporation	Amount ranging R4m-R30m for a duration of 4 years.	Loan Equity	www.deginvest.de
Development Bank of South Africa	For green initiatives related to the green economy.	Loan Equity Grant	www.sagreenfund.org.za
European Investment Bank	Direct and intermediated loans, minority investments in specialist private equity funds focussing on renewable energy and energy efficiency projects in emerging markets.	Loan	www.eib.org
GEF Special Climate Change Fund	Worth, ~USD350m, the fund is designed to finance activities, programs and measures under the following four financing windows: Adaptation to climate change (top priority), technology transfer, mitigation in selected sectors including: energy, transport, industry, agriculture, forestry and waste management, and economic diversification.	Grant	https://goo.gl/IQNu2i
German Bank for Reconstruction and Development (KfW)	For public entities focussing on energy and climate change	Loan	https://goo.gl/RALjfZ
Global Environmental Facility	The Small Grants programme (SGP) invests in communities affected by environmental degradation.	Grant	https://goo.gl/qwA6Ed
International Finance Corporation	Funds private sector development projects. May fund smaller businesses through financial intermediaries that on-lend.	Loan Equity	https://goo.gl/k4Br3Z
Overseas Private Investment Corporation	Private project development focussed on renewable resources (and less on technology, health care, food and people). Involvement of a US company preferred.	Loan Guaran-tee	www.opic.gov
The African Development Bank	Development projects in the public and private sectors.	Loan	https://goo.gl/QnTCz4
Global Innovation Fund	Invests in social innovations that aim to improve the lives and opportunities of millions of people in the developing world.	Grant Equity Loan	www.globalinnovation.fund/

World Bank	World Bank Green Bonds are an opportunity to invest in climate solutions through a high quality credit fixed income product.	Loan	https://goo.gl/RBZMGS
Government Department			
Department of Higher Education and Training	National Skills Fund: Finances costs directly related to the delivery of learning – not infrastructure and/or ongoing operational costs of SETAs.	Grant	www.dhet.gov.za
Department of Science and Technology	11D Tax Incentive: Undertaking R&D in South Africa qualifies for a 150% tax deduction of operational R&D expenditure.	Rebate	www.dst.gov.za/r-d
dti	Industrial Financing Loan Facilities encourage manufacturers to upgrade production facilities.	Loan	http://www.thedti.gov.za
dti	12I Tax Allowance Incentive supports capital investment and training. Application deadline: 31 December 2017	Rebate	www.thedti.gov.za
IDC[55]	Industrial financing loan facilities (the Working Capital Component) to promote competitiveness in manufacturing while ensuring job retention in the sector.	Loan	https://goo.gl/FySmGc
Department of Small Business Development	The Black Business Supplier Development Programme (BBSDP) is offered to small black-owned enterprises to improve their competitiveness and sustainability.	Grant	http://bbsdpgrants.co.za
dti	Black Industrialist Scheme: Unlocks industrial potential through targeted and financial and non-financial interventions, described in the IPAP and other government policies.	Grant	http://www.thedti.gov.za
dti	Strategic Partnership Programme (SPP) supports manufacturing and services supply capacity of suppliers with linkages to strategic partner's supply chains, industries or sectors	Grant	http://www.thedti.gov.za
dti	The Capital Projects Feasibility Programme (CPFP) contributes to feasibility studies that lead to projects increasing local exports	Grant	http://www.thedti.gov.za
dti	Critical Infrastructure Grant (CIG): A cost sharing grant for projects to improve critical infrastructure.	Grant	http://www.thedti.gov.za

[55] The production incentive grants administered by the Department of Trade and Industry (dti) as part of what used to be the Manufacturing Competitiveness Enhancement Programme (MCEP) has been suspended indefinitely. The loan component provided by the Industrial Development Corporation (IDC) is still available.

Department of Small Business Development	Co-operative incentive Scheme (CIS): A 100% grant for registered primary co-operatives.	Grant	http://bbsdpgrants.co.za
Department of Small Business Development	The Shared Economic Infrastructure Facility (SEIF) provides an enabling environment to crowd in investment, mostly in townships, rural areas and the inner city.	Grant	http://bbsdpgrants.co.za
dti	Sector Specific Assistance Scheme (SSAS): A reimbursable 80:20 cost-sharing grant offering financial support to for-profit export councils, joint action groups and industry associations.	Grant	http://www.thedti.gov.za
dti	Export Marketing & Investment Assistance Scheme: Develops export markets for local goods and services, and recruits new foreign direct investment.	Other	http://www.thedti.gov.za
National Research Foundation	Research/study funding for public tertiary institutions.	Grant	http://www.nrf.ac.za
dti	The Technology and Human Resources for Industry Programme (THRIP) is a research and development programme.	Grant	http://www.thedti.gov.za
Small Enterprise Development Agency	Seda Technology Programme (STP) is responsible for the provision of technology transfer, business incubation and quality support services for small enterprise. Excludes R&D.	Grant	www.seda.org.za
Small Enterprise Finance Agency	Direct Lending where individuals apply directly to sefa. Direct Lending: R50k - R5m with tenors of 1-5yrs.	Loan Guarantee	www.seda.org.za/
Small Enterprise Finance Agency	Wholesale Lending where financial intermediaries (Joint ventures, funds, RFI, MFI) are used. R20m-R100m with tenors of 1-5yrs.	Loan Guarantee	www.seda.org.za/
South African Revenue Services	37B and 37C: Deductions regarding environmental expenditure and environmental maintenance	Rebate	https://goo.gl/sC5Wos
South African Revenue Services	12K Clean Development Mechanisms (CDM) Tax Incentive (2009): South African businesses receiving CDM benefits are exempt from tax derived from such benefits, in Income Tax or Capital Gains Tax.	Rebate	www.sars.gov.za

Western Cape Government - DEDAT	Cape Capital Fund: Grows small businesses in agri-processing and oil and gas sectors: supports purchase or new equipment and and improvement of business processes.	Grant	https://goo.gl/OUHkJm
Technology Innovation Agency	Financial support to proposals based on merit. Includes R&D funding.	Grants Loans Equity	http://www.tia.org.za
Private Equity			
Atlantic Asset Management	Focus: Intermediaries or businesses creating new jobs with a record less than 5 years. Investment range of R15m-R60m with a duration of 3-5yrs	Loan	www.atlanticam.com
Business Partners	For: Businesses which actively develop, manufacture and provide goods and services by implementing measures and/or technology which reduce their adverse impact on the environment. Investment range: R500k-R30m.	Equity Loan	www.businesspartners.co.za
Adlevo Capital	Investments available to the public and private sector with technology-enabled business models.	Equity	www.adlevocapital.com
Treacle Private Equity	Equity capital to mid-market private and small cap listed companies in Southern Africa.	Equity	www.treacle.co.za
Sovereign Funds			
Entrepreneurial Development Bank of Netherlands (FMO)	Supports private sector entrepreneurship in developing countries: energy, agribusiness, food and water.	Loan Guarantee Equity	www.fmo.nl/home
French Agency for Development (AFD)	Development projects in energy, water, municipal sector support and biodiversity.	Loan Guarantee Grant	https://goo.gl/7QuiyH
German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)	International Climate Initiative (IKI), supports climate and biodiversity projects in developing countries. Fund size: EUR 120m, annually.	Grant	https://goo.gl/9qJEEb
Ireland Development Cooperation	Projects across various sectors involving an Irish Partner company.	Grant	www.idaireland.com
Japan Bank for International Cooperation	Focus areas: Energy & Natural Resources, Infrastructure & Environment and industry finance. Accessed through a Japanese business partner.	Loan Equity	www.jbic.go.jp/en/finance

Japan International Cooperation Agency	Intergovernmental work regarding technical cooperation.	Loan Grant	www.jica.go.jp/english
PROPARCO	Private sector development projects (energy, infrastructure, agriculture, etc.).	Equity Loan	https://goo.gl/XQ7lOb
United Kingdom: Prosperity Fund Programme	Fund to tackle climate change, strengthen energy security and promote an open global economy in emerging economies.	Grant	https://goo.gl/Rn4jLX
Embassy of Finland	Local Co-operation Fund: Supports initiatives in the area of export and investment promotion, businesses and other groups.	Grant	https://goo.gl/AmNv2P
Venture Capital			
4Di Capital	An independent seed- and early-stage technology venture capital firm based in Cape Town.	Equity	www.4dicapital.com
AngelHub Ventures	Angel seed fund investing into lean start-ups with disruptive business models and technologies. Investment range: R500k-R5m	Grant	www.angelhub.co.za
Edge Growth	Edge Growth has 2 funds to fund Green projects. Investment range: R1m-R20m. For: SMEs that have limited equity or don't qualify for credit from a bank.	Loan Equity	www.edgegrowth.com
Hasso Plattner Ventures Africa	Invests solely in fast-growing and IT-driven companies in seed stage or growth stage.	Equity	www.hp-ventures.co.za
Other			
Anglo-American Zimele Green Fund	Targets opportunities that mitigate carbon, reduce energy and water consumption, and improve waste and emissions management in the Anglo-American value chain. The Fund provides funding of up to R10 million per project or business.	Grant	https://goo.gl/wr4cPF

5.3. Manufacturing incentives

A proposal has been submitted for the Atlantis Industrial Area to be declared a Greentech Special Economic Zone. The dti's SEZ programme aims to increase industrialisation, economic development and job creation around the country. The dti has proposed a number of incentives to attract investors into the proposed SEZs, which include:

- **Reduced Corporate Income Tax Rate:** qualifying companies will receive a reduced corporate tax of 15%, instead of the current 28% headline rate.
- **Employment Tax Incentive (ETI):** aimed at encouraging employers to hire young and less-experienced work seekers. It will reduce the cost to employers of hiring young people through a cost sharing mechanism with government.
- **Building Allowance:** qualifying companies will be eligible for an accelerated depreciation allowance on capital structures (buildings). This rate will equal 10% per annum over 10 years.
- **VAT and Customs Relief:** companies located within a customs-controlled area (CCA) will be eligible for VAT and customs relief as per the relevant legislation (dti 2015).

Other incentives available to investments into a designated SEZ will include:

- 12i Tax Allowance Incentive (Application deadline: 31 December 2017)
- One-stop-shop facility within designated SEZ area
- SEZ fund for infrastructure development within the designated area.

Within Atlantis, the City of Cape Town has made vast tracts of land available at low cost for purchase or lease by green tech companies through an accelerated land disposal process.

GreenCape's Atlantis SEZ team can assist with information, and facilitate access to permits, licenses, planning and development approvals, incentives and finance. It is also worth noting that the dti has been willing to assure investors that investing prior to SEZ designation will not disqualify them from receiving benefits once the zone is designated.

6 – The Western Cape: Africa's green economy hub

The Western Cape is a world-class investment destination.

The province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is also a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life. Cape Town has been ranked among the top 21 global investment destinations by Foreign Direct Investment (fDi) Intelligence, a division of the Financial Times.

A great place for green business

There are compelling reasons why the Western Cape Province is viewed by many as Africa's green economic hub. Coupled with a strong and rapidly growing market for green tech and services in South Africa and beyond, the Western Cape offers:

- Africa's renewable energy and cleantech hub, with a critical mass of leading companies present.
- Local presence of major professional services and financiers.
- Significant market opportunities for businesses and investors in agriculture, energy services, utility scale solar and wind, waste, water, bioeconomy and resource efficiency.
- A supportive government that has made ease of doing business and the green economy key priorities.
- Five universities with comprehensive R&D capabilities and dedicated green economy skills programmes.
- A range of investment incentives in proposed Atlantis Greentech Special Economic Zone (SEZ).

Supporting businesses and investors

The province also offers dedicated support for businesses and investors focusing on green tech and services, including:

GreenCape: Provides dedicated support and market intelligence to green economy sectors

Wesgro: The official investment and trade promotion agency for the Western Cape

SAREBI: A business incubator providing non-financial support to green entrepreneurs

SARETEC: Offers specialised industry-related and accredited training for the wind and solar industries

Businesses and investors will soon be able to make use of a convenient one-stop-shop for investment support, offered by the Department of Trade and Industry (dti), the WCG and the City of Cape Town. Called the Cape Investor Centre, it will house various institutions with a permanent or semi-permanent presence at the centre.

Market opportunities in the province and South Africa

Some of the major market opportunity areas in the province and South Africa in the next five years are outlined in the graphic on the next page (see individual MIRs and the GreenCape website for more information).

Major market opportunities: Western Cape and South Africa

Agriculture

Solar irrigation
R2.9 bn market (SA)

Sustainable agriculture
Tools, data analysis, machinery rentals, local manufacturing, financing

Conservation agriculture
R114 m market, ~R1 bn potential market (SA)

Solar energy for packhouses
R1 bn potential market (WC)

Controlled environment agriculture
R600 m potential market; 15% growth p.a. (WC)

Precision agriculture
Tech & services to improve water & energy efficiency

Energy services (SA-wide)

Solar PV systems & components
500 MWp installed capacity & R2 bn investments predicted (2016-2019)

Local manufacturing & assembly
Solar PV systems and components – systems require compliance with local content regulations

Energy efficiency retrofitting
100 000+ public buildings require retrofitting

Utility scale renewable energy (SA-wide)

Independent power production
Ministerial determination for 6.3 GWp more RE generation capacity: 1.1 GW (670 MW wind; 450 MW solar) p.a.

Rest of Africa
RE deployment in the rest of Africa, some programmes mirroring REIPPPP

Local manufacturing
Through REIPPPP local content requirements

Waste

Municipal PPP
Public-private partnership projects of R1.3 bn (WC)

Secondary materials
Robust & growing market for plastics, metals, e-waste, etc.

Construction & demolition waste
Growing reuse & recycling market

Water

Industrial water reuse
Recycling & resource recovery; R600 m market: (WC)

Water & energy
Opportunities for efficiency & use of renewables

Local resource development
Brackish water desalination, ground, storm & grey water

Bioeconomy & resource efficiency

Food value retention
R600 m value through improved cold chain management & waste reduction (WC)

Solar thermal
>R100 m industrial-scale installations, R3.7 bn potential market for agri-processing (SA)

Biogas
For LPG replacement, heating & electricity generation: >R450 m market, R18 bn potential market, 395 MW potential generation (WC)

R&D capabilities and skills

The region's five universities – University of Cape Town, Stellenbosch University, University of the Western Cape, the Cape Peninsula University of Technology and the George campus of the Nelson Mandela Metropolitan University – underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.

Atlantis Greentech Special Economic Zone (SEZ): Investment incentives

The City of Cape Town established a greentech manufacturing hub in Atlantis in 2011 in response to the government's focus on localisation of manufacturing as part of the Department of Energy's Renewable Energy Independent Power Producer Programme (REIPPPP).

The City has made tracts of land available at low cost for purchase or lease by greentech companies through an accelerated land disposal process. A number of other financial and non-financial incentives are also on offer, including discounted electricity and rapid turnaround on development applications.

An application has now been submitted by the Western Cape Provincial Government for the Atlantis Industrial area to be declared a Greentech SEZ, a decision on which is expected in 2017. GreenCape's Atlantis SEZ team can assist with information, and facilitate access to permits, licenses, planning and development approvals, incentives and finance.

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7 – GreenCape's support to businesses and investors

GreenCape is a non-profit organisation that drives the widespread adoption of economically viable green economy solutions from the Western Cape. Our vision is for South Africa to be the green economic hub of Africa.

We work with businesses, investors, academia and government to help unlock the investment and employment potential of green tech and services, and to support a transition to a resilient green economy.

We assist businesses by removing barriers to their establishment and growth and provide our members with:

- free, credible and impartial market information and insights
- access to networks of key players in government, industry, finance and academia
- an advocacy platform to help create an enabling policy and regulatory environment for green business

We assist local, provincial and national government to build a resilient green economy by providing:

- support on the development of standards, regulations, tools and policies
- expert technical knowledge on key sectors in the green economy
- access to networks of key players across business, academia, and internationally

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, representing backgrounds in finance, engineering, environmental science and economics. We have facilitated and supported R17bn of investments in renewable energy projects and manufacturing.

From these investments, more than 10 000 jobs have been created. Through our WISP (Industrial symbiosis) programme, by connecting businesses with waste / under-used resources, we have to date diverted over 4360 tonnes of waste from landfill.

Our Market Intelligence Reports form part of a working body of information generated by sector desks and projects within GreenCape's three main programmes – energy, waste and resources.

Figure 12 shows the different focus areas within each of our programmes.

Benefits of becoming a GreenCape member

We currently have over 800 members, and offer free membership. Becoming a member of GreenCape will give you access to the latest information regarding developments in the various sectors; access to tools, reports, and project information; and offer you the opportunity – through our networking events – to meet and interact with various stakeholders in the green economy.

Cross-border matchmaking through the International Cleantech Network

GreenCape's membership of the International Cleantech Network (ICN) gives our members access to international business opportunities in countries where other cleantech clusters are based (mainly Europe and North America).

1 Renewable Energy

Utility-scale projects, small-scale embedded generation, and localisation of component manufacture.

2 Energy Services

Commercial, industrial and agricultural energy efficiency and embedded generation; incentives and financing options.

3 Alternative Waste Treatment

Municipal decision-making and policy and legislative tools on alternative waste treatment options; small-scale biogas, recycling and reuse (dry recyclables, construction and demolition waste).

4 Western Cape Industrial Symbiosis Programme (WISP)

The team matches businesses to share unused resources, cut costs and create value.

5 Water

Water provision and economic development; greentech opportunities for water use efficiency, treatment and reuse.

6 Agriculture and Bio-Based Value Chains

Sustainable agriculture, valorisation of wastes to high value bio-products, including bio-energy.

Figure 12: GreenCape's focus areas

For investors looking for opportunities in South Africa, GreenCape's Cross-border Matchmaking Facility offers a business matchmaking facility for green firms and entrepreneurs.

The matchmaking team helps international inbound firms and entrepreneurs looking for South African partners in the green economy. The team assists with contacts, introductions and matches to South African businesses. They also offer matchmaking activities for trade offices, missions and other inbound interests. These services can be accessed via the ICN passport or directly with GreenCape.

To become a member or to get your ICN passport, please contact GreenCape or visit our website: www.greencape.co.za

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For more information on market trends in the sector, visit GreenAgri[56].

[56] https://goo.gl/6ELiqw

9 – Appendices

Table 13: Key role players in agriculture

Key role players		
Conservation agriculture	Government	Research institutions and universities
Equalizer	National Department of Agriculture, Forestry and Fisheries (DAFF)	Agricultural Research Council (ARC)
Monosem	National Department of Energy (DoE)	Bureau for Food and Agricultural Policy (BFAP)
Piketberg Implements	National Department of Rural Development and Land Reform (DRD&LR)	Cape Peninsula University of Technology (CPUT)
Rovic Leers	National Department of Science and Technology (DST)	Council for Scientific and Industrial Research (CSIR)
Valtrac	National Department of Water and Sanitation (DWS)	Institute for Poverty, Land and Agrarian Studies (PLAAS)
Controlled environment agriculture	Statistics South Africa (Stats SA)	Stellenbosch University (US)
Clean Energy Farming	Western Cape Department of Agriculture (WCDoA)	University of Cape Town (UCT)
Greener Solutions	Western Cape Department of Economic Development and Tourism (DEDAT)	University of Pretoria (UP)
Vegtech	Industry associations	University of the Western Cape (UWC)
Precision agriculture	Agri Western Cape	Western Cape Department of Agriculture (WCDoA)
Aerobotics	Citrus Growers Association (CGA)	Nelson Mandela Metropolitan University (NMMU)
Aerovision	Grain SA	Other
Agri-Solutions	HORTGRO	World Wide Fund for Nature (WWF)
Agrista	Milk Producers Association (MPO)	
Crosscape Precision	National Wool Growers Association	
Precision agriculture	Industry associations	Other
DFM Software Solutions	Conservation Agriculture Western Cape (CAWC)	
Effective Farming Solutions	No-Till Club of KwaZulu-Natal	
EnviroMon	Potato SA	
IrriCheck	SA Olive Industry Association	
MySmartFarm	SA Pork Producers Association	
Renewable energy	SA Poultry Association (SAPA)	
EnerGworx	SA Rooibos Council	
MLT Drives	SA Table Grape Association	
Renenergy	South African Mohair Growers Association	
Renewable energy design	VinPro	
Solairedirect	Winetech	
Sustainable Power Solutions		

More role players can be found in the 2016/17 Agri Handbook for SA[57].

[57] https://goo.gl/gvkQq3

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