AGRI PROBE

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Game fight back!

Embracing the Future

Water security equals a growing economy

Research and news magazine of the Western Cape Department of Agriculture

A simple, **step-by-step guide** to establishing your own vegetable garden

Food security starts with you! Don't delay, start your own vegetable garden today.

Advantages

You will save money and contribute to food security.

Producing your own vegetables is a very rewarding feeling.

The time outdoors will boost your mental and physical wellbeing.

You will need:

Shovel, fork, rake, watering can, compost, fertiliser and vegetable seedlings/seeds.

Follow these easy steps:

Identify the perfect spot (at least 1m wide). Till the soil and remove all weeds.

Rake and work compost and fertiliser into the soil. (Fertilise plants once a week with 3:1:5 fertiliser and irrigate directly thereafter.)

Read seed packs to ensure you plant at the right time of the year.

Plant crops in a straight row with sufficient space in between each plant. Each crop requires different spacing (refer to the seed pack).

Transplant the seedlings and compress the soil slightly.

Place mulch (straw/ weeds) between the plants to conserve water in the soil.

Irrigate your freshly planted seedlings.

Remember:

Vegetables vary in water usage; read the instructions on your seed pack.

Leave earthworms to do their work - they are beneficial to your soil.

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#onehomeonegarden
#ForTheLoveOfAgriculture
#zerohunger

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Western Cape Government
Agriculture

From food relief to food sustainability
BETTER TOGETHER.

Setting the SCENE

by Carol Levendal

This volume of *AgriProbe* is released a year since 26 March 2020, when the country went into alert Level 5 lockdown due to the COVID-19 pandemic. Who would have thought our world would change so much in a year? The new normal is "no entry" unless you are wearing a mask, sanitising and social distancing. At work we meet on MS-Teams, Zoom, Skype, Discord and many other new platforms. We no longer have conferences and seminars; instead, we have webinars when working from home. The article "Embracing the future" shows our response to this new normal while the article "Wildlife industry fights back!" shows the resilience of people in agriculture coping with the new normal. Also read more about the BFAP launch that took place virtually and provided Government and a wide variety of agricultural stakeholders with critical insights for improved strategic planning and decision-making.

This volume is also jam-packed with articles that showcase our prowess in the international arena. Three international days are celebrated: International Women's Day (8 March), World Water Day (22 March) and World Radio Day (15 February). The theme of Women's Day is an equal future for women in leadership. The department has had more than 40% women in senior management for many years. The article "Landing drone technology at Elsenburg" celebrates three women who attained their drone operating licenses. We focus on water in relation to climate with articles on water and the economy, water management and irrigation water ("leiwater"). A short radio message to celebrate World Radio Day is embedded with activities that will please the reader.

Human capital development is a strategy of this department and we showcase this with an article on the graduation ceremony at the college. Three ladies completed a master's degree in animal sciences and the three students mentioned above received their drone operating licenses.

Agriculture is important for the economy of the Western Cape Province and a profile on this sector and a snippet are included. The importance of the readiness of agricultural economics for large data sets is discussed.

Since eating is an agricultural activity, no issue will be complete without a recipe that has been tried and tested. Enjoy.

Stay safe, practise social distancing, sanitise and wear your mask.

ON OUR COVER

Women take to the cover in this edition of *AgriProbe*. They are embracing new technologies and are claiming their place at the table in the scientific agricultural landscape. The cover is a splash of what is in store for agriculture with more sustainable and water-wise tactics. It illustrates how the department is soaring into bigger and better technologies offered by 4IR. Be it drones or WOWs, the triangle symbolises our focus – you, our clients. Investing in youth and women is key in keeping this sector growing. Read more and see how we can work better together for a brighter agricultural sector.

CONTENTS

AgriConnect
Your communications partner in the agricultural industry

PUBLISHING TEAM

Project leader: Henk Odendaal
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WE ARE PERFECTLY IMPERFECT

by Minister Ivan Meyer

During the Western Cape Department of Health's 2021 Leadership Conference, I had the opportunity to share my thoughts on the topic "Leading in turbulent times: from values to action". Below are some of these reflections.

Recently, I saw a person with a T-shirt with the following quote: "Perfect imperfect." Given the turbulent times we are currently facing, I am mindful that my reflections could be a "perfect imperfect". The Western Cape Government has six core values, and I want to draw from these values during our reflections.

1. Caring

A pandemic like COVID-19 requires a caring government, a caring culture, and a caring mindset.

2. Competence

Nowhere in South Africa was this seen more explicitly than here in the Western Cape. The pandemic confirmed that competent staff are appointed in the Western Cape Government.

3. Accountability

Accountability should not be reduced to merely reporting on the number of food gardens established, but must include an analysis of its impact on communities. It must also capture the personal experiences of the recipients.

4. Integrity

Integrity in public and private lives does matter. Data integrity is also essential when you lead in turbulent times.

5. Innovation

Leading in turbulent times requires innovation and speed. Time is a luxury and speed is therefore a necessity.

6. Responsiveness

The Western Cape MECs have each been assigned to a district to oversee the implementation of the Western Cape Health Response Plan. Together with the mayors and municipal managers, district health managers are working around the clock to respond to the demands of the pandemic.

The pandemic has highlighted the importance of values in organisations. Value-based leadership is back but values only matter when translated into action. I am responsible, together with Dr Elna von Schlicht (executive mayor of the Cape Winelands district municipality), Mr Henry Prins (municipal manager) and Dr Sebopetsa Mogale (HoD of Agriculture), for managing the COVID-19 pandemic in the Cape Winelands.

The leadership style of regional director of the Cape Winelands district health team, Dr Lizette Phillips, is a prime example of how values translate into action. On 8 October 2020, Dr Phillips and her team met in Paarl under the theme "Reflections on the COVID-19 pandemic". During this session, she drew our attention to the Law of Significance by author John Maxwell. I quote: "One is too small a number to achieve greatness". This law of significance means we need one another, and we need everybody's contribution to fight this pandemic.

The turbulent times we are experiencing require:

- value-based leadership;
- data-led governance;
- evidence-based decision-making;
- the integration of faith, reason and emotion; and
- leaders with empathy and compassion.

Turbulent times:

- are painful and take their toll – it is heart-rending to lose colleagues, loved ones, parents, family and friends;
- test our mental stability and emotional vulnerability;
- bring us closer to our spiritual dimensions;
- bring us closer to our families;
- bring us closer to those in need;
- bring us closer to our mortality; and
- show us that we are "perfectly imperfect" at times.

In turbulent times we must be empathetic, says writer Amy Savage in an article entitled "Leading in turbulent times: 5 things to remember". She writes: "Everyone is experiencing some degree of insecurity and fear, including you. You might find that some individuals have a heightened fear response. Take time to listen to their concerns and empathise with them. Their feelings are legitimate, so find ways to honour them, while also offering whatever reassurance you can. You don't have to have answers, offer a listening ear. People will appreciate you taking the time to hear them out."

To stay mentally sound, I now wash dishes at home, do more cooking, take my wife out for lunch and dinner more often.

I call more friends to say "I love you", because tomorrow may be too late.

I send more e-hugs, e-flowers and e-coffee to friends because tomorrow may be too late.

I listen to music more often, because tomorrow may be too late.

I drive out with my family – because tomorrow may be too late.

What are you doing to remain mentally sound?

Leadership in turbulent times has taught us that values matter, our feelings matter, our patients matter, our clients matter, and our families matter.

Let us now light a candle in remembrance of those who have gone before us, and quote Ms Anroux Marais, Western Cape Minister for Cultural Affairs and Sport: "As we physically distance, we are socially connected, and together we will beat this pandemic."

Turbulent times have taught us that our faith matters; it is our foundation, it keeps us on our feet, it keeps us sane, it keeps us healthy.

Remember, we are perfectly imperfect. AP

Water management innovations – opportunity to evaluate new technologies

by Claire Pengelly

As part of a pilot accelerator project funded by the Dutch Consulate General, GreenCape is currently working with two international companies that offer innovative water-management solutions for agricultural users. The companies are looking for sites to pilot their technologies and, depending on their success in applying for funding, may be able to subsidise a pilot project on a farm, partly or fully. A brief overview of the two technologies is given below:

- An innovative irrigation water storage solution that aims to increase the productivity and climate resilience of agriculture through managed aquifer recharge (MAR). Water is stored underground by recharging the aquifer through one or more injection wells – safe from evaporation and contamination – and then abstracted when needed during the dry season.
- Niche soil moisture sensors that integrate with weather stations and go through a GSM- or LoRmA connection to a central database. The smart dashboard converts the data into a user-friendly image. The farmer can view the image on a computer or mobile device to make real-time farming decisions with the added data interpretation it provides.

If you are interested in finding out more about these technologies, or are trialling either of the technologies, please contact GreenCape at **water@green-cape.co.za**. AP

Scarce skills in agriculture

Agricultural biotechnologist

What is an agricultural biotechnologist?

Biotechnology is essentially technology based on biology. An agricultural biotechnologist modifies living organisms (or parts of an organism) to improve our health and our lives.

A biotechnologist could use traditional breeding techniques to achieve this, or manipulate, replace, add, or remove specific genes to achieve a chosen outcome. An example of a biotechnologist's work is genetically modified food and antibiotics.

Where could you work?

A biotechnologist's work is research-based, and you could therefore work at any of the research institutions in South Africa, such as the Agricultural Research Council (ARC) or the Council for Scientific and Industrial Research (CSIR), or at a university. Government departments employ agricultural biotechnologists. In the private sector, there are opportunities in the pharmaceutical sector, food fermentation industry (and brewing companies), dairies, seed companies or private pathologists.

Where can you study?

There are opportunities to study for a diploma, a bachelor's degree, and postgraduate degrees (depending on your institution of choice). A BSc in microbiology and botany is another avenue (followed by a postgraduate degree in biotechnology). Institutions include the following:

- Cape Peninsula University of Technology
- The Durban University of Technology
- Rhodes University
- Tshwane University of Technology
- Unisa
- The University of Cape Town
- The University of Johannesburg
- The University of Pretoria
- Stellenbosch University
- The University of the Free State
- The University of the Western Cape
- The University of the Witwatersrand

What subjects and themes are you likely to study?

Universities offer a wide variety of undergraduate curricula, but most allow you to major in biotechnology. Other subjects include microbiology and biochemistry. There are also many postgraduate opportunities in biotechnology.

What is the duration of the certificate/diploma/degree?

Most degrees majoring in biotechnology take three years to complete.

General entry level-requirements to study agricultural biotechnology:

For a BSc in biotechnology:
Matric exemption

Mathematics	5	(60%–69%)
Physical science	5	(60%–69%)

Biology (recommended)

»

Agricultural economist

What is an agricultural economist?

Agricultural economists collect, understand and interpret both local and international economic activities and relate this to how they affect the agricultural markets. They collect and analyse data within the industry and use the results to advise their stakeholders (like farmers). Their research also allows them to spot trends and predict economic impacts and market movements. The ultimate goal is to help a "client"; be it a farmer, a company, policymaker or institution. The information collected by an economist can assist in creating a more stable and efficient working environment.

Where could you work?

You could work as an agricultural economist for the government (like the Department of Agriculture) or the private sector – including agricultural companies like food corporations, financial institutions, non-profit organisations and rural development institutions. You could become a lecturer or teacher, sharing your knowledge with others. Aside from local opportunities, you could work internationally as an agricultural economist. This scarce skill is not only used in the agricultural sector; there are also prospects to work in economic development or the financial sector. The opportunities are extremely broad and varied.

Where can you study?

You can study agricultural economics at a number of tertiary institutions:

- The North-West University
- The University of Fort Hare
- The University of KwaZulu-Natal
- The University of Limpopo
- The University of Pretoria
- Stellenbosch University
- The University of the Free State
- The University of Venda

What subjects and themes are you likely to study?

- Economics and agricultural economics are likely to be a major component of your degree.

You could also study subjects such as

- business law and management;
- accounting;
- labour law; and
- agricultural subjects such as
  - > agricultural development planning;
  - > agricultural marketing; and
  - > agricultural policy.

What is the duration of the degree?

You have two options:

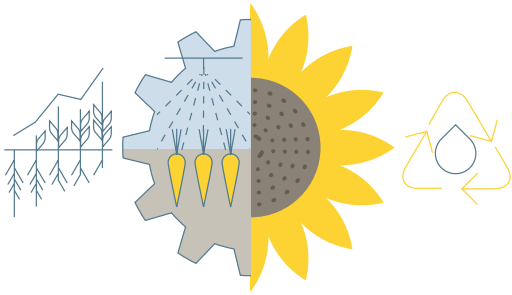
1. A BSc degree in agricultural economics (four years).
2. A BCom degree in agricultural economics (three years).

General entry-level requirements to study agricultural economics:

For a BSc in agricultural economics:

Mathematics:	4	(50%–59%)
Physical science:	4	(50%–59%)
English/Afrikaans:	4	(50%–59%)
Additional language:	4	(50%–59%)
Life orientation:	4	(50%–59%)

Agricultural engineer



What is an agricultural engineer?

Agricultural engineers are problem-solvers in the agricultural sector. They use mechanical, civil and electronic engineering principles to support sustainable agricultural production. The role essentially involves managing resources (including natural resources) in a sustainable way to protect them. For example, agricultural engineers could design gabion structures to protect eroded rivers. Or they could design machinery to improve production, or irrigation systems for nurseries.

Where can you work?

These engineers often work in consultancy roles (either for a company or self-employed) and are drafted in to support farmers or others working in the sector. There are opportunities in the research and academic world as a lecturer. Agricultural engineers can be appointed to work for national and provincial agricultural departments. In many cases, manufacturing and food companies require these skills to find innovative agricultural solutions to challenges.

Where can you study?

A national diploma or bachelor's degree are potential launch pads into a career as an agricultural engineer. These institutions offer related diplomas or degrees:

- The Cape Peninsula University of Technology
- The Central University of Technology
- Nelson Mandela University
- Unisa
- The University of Cape Town
- University of Mpumalanga
- The University of the Free State
- The University of Venda

What subjects and themes are you likely to study?

Depending on your institution of choice, and your course, subjects could include agricultural management, computer applications (agriculture), agricultural engineering and agricultural production techniques, among others.

What is the duration of the certificate/diploma/degree?

National diplomas are mostly three-year programmes, while degrees majoring in agricultural engineering are mostly four-year programmes.

General entry-level requirements to study agricultural engineering:

For a BSc Agriculture majoring in agricultural engineering:

Mathematics:	5	(60%–69%)
Life science:	5	(60%–69%)
Physical science:	5	(60%–69%)
Agricultural science:	5	(60%–69%)
Language of instruction:	4	(50%–59%)

Scan this QR Code to download the careers in the agriculture booklet:

deur Eloise Pretorius, eloisep@elsenburg.com

Oor die mikrofoon

Die Wes-Kaapse Departement van Landbou is uniek in dié opsig dat dit sy eie moderne en goed toegeruste radioateljee het en ook 'n voltydse aanbieder wat weekliks twee programme vir *RSG Landbou* voorberei en aanbied. Vir die vroeë opstaners is Vrydagoggende om 04:45 volgepak met interessante tegniese aanbiedings deur kenners, terwyl die joernaalprogram Saterdagoggende om 11:45 vir Jan Alleman van die lekkerte van landbou vertel.

In *RSG Landbou* is dit my voorreg om stories van hoop en inspirasie in ons sektor oor die radio te deel, wat ek glo die kragtigste medium op aarde is. Hier leer ken ons planmakers, innoveerders en mense wat toegewyd is aan ons land se voedselsekerheid en voortbestaan. Deur mense se stories te deel, glo ek dat sienings oor ons land positief beïnvloed kan word. 'n Radiojoernalis het 'n enorme verantwoordelikheid om wêreldbeskouings te help verander en 'n ingesteldheid van saamwerk te vestig. Ek wil jou graag uitnooi om enige storie-idees of nuusitems met my te deel by eloisep@elsenburg.com.

Die jaar 2021 het op 'n wonderlike noot vir *RSG Landbou* begin. Ons departement se WOW-dag het alle verwagtings oorskry, en baie van die landbou-innovasies wat ons daar raakgeloop het, is in programme vasgevang. Luister gerus weer daarna, of deel dit met iemand nadat jy dit gratis op **elsenburg.com** afgelaai het. Dis maklik om te vind wanneer jy gaan kuier op die departement se tuisblad.

Nog 'n hoogtepunt van die jaar se programme tot dusver is 'n uiters insiggewende seisoenale weervoorspelling deur bekende weerkundige Willem Landman. Ons eerste program van die jaar, wat op 1 Januarie uitgesaai is, is van onskatbare waarde vir boere regoor die land. Dit hou verband met die verwagte komende reënval in Suid-Afrika.

Tydens die eerste joernaalprogram wat op 2 Januarie uitgesaai is, het ons met 'n passievolle kersieboer van Ceres gesels oor dié merkwaardige klein vruggie. Die Wes-Kaapse Departement van Landbou se ondersteuning het gehelp om sy boerdery een van die suksesvolstes in ons land te maak. Arno Marais het ook vir ons verduidelik hoe boerdery die werkskeppingskwessie in Suid-Afrika doeltreffend kan aanspreek.

Verder het ons by Eugene Cloete, viserektor van die Universiteit van Stellenbosch, gehoor dat landbou die enigste sektor binne ons ekonomie is wat in die afgelope kwartaal groei getoon het. Landbouopleiding gaan in 2021 'n nuwe baadjie aantrek, en hy is opgewonde oor die belangstelling wat jongmense hierin toon. Hy is van mening dat al meer jongmense die waarde van opleiding begryp en graag 'n bydrae op hierdie manier wil maak, met die wete dat ons land se toekoms van landbou afhang.

In Januarie het ons ook met twee uiters innoverende vroue in landbou kennis gemaak. Truffels is peperduur en taai-om-te-kweek kulinêre kalante. Die misterie laat *aficionado's* en sjefs kwyl, terwyl Europese truffelboere in hul hande huil oor die

fiemiesrige groeigewoontes van dié fungi. Twee Pretorianers is egter besig om grense te verskuif, en tydens ons gesprek het ons saam met Helga Dagutat en Nita Breytenbach gaan truffelsnuffel in hulle onlangs voltooide moskamer. Hierdie program is een van my persoonlike gunstelinge. Gaan luister tog indien jy dit misgeloop het!

Op 27 is Juanita Belingham 'n alleenboer en bestuur sy 'n 20 000 ha-plaas met merinoskaap, angorabokke, Angus- en Simmentalerbeeste, en wild by Nelspoort in die Karoo. Sy was in 2018 'n deelnemer aan die Wes-Kaapse "Jongboer van die Jaar"-kompetisie. Op *RSG Landbou* van 23 Januarie deel sy haar drome vir die toekoms en waarom sy uitsien na 'n suksesvolle 2021. Sy verduidelik ook hoe sy kwessies wat verband hou met arbeid en die uitdagings wat die droogte gebring het, die hoof gebied het.

Kort voor die uitsending is die jonge Juanita met kanker gediagnoseer. Sy het wel 'n suksesvolle operasie ondergaan, en sterk tans goed aan. Haar storie is merkwaardig, en ek wil jou uitnooi om hierdie vasbyter nie net saam met my in jou gedagtes te hou nie, maar ook om haar storie van hoop en inspirasie te hoor. Dis juis hierdie jong boere wie se stories gedeel moet word, en dis my voorreg om met hulle kennis te maak en te verseker dat die res van Suid-Afrika jong landbouers van hierdie kaliber leer ken. Hoop en inspirasie was nog altyd die middelpunt van my programbeplanning, en glo my vry, daar is 'n eindelose arsenaal daarvan in ons land.

Januarie is afgesluit met 'n gesprek met 'n geliefde man in ons departement. Jerry Aries is waarnemende hoofdirekteur van Ondersteuning en Ontwikkeling van Landbouers. Waar sy eie pad met landbou begin het, is aangrypend, en wat die departement doen om veral jong boere te ondersteun, is 'n landboustorie vir die boeke. Soek gerus na die program van 30 Januarie op ons webtuiste.

Februarie se programme het merkwaardige stories ingesluit: Dr. Gideon Bruckner, voormalige hoof van die Program Veeartsenykundige Dienste van die departement, was die 2020 goue medaljewenner van die World Organisation for Animal Health. Hierdie toekenning word jaarliks aan persone gegee vir uitstaande tegniese, wetenskaplike en administratiewe bydraes op internasionale vlak in die veld van veeartsenykundige wetenskappe en dieresiektebeheer.

Een van die mees formidabele vroue in landbou en spesifiek die wildbedryf het haar buiging op 20 Februarie gemaak. Haar betrokkenheid in die jag- en wildbedryf was 'n leerkurwe soos min, maar Adri Kitshoff-Botha het in 2020 ná 19 jaar uitgetree met 'n string eerbewyse en internasionale erkenning. Sy het begin as 'n halfdagboekhouer wat die KwaZulu-Natalse Jagters- en Wildbewaringsvereniging se geldsake moes behartig en ook help met bemarking. Van wild en jag het sy omtrent niks geweet nie. Haar storie is grappig, ongewoon en 'n pragtige tentoonstelling van die wye verskeidenheid gaste wat saamkuier op *RSG Landbou.*

In Maart het ons kennis gemaak met Felix Reinders, 'n ingenieur, wat einde Desember 2020 afgetree het na 'n loopbaan van 41 jaar in besproeiingsingenieurswese by LNR Landbou Ingenieurswese. Hy is ook pas verkies as die nuwe voorsitter van die Globale Raamwerk van Waterskaarste in Landbouwater, en is die pas uitgetrede president van die Internasionale Kommissie op Besproeiing en Dreinering.

Riaan Manser is een van Suid-Afrika se waaghalsigste avonturiers. Buiten sy fietstoer in 2009 het hy ook man-alleen in 'n kajak om Madagaskar geroei, en ook om Ysland. Later het hy en sy vrou die eerste mense geword om van Afrika na New York te roei. Manser deel van die mees onvergeetlike boerderypraktyke wat hy eerstehands tydens sy byna twee jaar om Afrika beleef het, en waarom dit juis Suid-Afikaanse boere is wat hom inspireer.

Ek herinner jou graag weer daaraan dat *RSG Landbou* se programme beskikbaar is op **elsenburg.com**.

"Sien" jou op die radio! AP

Three students graduate with **master's degrees in animal science**

by Prof. Tertius Brand, tersb@elsenburg.com

Three students from the Animal Science Directorate graduated at the virtual Stellenbosch University (SU) ceremony on 4 December with divergent studies on ruminant nutrition, sheep breeding, and ostrich welfare. These studies demonstrate the depth and breadth of the animal science research programme conducted by the Western Cape Department of Agriculture (WCDoA).

Ms Leanne Jordaan studied different techniques to increase the rumen undegradable protein fraction (RUP or bypass protein) of local protein sources like canola oilcake meal, lupins, and soya bean oilcake meal. As an expensive nutrient in livestock nutrition, studies on the efficiency of protein utilisation of local plant protein sources such as canola oilcakes and lupins in ruminant diets are warranted. The supply of amino acids to the small intestine, and thus protein efficiency, may be improved by reduced dietary protein degradation in the rumen. Protection of protein from rumen degradation increases amino acid supply to the small intestine and reduces nitrogen wastage. This provides more essential amino acids for absorption in the small intestine to improve growth, and milk and wool production. Extrusion and the addition of either a polymer (like chitosan) or a polyphenol (tannin) potentially reduce rumen degradability of protein of plant origin and increase their nutritional value for ruminants.

This study investigated the effects of hot or cold extrusion with molasses, adding a polymer (chitosan) or using polyphenols (hydrolysable tannins) on the RUP fraction of lupins, canola oilcake meal, and soya oilcake meal. While extrusion lowered the soluble protein fraction, it increased the potential degradable fraction without affecting the degradation rate. Extrusion

Ms Leanne Jordaan.

Ms Monique Snyders.

lowered the effective degradability of the crude protein of lupins by 28% at a ruminal outflow rate of 0,08% per hour. In a second study, extrusion with 6% molasses significantly lowered the crude protein soluble fraction of both canola oilcake meal and lupins at every ruminal outflow rate tested. The biggest effect was seen at an outflow rate of 0,08% per hour, where effective degradation was lowered by 25,6%. The RUP fraction of the two locally produced protein sources was increased by a notable 85,4% on average.

The positive results of increasing the RUP fraction of locally produced feedstuffs may find its way to the feed industry. One manuscript from the study was published in a peer-reviewed scientific journal and a second one has already been submitted to a scientific journal. The study also prompted the initiation of another master's study at SU, namely, to perform a study to evaluate extruded lupins as well as canola oilcake meal in lamb finishing diets. This study was supervised by Prof. Tertius Brand of Elsenburg and Stellenbosch University.

Ms Monique Snyders conducted her MSc studies at the Oudtshoorn research farm, and her thesis was entitled "Perceptions about commercial ostrich farming: views of consumers, farmers

Ms Anieka Muller.

and secondary stakeholders". The aim of her study was to investigate potential differences in knowledge, opinions, and perceptions among these three categories of stakeholders with respect to ostrich production practices and their resulting welfare impact.

Using a comprehensive questionnaire, Ms Snyders found a general lack of knowledge about the ostrich industry and production practices, especially in women and the youth. However, consumers emphasised their preference for ostriches to be reared in environments that resemble their natural habitats. They also expressed a need to implement a formal welfare protocol for commercial ostrich production. Interestingly, farmers clearly preferred welfare-conscious production practices in contrast to secondary stakeholders who preferred welfare-neutral or even potentially compromising production practices. However, farmers were less likely to promote the introduction of ostrich-specific welfare protocols on-farm, than stakeholders in the industry.

The results of this survey emphasised the importance of a welfare protocol for the commercial farming industry. It will improve product quality and transparency and will enable farmers to promote the welfare of ostriches produced for slaughter. The study was jointly supervised by Dr Maud Bonato (SU), Dr Anel Engelbrecht (WCDoA, Oudtshoorn research farm) and Prof. Schalk Cloete (SU).

Ms Anieka Muller was promoted with her study on sheep breeding entitled: "Studies on the environmental and genetic parameters for lamb survival, growth and wool traits of the Elsenburg Dormer and SA Mutton Merino flocks". For this study

> The Animal Science Directorate of the Chief Directorate Research and Technology Development yielded three divergent MSc degrees at the 2020 virtual Stellenbosch University graduation ceremony.

she analysed data of two recognised South African ovine resource flocks that were recorded over a lengthy period.

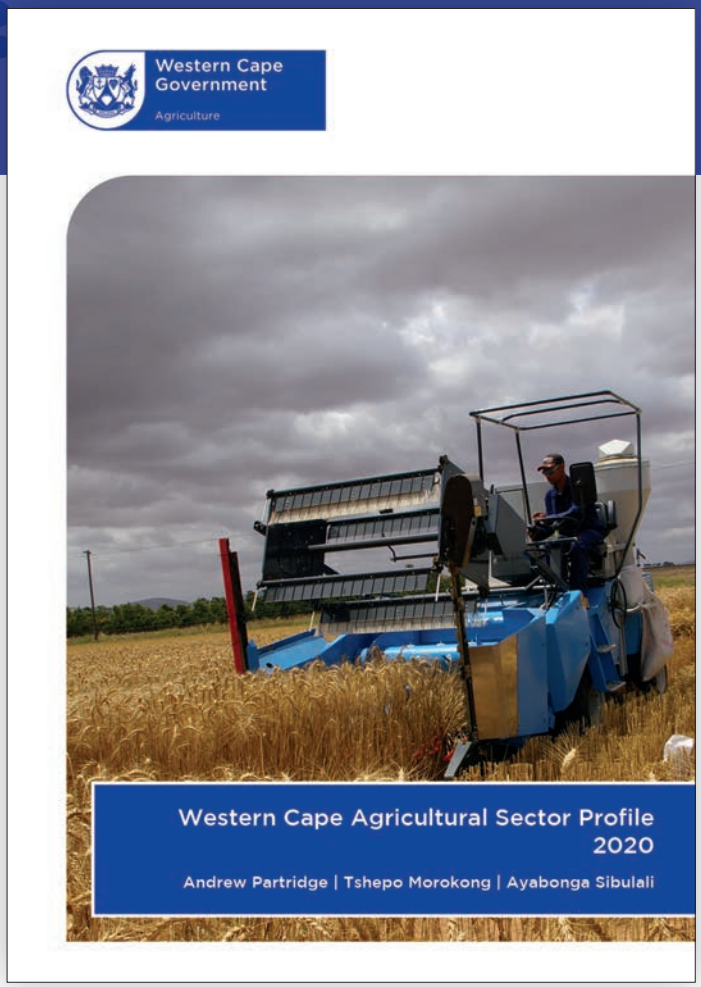
The study extends earlier work on the early growth and survival of Dormer and South African mutton merino (SAMM) sheep. It also reports on new analyses on yearling and wool traits in Dormers. Additionally, she assessed breed differences for the two breeds when maintained in the same flock. The study contributes to the phenotypic characterisation of important local sheep breeds and was presented as a series of separate chapters formatted as papers in peer-reviewed scientific media.

This approach has already borne fruit, since one of the chapters has been published in Small Ruminant Research, an international journal. The study recommends further research on the usage of the well-recorded genetic resources as part of breed-specific genomic reference populations. Prof. Schalk Cloete of SU, Prof. Tertius Brand of Elsenburg and SU jointly supervised her study.

All three studies were innovative and were conducted with the partial monetary support of the Western Cape Agricultural Research Trust and Cape Wools SA. Preparing promising young animal scientists for careers in science hinges on sound collaboration between the department, funding bodies, and tertiary educational institutions. AP

Western Cape Agricultural Sector Profile 2020

by Andrew Partridge, andrewp@elsenburg.com



The 2020 Western Cape Agricultural Sector Profile has been published, providing an updated snapshot of the province's agricultural and agri-processing sectors, to provide role players with information to improve decision-making for agricultural development in the province. The Sector Profile is an annual publication first published in 2018. Due to reliance on various data sources, it has a one-year lag, meaning the 2020 profile shows the state of the sector and trends up until 2019.

This year's special chapter makes use of the Census of Commercial Agriculture for 2017. The census was published in 2020, the first time since the last census in 2007.

The chapter looks at agricultural production inputs and operating expenses and how these are spread geographically in the province.

The Western Cape (WC) is prominent in South Africa both for the number of residents inside its boundaries (12%) and its contribution to the national economy (14%). The population of the province has consistently grown at a faster rate than the national population and there were 123 000 more people in 2019. The WC economy contracted in 2019 by a -1% real change in real gross value added (GVA) from 2018.

The impact of the recent drought in South Africa continues to drag on in the WC with agricultural real GVA falling by 13% in 2019. This was mitigated somewhat by real growth of 4% in the food processing sector, continuing a strong upward trend seen over the past decade. Investment in both sectors has been declining in real terms in recent years, although there was an increase in investment in agricultural research and exploration, and an overall increase in food, beverage, and tobacco investments for 2019.

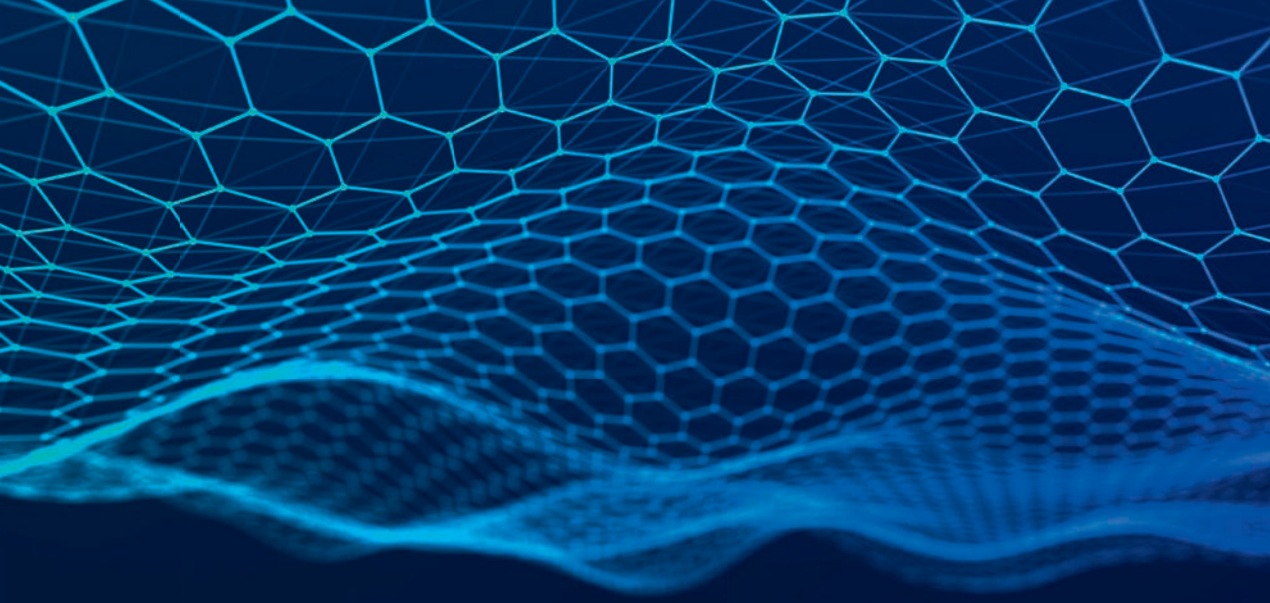
The WC is dependent on horticultural production, which accounts for 47% of gross farm income for the province, compared to only 18% for the rest of South Africa. Despite a declining share, the Cape Winelands remain the main agricultural area in the province, accounting for more than a third of total agricultural GVA. In the Cape Winelands, horticultural production accounts for 60% of farm income.

Agricultural exports from the WC had been growing strongly over recent years, resulting in a growing trade balance. However, a decline in exports for 2019 meant that the trade balance decreased while remaining substantial at R30 billion (exports were R34 billion and imports R4 billion). There was minor diversification in export destinations between 2018 and 2019. Also, a significant increase in the share of exports going to Africa (15% to 19%) and a slight decline in the share of exports going to the top three destinations, namely the Netherlands, United Kingdom and China (35% to 33%). Table grapes became the province's biggest agricultural export in 2019 after declining exports of wine and citrus. Continued positive performance was seen for blueberry exports, and substantial growth in the main two agricultural imports, namely rice and beer.

Despite the decline in agricultural GVA, the agricultural sector created 22 000 jobs in 2019 and the food, beverages and tobacco sector added 12 000 more, altogether adding 34 000 jobs in total for the year. The jobs created also contributed to South Africa's broader developmental goals with increases in the shares attributable to black employees, females, the youth, and rural dwellers. There was also an increase in the number of WC households involved in subsistence agriculture in 2019, breaking a downward trend since 2015. These positive trends have contributed to a decline in hunger levels reported by households in the province, reaching the lowest levels observed over the past decade.

These highlights show the significant challenges still being faced by the WC agricultural sector. However, it also shows that amid these challenges, agriculture and agri-processing are contributing positively toward the economy, livelihood creation, and South Africa's objectives in respect of promoting regional development in sub-Saharan Africa. The full report provides a more comprehensive picture and touches on a much wider range of relevant issues.

Scan this QR Code to view a pdf version of the Western Cape Agricultural Sector Profile 2020. AP



Are agricultural economists READY FOR BIG DATA?

by Wilna Malan, wilnam@elsenburg.com

The Agricultural Economics Association of South Africa (AEASA) commemorated World Statistics Day, held on 20 October 2020, with a webinar entitled "A career in agricultural economics: The importance of data, analytics, technology and digitalisation – are we prepared?".

The purpose of the webinar was to get inputs from data scientists, agricultural economists and an agricultural recruiter on the prominence of data and analytics in their current positions. The discussion also looked at whether agricultural economists are ready to deal with the wealth of data, opportunities, and challenges posed by digitalisation.

Mr Hanjo Odendaal, senior data scientist at 71point4, presented "The rise of the digital age economist". According to him, what distinguishes agricultural economists from the modern-day data scientists is their niche knowledge and the ability to communicate analytical findings and influence policy or business decisions. Hard skills such as coding and scientific rigour are important for agricultural economists, but their integration into domain knowledge and understanding of economic incentives is what differentiate them from others.

Ms Marion Delport, lead data scientist at the Bureau of Food and Agricultural Policy (BFAP) identified different interpretations of the term "big data" as a challenge. She cited the Analytics Software and Solutions (SAS) definition, which states that big data exists "when the volume, velocity, variability

and variety of data exceed an organisation's storage or computing capacity for accurate and timely decision-making". Ultimately, the most important role of economists is to use such data in a process of visualisation, transformation, and modelling to create intelligence and understanding to make better decisions.

After the two presentations by the data scientists, reflection from a panel of practising agricultural economists provided further insights. First, each panellist confirmed the importance of having relevant tools to manage and analyse data well. Secondly, Ms Lindie Stroebel, South African Country Manager: Mission, reiterated how important it is for agricultural economists to apply their skills and through data analysis, use the information to make decisions, to inform policies or assist clients with the day-to-day workings of their businesses. Thirdly, each organisation or business in which agricultural economists work has a diversity of datasets, each uniquely aligned to its industry. In one example, Mr Tshepo Morokong, senior agricultural economist at the Western Cape Department of Agriculture, explained why it is crucial in his line of work, studying the macro economy, to contextualise data and to answer a specific research question. He also cautions that data alone without the underlying context can lead to very misleading findings.

> 'Information is the oil of the 21st century, and analytics is the combustion engine' – Peter Sondergaard.

Another agricultural economist from Grain SA, Ms Ikageng Maluleke, pointed out that although her formal education provided the necessary skills for data analysis, she lacked the understanding of industry-specific issues and how to package data in a way that farmers can understand, use and apply to improve their businesses. This problem was also identified by Mr Louis Fourie, General Manager:Trade at Idea Fruit. One of the most important undertakings of their company is to ensure that their data is integrated and that their data integrity is in place. Because their industry is unique, they needed to design and build customised systems. He had to learn these skills on the job.

Mr Tshepo Morokong, senior agricultural economist WCDoA.

Finally, recruitment specialist Ms Marianne van der Laarse from Agrijobs noted a recent trend where agricultural economists are moving towards integrating disciplines. They do this by combining their field of study with other fields like industrial engineering or data science. However, prospective agricultural economists should focus on their domain knowledge of agriculture.

It is said that information is the oil of the 21st century and analytics is the combustion engine, according to Peter Sondergaard. Are our agricultural economists ready for this challenge? The author believes so, because agricultural economists are excelling in diverse areas within the industry through their acquired expertise, knowledge and ambition to learn specialised skills in their respective fields. AP

Department of Agriculture and GreenCape are greening agriculture

by Louw Pienaar, louwp@elsenburg.com

September 2020 marked the fifth anniversary of the collaboration between the Western Cape Department of Agriculture (WCDoA) and the GreenCape sector development agency. This partnership was born out of the need to address the risks and threats associated with climate change and resource inefficiency in the province. The agricultural sector is challenged because on the one hand it needs to grow to create economic growth and jobs, but on the other hand such production needs to be done sustainably. The agricultural sector is exposed and vulnerable to adverse weather conditions and climate change, yet it also contributes to the latter by emitting greenhouse gases in its activities. The department has recognised the importance of converting the sector to an environmentally sustainable, climate change-resilient, low-carbon economy as it is clearly detailed in the departmental outcomes.

To effectively support the development of the green economy, the department identified GreenCape as a key partner with complementary expertise to support the agricultural and agribusiness sector value chain. In short, the collaboration within the Agricultural Economic Services Directorate and GreenCape has led to the development of the Agri-Sector Desk housed at GreenCape. The desk is a support service where dedicated analysts provide advice,

disseminate information, and communicate with stakeholders on key sustainability issues in agriculture. One of the mechanisms to disseminate knowledge is through the GreenAgri website (**greenagri.org.za**). This is a one-stop portal that was developed in collaboration to support smart agricultural farming practices and resource and waste minimisation in the agricultural value chain, and to balance farming and conservation needs. Since starting, around 68 000 people have visited this site, including a relatively large (25%) international audience. GreenCape has also completed a project called "Future-proofing Western Cape agriculture through greater resource efficiency and improved resilience to climate change", as part of its climate change portfolio of projects. The project addressed some key sustainability challenges identified by the WCDoA. The adoption of green technologies can reduce the resource and carbon intensity of Western Cape agriculture and agri-processing. It will enable continued and enhanced competitiveness and climate resilience. The purpose of the project was to increase the understanding and demand for green technologies for sustainable agriculture within WCDoA extension services particularly. It is also aimed at providing an easy-to-use "green filter" to identify agricultural projects that are suitable for specific categories of green technology. This supports the Comprehensive Agricultural Support Programme process of the department in identifying projects, which could make use of these technologies to be more resource-smart and more sustainable.

Finally, another key resource that specifically targets green investments in agriculture is the annual publication of the Sustainable Agriculture Market Intelligence Report (MIR). It highlights opportunities for greening agricultural production and is written for investors, with a focus on new investors exploring the South African agricultural technology market. The various MIR reports can be downloaded from this link: **greencape.co.za/market-intelligence.**

The past several years of drought, outbreaks of various animal diseases, and volatility in the global economy have emphasised the importance of sustainable agricultural production and good partnerships. The department is proud of its collaboration with GreenCape to build a prosperous agricultural sector in harmony with nature. AP

2020 BFAP Baseline virtual launch during COVID-19 pandemic

by Ayabonga Sibulali, ayabongaS@elsenburg.com

The annual Bureau for Food and Agricultural Policy (BFAP) Baseline launch has become a crucial event on the calendar of many agriculturalists in the Western Cape. In 2020, the Baseline event was launched online due to the impact of COVID-19. The Western Cape Department of Agriculture is the committed sponsor and partner of the BFAP launch and continues to strengthen the collaboration to forecast the projections over 10 years. This collaborative work is done by key local and international partners such as the Bureau for Economic Research, the Organisation for Economic Co-operation and Development, the Food and Agriculture Organization, and the Food and Agricultural Policy Research Institute.

This year's virtual BFAP Baseline launch highlighted several factors during the world pandemic. These include production trends, food consumption, price fluctuation, trade, value chain analysis, policy changes, environmental issues and the possible risks in the world food market that may affect the performance of the South African agricultural sector.

The BFAP information presented at the launch provides Government and a wide range of agricultural stakeholders with critical insights for improved strategic planning and decision-making. At best, the Baseline serves as the benchmark to test, interpret and analyse external shocks on South Africa's agricultural sector and it provides recommendations for achieving the Western Cape Department of Agriculture (WCDoA) objectives to gain market access, address climate change, and get farmer support, among others.

Main insights

During the pandemic, the South African agricultural sector contributed positively to the economy and the BFAP Baseline

projected that this sector would grow by 13% in 2020. The BFAP Baseline also addressed general inclusive growth along the value chain. The country's agricultural sector is developing an Agriculture and Agro-Processing Master Plan (AAMP), which will have an impact on preliminary interventions to yield 11,8% growth in real agricultural gross domestic product.

In 2020 the agricultural sector is set to perform remarkably well, despite the impact of the pandemic, largely due to a bumper maize crop and drought recovery in several horticultural industries. Most meat sectors are integrated into the global markets and prices are expected to benefit from the weaker exchange rate regarding trade. Locally produced poultry, relative to imports, will further benefit from recent tariff increases and the combination of strategies under the recently signed poultry master plan, which is aimed at ensuring fair competition with imported products.

The horticultural industry was also expected to benefit from price changes as the result of the weaker exchange rate with citrus exports, firm international prices, and timing of its peak. The combination of price pressure and increasing competition for resources, especially water, will lead to a slowdown in expansion for large fruit such as citrus, pome fruit and grapes over the next decade. Expansion is still expected in smaller fruit sectors such as avocados, blueberries, and nuts.

There remain many opportunities for emerging farmers and new entrants into the sector to drive economic development in various informal value chains. Given the financial support, links to the markets, land reform programmes and public–private partnership support, there is room for this sector to grow. However, smallholder subsistence farmers are under severe stress, which is driven by the impact of the drought in the 2015/16 production year, lack of institutional support, little resilience, and lack of coordination. Also, combining farm systems and food systems is important moving forward.

Finally, the BFAP suggests several preconditions that need to be adopted for the sector to contribute to economic growth and job creation. These are increased investment (diverse capital and financial requirements), optimising and coordinating public and private sector resources, expanding production on underutilised land, and improving irrigation efficiency. In doing so, the lessons learnt from the wheat industry show that policy support matters. AP

Wildlife industry fights back!

by Riaan Nowers, riaann@elsenburg.com

Amid the doom and gloom of the global and individual impact of the COVID-19 virus, the wildlife ranching industry fought back the only way it could in order to survive and to lessen the socio-economic impact of this unwelcome phenomenon.

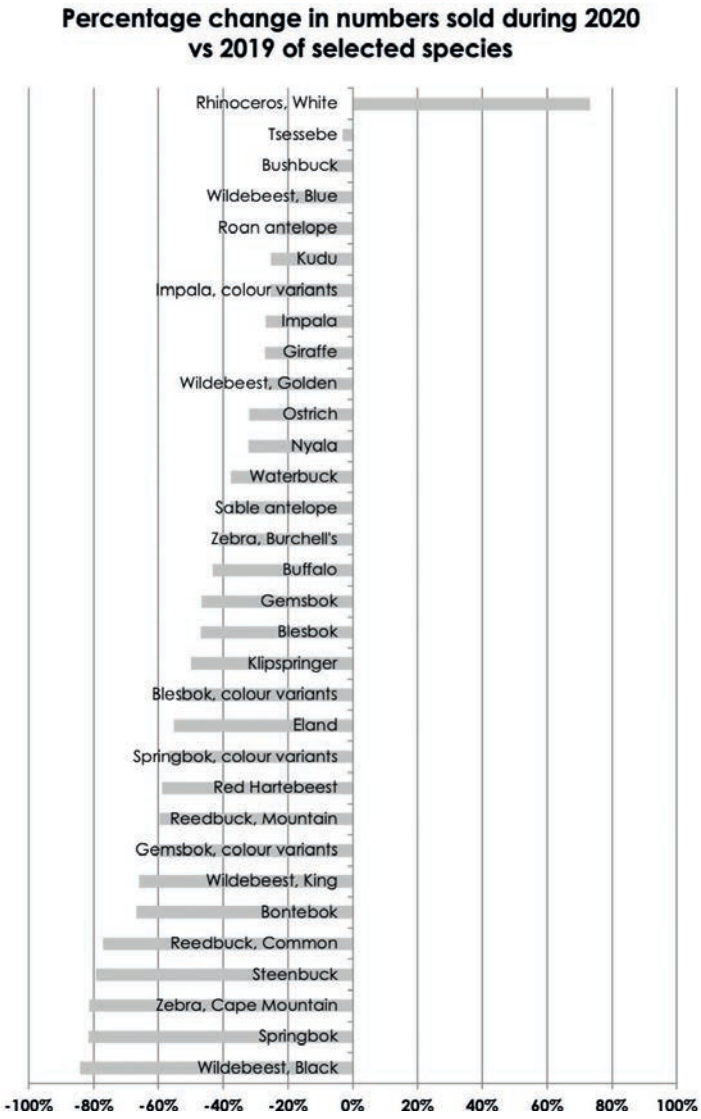
Yes, this virus affected the game auction industry negatively. Yes, gross income across the industry was affected disastrously not only by the "lockdown" ban on physical auctions dictated by government, but also on the ability of potential buyers and sellers to purchase and sell excess stock and new genetics. And yes, the number of animals transacted was substantially lower than in previous years – 41,3% lower than in 2019, for example.

The resilience, entrepreneurial spirit and creativity of those involved resulted in the industry fighting back in the second period of 2020 to lessen the effect of this pandemic.

With most game auctions prohibited in the first half of 2020, the industry responded by changing its strategy. This resulted in the

development of some of the most creative electronic applications developed to allow for remote marketing and selling of top genetics within the game ranching industry. As a result, only 26% less auctions took place in 2020 and this saved the economic life of many a rancher and agriworker.

These applications were impressive, making for easy and transparent operation. Even more impressive was the thorough way in which individual animals' genetic history and animal-specific data were shared with prospective buyers. Therefore, it was not surprising to see how the more traditional livestock auction houses responded and also ventured into this relatively new way of transacting. These auctions also resulted in record prices realised in 5% of the various species categories during 2020 – a somewhat astonishing, but not surprising achievement!



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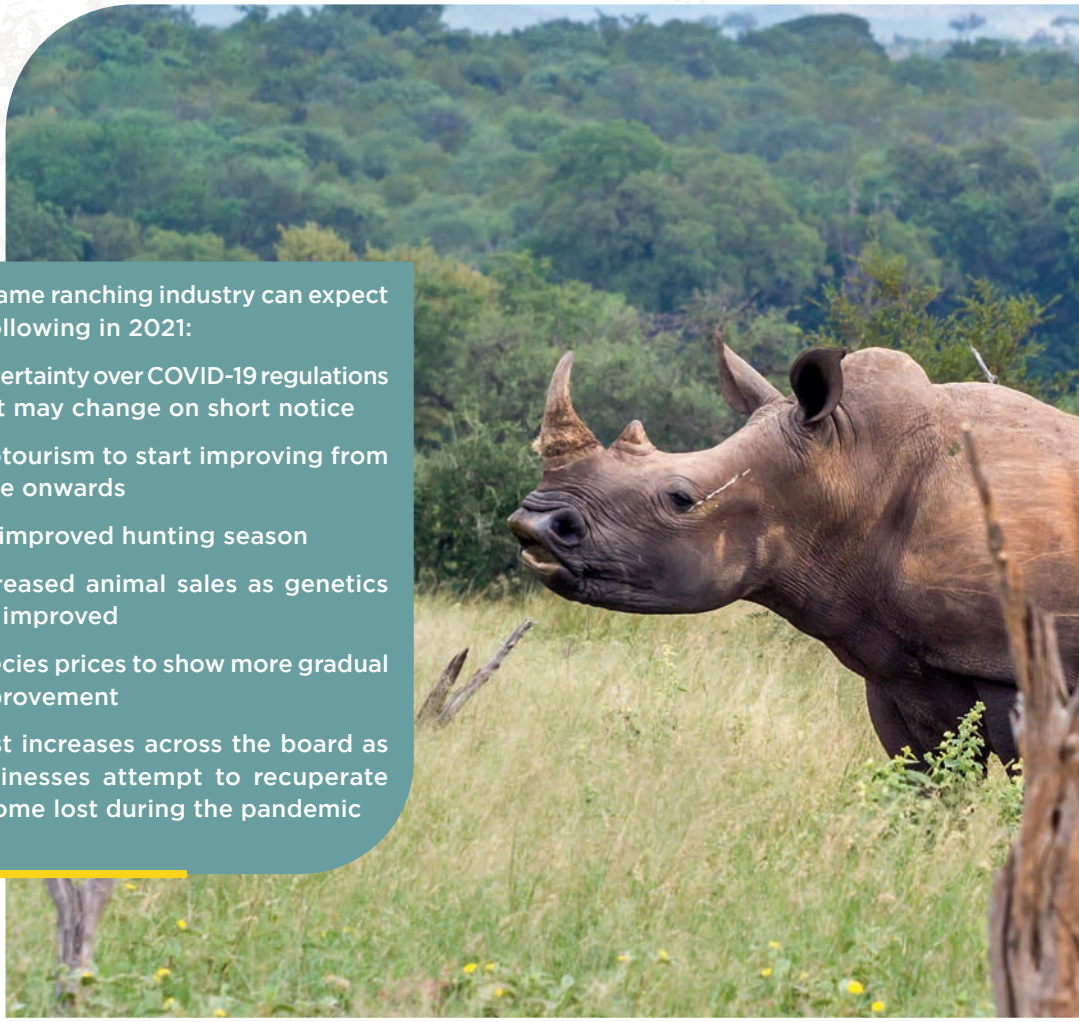
Electronic/remote/online auctions seem to be the way to go as it is cheaper, more time-effective and easier to partake in. However, the traditional way of selling animals in front of a live audience should never be underestimated. Data analysis at the Western Cape Department of Agriculture shows that live auctions sold 29,4% more animals than their electronic counterparts. It seems that the adrenaline that is experienced during physical, live audiences accounts for some 90,2% of animals sold at the auction, compared to the 81,9% of animals sold during online auctions.

Electronic/remote/online auctions seem to be the way to go as it is cheaper, more time-effective and easier to partake in.



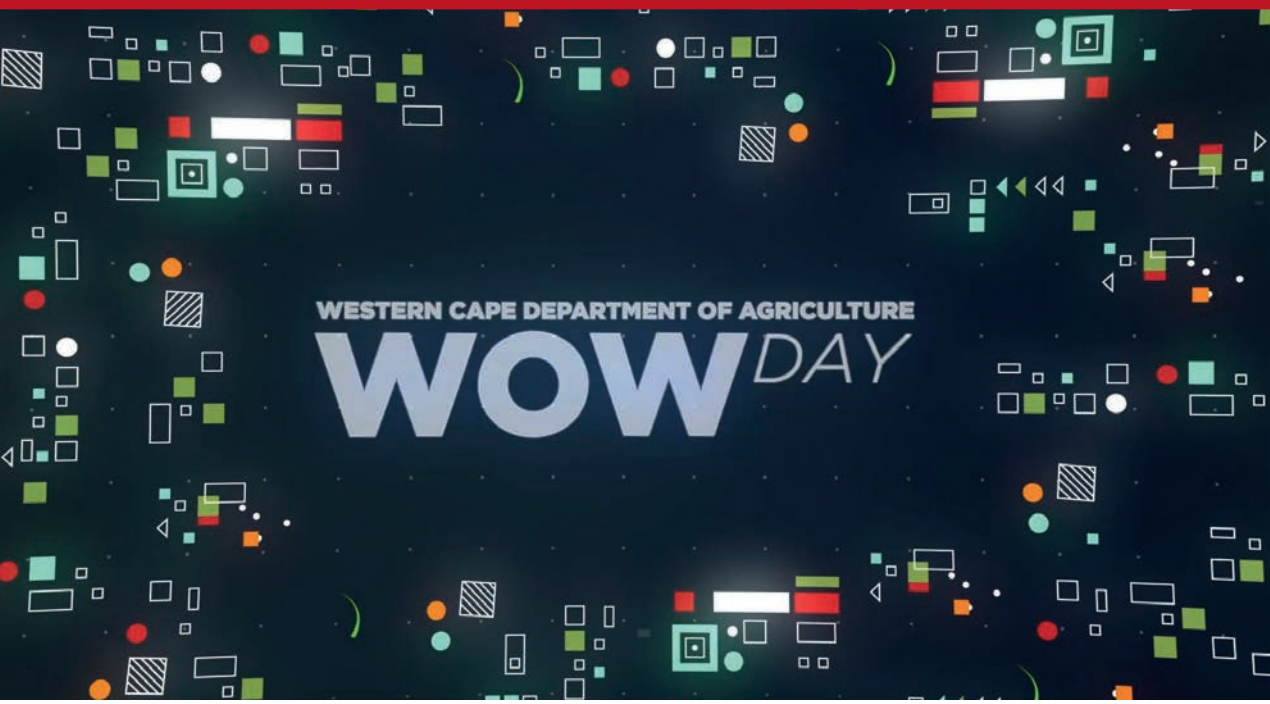
The game ranching industry can expect the following in 2021:

- **Uncertainty over COVID-19 regulations that may change on short notice**
- **Ecotourism to start improving from June onwards**
- **An improved hunting season**
- **Increased animal sales as genetics are improved**
- **Species prices to show more gradual improvement**
- **Cost increases across the board as businesses attempt to recuperate income lost during the pandemic**

When comparing some of the numbers of animals sold during 2020 with that sold in the previous years, it becomes evident from Figure 1 that except for white rhinoceros, all of the species showed a decline in sales. However, it is good to see that tsessebe, bushbuck, blue wildebeest, roan, kudu and giraffe performed well against all odds.

Given the above, the game industry has invested enough financial and intellectual capital to survive this pandemic. Its organisational structures entered into dialogue with bodies across its supply chain and government. It is a positive example of an industry that is not allowing disasters to deflect it from its goals, but is fighting back with technological innovation and successful strategic planning. AP

Showcasing **innovative solutions** for service delivery in agriculture



by Dr Ilse Trautmann, ilset@elsenburg.com

The Western Cape Department of Agriculture (WCDoA) hosted a WOW Day during November 2020 aimed at highlighting the latest innovations and technologies that the department has developed for the agricultural sector of the Western Cape. Fourteen new innovations and technologies were presented, showcasing novel approaches to improved service delivery.

Given COVID-19 social distancing regulations, the event was opened in a virtual way with an innovative and technologically advanced video of all guest speakers. Hereafter the stakeholders and media could visit the exhibits and engage with the experts.

Dr Ivan Meyer, Western Cape Minister of Agriculture, mentioned in his opening

words that "We are seeing many farmers embracing the Fourth Industrial Revolution (4IR) and using innovation and technology very successfully in their businesses, with good results. There are many innovations in both plant and animal science, and it can reduce input costs and help farmers to farm effectively. Agricultural stakeholders should embrace the 4IR and its technology and innovation as this is the future of agriculture in South Africa".

Head of Department Dr Mogale Sebopetsa explained: "The world as we know it has become intelligent; we need new and innovative technologies to remain competitive and solve new problems that the sector faces. It is motivating to see the out-of-the-box innovations we are developing to ensure growth and jobs in this sunrise sector".

The innovations and technologies showcased included the following:

- **Fruitlook** – an application that helps farmers to improve efficient use of water and overall quality of yield.

- **CapeFarmMapper** – an online mapping tool designed to improve the spatial information available to improve foresight for decision-making in agricultural and environmental management.

Both Fruitlook and CapeFarmMapper have seen several additions since their debut and have enlarged their user databases.

- **New technologies in research** – from transistors to lasers and enhancements in agricultural research. The fleet of drones, including the latest spray drone, was also on display.

- **Water- and energy-saving technologies** – reducing the department's own carbon footprint.

- **AgriStats portal** – a comprehensive web-based agricultural statistics portal designed to help with farm business planning and decision-making.

- **Agricultural Information Management System (AIMS)** – a workflow-based system with different data-input and -capture methods. The strong spatial component aims to improve the department's decision-making through business intelligence. It updates its strategies to improve quality service delivery.

- **Rural safety-monitoring dashboard** – a brand-new interactive digital platform with a combination of technological tools. These include mobile and web-mapping applications. It aims to improve safety within rural and agricultural communities across the province, to have an overall improved, protected, and safe agricultural environment.

- **Landcare river restoration** – improving and restoring the ecological infrastructure on which farming communities are dependent, such as the planting of indigenous trees and alien clearing.

- **Biannual disaster risk assessments** – assessing the conditions of the veld to build a baseline, which can be used as an early warning system.

- **E-learning platform** – established by the Elsenburg Agricultural Training Institute, in collaboration with Stellenbosch University, to save the academic year amid the COVID-19 pandemic. This online learning tool is designed to help students stay abreast of all the content, assignments, and academic information.

- **Diploma in agriculture** – a three-year diploma developed by the Elsenburg Agricultural Training Institute, replacing the two-year higher certificate and one-year diploma. Accreditation was obtained from the South African Qualifications Authority (SAQA) in October 2019. In obtaining this diploma, the graduate gains the best knowledge, skills, and attitude to function within any sphere of agriculture.

- **Export certificate office system (eCOS)** – an online management tool in its development phase to help with information needed during export certification and market access with various uses.

- **Embracing the future** – a new approach by the department to plan its future. The department hopes to maximise its mandate within the constraints of its environment and highlights the ways in which it hopes to support the sector.

- **Several communication tools** – i.e. *AgriProbe*, *RSG Landbou*, and the department's own radio studio, *Careers in Agriculture*, which are used to share information with stakeholders.

Through innovation and technology, the Department of Agriculture aims to deliver jobs, ensure safety, and promote dignity and well-being for all agricultural stakeholders.

All the information on the WOW Day is available on the department's website (**elsenburg.com**) homepage. AP

Disease control for the community: Experiences with rabies campaigns in the Boland

by Maresa Fourie, maresaf@elsenburg.com

The main purpose of Animal Health at Veterinary Services is to control animal diseases. One of the most important of these is rabies, a deadly viral disease that can be transmitted to humans from the bite or saliva of an infected animal. If people are treated immediately after contact with a rabid animal, disease can be prevented, but once symptoms of the disease start to show, it is fatal. However, human rabies deaths can be prevented through the vaccination of dogs and cats, which is cheap and effective.

In the Western Cape rabies in dogs and cats is rare, but every year there are several reports of rabies in wild animals like bat-eared foxes and mongooses. People living in the rural areas close to the mountains and on farms are more likely to come across rabid wild animals.

One of the ways veterinary services are protecting our people and animals is by organising routine rabies vaccination campaigns. They are advertised beforehand and everyone in a specific community is invited to bring their dogs and cats for free rabies vaccinations at a specific place and time. Animal health technicians also give school talks to increase awareness of rabies and the importance of vaccinating pets.

Some of the things I have learnt during rabies campaigns are:

- People are usually more afraid of the injections than their pets are. Most dogs and cats do not feel a thing. They are excited to be out and about, and the

An adorable litter of ten puppies coming for their rabies vaccinations.

dogs examine one another. The cats are very agitated about being out of their safe environment, but to my amazement, some aren't bothered by the chaos or the dogs. However, if you don't want to get scratched or take the risk of your cat jumping out of your arms, bring it in a container or box.

- People normally think it is a lengthy process, but it is not. The injection takes two seconds provided the dog or cat is kept still. People are amazed that it is so quick – it takes them longer to bring their pets either by walking or by bringing them by car than it does to have them injected. I sometimes feel bad about this. I can see that it takes a great deal of effort to bring the dog or cat to us. They are sometimes totally out of breath. Then again, it is good exercise for the owner and pet!
- Most pets are quite friendly, but some are fearful of being vaccinated. Being bitten and scratched is the risk we take. Sometimes we are lucky when only our clothes get ripped and not our skin. A good method to use with a cat that is really wild (if you are able to catch it), is to hold it behind its neck and let it cling to a tree/pole/cushion, or anything to dig its claws into, other than your arm.

A kind neighbour in Jamestown brought us coffee and rusks one chilly morning.

Kapeldien taking up his position as self-appointed guard dog of the vaccination station.

- Most people have queries about animal health issues such as treatment for worms, ticks, fleas or mange, and we advise them accordingly.
- Many dogs are not used to walking on leashes, so their owners find creative ways of transporting them to the vaccination station. Pets are carried, tucked into bicycle baskets or brought in shopping trolleys. One dog was quite happy to arrive in a wheelie bin with rubbish still inside!
- Working with animals and people from different cultures can be quite entertaining at times. I will never forget Kapeldien, the self-appointed guard dog from Groendal. He was prepared to defend us with his life against other dogs, but our aim was to attract pets, not to attack them. So we made a plan: Cornel, the intern, was given the job of rubbing Kapeldien's ears and head to distract him when other dogs came for their vaccinations. That seemed to work and Cornel ended up having the most important job of all.

All in all, we do this for the love of people and, of course, the animals. To control diseases such as rabies gives us the opportunity to work with animals and therefore do what we love doing.

Cornel and the local children distracting Kapeldien from his guarding duties.

> All in all, we do this for the love of people and, of course, the animals.

XHOSA SUMMARY

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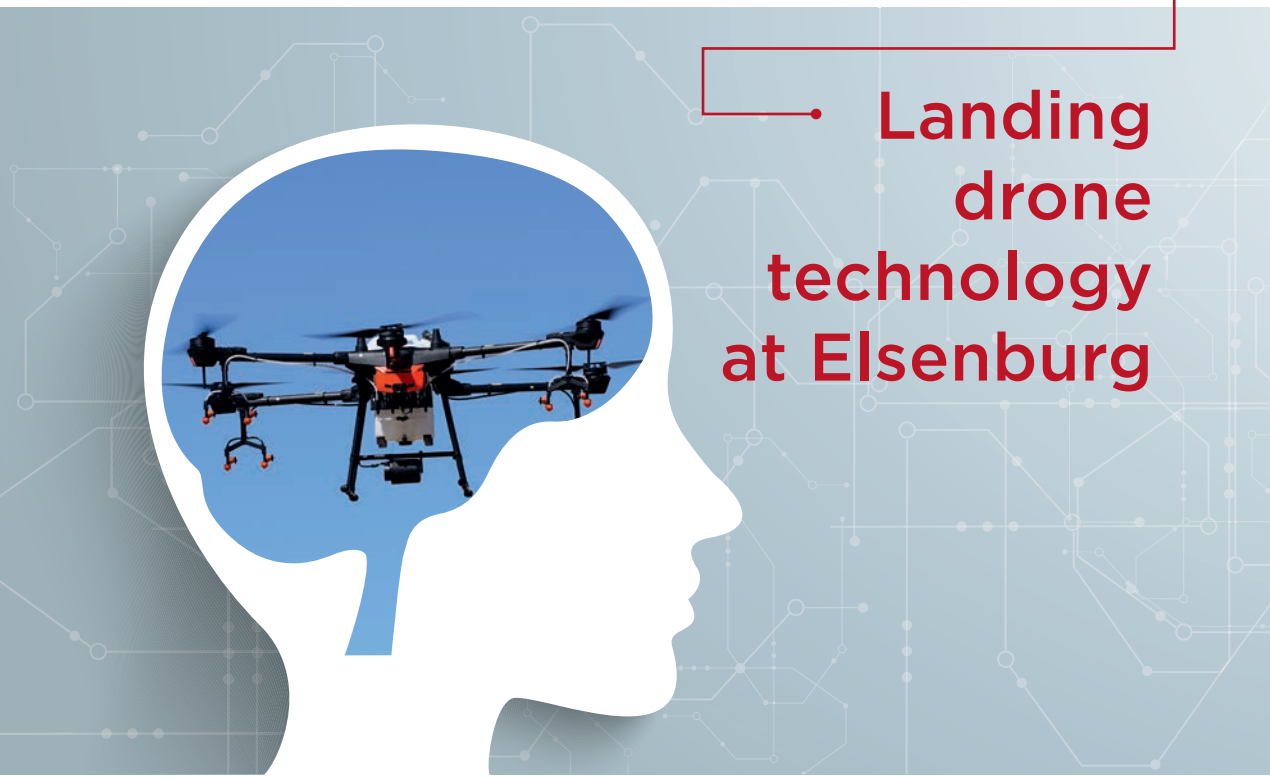
Embedding the Fourth Industrial Revolution for agricultural development



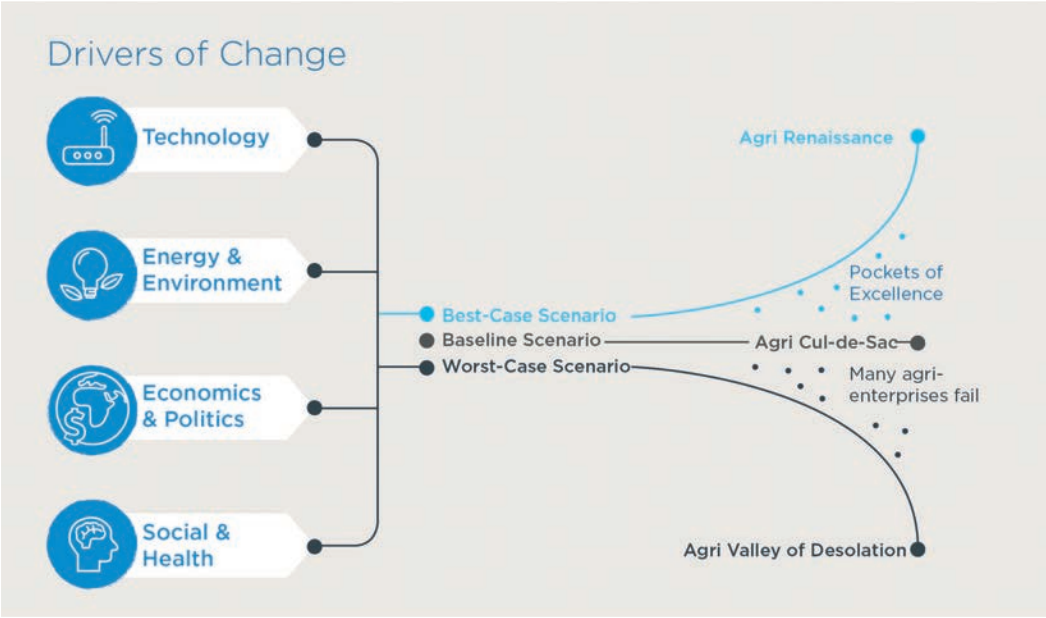
Landing drone technology at Elsenburg

by Shelton Kaba Mandondo, sheltonm@elsenburg.com

Context

In 2018 the Western Cape Department of Agriculture conducted an evaluation to determine the future of the Western Cape agricultural sector, in the context of the Fourth Industrial Revolution (4IR). The process involved an in-depth analysis of the various trends underlying the 4IR, its impact on the Western Cape and how the province can minimise any negative impact and support positive trends. On completion of the study, stakeholders were consulted to scrutinise the possible avenues the sector could pursue in the next decade to respond appropriately. These future scenarios are presented in Figure 1.

Figure 1: Future scenarios for the Western Cape



The 4IR has already started.

The Western Cape agricultural system needs to shape its own future.

A way of doing this is to focus on the desired end-state, which in this paper is described as an "agri renaissance".

There was broad consensus that the dramatic pace of technological change poses a threat to the employment of rural young people and sector development. Subsequently, significant changes and realignments were mapped in response to the inputs received. The final recommendations were used in the development of the management improvement plan (MIP). In this MIP, four improvement objectives (with specific activities) were developed for implementation, namely:

1. Embed "agri renaissance" in the Western Cape as the desired end-state of the 4IR.
2. Accelerate responsible technological adoption in the Western Cape's agricultural sector.
3. Develop young people to embrace the 4IR in support of agricultural development.
4. Shift perceptions of agriculture to align with the context of the 4IR.

Implementation

Out of the four improvement objectives above, the development of the youth to embrace the 4IR in support of agricultural development emerged as a low-hanging fruit for the picking. Globally it has been proved that training the youth in the application of drone technology will give the agricultural sector a high-technology makeover. It will enable a host of activities that include planning and strategy based on real-time data gathering and processing and development. For this reason, the »

introduction of unmanned aerial vehicles (UAVs, better known as drones to students and officials in the agricultural space) was deemed imperative to address the "agri renaissance" objective. Figure 2 shows one of the ways aerial and ground-based drones can be used for agricultural production.

UAVs were first tested by the Chief Directorate: Research and Technology Development at the start of 2017 to assess their application and functionality in agriculture. After successfully evaluating UAVs' true potential, they were regarded as a useful tool for a variety of applications in the agricultural sector. The Chief Directorate: Structured Agricultural Education and Training was used as a strategic launch pad for the first awareness programme on 20 July 2019. Government officials, students, stakeholders, and other major role-players attended this event and were exposed to the practical application of drones in agriculture. Drone technology and its benefits were discussed, as well as the challenges and the efforts to overcome these challenges.

This was followed by a series of intensive training workshops comprising lectures and practical demonstrations for selected participants. They were held at Elsenburg from 25 to 26 October and at the Denneoord airstrip in George from 14 to 15 November 2019. Out of these two workshops, 14 participants who emerged as top of the class were recommended for further training to attain a remote pilot licence (RPL).

This RPL training for individual students and staff was the third part of the project on advanced drone training. The practical training was done at Wild Clover in the Stellenbosch area. Theoretical training courses included air law, principles of flight, aircraft technical and general aspects, human factors, meteorology, a radio course, navigation, flight planning, and exams. On completion, the participants received their licences in October 2020 to legally fly a drone for commercial purposes. This qualification is recognised by the South African Civil Aviation Authority (SACAA).

Figure 2: Opportunities for drone users

- **Thermal sensors for precision irrigation**
- **Precision crop spraying**
- **Crop monitoring**
- **Health assessments**
- **Soil field analysis**
- **Planting**

Moving forward

The WCDoA has embraced the drone technology training as a useful adjunct to repositioning the sector for sustainable growth during the 4IR. The drone RPL graduates will have a competitive advantage in the sector labour market. It is expected of the graduates to help towards giving the agricultural sector a high-technology makeover. This includes the capability to use drones for planning and strategy development based on real-time data

gathering and processing. Farms and agri-businesses that absorb our RPL graduates stand a good chance of improving crop yields, saving time, and making land management decisions that will improve the long-term sustainability of the sector. The success story of the first RPL training intake has prompted the department to launch a second RPL training course in the 2020/21 financial year. To keep the graduates active, a process is underway to establish a drone club. An application for a departmental remote operating certificate (ROC) is also on the cards. This move will keep the drone spirit at Elsenburg beyond the 21st century. Watch this space!

XHOSA SUMMARY

Ubuchule nge Drone ehlala phantsi e elsenburg

Kumnyaka ka 2019 iSebe leZolimo eNtshona Koloni liveze uqeqesho olungobuchule bokusetyenziswa kwe "Drone" njengomatshini osetyenziswa ekuncedeni ukulungelelanisa elicandelo leemveliso kuhlumo oluzinzileyo ngelixesha le "4th Industrial Revolution (4th IR)". Inkqubo elandelweyo iquke ukukhangelwa ngemo yeziphumo zayo kunye nohlalutyo olunzulu ngeendlela eziliqela ezixhase ukusebenza kwe "4IR", imiphumela yayo emihle eNtshona Koloni kunye nendlela eli phondo elinokunciphisa ngayo imiphumela engafunekiyo ze ixhase ezona zinto ziyingenelo. Kuvunyelwene ngembono yokuba ukutshintshwa-tshintshwa ngokukhawuleza kwezobuchule kunika ingxaki ekuqeshweni kolutsha lwasemaphandleni kunye nokuphuhliswa kwecandelo leemveliso apho uqeqesho lo Lutsha kubuchule bokusetyenziswa kwe "Drone" bekunokunceda kumathuba okuphuhlisa kwezolimo. Ukusetyenziswa kwee "Drones" kunkcenkceshela kanye kwindima ekulinywe kuyo, ukutshizwa kwezityalo, Ukubeka esweni kwezityalo, ukuxilonga imo yempilo, uhlalutyo lomhlaba wamasimi kunye noCwangciso.

Kunamhlanje, ngama 32 abathathi-nxaxheba nabaquka amagosa karhulumente kunye nabafundi abathe baboniswa indlela yokusetyenziswa kwe "drones" kwezolimo. Ngenyanga yeDwarha 2020, lishumi elinesine abathathi-nxaxheba abaphumeleleyo anabikwe iphepha-mvume lokuyibhabhisa (RPL) nelamkelweyo liGunya Lezophapho kuMzantsi Afrika (SACAA) ukuze bazisebenzise ngokusemthethweni kwimisebenzi yokurhweba. Ezi zifundiswa zinezakhono zokusebenzisa le "drone" ekucwangciseni nakuphuhliso lwamacebo okusebenza ngokusekelwe kwiinkcukacha eziqokelelwe kulwazi lwala-maxesha ze lusetyenziswe. lifama kunye namashishini angezolimo nathe aqesha ezi zifundiswa asethubeni elihle okufumana isivuno esongezelekileyo, onge ixesha ze athathe izigqibo ngolawulo lomhlaba oluzakuphucula uzinzo lwexesha elide kweli candela leemveliso. Ukugcina umoya wokusetyenziswa kwe "drone" e Elsenburg, kuzakusekwa i"Club ye Drone" apho eli Sebe lizakuba nephepha-mvume lokuzibhabhisa (ROC) nelilelokusebenzisa i"drone" kwimisebenzi yayo e Elsenburg. AP

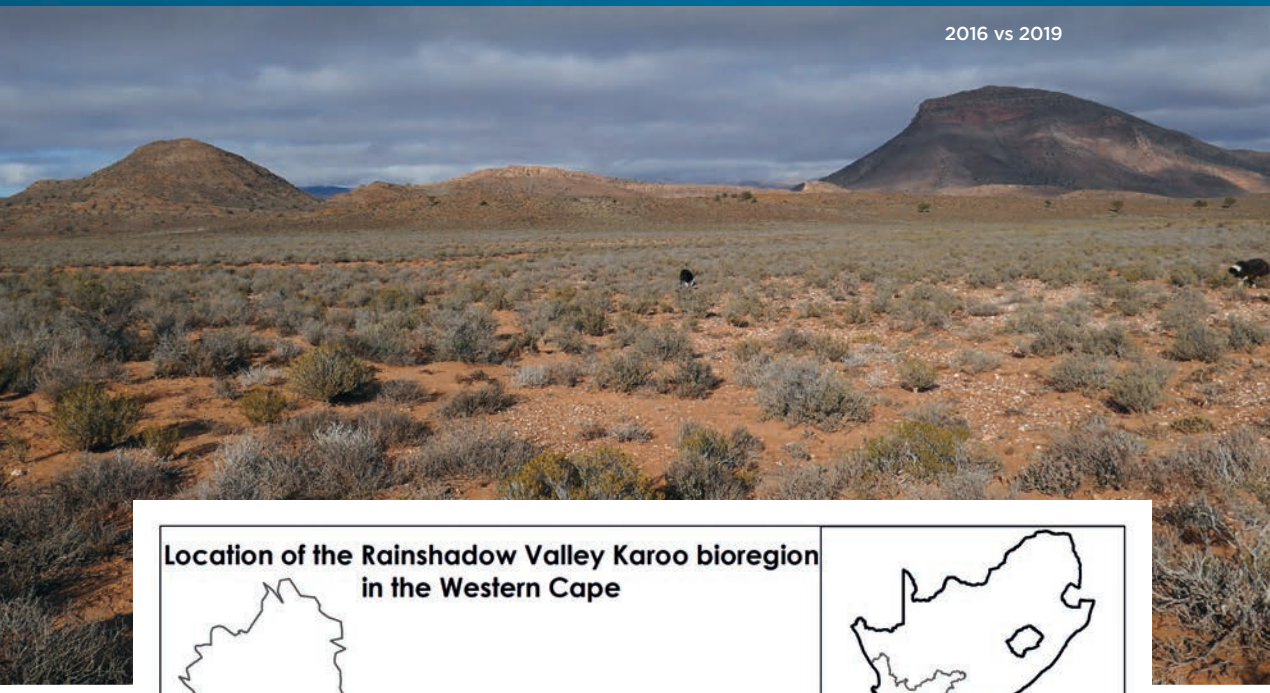
The lingering effect the Rainshadow

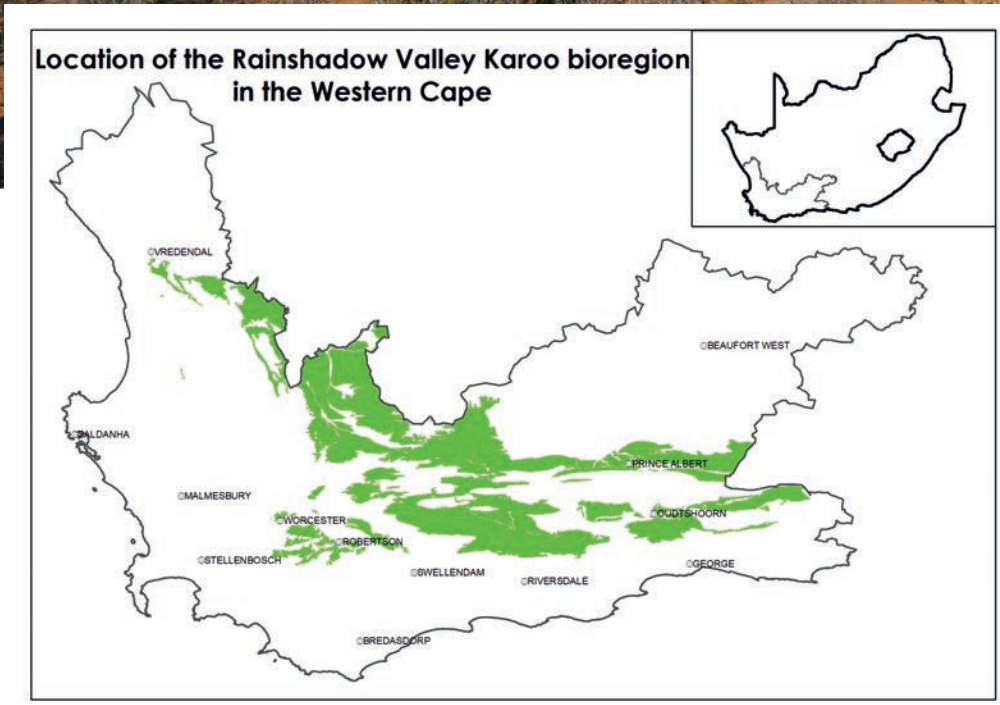
by Nelmarié Saayman, nelmaries@elsenburg.com

South Africans are all too aware of the impact of the drought of the past few years. Not only because of Cape Town's (almost) Day Zero, but because of the cries for help from our farmers. They do not have food for their animals, nor can they produce it on irrigated land as the dams are dry. This is especially true for the Little Karoo.

The Little Karoo forms part of the Rainshadow Valley Karoo bioregion of the Succulent Karoo, which is a very special place regarding, among others, its high plant species diversity. The high diversity is possible because it has a predictable winter rainfall with few extended droughts. However, the bioregion has experienced an extreme drought since 2015, receiving less than 50% of the mean annual rainfall in the past couple of years. Droughts lead to changes in plant species composition and cover, and ultimately

of the **drought** in Valley Karoo





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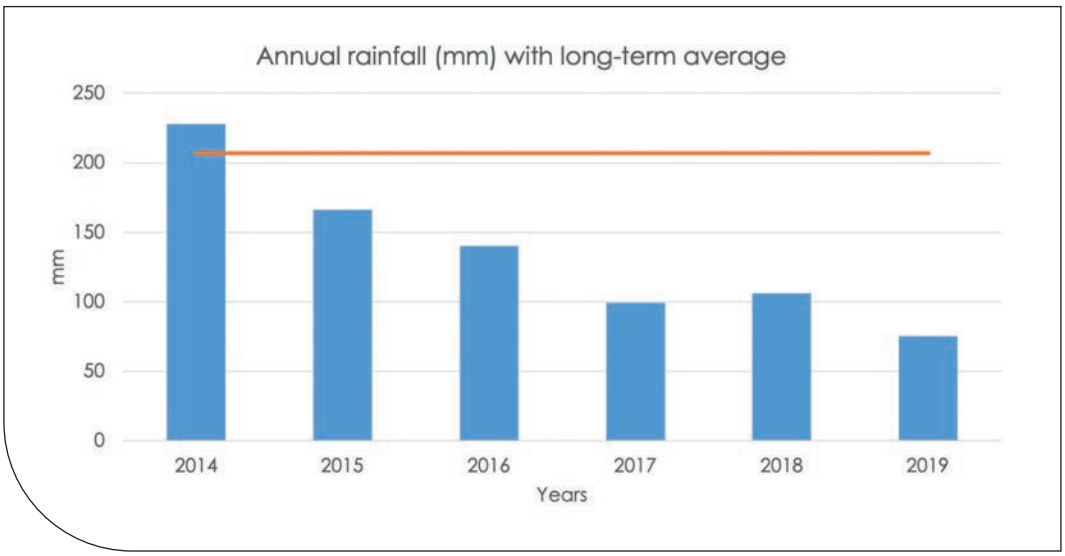
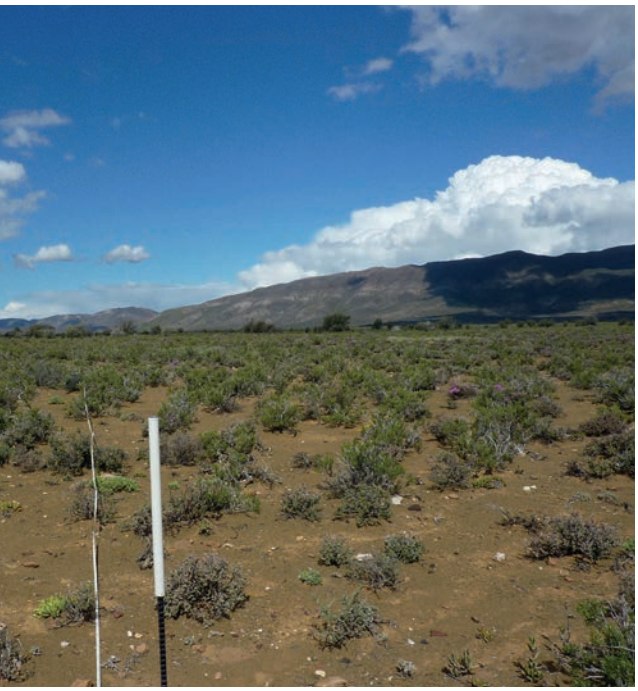


the condition and carrying capacity of the veld that animals, and many people, as a result, are dependent on for their livelihoods. Droughts have the potential to degrade the vegetation to such an extent that it cannot support livestock economically.

The veld research team at the Western Cape Department of Agriculture is studying vegetation changes in the arid regions of the Western Cape over the long term. It has been decided to use the data from 14 farms in the Rainshadow Valley Karoo to determine the possible impact of the drought on plant species composition and cover. Surveys in the bioregion were done in the winter of 2016 at the onset of the drought and were repeated in the winter of 2019. Rainfall figures were also obtained from the farms.

There was a significant change in the species composition with more than 15% of the species lost during the study period. Most of these species were previously present in small numbers. More common species that showed a sharp decline in their cover over time included bitterbos (*Chrysocoma ciliata*), asbos (*Psilocaulon junceum*) and bierbos (*Pteronia oblanceolata*). It appears that these species are not drought tolerant. The first two species have little value from a grazing perspective and if present in high numbers, is a sign of mismanagement. However, bierbos is a highly valuable dwarf shrub that is readily

> The drought has affected the species composition negatively with fewer, mainly less valuable, forage species remaining after the drought. Therefore, the overall condition and potential agricultural productivity of the Rainshadow Valley Karoo veld has been reduced by the five-year drought.



browsed by livestock and game and its presence indicates veld in good condition. Their numbers are generally not high in the study area.

Succulents, dwarf shrubs and shrubs accounted for 99% of the plant cover, with succulents, as expected, the most dominant (53%). The cover of all three of these growth forms decreased significantly with the highest percentage change in the dwarf shrubs (-32,4%), followed by the succulents (-27,5%) and shrubs (-27,1%). A study by Milton and others in the Steytlerville area after the drought of 1990/91 found that succulents were much less affected by drought than the dwarf shrubs. However, since most of the succulents are not that palatable, their decrease in this study was most likely due to the drought rather than grazing. The cover of all palatability classes declined over the study period with the highly palatable species showing the greatest decrease (-67,2%). Highly palatable and palatable species accounted for 14% to 16% of the plant cover and unpalatable species 25%, where most species present in the Rainshadow Valley Karoo are unpalatable species. The total plant cover declined by 26,2%, while the cover of dead plants increased by 71,4% during the drought. The loss in plant cover allows space for new plants to establish after the drought. However, this can only be positive if there are desirable species present in the veld that can provide seed, and in the case of this bioregion it seems highly unlikely.

The drought has affected the species composition negatively with fewer, mainly less valuable forage species remaining after the drought. Therefore, the overall condition and potential agricultural productivity of the Rainshadow Valley Karoo veld have been reduced by the five-year drought. It will need several years of above-average rainfall and sound veld management practices to recover. With the long-term study underway, we might be able to predict how many years it will need to recover. AP

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The camera maketh the bird

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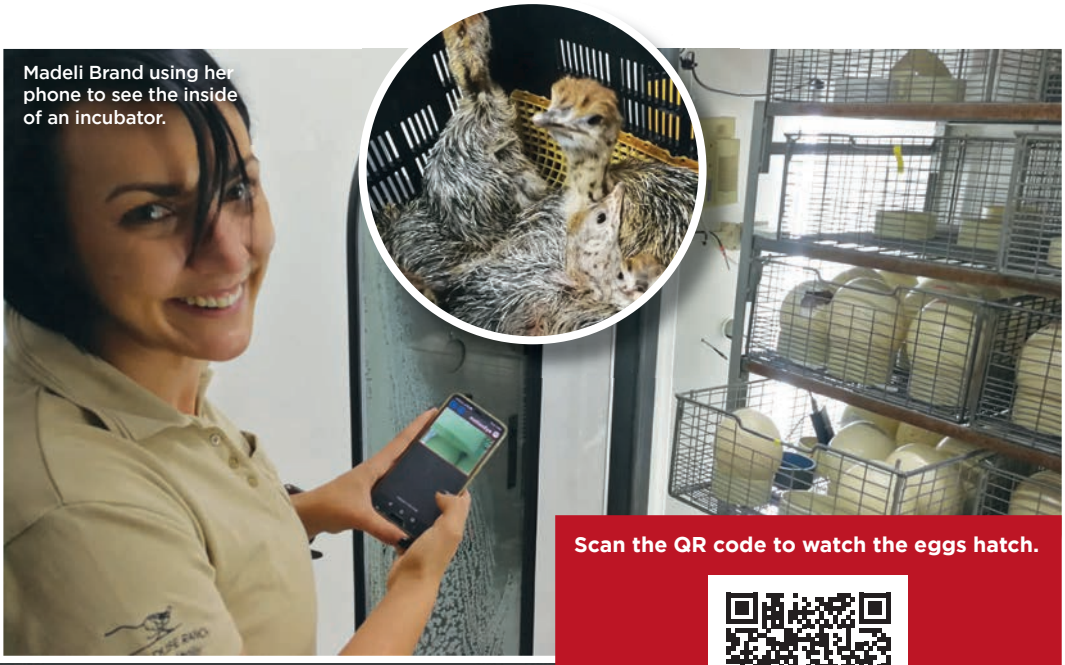
by Arie van Ravenswaay, arievr@elsenburg.com

It is an early morning indeed on the Oudtshoorn research farm, the only ostrich research facility in the world. At four o'clock the researcher is already at work and checking the ostrich chicks in the incubator. These machines are quite large and have stacked drawers to put the eggs in. It is the responsibility of the researcher to make sure these chicks hatch safely without any problems, and that is where our problem starts.

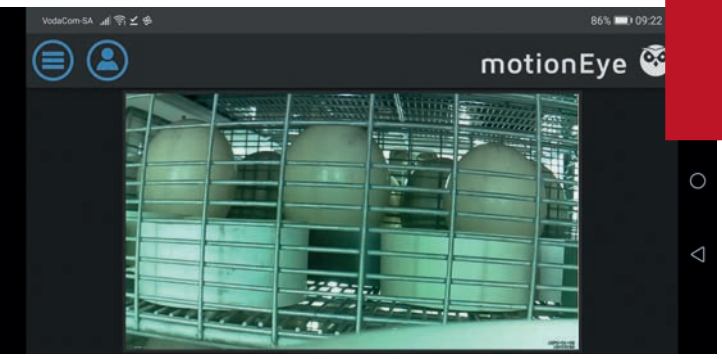
This task can become daunting and every year during the hatching period the researchers virtually live at work. The chicks need to be constantly watched for several factors including heat, humidity, removal of chicks, stress of the hatched chicks and cleaning of the incubator. The day starts early and ends after 10 o'clock at night.

What if there were a way to watch the chicks, without disturbing them, from your phone or laptop, anywhere, at any time? A new concept is a small night vision camera connected to a Raspberry Pi (no, not the food, the microcomputer) and a Wi-Fi module. It is a compact device that can be installed inside the incubator allowing one to view these wispy animals and record their every move.



Madeli Brand using her phone to see the inside of an incubator.

Scan the QR code to watch the eggs hatch.



The Raspberry Pi uses an infra-red camera with night vision capability. This means that the researchers never disturb the chicks by switching on the lights. The researchers can still see everything happening inside the incubator, although not in colour. All recordings are saved to either the onboard memory, an external hard drive, a network drive, or a combination thereof. A video feed can even be shared live to an online platform for the whole world to see.

A choice of time-lapse photography, video recording, movement tracking and recording or photo tracking with movements is available.

This is especially useful as no recordings are made until the eggs start to break. It saves memory and allows researchers to see the entire process on video. Timestamps are available so the time taken for the entire process is recorded. If the lights do go on again the camera goes back to normal colour mode. Future models may incorporate various sensors to monitor the surroundings and log this data while recording.

This innovation is part of our drive to take 4IR and related technologies deeper into our department and in programme research and technology development, which are our core objective.

The possibilities are endless with new technology, and not only does it allow us to take greater care of our animals, but it also allows us to take care of our researchers. AP

Extract from *Caring for People and the Planet*

Water security equals

Scan this QR Code to download The Abundant Harvest:

a growing economy

In a country that has been listed among the world's 30 driest countries, water security is paramount. It goes without saying that structures for the storage and distribution of water for activities such as agricultural irrigation, human consumption and industrial use are worth their weight in gold. The recent drought has magnified the importance of efficient water management for those involved in agriculture, and poor or aged water infrastructure is not to be tolerated.

Preventative and continuous maintenance by the Western Cape Department of Agriculture (WCDoA) in areas such as the Lower Olifants River and Leeu River not only provides water security, but averts the loss of productive agricultural land. This, in turn, results in sustained job security in communities largely dependent on agriculture for their livelihoods.

New life for an ageing canal system

Irrigation agriculture is the biggest water user in South Africa, responsible for nearly 62% of the national water usage. When it became clear that the ageing canal system of the Clanwilliam Dam is threatening water supply, the WCDoA and the Lower Olifants River Water Users Association (LORWUA) jointly tackled the problem.

The canal is the sole infrastructure for bulk water supply to the regional population of approximately 60 000 people of the towns of Klawer, Vanrhynsdorp, Vredendal, Lutzville, Koekenaap, Ebenhaeser, Papendorp, Strandfontein, and Doringbaai. The canal also provides water to local industries and commercial wine cellars. Most importantly, irrigation agriculture on 860 farms (12 000 to 14 000 ha) is a key driver for economic growth and job creation in the area and is highly dependent on this water system.

The 280 km concrete-lined canal system reaches from the Bulshoek Dam, along the Olifants River to Ebenhaeser and supplies bulk water for domestic, industrial and agricultural use in the wider Matzikama municipal area. However, the 80-year-old canal increasingly requires maintenance to minimise water losses.

On 5 January 2015, 180 metres of the left bank branch collapsed and washed away, directly impacting on water supply to 4 300 hectares under irrigation during the peak summer period. In the following

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years two more canal breaks occurred, demonstrating the vulnerable condition of the canal. Following the canal break in 2015, LORWUA embarked on a preventative maintenance programme to identify high-risk areas for refurbishment. A partnership between LORWUA and the WCDoA has made R12,5 million available for this process over the past five years (2015 to 2020). The arrangement mitigated the economic impact resulting from job losses and loss of revenue due to damaged crops following the disaster.

Maintenance on the canal is done in a two-weekly intermittent period during the winter when the canal is shut down. It comprises the cleaning and removal of old concrete and applying specialised materials to waterproof and protect the integrity of the structure.

This labour-intensive project not only addresses water losses, but provides valuable employment opportunities to the local communities, while contributing to the economic sustainability of this extensive area.

Restoring the Leeu River weir

The Voëlvlei Dam is an off-channel dam in the Berg River catchment area. It is not situated in the path of a river, but receives water diverted from several nearby rivers through a network of canals. This requires a high level of infrastructural maintenance to weirs that divert water from the rivers, as well as to the canal network linking the rivers to the dam.

The Voëlvlei Dam, currently one of the six largest dams in the Western Cape, was commissioned in 1952, and was the first large water supply scheme in the Berg River catchment area. The catchment area of the dam was originally only 31 km^2. Canals were added from the Klein Berg River, and eventually from the Leeu and Twenty-four rivers in 1971 to satisfy the increasing demand for water. The towns of Riebeek Kasteel, Riebeek West, Malmesbury, Darling, and Moorreesburg, numerous farms, and the ever-expanding Cape Town, all depend on this water source.

The Leeu River weir – a concrete structure, which collects and then diverts the river run-off into a canal – is situated near Porterville. Following a wildfire toward the end of 2014, the subsoil in the catchment area was exposed and heavily eroded, totally filling up the weir, which compromised the weir's capacity to store and divert water. Not fixing the weir would carry the risk of a 10 million cubic metre loss to the water system. The prevalent drought further intensified the need to ensure that all possible water resources be fully operational.

The WCDoA therefore made R3,5 million available to conduct emergency maintenance, including the removal of sediment from the Leeu River weir. This made a significant amount of water available during a time of drought. A side benefit of the clearing action was that the sediment was repurposed on the adjacent farm to reclaim land for producing export table grapes under netting.

The department is committed to continuous preventative maintenance on infrastructure throughout this water-scarce province for the benefit of communities and producers. AP

> Most importantly, irrigation agriculture on 860 farms (12 000 to 14 000 ha) is a key driver for economic growth and job creation in the area and is highly dependent on this water system.

It all started with **water**

by Chris Barr, chrisbarr@telkomsa.net

When business strategist Chris Barr moved to Murraysburg, he asked one question: What can we do to fix this town? The answer was: Start with water.

Murraysburg is a town in the far northeast of the Western Cape Province. It is part of the Beaufort West municipality deep in the central Karoo, with approximately 5 000 people.

As in all Karoo towns, water is the *dorp*'s lifeblood – and by 2007 Murraysburg's biggest problem was that it did not have any water for agricultural use. "We knew the soil was very fertile. Anything grew here but there was no water." The town's history pointed to a very different situation, however. A water system constructed in the 1800s, diverting water from the Buffels River, supplied Murraysburg with uninterrupted water. It included irrigation furrows ("leiwater") servicing the town's irrigated properties, but in 1988 the infrastructure was badly damaged by floods and the municipality decided not to fix it.

By the late 1990s it was in total disrepair, and the Murraysburg Sustainable Development Council (MSDC) then stepped in. It is a non-profit organisation founded by Barr, a local farmer, Izak van der Merwe and Adri Smit, and the organisation's predecessor, the Murraysburg Environmental Forum.

"We called the guys from Water Affairs and they said the water license had lapsed because the scheme had not been used for so long. I started researching. Izak van der Merwe told me that his family had been keeping meticulous records of the water. He showed me one of those black hardcover notebooks with the gold writing on it. The records went back decades. He said there were more if we needed it." After perusing the notebook, Barr discovered that a borehole had been sunk next to the river in 1906 and it had been in continuous use. "The officials from Water Affairs agreed with me and we got our license back," he said.

Much of the "institutional knowledge" associated with operating and maintaining

the entire irrigation distribution system had been lost over time. But the MSDC pressed on …

"We must create hope in this town," Barr says, "and we must do it visually. The refurbishment of the dams was a way for us to start doing this." Using local contractors and with a R1,5-million grant from the Western Cape's Department of Agriculture's Sustainable Resource Management programme, the fixing of the town's water scheme started in September 2016 and was completed three months later. "I will never forget the one night when I went to do my rounds. I saw a man standing at the dam as it was filling up and he was crying. He was a security guard at the school across the road and he told me how he had been watching the construction taking place. It was tears of joy just to see the dam filling up."

The two major irrigation canals in the Town were rebuilt from scratch in order to reduce the loss of flowing water to a minimum. Over a period of six months a dedicated team of local workers were trained. They painstakingly constructed

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> We must create hope in this town," Barr says, "and we must do it visually. The refurbishment of the dams was a way for us to start doing this."

new furrows using locally produced bricks. Wherever possible, sections of the original stone furrows were preserved.

Lucern patches (*akkers*) have sprung up on previously fallow ground to provide feed for goats and sheep in the town.

Then came the garlic. "We were looking to find something that would be labour intensive, a crop that would not easily be stolen, and something that would survive the harsh Karoo weather," Barr said. After one of the local farmers told him about the Murraysburg heritage garlic that grew in the area, he investigated further. Garlic ticked all the boxes.

In 2017 a 1 000 square metre pilot project was launched at what Barr jokingly calls "Knoffelhoek" (Garlic Corner) to determine the feasibility of garlic. Apart from Egyptian white garlic, which had a high commercial value, Murraysburg heritage garlic was also planted. The garlic flourished and approximately 1,3 metric tonnes were harvested. The harvest was replanted at several spots around town and by 2018 the small Karoo town had 10 000 square metres under garlic.

Murraysburg Garlic (Pty) Ltd, majority-owned by local beneficiaries as well as two brothers Craig and Ryan Newborn, fourth generation Murraysburg descendants, was born. "They had very close ties to the town," Barr said.

Four years later Murraysburg Garlic (Pty) Ltd is thriving, employing several residents and also allowing for others to become "out-growers" that supply them with garlic. Several women are involved in the packing of the garlic bulbs and plans are going ahead to construct a fully equipped processing plant to expand operations.

Murraysburg residents who worked on the project in the early stages have become shareholders and directors of one of the

companies. A part of the land that was home to a failed vegetable project, initiated but not sustained by local-government, is also being planted with garlic.

While garlic production is ongoing and the area under cultivation is expanding, an agriculture processing facility is being established, creating more jobs and income opportunities within the local community.

A project is currently under way to extablish the viability of harvesting storm water flowing through the town during local rainfall events. The project would make use of existing excavations surrounding the 160-year-old brickfields in the town to provide an additional 500 000 + cubic metre storage facility which will enable us to expand the land under cultivation.

The Western Cape Department of Agriculture has been a key partner in this success story for more than twelve years now.

And it all started with water ... AP

ELSENBURG JOURNAL

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Embracing the future

GreenCape 2021 sustainable agriculture market intelligence report: Insights and trends

Embracing the future

by Dr DP Troskie, dirkt@elsenburg.com

Embracing the future is a new approach followed by the Western Cape Department of Agriculture (WCDoA) to plan its future. With this approach, the external environment of the Western Cape agricultural sector is continuously analysed, the future reimagined, and causal linkages between service delivery and outcomes developed. To this end the department has developed an innovative approach over the years to ensure maximum benefit to the scarce resources invested by the taxpayer.

Firstly, it is important to understand what is to be delivered (what to do). According to the Constitution of the Republic of South Africa (Act 108 of 1996), agriculture is a Schedule 4A or "concurrent" function. This means that both the national and provincial spheres of government have legislative powers over agriculture. At the same time, agriculture is a key element of all three spheres of government. At national level, the National Development Plan has challenged the agricultural sector to create one million jobs in rural areas by 2030 and to transfer 20% of white-owned land to previously disadvantaged people. This is to be achieved by growing labour-intensive, export-focused irrigation farming. In the Western Cape the Provincial Strategic Plan has identified five "visionary inspired priorities" (VIPs), which will support the achievement of its objectives over the next five years. The agricultural sector plays a key role in each of them but is particularly prominent in VIP2 (economy and jobs). Three focus areas, one of which is jobs, were also identified by the province as part of its post-COVID-19 recovery plan. Finally, in most of the municipalities of the province, agriculture is the most important economic sector with tourism (often heavily reliant on farm-related activities) in second place. In each district of the province, agriculture is also the most competitive economic sector.

Because agriculture is an important part of delivery in each sphere of government, the WCDoA is expected to deliver on 109 distinct targets. Furthermore, this delivery needs to take place within the following constraints:

- natural (land, water, climate)
- social (human, skills, cultural)
- economic (capital, markets)
- natural, social, and economic risks

For this reason, the WCDoA developed its own model of causality or theory of change (TOC) to deliver on these expectations. According to the high-level TOC (see Figure 1), farming is about combining resources during the production process. From primary production, secondary production can follow and the output from both is marketed via domestic and export markets. Economic growth, food security and jobs can only flow from markets or production in the value chain. Numerous factors cover the whole value chain, including enablers such as:

- technological development;
- innovation;
- embracing the Fourth Industrial Revolution (4IR); and
- a capable state.

At the same time, transformation must take place and special attention needs to be given to designated groups.

Based on this model, 14 different points of intervention were identified and for each a unique TOC was developed. The paths between outcomes and the necessary outputs for each activity and input where chartered. Furthermore, the most appropriate places to measure indicators were identified.

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The development of these causality arguments is not a once-off event but is part of a long-term iterative process, and evaluations or research projects play a key role. These projects include the following:

- Diagnostic projects (what is happening out there and what should we do)
- Design (how should we respond)
- Implementation (how effectively did we respond)
- Outcome (what was the result of our response)
- Impact (what was the contribution to our goals)

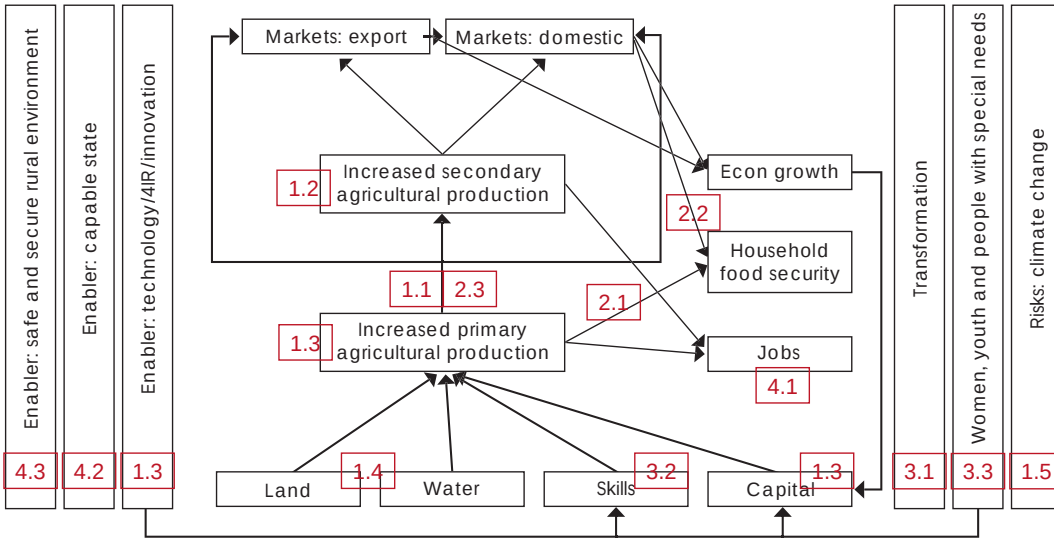
To be objective and ensure an unbiased view, these evaluations are usually conducted by an external service provider. The department must then develop a response plan, called a management improvement plan (MIP), to address each of the recommendations made in the evaluation report. It does not mean a recommendation must be accepted, but a sound motivation must be provided if it is not to be implemented. For those recommendations that are accepted, an implementation plan with deliverables, targets, timelines, responsible persons, and budget allocation must be included in the MIP. Furthermore, progress with implementation is to be monitored on a regular basis. The evaluation reports and the MIPs are available on the website of the department.

Since 2013, 24 evaluations have been completed. One example of an environmental scanning project is the diagnostic and design evaluation of the impact of the 4IR on the Western Cape agricultural sector. This external evaluation was conducted by Stellenbosch University Business School and in the subsequent MIP, four improvement objectives were included:

- Embed the 4IR in the activities of the department
- Accelerate responsible technology adoption in the Western Cape agricultural sector
- Develop young people to embrace the 4IR
- Reposition perceptions of agriculture in the context of the 4IR

Some of the key projects flowing from the implementation of this MIP include the following:

Figure 1: High-level TOC for the WCDoA



- Thirteen officials, students and interns were assisted to attain their remote pilot license (RPL). A further 18 are currently undergoing training. The result is that young people now have an RPL as well as an agricultural qualification, which makes students and interns highly marketable.
- The department has applied to the South African Civil Aviation Authority for a Remotely piloted aircraft systems Operator Certificate (ROC).
- A module in e-commerce has been developed with the University of the Western Cape (UWC) and 50 smallholder farmers have been trained. This will enable them to take part in the post-COVID-19 environment.
- A module in digital literacy has been developed for agri-workers and presented to a pilot group. This will enable the most marginalised segments of our society to effectively become part of the bigger society.
- UWC is the only university in South Africa with a postgraduate course in augmented/virtual reality (AR/VR). The students have been sponsored to do their practical exposure in agriculture and, in this way, potential applications in farming were explored. At the same time, the students were stimulated to consider the potential of agricultural applications.
- A range of projects such as CapeFarmMapper, the Smart Pen, FruitLook, and Tractor Tracker have already been implemented.

Other external evaluations include the following:

- A diagnostic and design evaluation of farmers' needs. The clients of the WCDoA range from food gardeners with access to a plot the size of a door to multi-national farms with properties on various continents. For each of these farmer categories specific needs have been identified.
- Two implementation and impact evaluations of the success of land reform beneficiaries supported by the department. In 2014 a success rate of 62% was achieved and in 2018, 72%. This is in sharp contrast to the less than 10% success rate found in the rest of the country.
- Three implementation and impact evaluations of research focus areas such as dairy research and crop rotational trials.

This process is continuing. Because arid areas will face the biggest impact of disruptors, the WCDoA is currently doing a diagnostic and design evaluation of the future of farming in the arid areas of the province. We are all aware of the devastating effect of the long-lasting drought in parts of the province. Since animal farming is the core activity, one can only speculate on the impact of something like artificial meat on farming systems in arid areas. One should also not ignore the rapid strides made in the development of artificial materials and fibres, which could replace wool and mohair. This evaluation report is due by 31 March 2021.

The development of a post-COVID-19 strategy for the Western Cape agricultural sector has been completed. A number of critical themes have been identified and five potential scenarios for the future have been developed. Based on the themes and scenarios, four intervention points with high leverage have been identified:

- Deploy and "democratise" 4IR technology
- Make large-scale sustainable, "climate-smart" agriculture possible
- Conduct agricultural education and knowledge transfer leading to resilience
- Practice "anticipatory governance"

These intervention points are not in conflict with the priorities identified above but provide context and quality to those previously identified. Furthermore, interventions are focused on areas that could provide the highest value to the taxpayer.

GreenCape 2021 sustainable agriculture market intelligence report: Insights and trends

Introduction

GreenCape[1] produces an annual market intelligence report (MIR) on sustainable agricultural production in South Africa. GreenCape's Agriculture Sector Desk was established in 2014 in partnership with the Western Cape Department of Agriculture (WCDoA). The desk aims to support the development of sustainable and competitive agricultural value chains through the uptake of sustainable technology and production practices.

This article provides key insights from the 2021 MIR, which includes updates on key issues and opportunities identified in previous MIRs[2]. It also highlights new opportunities related to technologies and practices that:

- increase input resource efficiency in primary production;
- benefit the environment, primarily by conserving resources, reducing negative impacts like soil degradation and pollution;
- increase resilience to climate change; and
- have the potential to attract international investment.

The 2021 MIR will be published in April 2021 and will be freely available for download. The reader can request a link by using the contact information at the end of this article. Alternatively, readers can sign up to become GreenCape members[3] (free) and receive our latest reports, news, and other developments in relevant sectors.

1. Sector overview

South Africa is classified as mainly semi-arid and has limited arable land (~13% of land cover) and low average annual rainfall (close to half of the global average), which constrains agricultural production. The country's land cover (122 million ha) and select land-use classifications are illustrated in Figure 1.

This natural resource input scarcity is exacerbated by conventional unsustainable practices such as tillage, monoculture, over-irrigation, and the use of synthetic chemicals. The harmful environmental effects include:

- loss and degradation of arable soil;
- loss of ecosystem services; and
- increased water scarcity.

Figure 2 highlights the increased uptake of more efficient irrigation systems in South Africa since 1910, where relatively more water-efficient systems such as micro- and drip irrigation has replaced less efficient systems such as flood irrigation.

These factors are key drivers for the uptake of sustainable agricultural production technologies and practices in the country.

[1] greencape.co.za

[2] greencape.co.za/market-intelligence

[3] greencape.co.za/become-a-member/.

Other trends driving investment in sustainable agricultural production include:

- the rising cost of inputs such as electricity, fuel and synthetic chemicals;
- decreasing costs of green tech, such as solar photovoltaics (PV);
- international market pressure and evolving regulations for more environmentally friendly products;
- climate change and population growth exacerbating resource scarcity; and
- increasing awareness of the importance of sustainable production among consumers and producers.

Figure 3 and Figure 4 illustrate rising input costs and the decreasing cost of green tech as factors driving conventional versus sustainable farming:

- Input cost that is higher than inflation increases for energy (especially electricity), fertiliser, and pesticides as highlighted in Figure 3.

Figure 1: South Africa's land cover and select land-use classifications (DAFF, 2013).

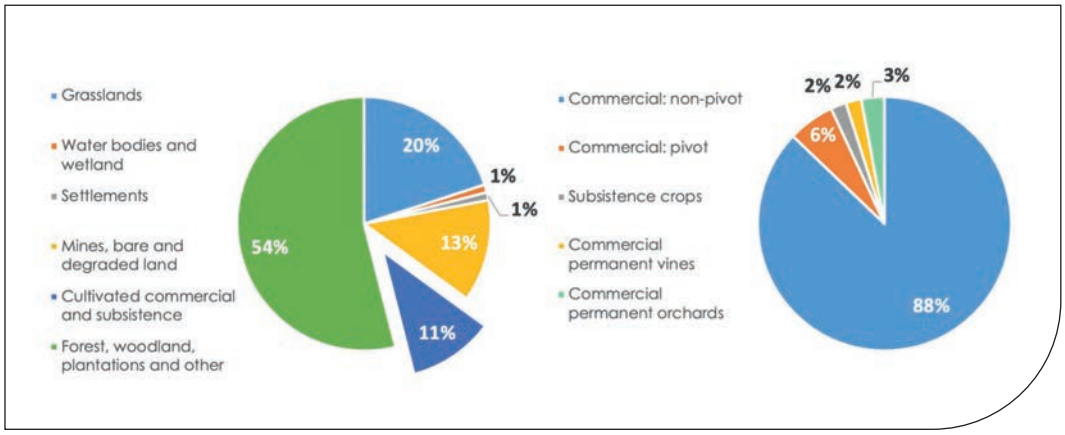


Figure 2: Irrigation development in South Africa from 1910 to 2020 (Botha, 2020).

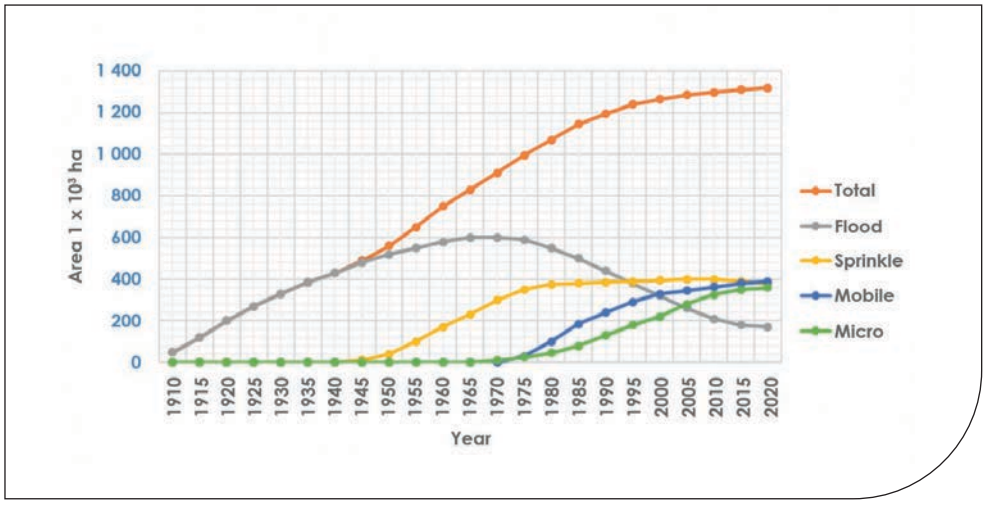
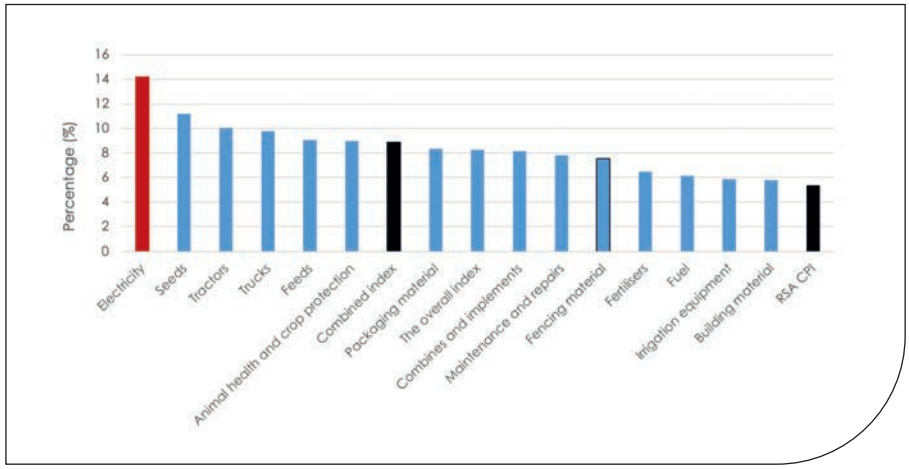


Figure 3: Cost inflation in the South African farming sector from 2009 to 2019.



- Decreasing costs of cleantech such as solar PV[4], as illustrated in Figure 4.

2. Policies and regulations

The policies listed below provide an update of recent policies and legislation relevant to sustainable agricultural production since the 2020 MIR.

2.1 Cannabis legislation

In May 2020, the Minister of Health published amendments to the schedules[5] of Medicines and Related Substances Act, No 101 of 1965 (Medicines Act), which previously excluded preparations of products containing cannabidiol (CBD) from certain provisions of the Medicines Act (Verwey, 2020). This amendment allows for cannabis as a raw agricultural commodity and the variety of its industrial applications, such as hemp. It will be regulated by the Department of Agriculture Land Reform and Rural Development (DALRRD).

The amendments of the Medicines Act are a key step towards opening up economic opportunities for the cannabis and hemp industry. South Africa has good growing conditions for the cultivation of cannabis in places such as the Eastern Cape, KwaZulu-Natal, Limpopo, and the Western Cape. The market for commercially grown cannabis has been estimated at US$1,2 billion (Agriorbit, 2020).

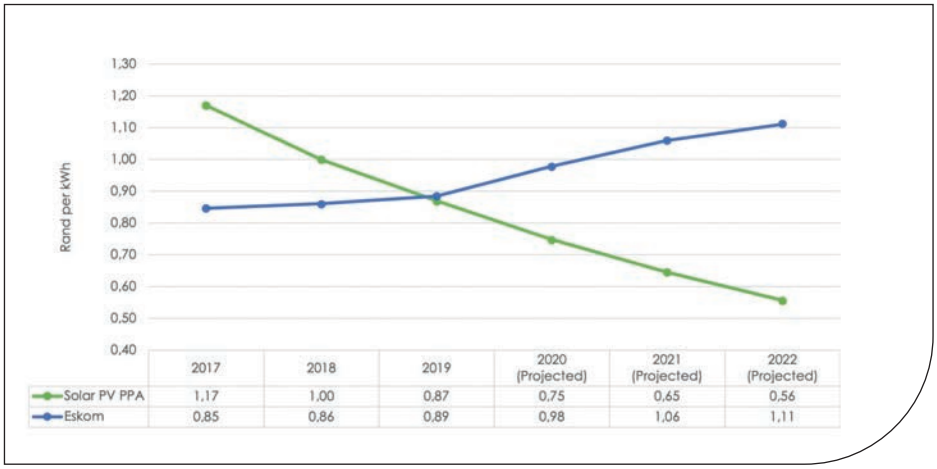
Further clarification from the DALRRD is needed on the new scheduling of industrial hemp. Currently, hemp is recognised as an agricultural crop but a permit is still required from the Department of Health to cultivate hemp for research purposes (Agriorbit, 2020). However, investments into this sector in the Western Cape have already been observed, with Felbridge Pty Ltd investing R120 million into cultivation of South African medicinal cannabis[6].

[4] For more information, see Energy Services MIR 2021.

[5] In terms of the Medicines and Related Substances Act (Act 101 of 1965), a "Scheduled substance" is defined as: "any medicine or other substance prescribed by the Minister under section 22A".

[6] cbn.co.za/featured/western-cape-to-receive-more-than-r10-billion-boost-over-next-five-years/

Figure 4: Solar PV Power Purchasing Agreement (PPA) versus Eskom tariff (GreenCape, 2020).



2.2 National Climate Change Adaptation Strategy

The National Climate Change Adaptation Strategy (DEFF 2019) was approved in August 2020 and outlines plans to build climate resilience and reduce climate vulnerability. The key actions relevant to the agricultural sector include:

- support to farmers to implement more efficient climate-smart and conservation practices;
- promotion of urban agriculture, including community and household food gardens in areas not classified as agricultural land;
- increasing the role of agricultural extension officers to support vulnerable farmers; and
- promotion and subsidisation of water conservation technologies.

2.3 Carbon tax policy update

The Carbon Offset Administration System[7] (COAS), administered by the Department of Mineral Resources and Energy, was launched on 23 July 2020 and serves two purposes:

- To define the procedures through which project developers submit eligible projects and list their credits
- To provide a platform through which emitters can surrender carbon credits against their tax obligations

Based on the carbon offsets regulation, a project qualifies as an approved project if it complies with eligibility standards that rely on existing international carbon offset standards. These include the Clean Development Mechanism (CDM), Verified Carbon Standard (VCS) and the Gold Standard (GS). The carbon offset regulations[8] provide opportunities for large-scale carbon sequestration and storage in the agricultural sector. To be eligible to generate credits for use instead of the carbon tax, projects must be located in South Africa. Projects in the transport, waste, agriculture, forestry, and land-use sectors, which are not covered by the tax, can generate carbon credits.

[7] carbon.energy.gov.za/Home.aspx

[8] cer.org.za/wp-content/uploads/2019/05/Carbon-Tax-Act-Regulations.pdf

2.4 Energy

An imbalance of supply and demand in South Africa's energy provision over more than a decade has resulted in intensive load-shedding (rolling blackouts) country-wide in 2019 and the first half of 2020. About 1,3 TWh were load-shed during these periods (Wright & Calitz, 2020). The current and anticipated future load-shedding will continue to have severe implications for the agricultural sector. In addition, irrigation-reliant and energy-intensive agribusinesses are negatively affected by above-inflation price increases for electricity due to the energy crisis. The policies and legislation in the energy sector have consequences for the productivity of the agricultural sector. Policies in the energy sector that govern the agricultural sector are detailed in the Energy Services and Utility Scale Renewable Energy MIRs[9].

Table 1: Summary of 2021 sustainable agriculture opportunities.

Opportunity	Market size update (SA)	Barriers	Macro environment
Regenerative agriculture (RA): No-till farming equipment	The estimated market size for no-till machinery in South Africa is R108 million (2019)	• High cost of equipment • Long-term return on investment when converting from conventional to regenerative practices	Globally, the uptake of conservation agriculture (CA) is high, especially in South America. Most equipment is imported. Only 15% to 20% of commercial grain farmers and 5% of smallholder farmers in South Africa have adopted CA.
Undercover farming (UF): Low- to high-tech systems with various technologies	• Low-tech systems: ~R6 billion • The market for medium- to high-tech systems is worth over R1 billion	• High capital cost with limited financing options • High cost of electricity affects viability of controlled environment systems • Business case not well established for high-tech systems	Greenhouses are well established globally. South Africa, as a developing country, has been slow to adopt greenhouse technology. Low-tech systems such as netting and tunnels are growing rapidly, especially for high-value export fruits.

[9] greencape.co.za/market-intelligence/

Opportunity	Market size update (SA)	Barriers	Macro environment
Smart farming (SF): Applying smart technology to agricultural production, particularly the Internet of Things (IoT), sensors, and communication software	Estimated market: ~R180 million.	• The mind-set change required for farmers to adopt new farm management technologies • A lack of integration between various disciplines • The inclusion of the end user in developing software solutions, which results in limited understanding of the end user's actual needs	Globally, agriculture is the least digitised sector (throughout its value chain) and technology-based decision-making is still emerging. Remote sensing applications and communication software is an emerging market in South Africa's agricultural sector.
Renewable energy applications including: • small-scale embedded generation (SSEG); • solar-powered irrigation systems (SPIS); • distribution; • storage; and • biogas	Installed capacity of solar PV in the South African agricultural market is estimated to be ~200 MWp, growing by between 50 MWp and 80 MWp over the past 12 months.	Strong business case for large (e.g. cold storage) and year-round energy users. Seasonal nature of agricultural production affects the business case.	South Africa was the fastest grower of solar photovoltaic (solar PV) installations in 2017 globally. About 10% of all solar PV installations are in the agricultural sector and the business case is well known to the industry.

3. Opportunity highlights

The following section shows a summary of the opportunities discussed in the 2021 MIR. It explains renewable energy uses in agriculture, which is the main focus of the report.

3.1 Renewable energy application in agriculture

As shown in Section 2, a historical imbalance of supply and demand in South Africa's energy system over more than ten years

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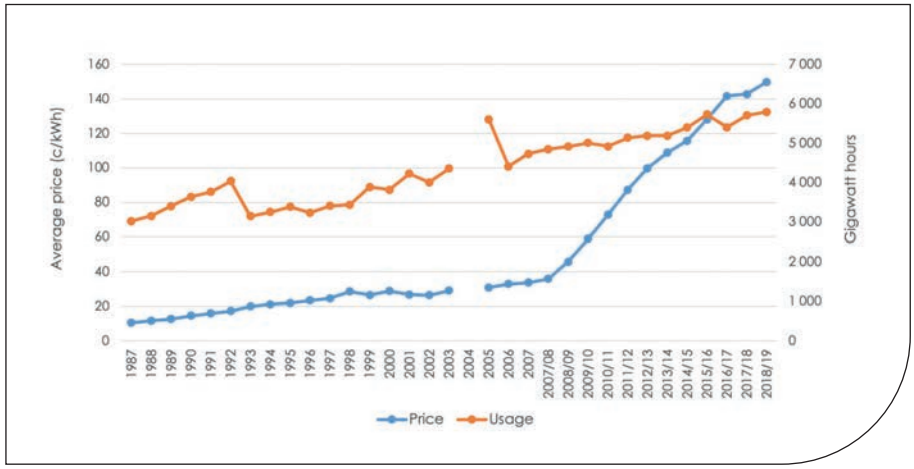
Figure 5: Electricity in SA farming (price vs demand).



has resulted in intensive load-shedding experienced country-wide in 2019 and the first half of 2020.

Current and future load-shedding has and will continue to have severe consequences for the agricultural sector as irrigation-reliant and energy-intensive agribusinesses are negatively affected by the energy crisis. This demand for energy security, coupled with falling renewable energy costs, increasing electricity prices, and favourable government policy has created a big opportunity for the agricultural sector to investigate renewable energy options.

Renewable energy technology prices have been dropping steadily since 2010. The global average price for solar PV in 2018 was R1,22 kWh, down from R5,33 kWh in 2010 (IRENA 2019), a ~77% drop in eight years. In South Africa, the small-scale solar PV levelised cost of energy is already less than R1/kWh, and on a larger scale, already less than 60c/kWh.

Rapidly rising Eskom electricity prices have created a large demand for viable alternative energy sources in South Africa. The average standard Eskom tariffs have risen by 360% since 2007. Figure 5 details the increase in the average cost of electricity as it compares to the increase in demand.

To lower the demand on the national grid, to reduce carbon emissions and to unlock new economic growth, national government and local government have put in place several energy policies and incentives to encourage energy generation from renewable energy. For more information on these policies and incentives, please visit the GreenCape Energy Services and Utility Scale Renewable Energy MIRs.

For more information on sustainable agriculture or any of our other sectors, please contact GreenCape (details below).

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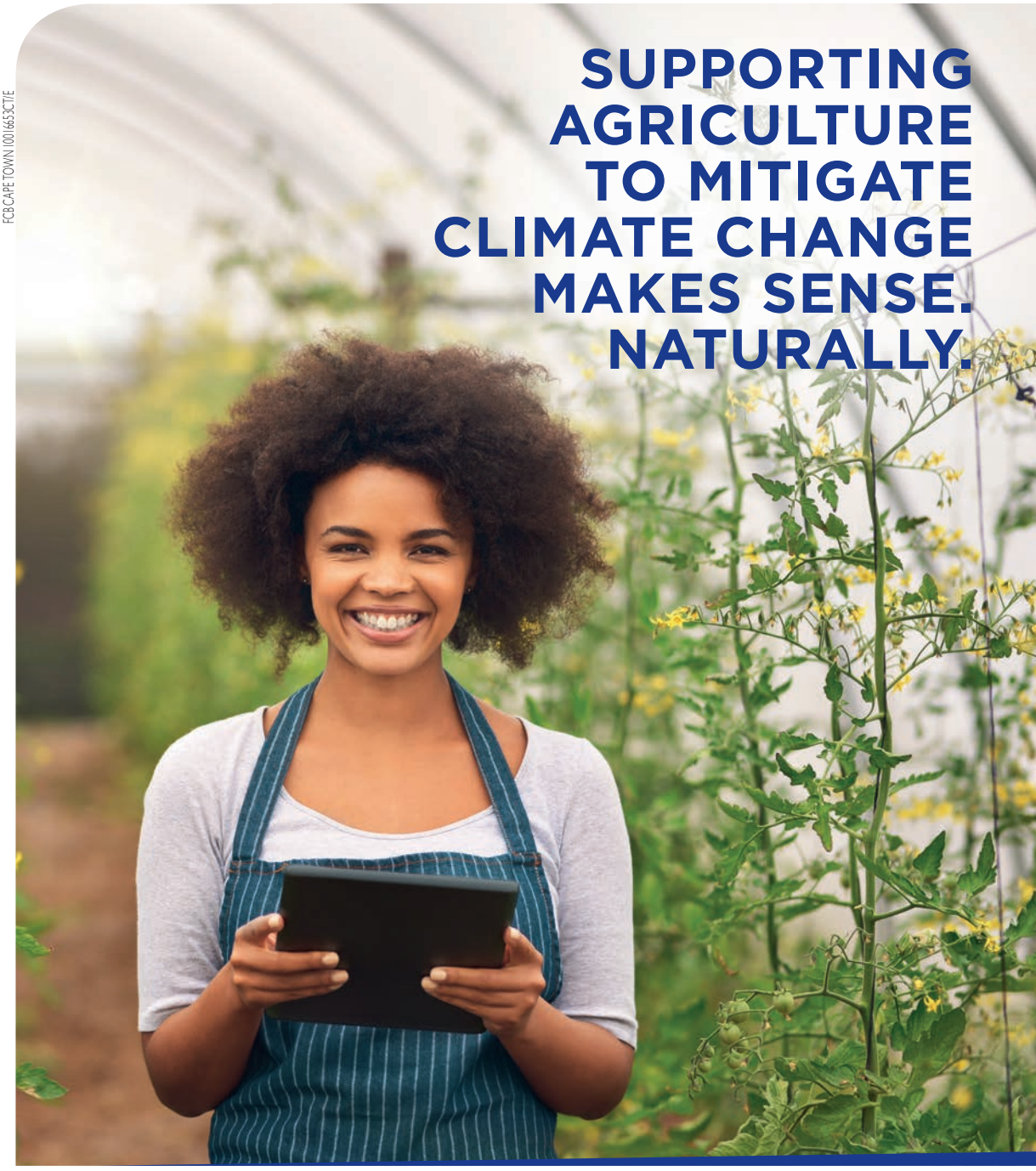

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