# ABUNDANT HARVEST

## Caring for People and the Planet

Western Cape Government

Agriculture

BETTER TOGETHER.

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Caring for People and the Planet


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# INTRODUCTION

Joyene Isaacs
Head of Department

Looking after our planet and our natural environment takes dedication and commitment. The people in this publication demonstrates both the dedication and commitment, but also a determination that can only be admired and applauded. So to all the people that cares, thank you. The next generation will realise that we are leaving them a legacy that they (the youth) must continue to build on.

The sub-theme of this Abundant Harvest book is 'Caring for People and the Planet' and resonates in the Sustainable Development Goals of the United Nations. So often, we see the planet at a distance and forget that we are part of the planet, making us responsible for the maintenance of our earthly residence. We talk about sustainability as a theoretical construct, but fail to understand that the concept of sustainability deals with our behaviour(s) and actions. The stories highlight to us the behaviours and actions required to look after our planet. A lesson for all of us to embrace and build on!

Look around and see how beautiful your environment is, let's stand still, smile and appreciate the beauty. And if it is not beautiful and not healthy, start to change it, by changing

the way you do, and if you don't know, ask for assistance – your neighbour, your friend, your family or a colleague. Ask for support to change your environment. A small action at local level can have a huge impact globally. Start now!

To all the people in this Abundant Harvest publication and to those not mentioned here, but working hard to care for the planet, thank you and keep up the good work. The planet and the environment needs you. You will get the benefit or in an agricultural context, you will experience the fruit of your labour. It is beautiful to see the 'Better Together' in action – by people, for people, for the planet and the generations to come.

The Abundant Harvest publication is the platform to acknowledge everyone in the natural resource management 'environment'. Celebrate your hard work, commitment and dedication and enjoy the wonderful stories.

# FOREWORD

## Dr Ivan Meyer
## Western Cape Minister of Agriculture

During the last quarter of 2019, I explored the majestic Western Cape - travelling to areas such as Bitterfontein, Vanrhynsdorp and Vredendal in the Matzikama region, Ladismith in the Klein Karoo, Beaufort West and Laingsburg in the Central Karoo and Touws River in the Cape Winelands district – often called the gateway to the Karoo. I met with the leadership of organised farming, the Vroue-Landbouvereniging (VLV) and visited a number of farms.

One rather memorable journey was by train from Cape Town to Laingsburg. I was struck by the changing landscape. A landscape which highlighted the beauty of our province on the one hand and the devastation of the drought on the other. The beauty of Table Mountain never ceases to amaze me. The Cape Winelands and the stretching hectares of vineyards always reminds me how blessed we are, while the quiet town of Matjiesfontein conjures up visions of elegantly dressed men and women meeting at the historic Lord Milner Hotel to enjoy my favourite beverage, tea.

The closer we travelled toward Lainsburg, the more obvious the devastation of the drought became. The bone dry, dusty veld - often sprinkled with small flocks of sheep - shout-

ed out to the world that all was not well and clearly it was not. It saddened me.

Thankfully, my sadness was soon replaced with a sense of hope. Accompanied by staff, I visited a number of farming communities. For hours we not only gained first-hand knowledge of the impact of the drought, but I also gained renewed appreciation for the work done by my staff to support farmers during the current drought and the work they are doing to promote and establish a culture of sustainable resource management.

We need to do things differently. The work being done by officials of the Western Cape Department of Agriculture is of great value. Our engineering services, agricultural extension officers and their colleagues in disaster risk management, sustainable resource management and LandCare are doing fantastic work. They are at the forefront of initiatives to enhance our management of natural resources such as land, water, soil, plants and animals. They are ably supported by our researchers and the work being done on our research farms.

The agriculture sector, and here I include workers and agri workers, need to focus on how the management of our natural resources affects the quality of life and food security for both present and future generations.

Effective sustainable resource management nourishes agriculture, the life blood of the Western Cape's rural economy. We will continue to support our farming communities. We do so **#ForTheLoveOfAgriculture.**

# OVERVIEW

## Ashia Petersen
## Director Sustainable Resource Management

The Community Based Natural Resource Management (CBNRM) approach has seen many successes in our province, with communities taking charge of managing their natural resources in a sustainable manner. The CBNRM approach builds healthy agro-ecosystems that are climate change resilient, i.e. the extent to which the natural environment responds to any disturbance, e.g. disasters - droughts, floods, fires, animal and plant disease outbreaks etc. In the story on **"Removing alien vegetation, restoring nature"** we highlight the successes of where our department collaborates and support our landowners to clear invasive aliens and rehabilitate the area to increase efficient run-off. Whilst getting rid of invasive alien plants, community alien clearing contractors are empowered and green jobs are created, providing work to unemployed locals. In our story "**A partnership, a fence and a strengthened community"** the economic benefits of sustainably managing the environment are highlighted, e.g. increased lambing percentages for farmers that were part of this project.

Building resilience and mitigating the impact of climate change would not have been possible without a dynamic, diverse and com-

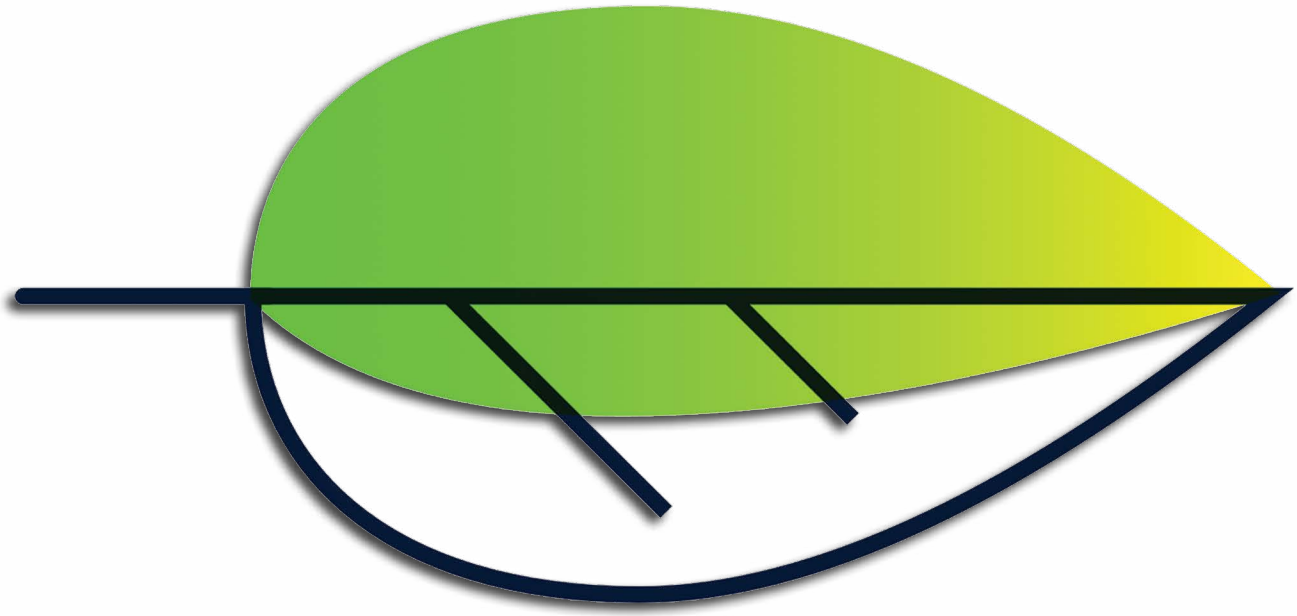
mitted team. Investing in our future is crucial and in "**Junior LandCare: When nature does the teaching"** we showcase the importance of starting early with environmental awareness and education, specifically for rural children. Moreover, to give effect to our policies, strategy and service delivery it is critical that we empower and nurture our youth, as we show in "**Potential to grow our future**." In the article **"On the shoulders of giants"** we pay homage to those who have been part of this programme over the last ten years – who have retired, moved to explore other opportunities or sadly passed away.

The ever growing population and competing demands place significant pressure on highly productive agricultural land. In "**Today's decisions – tomorrow's reality"** the importance of policy, strategy and co-operative governance is highlighted in protecting the fragmentation and loss of productive agricultural land.

Climate change predictions have shown that the Western Cape will become drier with an even more variable rainfall pattern. As such, managing our water resources is imperative. Our department has the innovation as well as effective and efficient water resources management as shown in "**Water security equals a growing economy"** and "**Conserve water via satellite technology."**

Internationally there has been a marked increase in the frequency and intensity of disasters. In the last five years, the Western Cape has experienced at least three disasters per year. This includes the current drought experienced across some parts of the province. The bi-annual veld assessment article **"Knowledge is power"** shows how continuous monitoring and evaluation of the veld conditions, which forms part of our base-line data and early warning system, support our decisions in identifying the areas in need of drought fodder support and the frequency of the fodder support. **"Bales of hope"** and **"Facing floods head-on"** provide an overview of our green engineering mitigation interventions that build resilience in preventing the destruction of the water course and loss of sediment, which is deposited downstream and impacts on the natural flow of the water resource. The articles **"Veld Fires – when disasters strikes"** demonstrates our responsiveness to the post disaster recovery period with the support provided to farmers.

Sustainable Resource Management is committed to building climate change resilience in the agricultural sector, through building healthy agro-ecosystems. We try and stay relevant through the proactive initiatives, monitor and evaluate the environmental risks and provide support in the event of a disaster. We are sure that you will enjoy reading about some of our successful interventions in this issue of the Abundant Harvest.



LandCare

# Communities rallying together

A close partnership between government and a community in need, a common goal, and collaborative planning and honest consultation have resulted in interventions that have helped build resilience in the face of extreme environmental occurrences and a healthier ecosystem that can better absorb disasters. For Rietpoort, a small settlement near Bitterfontein in the Namaqua West Coast region, something as simple as fencing, has made a major contribution towards the building of lasting relationships and addressing environmental, social and economic challenges.

The Rietpoort area is climatically classified as a desert, with extensive sheep farming the only viable farming activity. Small scale and communal farmers – just as their commercial counterparts – face protracted periods of drought, which limit the availability of potable drinking water for both humans and livestock, excessive predator activity which curbs lambing successes and low grazing capacity. Overgrazing is almost an inevitability and sustainability challenge.

“It is vital that government works alongside communities, land users and landowners to jointly find sustainable solutions to critical is-

sues," says Ashia Petersen, Head of the programme for Sustainable Resource Management of the Western Cape Department of Agriculture. "The interventions in Rietpoort and surrounding settlements, serve as perfect examples of how various disciplines of government deliver impactful solutions by working with a single-minded goal, side-by-side with the people they wish to serve."

In this area, drought management cannot be viewed as an occasional excercise, but should form an integral part of farm management. In addition, proactive measures to manage available grazing have the power to significantly contribute to sustainability – even in the face of continued periods of drought. Fencing, if properly planned and executed, has proven to be one of those measures that render impressive results.

## One goal – many heroes

Funding was consequently lobbied through the national Department of Rural Development and Land Reform, Departmental Equity Share Projects and the national LandCare programme. Cohesive support from the Western Cape Department of Agriculture to the small scale and communal farmers of the Swart Doorn (Stofkraal), Hardeveld (Molsvlei) and Rietpoort Farmers' Associations, has enabled these communities to pull through. Technical services such as mapping, topographical surveys, updating farm plans and stock-water systems designed by the LandCare sub-programme, capacity building by the programme Farmer Support and Development, as well as practical drought relief by means of fodder support by the sub-programme Disaster Risk Management have contributed significantly to

them building resilience against drought and supporting their livelihoods.

Hansie Owies

Hansie Owies, an extension officer from the department's programme for Farmer Support and Development, served as an invaluable go-between for the project. "One must never underestimate the importance of earning the trust of communities before fixing their problems," says Hansie, a local who initially served as a community worker. Based on his relationship with the different role players, he was able to play a vital facilitation role.

## Success breeds success

The success of the initial involvement in this community and the good levels of co-operation, led to additional funding being made available in 2018 and 2019 for the erection of further fences and stock-water systems. In the Stofberg community, a camp was fenced off for the breeding rams in order to improve the management of lambing intervals, and fencing was installed to separate the grazing area from the community. With the help of the then Department of Agriculture, Forestry and Fisheries (DAFF), four boreholes were also successfully sunk.

"Heightened environmental awareness is very important for long-term sustainability," says Jan Smit, District Manager of LandCare West Coast.

"A drought workshop, which aimed to capacitate farmers on sustainable agricultural practices, was arranged with the assistance of the Bitterfontein farmers, and LandCare was able to supply communal farmers with transport to attend." Interaction between the different farmers' associations further improved when the Bitterfontein Farmers' Association inclu-

### FACTS AND FIGURES

- Initial budget allocation: R820 000.
- Fencing material and labour: R300 000.
- The Rietpoort Farmers' Association was appointed as the fencing contractor.
- 15.6 km of run-down jackal proof fencing was replaced.
- 5.2 km of new stock proof fencing was constructed.
- More than 100 job opportunities were created.
- More than 3 000 person days of work were generated for the local communities.

Some of the benefits of secure fencing and safe kraaling of stock:

- Decreased impact of predation.
- Fewer road accidents occured as the fence prohibited livestock from wandering the road.

> One must never underestimate the importance of earning the trust of communities before fixing their problems.

Jan Smit

ded the Rietpoort and Lepelfontein communal areas in the Berg and See Area Wide Planning project – an inclusion which will provide employment opportunities to these communities.

The Rietpoort and neighbouring farming communities have been given a tangible leg up through these interventions that have not only strengthened their drought resilience for years to come, but have actively increased their lambing percentages as a result of effective predator monitoring and overall improved veld conditions.

# A partnership, a fence and a strengthened community

Despite meat prices reaching its highest peak since 1947, sheep farmers from the Koup, a farming community between Beaufort West and Laingsburg in the Karoo, were facing the worst financial reality ever. The threats to sustainable agriculture were piling up, with predation (jackals killing off hundreds of lambs) topping the list, closely followed by veld degradation and dwindling employment figures due to consequent financial restraints.

Previously this area boasted some 200 000 breeding ewes – at the point of the intervention a mere 46 000 remained to generate income. The number of employees on a farm decreased on average from four to one. In addition, the number of lifestyle or weekend farmers have increased to 54% of the total number of farmers, leaving less land being actively and economically farmed (and less labour needed). An increase in game numbers on lifestyle farms contributed to the degradation of veld as game, unlike with sheep, cannot be moved from camp to camp to let the natural vegetation recover. Also, more lifestyle farms mean less properly maintained border fences, which leads to the uncontrolled movement of problem animals such as jackals.

> As agriculture plays such a vital role in the economies of rural areas, the development of new agricultural infrastructure and the upgrading of existing infrastructure is key to the revival process.

## One for all, and all for one

The challenge demanded a united approach, community-driven, with all parties fully committed to the same vision – in other words, an **area-wide development plan** aimed at creating resilient agro-ecosystems in collaboration with the community and a positive ecological, social and economic outcome in mind. The Koup Area-wide Development Plan was compiled in conjunction with landowners and LandCare: Central Karoo, a sub-division of the programme Sustainable Resource Management.

"The revival of the rural economy is one of the main priorities of government," says Phyllis Pienaar, District Manager of LandCare: Central Karoo. "As agriculture plays such a vital role in the economies of rural areas, the development of new agricultural infrastructure and the upgrading of existing infrastructure is key to the revival process." The LandCare fencing project undoubtedly stimulated economic growth, while simultaneously boosting the effective and sustainable management of natural resources.

Jackal proof fencing were last completed in 1952 with full subsidy from government and carrying capacity for the area was last done in 1974. Following consultation with local landowners, fencing the 80 000 hectares was deemed the best solution. Farmers expressed their commitment to rotational grazing, adherence to grazing capacity and openly declared their stock numbers. These improved grazing practices meant an improved biodiversity and an increase in palatable plants which now had time to restore thanks to the constant movement of stock to different camps.

**Phyllis Pienaar** (second from right)

While the department contributed financially, farmers took responsibility for the transportation of fencing teams, provision and transport of rocks where necessary, and for the regular maintenance of the fences after the initial project.

**SO MUCH MORE THAN A MERE FENCE**

- 93 km of border fences finished to date.
- 4 000 person-days of employment created.
- 30 households impacted with new skills and improved socio-economic circumstances.
- 60 - 80% increase in weaning rates following the restriction of predator movement.
- R2 340 000 spent on material and labour for the fences.

## Predator vs lamb

While proper fencing addressed the problem of predation to a degree, it needed further intervention. In order to effectively manage jackal numbers, insight into their behaviour was needed and an expert researcher from the University of Cape Town was invited to participate. Consequently, multiple trail cameras were placed throughout the area. *This is currently the most extensive camera monitoring project in the world.* According to Marine Drouilly, project researcher, the ideal is to find harmony through understanding and knowledge. The next step in this line of research will be to introduce Anatolian guard dogs to the area and determine their effectivity against predators.

Due to the presence of predators, lambing and weaning percentages were extremely low – less than 40% in some areas. “Farming in these areas are extensive and farmers are sometimes unaware of the exact number of lambs born in a season,” explains Lukas Botes, one of the local farmers. “When these farmers see the lambs for marking at

about two months, there is no way of knowing how many of those born had become predator prey."

Farmers had no access to scanning equipment to determine conception rate of ewes. As part of a comprehensive scanning project the Western Cape Department of Agriculture will assist farmers to scan some 38 000 ewes over a period of three years, and in conjunction with experts from the UCT's School of Economics and the Karoo Predator Project, this process will help to accurately determine real conception and lambing, as well as weaning figures. Independent researchers like Marine Drouilly, Dr Beatrice Conradie and Prof Justin O'Riain explored various aspects of the project to ensure that informed decisions were made.

In many instances the difference between success and failure is teamwork. This project stands testimony to how collaboration changed the future of a community.

# Junior LandCare: When nature does the teaching

Learning about nature in class is all well and good, but a first-hand experience about the wonders of nature while spending time in the outdoors, makes all the difference to the levels of enthusiasm and information retainment. Herein lies the success of the approach to environmental education as presented by the Western Cape Department of Agriculture's Junior LandCare sub-programme. In tandem with the curriculum of the National Department of Basic Education, it aspires to teach young children about topics such as conservation, sustainable agriculture and food security. While various other institutions also offer some measure of environmental education, DoA:LandCare is the only entity that brings this vital information to rural communities who are generally excluded from such activities.

Some 25 years ago Frikkie Saayman, a LandCare official in Swellendam, initiated the Junior LandCare programme when a local conservation committee deemed it a good idea to reach parents by involving their children. It was so successful that it soon escalated to neighbouring towns like Oudtshoorn.

Stefan Pieterse, a LandCare official at Oudtshoorn, then escalated the teaching out of

> These kids are exposed to agriculture in their everyday life and really benefit from the exposure to the concepts of conservation, sustainability and responsible agroecosystem management, as well as the idea of agriculture as a viable career. We might just be growing responsible agriculturalists in this way.


doors to a camp set-up, an approach which reaped great rewards in terms of behavioural changes towards nature, but in time had to cease due to the issue of indemnity. In addition to exposure to subjects such as birdlife, reptiles, soil health – all taught in a fun and interactive way – inter-school competitions and provincial and national conferences contributed to heightened awareness. Attendance of the national biennial Junior LandCare conferences is greatly enjoyed and approximately 350 children between Grades 4 and 6 benefit from the expertise of international speakers and teaching incorporating drama, dance, speech and debate.

## The Junior LandCare growth curve

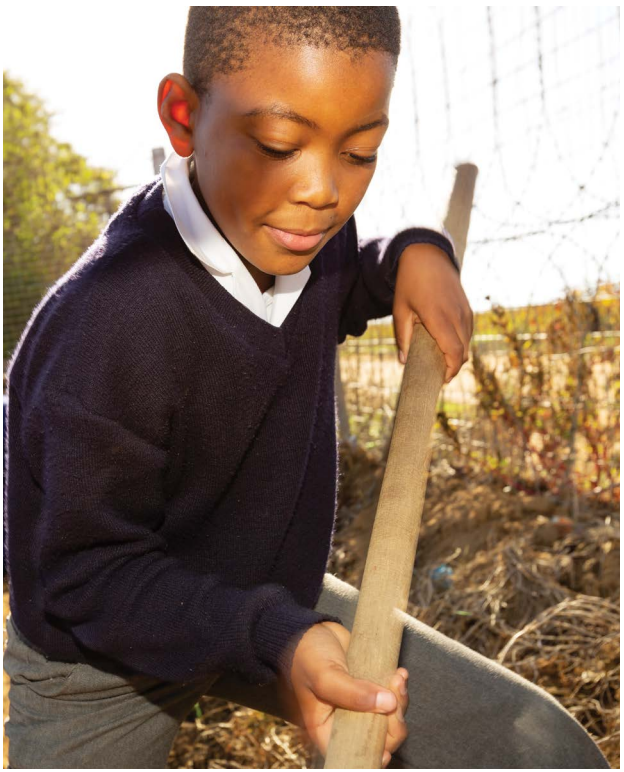
In the Western Cape, Junior LandCare has grown substantially. Today, this programme is successfully presented in five rural districts and no less than 7 000 Grade 4 to 6 learners from 35 schools have been reached annually since the inception of the programme. Five illustrated, educational books on nature have been published for use in schools and the use of specially developed puppet shows has proven to be a very popular tool. “We especially target rural farm schools that are often neglected by other organisations,” says Francis Steyn, Manager of the LandCare sub-programme. “These kids are exposed to

agriculture in their everyday life and really benefit from the exposure to the concepts of conservation, sustainability and responsible agro-ecosystem management, as well as the idea of agriculture as a viable career. We might just be growing responsible agriculturalists in this way."

The department's intervention stretches into real investment and is used as a platform whereby interested children are identified for the available bursary scheme. Vanessa Barends-Jones, a qualified agricultural economist, bears testimony to what happens when the flame of enthusiasm is ignited. This after a former official from LandCare in the Overberg spotted Vanessa's interest in agriculture and subsequently introduced her to the department's bursary scheme. "I could have been back in Bredasdorp hitting the till, but Hennis Germishuys saw my potential and introduced me to the opportunities within agriculture. Never in a million years would I have found my way into agriculture without his prodding."

## It takes a village

Partnerships are one of the blueprints defining the success of the Junior LandCare programme. From farmers, SANParks and the South African Police Service to CapeNature,



consultants presenting puppet shows and the Western Cape Departments of Environmental Affairs and Development Planning and Education, as well as local governments – each plays a critical role in completing the circle of influence.

School nutrition lies very close to the heart of the Junior LandCare programme. Setting up a school food garden is often a natural next step and in partnership with the department's programme Farmer Support and Development, food gardens have been established at more than a hundred schools. The benefits of the school food garden initiatives are foremostly the creation of awareness of the environment and the transfer of skills. Naturally, such projects also succeed in keeping youth productively active and has the added benefit of producing healthy food. The children take full responsibility for working the land and their harvests are bountiful. The programme has also invested by gifting schools with 35 water tanks in water scarce areas.

Thousands of children have been exposed to the LandCare message to date, empowering a next generation with knowledge and passion for the conservation of nature towards a sustainable future.

# Removing alien vegetation, restoring nature

Farmers face many challenges. The presence of alien vegetation undoubtedly counts amongst one of their biggest headaches. As if the drought was not enough to deal with, these water guzzlers can reduce water run-off by as much as 30% in heavily infested areas, illustrating their severe effect on water resources.

Invasive alien plants pose a major threat to biodiversity in catchment areas, potentially disrupting the delicate natural balance in ecosystems. As we depend on biodiversity for water, food, wood, clean air, medicine and much more, it is vitally important that we protect this resource.

## A united front

However, fighting alien vegetation needs a united front by various organisations that share the same objective. As far back as 1995 the severity of the impact of invasive plants has been recognised and led to the establishment of the Working for Water initiative by the national Department of Environmental Affairs (recently renamed, Department of Environment, Forestry and Fisheries - DEFF).

Coincidently, the LandCare sub-programme (Western Cape Department of Agriculture), as well as CAPE (Cape Action for People and the Environment co-ordinated by SANBI)

have been fighting the same enemy for years. More partners, like the various Water Users' Associations and Catchment Management Agencies, business, civil society (WWF), CapeNature, City of Cape Town, and the provincial Department of Environmental Affairs and Development Planning (DEADP) also joined the fray.

Concerted effort pays off: the impact of DoA:LandCare over the past 21 years speaks volumes. This programme was able to clear no less than 3,000 hectares per year and an impressive 750 people found employment each year, equating to 25,000 person-days of work per annum.

The other instrumental partner is the impacted community and/or landowner or farmer. One of the six principles of LandCare is that any project must be community-led with strong input and participation from the affected parties. For this reason, before LandCare officials start a project, they lobby for total support and commitment from the landowners – in most cases a number of landowners in an area – to ensure a bigger impact. "In this way the landowner includes alien clearing activities in his normal farming activities and landowners would rarely allow something that they have invested in to return to the original state of degradation," says Francis Steyn, Manager of the LandCare subprogramme. "Some projects are funded by as much as 30% from the landowner. This level of buy-in and participation is what sets the DoA:LandCare programme apart and ensures that work done is more sustainable than most other similar approaches. This is especially evident in the hundreds of kilometres of rivers cleaned, which remain clear of alien vegetation.

**ALIEN VEGETATION - THE REALITY**

- Invasive alien plants involve plants brought to South Africa from other countries – intentionally and unintentionally.
- Cause human, environmental or economic harm.
- No natural enemies; reproduce and spread rapidly.
- Dense infestation intensifies veld fires, damaging the burnt area's soil structure.
- Can change flow patterns of river systems during floods causing soil erosion of valuable agricultural land, wetlands and river riparian and higher turbidity levels in the water.

Francis Steyn

Before removing alien vegetation

After removing alien vegetation

Following stakeholder engagement, priority areas for alien clearing are identified and agreements stipulating responsibilities put in place. One of the landowner's responsibilities is to maintain the cleared site. Although this has a cost implication for them, it is viewed as a long-term investment with a major impact on their business. On the other hand, the quality control of the work performed is the responsibility of the department and continuous monitoring and evaluation underline the sustainability of the project.

## Alien clearing and restoration

"While we do talk about alien clearing projects, the overarching objective of these initiatives is building resilience," says Francis Steyn. "SmartAgri, the department's response strategy to climate change, has listed a number

of interventions towards becoming climate change resilient. LandCare's objective to provide defence against degradation of natural resources and thus ensuring clean and sufficient water, gives effect to one of these interventions."

"In most cases we were restoring fynbos in the Western Cape in order to ensure efficient run-off and good cover. And restoring or re-establishing indigenous plant life is a vital part of building resilience and supporting sustainable agro-ecosystems," Francis Steyn explains. "Participation by the agricultural sector as a whole, and specifically farmers, hugely contribute to the successful managing of the functionality of our ecosystems."

According to Francis Steyn, the LandCare initiative in alien clearing had humble beginnings in small areas and in isolation of the current partners. "For example, we started clearing the Berg River water flow area on one farm with a team of 12 people (employed by the department on contract) using chainsaws and carrying the wood out of the river by hand. Today this is a multimillion rand project using several contractors with modern machinery chipping the alien biomass for further use in agriculture as compost and in the production of energy. This work is now the priority of several partners including the farmers."

## Community involvement – key to success

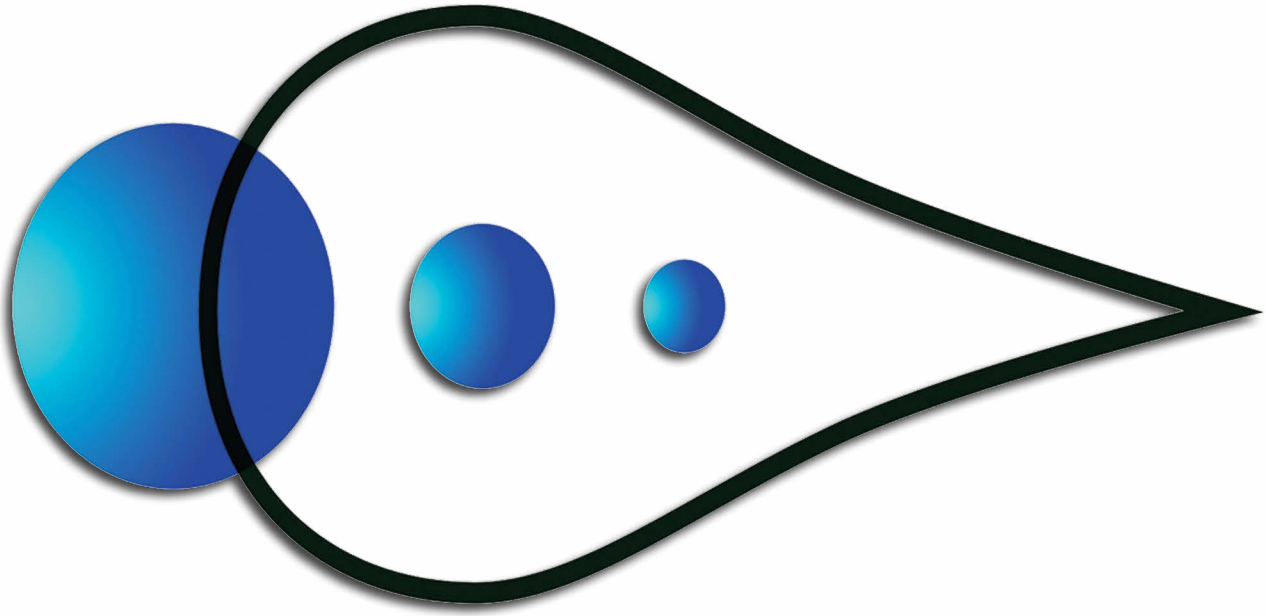
Community involvement offers ensured successes, amongst them the creation of jobs. Several community members have tapped into this secondary industry of alien clearing and restoring natural vegetation and have been given a new lease on life.

Fifty year old Linda Jansen can attest to this.

> The impact of DoA:LandCare over the past 21 years speak volumes. Through partnerships and co-funding, this programme was able to clear no less than 3 000 hectares per year and an impressive 750 people found employment each year, equating to 25 000 person-days of work per annum.

Linda oversees three alien clearing teams in the Winelands – providing employment to 39 people. She is full of praise for the work of LandCare, "LandCare has helped to provide us work almost without interruption and as a result, my dreams have come true," she shares. "I have been enabled to buy a house; I can employ people. People are proud of the work they do."

Providing clean water to the general public is one of the other most rewarding feats for LandCare and working hand-in-hand with farmers in achieving the goal of restoring ecosystem health, forms a major part of the success story. Over the past seven years, some 750 hectares of the Nekkies wetland have been cleared and the impact of this project in terms of the supply of water to the public and the agricultural sector is quite astounding.



# Engineering Services

# Water security equals a growing economy

In a country that has been listed among the world's 30 driest countries, water security is paramount, and 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 are not to be tolerated.

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

## New life for an aging canal system

Irrigation agriculture is the biggest water user in South Africa, responsible for approximately 62% of the national water usage. When it became clear that an ageing canal system of the Clanwilliam Dam is threatening water supply, the Western Cape Department of Agriculture and the Lower Olifants River Water Users As-

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

sociation (LORWUA) jointly tackled the problem heads on.

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 taking place on some 860 farms (12 000 – 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 280km 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 Matzikamma municipal area. However, the 80-year-old canal increasingly requires excessive maintenance to minimize water losses.

On 5 January 2015, 180 meters of the left bank branch collapsed and washed away, directly impacting on water supply to 4 300 hectares in need of irrigation during the peak summer period. In the following years two more canal breaks occurred, demonstrating

the vulnerable condition of the aged 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 Department of Agriculture has made R10 million available for this process over the past four years (2015 - 2019) – an understanding that mitigated the economic impact resulting from job losses and loss of revenue due to damaged crops following the disaster.

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

In addition to addressing water losses, the project, which is labour-intensive, provides valuable employment opportunities to the local communities, and simultaneously contributes greatly to the economic sustainability of this wide-spread area.

## Restoring the Leeu River weir

The Voëlvlei Dam is an off-channel dam in the Berg River Catchment, meaning 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 in 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. As the catchment of the dam originally only measured 31 km$^2$, the increasing demand

for water from the direct dependent area (the towns of Riebeek Kasteel, Riebeek West, Malmesbury, Darling and Moorreesburg, numerous farms and the ever-expanding Cape Town) necessitated that additional water be provided via canals from the Klein Berg River and eventually from the Twenty-four and Leeu Rivers in 1971.

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

The Western Cape Department of Agriculture consequently availed R3.5 million to conduct emergency maintenance, including the removal of sediment from the Leeu River weir – an action which made available a significant amount of water in a time of drought. A side benefit of the clearing action was that the sediment could be favourably utilised on the adjacent farm to reclaim land that is now being used for the production of export table grapes under netting.

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

# Conserve water via satellite technology

Natural disasters such as the current drought inevitably highlight the need for producers to future-proof their operations against the realities of climate change and put renewed emphasis on the importance of the conservation of water resources. In addition, the pressure to have that competitive edge that drives productivity and profitability, necessitates measures to manage available resources more efficiently*.

Innovation and the employment of state-of-the-art technology have become paramount for producers worldwide – and no less so in the water-scarce Western Cape. The Western Cape Department of Agriculture has not lagged – instead, they have joined the 4th Industrial Revolution, a movement often described as the blurring of boundaries between the digital, physical and biological worlds. “For both irrigation agriculture and rain fed agriculture, it is especially important to embrace technology,” says Peter Keuck, Chief Engineer of the department. “Producers can no longer afford to ignore the challenges of climate change and have to make use of all modern resources and technologies to optimise production and water use efficiency.”

Peter Keuck

As long ago as 2010, the department had the foresight to invest in and test an international online platform, FruitLook, which uses satellite data sources, weather information and smart models to describe crop growth, water consumption (as calculated from evapotranspiration) and plant nitrogen content. Updated weekly, the FruitLook programme presents users with regular information in visual format, which enables them to make vital farming decisions, and to manage crop productivity, growth and water use more efficiently. Today, more than 700 users who registered more than 50 000 ha are reaping the benefits of the platform which is free of

***PROFITABILITY CALCULATOR**

10% increase in yields + 10% decrease in input costs (water, fuel, fertiliser, chemicals) = increased income:

- ↑ R7,036 per hectare (wine grapes)
- ↑ R25,630 per hectare (deciduous fruit)
- ↑ R33,858 per hectare (table grapes)

(Agricultural Economic Services, Western Cape Department of Agriculture)

charge due to complete funding by the department.

## You can only manage what you can measure

Ten years ago, the department selected forty grape farmers to trial the then-called GrapeLook system, owned by Dutch company eLEAF, international leaders in this field. It supported wine and table grape producers with information to improve their on-farm water use efficiency and since then the system has been expanded to cover all the main irrigation and other crop growing areas in the Western Cape. The total area covered by Fruitlook is 9.5 million hectares, realising the promise of *'more crop per drop'.*

FruitLook has proven to be an effective tool for planning water budgets, prioritising water allocation, monitoring problem issues and evaluating impact. Traditional ground moisture sensors measure soil moisture content only at a single location in a block. In comparison, FruitLook's remote satellite technology regularly provides the full picture of a farm, in a cost-effective way.

The information generated provides additional information about the physical world that is not necessarily visible to the naked

With over 700 users, of which 74% are producers, while researchers, consultants and students benefit as much, the success of FruitLook is undeniable.

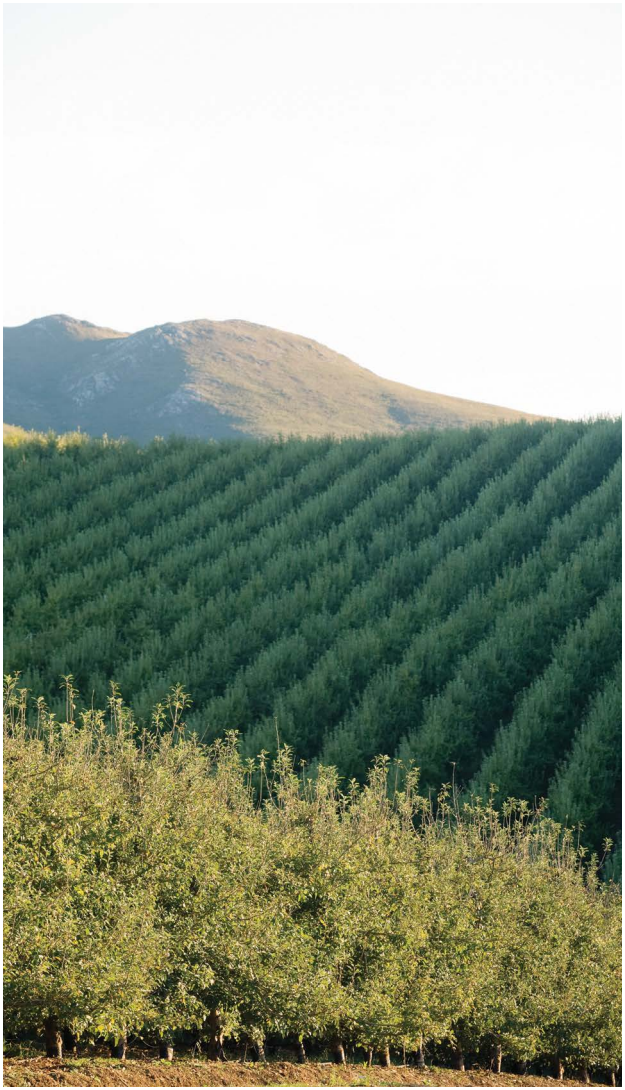
eye. One of the benefits of any information system is historical data for purposes of referencing and prediction. Internationally, there is no other system that is so wide-ranging in terms of the spatial coverage of the data and it boasts a 9-year database on the Fruitlook website.

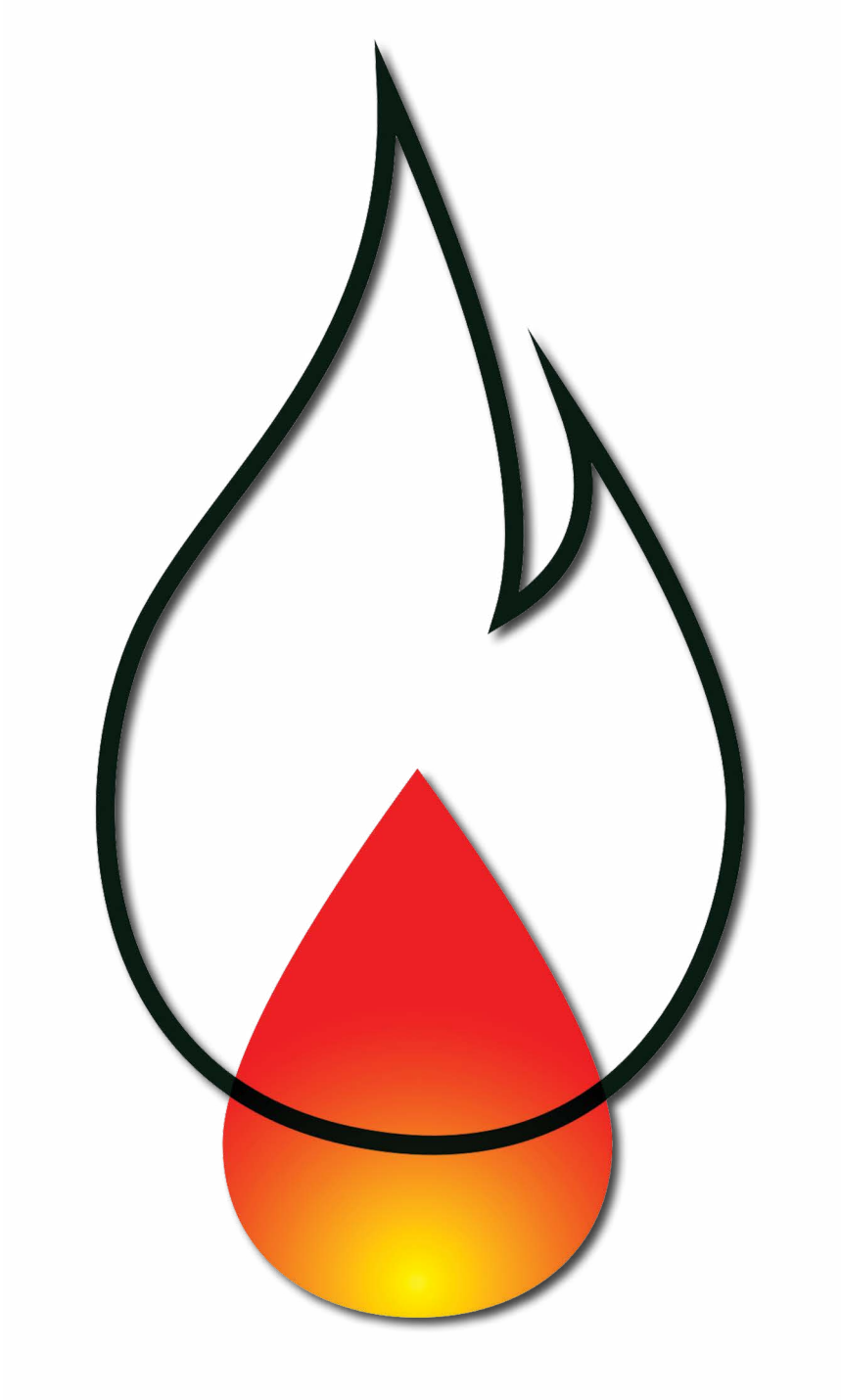
## Smart farmers choose smart solutions

With over 700 users, of which 74% are producers, while researchers, consultants and students benefit as much, the success of FruitLook is undeniable.

Hendrik Schoeman, from Lochlo farm in Villiersdorp agrees: “Since I’ve been using FruitLook and managing our irrigation accordingly, we’ve been able to conserve water significantly. For example, I’ve changed from a 5-hour water cycle to a 3-hour cycle and the impact on my yield was positive, showing an increase of 30%. Our effective water management is also limiting the appearance of pests and diseases like nematodes and Phytophthora, which thrive under over-irrigation.”

Visit www.fruitlook.co.za for more information – change the way you farm today!





Disaster Risk Management

# Knowledge is power

With the increased occurrence of extreme environmental conditions over the past decades, the department has identified the need to create an ecological database for various Western Cape areas, derived from comprehensive biannual veld assessments. This data now serves as an invaluable baseline against which new circumstances and disasters can be measured. Amongst others, it shows trends in the habitat (soil and vegetation) and fluctuations of animal populations. Deviances from this baseline then act as an effective early warning system demanding changed farming behaviour.

Officials of the sub-programme Disaster Risk Management are enabled to respond timeously to the occurrence of disasters and can advise farmers accordingly on the management of issues such as grazing and carrying capacity – all in an effort to secure economic and ecological sustainability.

The veld assessments are performed annually during the summer and winter months in collaboration with the rangeland specialist, Nelmarie Saayman, from the programme Research and Technology Development. Apart from the veld assessments, workshops with departmental officials from different disci-

plines are held, and on-farm visits and personal engagement with existing disaster relief beneficiaries, as well as those farmers who might qualify, serve to keep the communication alive. “The two-way communication channels established in this way between government and the province’s farmers, are of great value and strengthens the unity of the agricultural sector,” says Jody Wentzel, Manager of the sub-programme. “With this real-time comparative information, we are also able to responsibly and efficiently distribute the resources (such as fodder vouchers) available during times of pressure.”

Responses similar to that of Jan Bostaander of a farm in Beaufort West, Central Karoo, sound up all over the drought-stricken province: “The fodder support was very helpful during the difficult time and I am thankful to be in a position to be able to continue to feed my animals because of it.”

> “The fodder support was very helpful during the difficult time and I am thankful to be in a position to be able to continue to feed my animals because of it”. - Jan Bostaander

## Immediate and long-term value

Farmers’ inclination and ability to sustainably manage their veld during periods of abundance as well as when dry spells strike, have a direct correlation to their ability to absorb periods of drought and conserve the long-term health of their ecosystem. Adherence to prescribed livestock numbers, well-managed grazing systems and the rotation of animals in harmony with pasture growth, have a significant impact on sustainability.

In cases where the veld has severely regressed despite responsible measures, the veld assessments highlight the need for rehabilitation. In partnership with the LandCare programme, support is also provided for the erection of fencing to give severely affected veld a chance to recuperate.

Disaster management is indeed a team effort and generations to come will benefit from the joint efforts of the department and conservation-conscious farmers.

# Bales of hope

If there is one sector that understands both the beauty and brutality of the environment, it is agriculture. The Western Cape, as well as other parts of the country, are in the grips of the worst drought in recorded history. Despite welcome rains in some areas, regions such as the Central and Little Karoo and large parts of the Matzikama district are still in the throes of a five-year drought. In addition, the impact of a drought of this magnitude does not vanish overnight and producers and rural communities interdependent on agriculture, often bear the brunt of a drought for years to come.

Livestock farmers are especially vulnerable during prolonged periods of drought and the past five years have brought many to their knees.

"The Western Cape Department of Agriculture's main objectives in terms of drought intervention are building resilience and mitigating the impact of the drought for livestock farmers (specifically, maintenance of the core herd) and lessening the potential disturbance of natural veld by overgrazing during such dire conditions," says Ashia Petersen, Programme Manager of Sustain-

> Since 2015 more than R300 million worth of fodder vouchers have been distributed to 2 600 livestock farmers – both small-scale and commercial.

able Resource Management. "You could say we try to cushion the blow with the resources available to Government."

According to Jody Wentzel, Manager of Disaster Risk Management, one of the mitigating measures is the provision of fodder vouchers. "Farmers benefiting from this very practical and relevant form of support have shown tremendous gratitude and appreciation," she says. Peters, a farmer from Riversdale, echoes Wentzel's observation: "If not for their support, I would not have made it. It resulted in a better than expected lambing season for me."

## Disaster relief – this is how it works

A vital first step is the department's thorough biannual veld assessments, which gauge the extent of the drought per area. The assessments act as an early warning system and builds a long-term data set which will prove invaluable in years to come. These ongoing

**WESTERN CAPE DROUGHT - FINANCIAL IMPACT:**

- Exports have seen a drop of 13 - 20%.
- In the Western Cape alone, the agricultural sector has reported an economic loss of around R5.9 million.
- An estimated 30 000 jobs were lost in this sector.
- ± 30% decrease in sheep numbers equals a financial loss of R1.5 billion.
- ± 600 000 fewer lambs translate to a decrease in income of some R1.2 billion.
- Lower wool production cost the Western Cape's economy R343 million.

veld assessments, conducted in winter and summer months, provide the sector with baseline information of veld conditions, current and past. These baselines are recorded as GPS points and the Normalised Difference Vegetation Index and the Vegetation Cover Index are then analysed to assess whether sufficient vegetation for grazing exists or not.

In terms of the Conservation of Agricultural Resources Act 43 of 1983 (CARA) farmers must conserve their natural veld by not overstocking and compliance is taken into consideration when determining whether a farmer is eligible for disaster relief. The department is able to assist severely impacted farmers to maintain their core herd, a measure which ensures that as many farmers as possible benefit from available funds. "Our farmers are innovative and resilient," says Jody Wentzel. "They have answered the call to responsibly reduce their stock and we laud them for this. In turn, we are committed to lobby for tangible support for as long as possible."

The findings of the surveys are reported to the Rural and Agricultural Sector Support Committee, where after the Provincial and National Disaster Management Centres play key roles in motivating for a disaster area to be declared. Together with the Provincial Department of Agriculture, their national counterparts (Department of Agriculture, Land Reform and Rural Development) then lobby for national funding and the wheels are brought into action for farmers to be able to apply for and receive drought relief – which, in the case of livestock farmers, comes in the welcome form of fodder vouchers.

The management and distribution of the allocated fodder support then falls within the sphere of responsibility of the Disaster Risk Management sub-programme. Since 2015 more than R300 million worth of fodder vouchers have been distributed to 2 600 livestock farmers – both small-scale and commercial.

Jody Wentzel

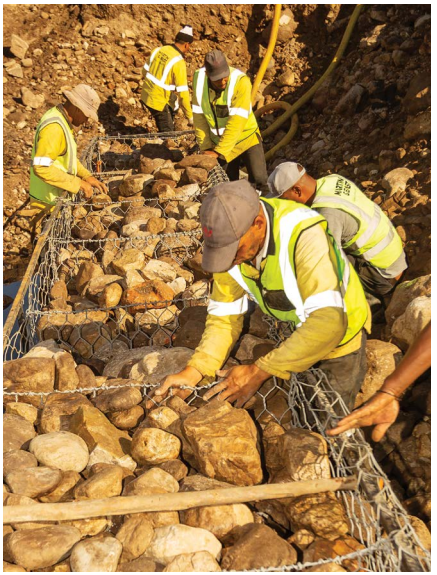
# Facing floods head-on

The possibility of increased risk of natural disasters is considered to be one of the most troubling and potentially costly impacts of climate change in South Africa and globally. Understanding these risks is critical for developing suitable and sustainable solutions. The occurrence of floods is one of the agricultural hazards for which the sub-programme Disaster Risk Management must develop impactful response and recovery plans.

Measured in terms of the environmental (and agricultural) impact, floods are so much more than large bodies of water effortlessly making their way to the ocean along existing river paths. Unstable and eroded riverbanks, and high volumes of alien vegetation along these banks and in the rivers, exacerbate the effect of floods. In extreme cases, river courses are altered and arable soil swept along and deposited elsewhere.

The Disaster Risk Management response team's goal is to restore affected water ways, to re-establish indigenous plants towards an overall healthy ecosystem, and to prevent the further loss of productive agricultural land. Based on a thorough assessment of the damage, consequent recovery measures entail the installation of river stabilization structures such as groynes

The Disaster Risk Management response team's goal is to restore affected water ways, to re-establish indigenous plants towards an overall healthy ecosystem, and to prevent the further loss of productive agricultural land.



and weirs, which are built to protrude into the river system to slow and direct the speed of water and to prevent turbulence and destructive flooding.

## Recovering from disaster

In 2011 and 2013 the Western Cape experienced two major floods where the Central Karoo, Overberg, Cape Winelands and Eden districts were declared disaster areas. The Western Cape Department of Agriculture availed R190 million for the 2011 flood recovery process and R78 million to mitigate flood damage in 2013.

Since then more than 100 groynes, one spillway (the outlet of a dam that broke) and five weirs were constructed in the impacted river systems. This restoration also allows for aquatic organisms including fish, amphibians, insects and molluscs to flourish again.

Some of the projects embarked on, highlight how seemingly small erosion sites in rivers can have far-reaching devastating impacts on a whole river.

Historical aerial photographs show a small lemon orchard developed in the upper **Duiwenhoks River** catchment in the late 1970's. Between the edge of this orchard and the adjacent wetland was a small drainage furrow to stop the orchard from becoming waterlogged.

Later aerial photography shows how the 1981 and subsequent flood events ripped this furrow out into what is today a gulley 100m across, 6m deep and almost a kilometre long. This on-site damage is only the small part of the picture. The impact of the formation of this gulley is that in three or four major flood events, some 250 000m$^3$ of soil washed down the **Duiwenhoks River**, causing block-

> Some of the projects embarked on, highlight how seemingly small erosion sites in rivers can have far-reaching devastating impacts on a whole river.

ages and deflecting the flow of the river into the banks, causing fresh erosion and helping make an already unstable river even more unstable.

Similarly a small gulley observed in a river infested with black wattle trees near **Tesselaarsdal** did not receive the attention it should have, because it was seen as having a lower priority than other projects at the time. Within the space of 10 years, this gulley rapidly spread into an upstream peat wetland, increasing from 100m$^3$ to an estimated 150 000m$^3$. The gulley was 600m long and up to 13m deep. The sediment washed out of this gulley impacted on several kilometres of watercourse downstream where sediment was deposited forcing the river to wash the river bank away. This project was addressed by the construction of a series of weirs stepping the water down through the gulley to a safe discharge point, and the re-introduction of indigenous wetland vegetation to hold back the soil.

A three-kilometre length of the **Brandwacht River** became seriously unstable after some years of black wattle infestation blocking the natural flow path and driving the flow of the river into the banks. Not only was the loss of agricultural soil on-site significant, but downstream as well, due to the volume of sedi-

ment washed out of the banks. This problem was resolved by clearing the alien vegetation, returning the river to where it was 10 years prior to the start of the project by means of groyne structures, and the re-establishment of indigenous wetland vegetation to bind the soil.

According to Jody Wentzel, this kind of support does not only benefit the owners of affected farms. “The beauty is that farmers downstream benefit equally and, in addition, jobs are created in the areas when local labour is utilised during construction.”

Naturally, prevention is always better than cure and landowners are encouraged to adhere to the guidelines set out in policies such as CARA (the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and the National Environmental Management and Biodiversity Act (No 10 of 2004). Some of the pro-active ways – also called ‘green engineering’ – through which farmers can mitigate the effects of floods on agriculture, include refraining from production practices within 32m of a river system, regularly restoring catchments, rivers and floodplains to their natural condition, creating wetlands, effectively capturing runoff, removing alien vegetation and planting trees to decrease the probability of erosion.

“These measures complement official integrated disaster management efforts and help bolster the performance of flood defences,” says Jody Wentzel. “The resilience of our water systems depends on this being a co-ordinated and long-term approach.”


MARTIN & EAST
MARTIN & EAST

# Veld fires - when disaster strikes

An uncontrolled veld fire can be likened to a two-sided coin. The most obvious is the trail of destruction it leaves in its wake – a skeleton landscape seemingly devoid of life. On the other hand, many fynbos and other plants indigenous to the Cape are dependent on fires as the instigators of new ecological lifecycles.

For farmers, so dependent on vegetation for their livelihood, runaway fires often have significant financial implications and severely impacts on the sustainability of their farms and the environment itself. It is known that a high incidence of veld fires impairs biodiversity, causes erosion and leads to the extinction or migration of important pollinators and predators.

In the Western Cape, one of the worst affected veld fire areas in the country, fire fighting teams are constantly at the ready, especially during the hot and dry summer months. However, for the Western Cape Department of Agriculture's disaster risk management team, the solution starts with the saying 'prevention is better than cure'.

Although veld fires can rarely be prevented, effective hazard-mitigation strategies can

manage and lessen the impact on humans and the environment. Building a fire resilient agricultural sector is a top priority for Disaster Risk Management. The sub-programme follows a two-pronged approach for proactively managing healthy ecosystems, including the reduction of the risk of fire by regular clearing of alien vegetation, investing in proper fire breaks and communication, including early warning information predicting extreme weather conditions. In addition, regular workshops and information days serve to empower farmers in terms of preventative measures and the best course of action when disaster strikes.

Highly flammable alien species such as pines, wattles and gum trees boost the fuel load during a fire, increasing the intensity and heat drastically and making fires far less manageable. Their presence also causes damage to the soil and underlying seed bed, resulting in erosion at a later stage.

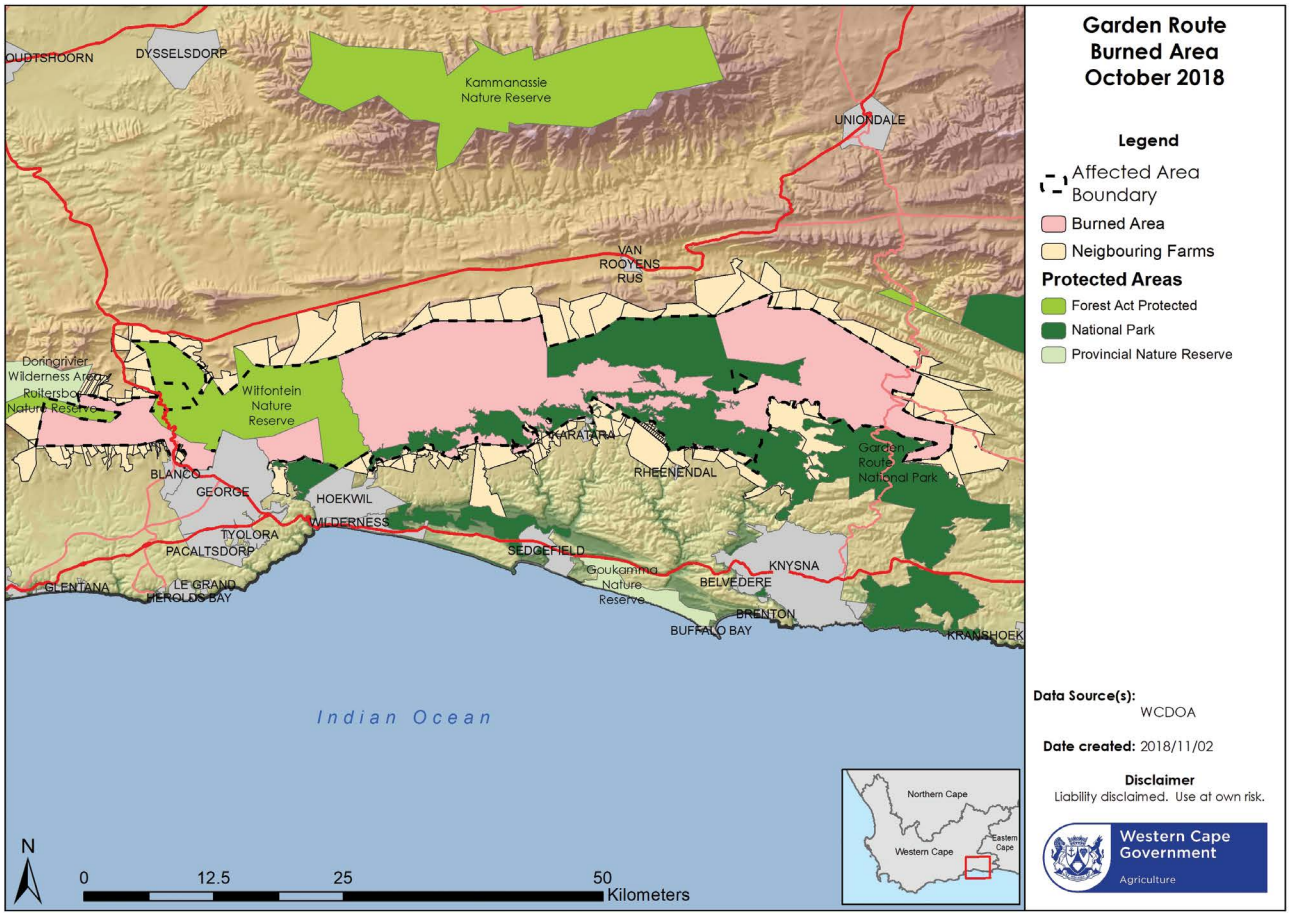
> Although veld fires can rarely be prevented, effective hazard-mitigation strategies can manage and lessen the impact on humans and the environment.

## Rising from the ashes

Unfortunately, debilitating veld fires will remain a reality, even increasingly so, due to vast stretches of vegetation scorched by prolonged droughts, and uncontrollable human behaviour including arson. For this reason, the Disaster Risk Management team, under leadership of Jody Wentzel, is extremely responsive and provides support in rebuilding a healthy and functional agro-ecosystem for vegetation, grazing and livestock to thrive again.

The fires of 2017 and 2018, which ravaged Knysna and the broader Garden Route, still burn brightly in the collective memory of our country. A crisis of such a magnitude renders many heroes and the members of the Disaster Risk Management unit undeniably count among these.

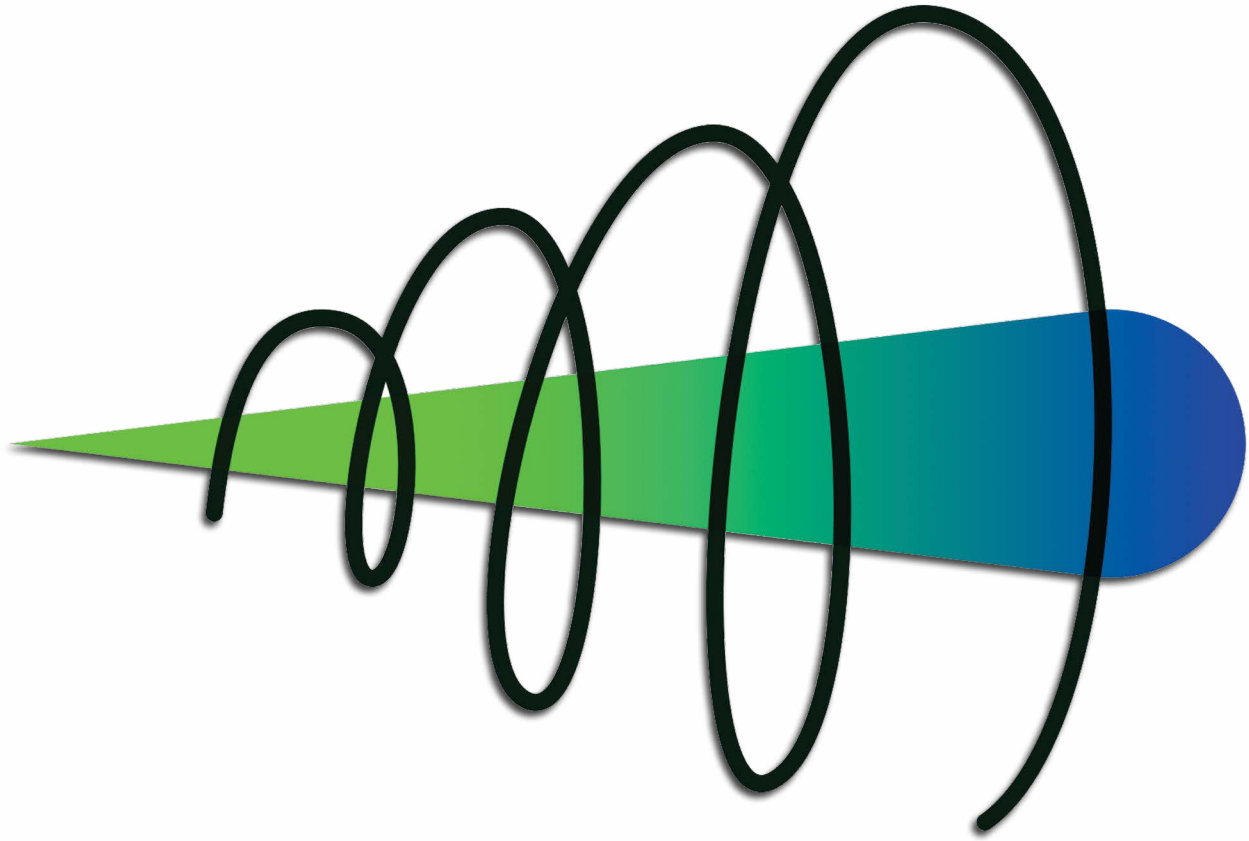
As an immediate and urgent response, the sub-programme conducted a survey to assess the severity of the impact of the fires on farms specifically – leaving other relevant groupings to focus on other affected areas. Feedback




from 79 farms showed that millions of Rands' worth of infrastructure, crops, livestock, natural vegetation, grazing, fencing and water pipelines were destroyed.

Following the assessment of the damage of any such risk, the sub-programme goes the extra mile to expedite support in terms of securing funding for fodder and fencing (to keep predators out) and the general rehabilitation of the burned area.

According to Jody Wentzel, it is vital to keep farms productive immediately following such a disaster. "Our team often also supports farmers emotionally in these trying times and assists them with the preparation of thorough reports necessary for applying for financial and other aid." In the aftermath of the Garden Route fires, the sub-programme assisted affected farmers with more than R10 million towards the restoration of fencing, the rehabilitation of vegetation and for fodder relief.



# Land Use Management

# Today's decisions - tomorrow's reality

South Africa consists of 122 million hectares of land of which about 100 million hectares is classified as agricultural land. Approximately 13%, or 13 million hectares, is regarded as high value or arable agricultural land. Studies showed that since the 1900's as much as 25% of South Africa's topsoil has been lost. The ratio of agricultural land per person has decreased from 0.86ha in 1970 to 0.5ha in 1980 (DAFF) and a further decrease is estimated to 0.2ha in 2020. It is also estimated that 6 million South Africans are dependant on agriculture for their livelihoods.

Today's choices regarding the utilisation of land will undeniably have major consequences on the long-term sustainability of related ecosystems. One of the principles of sustainable agriculture is the conservation of natural resources and implementation of conservation agriculture to be executed in balance with the environment. A healthy agro-ecosystem, therefore, implies that human activity (such as agriculture) coexists with the natural environment and that biodiversity is actively conserved, soil degradation is curbed, soil, water and air quality is preserved, while the social and economic well-being of people re-

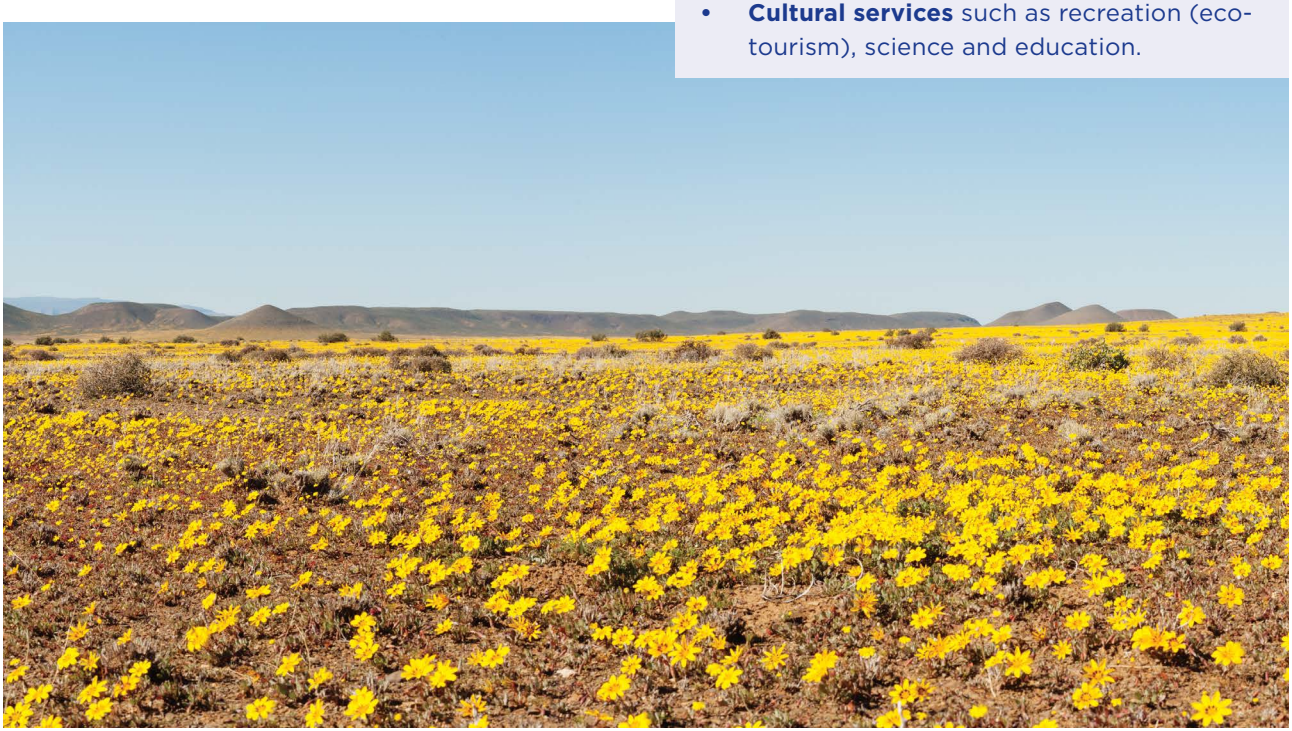
> Generations to come will thank those who purposefully and with a long-term view acted as custodians of our natural resources, while enabling farmers to produce food for the people.

liant on the land is also looked after.

Land use planning is a concurrent function between all spheres of government to ensure proper spatial planning and to guide decision making to optimally regulate the development of all land, including agricultural land. Land use and spatial planning is defined as the arrangement of human activity to ensure

**HEALTHY ECOSYSTEMS DELIVER 'SERVICES' OR 'FUNCTIONS' IN FOUR CATEGORIES:**

- **Supporting services** – nutrient recycling, pollination, and purifying water.
- **Provisioning services** – food, energy, water and mining.
- **Regulating services** – carbon sequestration, pest and disease control and waste decomposition.
- **Cultural services** such as recreation (ecotourism), science and education.



that land is put to optimal use, considering the social, political, economic and environmental impact of such activity. The broad objective is to advise on the allocation of land uses that provide the greatest sustainable benefits from a spatial planning perspective.

## Safeguarding our natural resources (ecosystems)

Official approval needs to be secured for such activities as the cultivation of virgin land, construction of canals and dams, expansion of urban areas, subdivision of land, managing of storm water and erosion control. In some instances, more than one approval is required as different legislations govern different aspects of the same application for the change in land use.

Cor van der Walt

In the Western Cape the following legislations, policies and documents guide decision-making on the change of land use:

a) Subdivision of Agricultural land Act no 70 of 1970
b) Western Cape Land Use Planning Act no 3 of 2014
c) National Environmental Management Act no 107 of 1998
d) Conservation of Agricultural Resources Act no 43 of 1983
e) Municipal Zoning and Planning by-laws
f) Spatial Development Frameworks
g) Western Cape Rural Planning Guidelines

A vital part of the process includes the opportunity for all interested and affected parties to comment and voice concerns. For the DoA it is particularly important to participate as the guardians of the sustainability of agriculture and the conservation of natural land. “Our participation in an application for the cultivation of virgin land, would for instance require an Agricultural Impact Assessment in addition to the Environmental Impact Assessment,” explains Cor van der Walt, Manager of the sub-programme.

## Subdivision of land – what to take into account

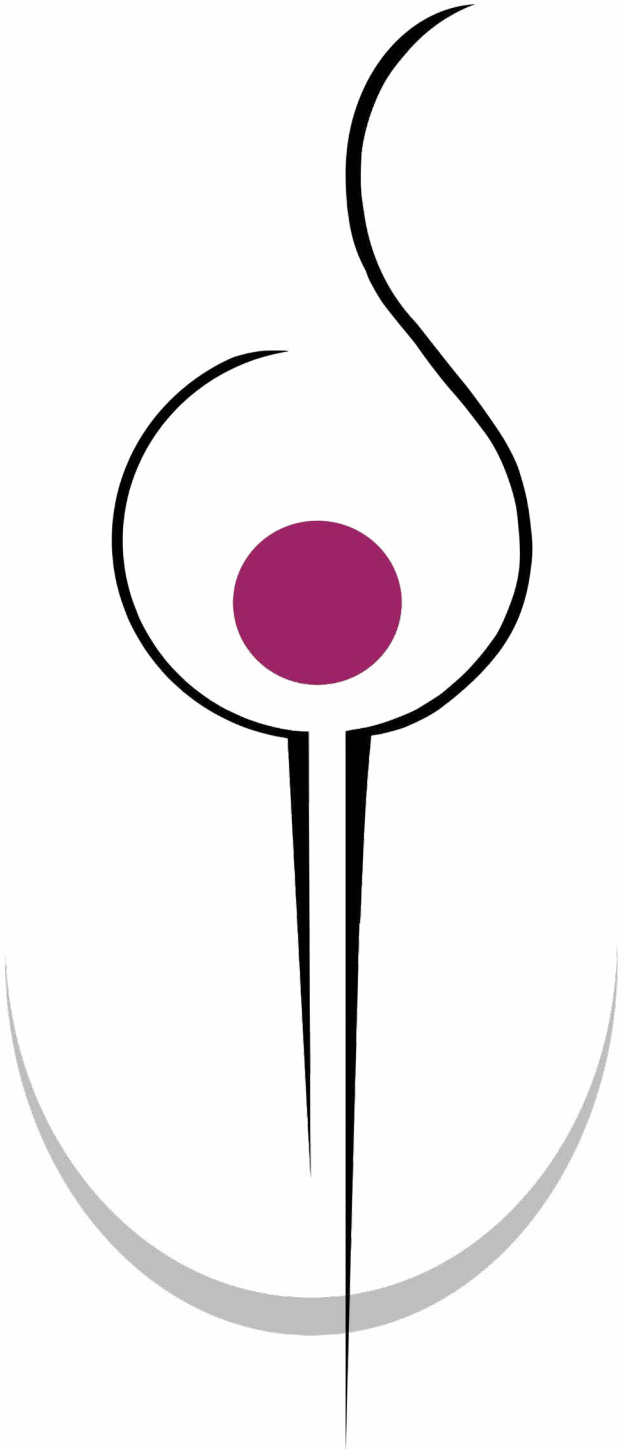
Since 1994 more than 4 million hectares of agricultural land have been lost due to urban sprawl, lifestyle developments, mining and expansion of parks and forests. Land use and development decisions must promote a har-

monious relationship between the developed and the natural environment. Although the DoA only has commenting authority in terms of spatial planning and land use management and the decision-making mandate resides at national level, the department is committed to influence and help guide these decisions to ensure that agricultural land is preserved.

"Sustainable agriculture is regarded as one of the most effective strategies to stimulate socio-economic growth," says Cor van der Walt. "A growing demand for agricultural products and the risks associated with climate change and pressures to develop agricultural land for non-agricultural uses will result in increasing pressures on sustaining natural agricultural

resources. The norms of sustainability which are brought into consideration when subdivision is discussed, are meant to create an enabling environment, which must not only preserve but enable agriculture to move forward."

Generations to come will thank those who purposefully and with a long-term view acted as custodians of our natural resources, while enabling farmers to produce food for the people.



Human Capital Development

# Potential to grow

Government is well-known for its policies and implementing plans, justifiably so. However, without the human capacity to deliver on it, everything falls flat.

A critical part of translating policies and strategies into implementation of projects is human resources and talent development. Skilled, knowledgeable, experienced and passionate employees are an essential component in delivering an effective and efficient service to meet the demands of the sector.

The Western Cape Department of Agriculture manages a vibrant and responsive human capital development programme. The Head of Department, Ms Joyene Isaacs, places a high premium on this initiative and stresses the importance thereof: "The department has long realised that people are key to managing funds and making systems work, hence the development of a 20-year human capital development strategy that focusses on both internal employees and potential (future) employees as well as the skills of the agricultural sector broadly."

The initiatives for developing talent and preparing young people for a career in agriculture

ranges from bursaries to internships and a programme focused on post graduates called the Young Professional Programme (YPP). The programme Sustainable Resource Management has employed a number of people who benefitted from the department's Human Capital Development Initiatives.

This chapter aims to introduce them by sharing their stories where an elixir of drive and passion mixed with opportunity turned into prosperous careers.

**Jody Wentzel**
**Manager: Disaster Risk Management**

The initial training and experience afforded me the opportunity to operate independently and take responsibility for the decisions made on-farm. I also consulted and took guidance from my senior colleagues, where I needed to. It also taught me to manage multiple technical projects and find sustainable solutions. This solid foundation ensured that five years later I was ready to effectively manage and co-ordinate all disaster related issues affecting the Western Cape Department of Agriculture.

I am the first female engineering technician to be registered as a Professional Engineering Technician with the Engineering Council of South Africa (ECSA) in the Western Cape Department of Agriculture. It is a rigorous process and really difficult to achieve. This opportunity and experience gave me an opportunity to break stereotypes. Through hard work and dedication anyone is capable of achieving it.

As a young intern, I struggled to see the connection between civil engineering and Agriculture. Today I can really encourage any student to have a closer look at agriculture as a career path. It does not only focus on animals and plants.

It has been an honour working for and growing in a department and sector that has supported me from intern to management level.

**Grant Jephtas**
**District Manager: Overberg**

The opportunities given to me by the department means a lot and is difficult to express in words. It has showed me that through hard work and commitment all obstacles can be overcome. It has also created an opportunity for me to further my studies in the agricultural field. Furthermore, it has also provided me with support and guidance to obtain my registration with the Engineering Council of South Africa (ECSA) as a Professional Engineering Technician.

Agriculture gives me the platform to uplift the livelihoods within rural communities.

By conserving the environment, numerous employment opportunities are also created in local communities and rural areas. I feel like I contribute to food security and the economy by giving technical advice to farmers.

During my internship I saw how Civil Engineering can be applied in the agricultural field. This changed my view about agriculture tremendously.

I count myself as an extremely lucky person to be working at the department. I had great supervisors and mentors who supported me throughout the years.

**Zimu Mkhanyiseni**
**Engineer**

I was employed by the department as a Candidate Engineer in February 2012. This gave me an opportunity to work towards my registration as a Professional Engineer. I successfully completed my registration in October 2016. This opportunity meant I could work on my professional development, while at the same time contributing to the departments' objectives.

What impressed me in the Western Cape is the high level of organisation within the agricultural sector.

The department invests in one's continued growth, even after graduation. I appreciate the access the department affords us to various professional development opportunities through short courses, workshops and conferences. This further enhances our knowledge and development.

**Georvine Olyn**
**Administration Clerk**

The chance to study, given to me by the department, made me knowledgeable and confident in my field. If not for this opportunity, I would probably still be working at the sheep section where I herded, fed and moved sheep on a daily basis.

Working at the department puts me in a position to assist farmers. Working with people and seeing how my advice to them can make a difference, is very fulfilling.

Like many young people out there who were not exposed to rural life, I also thought agriculture only relates to farming. But now I know there are different aspects, categories and sciences to the sector. Agriculture is the first career given unto mankind by God, and therefore I regard it as the most essential.

**Gary Jones**
**Candidate Engineering Technician**

The department offered me a bursary to study Civil Engineering. I started working in Bredasdorp as a Candidate Engineering Technician in 2013.

If not for this opportunity, I would probably be working on a construction site and not in the beautiful environment I have an opportunity to see every day.

To blend engineering and conservation assisted me with the process of becoming an engineering professional and to help create job opportunities for my local municipality.

If one had told me that I would be working as an engineering technician within the agricultural sector, I surely would have laughed. To me, agriculture was animals and crops. This job has exposed me to many facets that I did not know existed in agriculture.

Seeing new possibilities of work in agriculture as an engineer, motivated me to complete my Baccalaureus Technologiae (B Tech) Water Engineering in 2018.

**Vivi Mbandezelo**
**Candidate Engineering Technician**

I started in the department as an intern. Back then it was an opportunity of a lifetime to learn about conservation and the environment, which is something not even thought of or considered as an engineering student.

My passion has, in an incredible way, shifted to caring and worrying about the environment. I want to do my best to ensure we leave sustainable natural resources for the next generation. Studying engineering, I thought I would be building skyscrapers. Now, I cannot see myself anywhere else but in agriculture.

If I can help just one person to live sustainably from agriculture, I sleep better. Ultimately my dream is to become a female farmer.

**Najma Adams**
**Professional Registered Engineering Technician**

Receiving a bursary from the department with the prospect to work after my studies was one of my biggest blessings. This opportunity has provided me with a solid foundation in an agricultural vs engineering career path. Along with the experience I've obtained as a Candidate Engineering Technician under an award-winning mentor, Mr Johan van der Merwe, the journey has also taught me independence.

It's actually a scary realisation knowing how difficult it is to find work. Life is tough and this kind of opportunity doesn't come knocking every day.

I've always had a passion for nature and helping people, and working for the department allows for just that. It is only fair that once you reach a level of accomplishment you are comfortable with, you need to help and assist as many people as possible. The candidacy and internship programme provided by the department is such an influential tool that needs to be used and spread as far as possible.

Before starting at the department, I was under the impression that the only activity that takes place in agriculture is farming. I didn't acknowledge all the aspects it entailed and the array of opportunities available. Engagements with farmers and communities through my work with LandCare are humbling and I've developed such a huge appreciation for the farmers and the hard work it takes to provide quality food in our grocery stores.

**Michael Appolus**
**Candidate Engineer**

I was lucky to have been part of a number of youth skills development opportunities of the department. In high school, I obtained a scholarship, followed by a bursary to study and the chance to join the department's Young Professional Programme (YPP) until I graduated this year with a Master's degree. I have been a beneficiary of the department's human capital development initiatives for no less than 10 years! They really took me full circle.

I have been employed as a candidate engineer - an opportunity that will provide me with the necessary skills, knowledge and training to register and be accredited as a Professional Engineer with the Engineering Council of South Africa (ECSA).

**Ashraf Mohamed**
**Candidate Engineering Technician**

The training that was given to me by the department was a major opportunity for myself to grow as an individual in my respected field of Civil Engineering, and also to acquire the newfound knowledge and love for agriculture.

Before agriculture, I worked in construction for a few years while completing my studies. I realised that I wanted to do something that made a bigger change to the world, and I wanted to give back in some way.

This opportunity provides me the chance to help people: from small scale farmers to a range of agricultural clients. It also gives me the great feeling of being able to see the joy on others' faces when providing them with information generated through our initiatives, that would inevitably be able to help them.


**Patuxolo Demeshe**
**Graduate Intern**

Working at the department has paved my career path for me. Gaining valuable experience is the key to doors opening for me in the future. I am growing my knowledge base in agriculture every day. Apart from assisting me to carve my profession, the department also exposes me to courses which complements my skills in Agriculture and Extension.

My family and I did not have the means for me to study further and with the department stepping in, it was not only an opportunity to graduate, but even more so it was a dream come true. If you are reading here, take the words of our beloved Madiba to heart: It always seems impossible until it's done.

**Lonwabo Mbam**
**Graduate Intern**

The opportunity given to me by the department means everything. It has given me great exposure to the working industry and allowed me to grow both as an individual and as a professional.

Part of my work involves assisting farmers with drought relief support and I get to visit some of the beneficiaries. Every time we help a farmer we see the impact it makes.

I always had this perception that agriculture only involves people that plant and harvest crops on the farms, managed by a boss. Since working at the department, I have been exposed to various careers in agriculture. For the first time, I realise how much "behind the scenes" work is being done to ensure that a farm runs smoothly.

The department does a great job in developing young people and I am very thankful that I was a beneficiary of their development programme. I hope they continue giving young people like myself a chance to better their lives.

**Herman Nkonyana**
**Graduate Intern**

I am very grateful to have the opportunity to work at the department. It gives me a bigger picture of what agriculture is about and the role it plays in our everyday lives. My knowledge about agriculture has vastly expanded and I have also grown as person.

The department affords me the opportunity to assist farmers with drought support and to perform certain agricultural activities. I have realised that we make a positive impact on the lives of farmers by supporting them through the drought.

I realise now that agriculture is not all about doing farm work or getting dirty. Agriculture is also about making a difference and there are a lot of careers in agriculture one can choose from.

**Terriann Thavar**
**Graduate Intern**

Affording me the opportunity to study and accommodating me as an intern has added so much colour to my career path. Applying my skills and knowledge to sustainable resource management is highly rewarding as I value the essence of sustainability and conservation. In addition, I was fortunate enough to attend various agricultural based courses, conferences and events that have strengthened my understanding on the current occurrences in agricultural resource management.

My passions and interests lie within a combination of agricultural conservation and research and technology. My master's project entails conserving the Southern Right Whale population using drone technology. Drone technology is a fairly new and upcoming tool being used for agricultural purposes. I believe that as the youth of today, we should not limit ourselves to one field of expertise. Allow yourself to tap into more than one interest so that you do not limit yourself from experiencing amazing opportunities. I have always remained loyal to supporting two causes in life: conservation and helping others through teaching and volunteering. Working for the department gives me a platform to make a real change. I get to protect agricultural land and also help to support socio-economic growth.

I sincerely appreciate everything the department has offered and I want to encourage young people to familiarise themselves with all the resources and support that is out there to turn your dream into a dream job.

# On the shoulders of giants

People working at Sustainable Resource Management have one common goal, a passion really: protecting the environment. Personnel employed across various levels at this section share this vision and understand their respective roles in attaining this. In this chapter we would like to celebrate some of the trailblazers of this programme for their significant impact over the past ten years – especially their inclination to go beyond the call of duty. We'll continue to build on the exceptional work they've done.

**The story of President John F. Kennedy and the janitor comes to mind:**

The President was visiting NASA headquarters in the early sixties. While touring the facility, he introduced himself to a janitor who was mopping the floor and asked him what he did at NASA. "I'm helping to put a man on the moon!" he exclaimed.

**André Roux**
**Director: Sustainable Resource Management**

Though André spent close to 22 years of his career at the Western Cape Department of Agriculture, when he recently retired his years of service to government spanned more than 40 years. According to colleagues, he left more than a mere footprint, he left an indelible mark.

His most valuable contribution, perhaps, came from his affinity for innovation and his aptitude for identifying and incorporating the latest technologies to solve problems. "Agriculture does not have the luxury of stubbornly sticking to traditional ways of doing things," he says. "At the department, we were determined to be innovative and employ new technologies/ methodologies to improve our service."

André managed to build a strong dedicated team of experts who continue to this day to provide high quality service to the agricultural sector. Solid and enduring relationships with Disaster Management colleagues at the national Department of Agriculture, Forestry and Fisheries contributed to the timeous allocation of disaster funds to support local farmers.

André's message to young people is clear: "We only have one planet to support our activities and to provide the natural resources we require to live and work. We are already using more than the earth can provide – it is not sustainable. It is vital that we all work together to reduce our impact."

**Callie van den Heever**
**Disaster Risk Manager**

"Assisting people and animals that have been rendered vulnerable in a time of disaster – whether it is a flood, drought or a fire – is highly rewarding and it allowed me to make a real difference where it was most needed," said Callie, who served the department for two decades. "Delivering an effective service as a government official means that the taxpayer is assured that his money is well-spent."

Callie was passionate about nature conservation. Minimising the impact of disasters and protecting natural resources gave him the platform to be actively part of enhancing the Western Cape's sustainability. One of his most important contributions was developing a disaster data base delineating any type of disaster. A variety of reports can be drawn from this data base which means that clients can be assisted effectively and timeously.

Callie used to say: "Tell young people that the Earth's natural resources include air, water, soil, minerals and plants – all things needed to survive. If we do not protect it, it will be lost."

**Callie unfortunately passed away during the production of this book.*

**Zaibunesa Arai**
**Administration Clerk**

Zaibu, as she is fondly known, had served the Western Cape Department of Agriculture for more than eleven years when she recently exchanged it for the corporate world. One of her responsibilities was the administration of the distribution of drought relief, which comes in the form of fodder vouchers.

This might seem a behind-the-scenes job. However, one doesn't inspire farmers to name sheep after oneself by *just doing your job.* Meticulous record-keeping, creating an auditable paper trail and going out of her way to make sure that help always arrives in time – all with the friendliest disposition – have earned her the respect of affected farmers and colleagues alike.

"The sector is an inspiring one to serve and I would most definitely encourage young people to consider it – whether for an office job or for one that takes you out and about," she says.

**Solomon Tshongweni**
**Auxiliary Services Officer**

Nine years in the service of the Sustainable Resource Management programme has thoroughly prepared Solomon for his position as Assistant Production Manager on a citrus farm outside Swellendam. As part of the Junior LandCare programme, Solomon annually impacted no less than 1 200 learners at 20 rural or farm schools by sharing his enthusiasm and knowledge about conservation agriculture and well-point gardening.

Solomon is a firm believer in the value of healthy food which can be produced without access to vast tracts of land. "A school and community garden can offer a very real opportunity for the production of food," he shares. "I feel LandCare makes a big difference in rural communities, promoting food security and especially with the lessons on the conservation of natural resources. When a young farmer returns years later to remind you of a lesson you shared with him in Grade 7, you realise that LandCare is not just a programme, but a movement that has impacted on the lifestyle of our communities and will continue to do so for years to come."

**Alvina Fortuin**
**District Administrator**

"I believe that I was the best version of myself when I worked for Sustainable Resource Management as part of the Beaufort West LandCare team," she reminisces. Building lasting relationships with clients and colleagues and delivering a service that went beyond her normal duties brought her in good stead with her managers and clients of the department.

Her ability to live the principles of *Batho Pele* (People First) by always putting clients first, has made her a beloved team member. Educating young people about the environment brought her great pleasure. "It is everyone's responsibility to make sure nature is looked after. The next generation must equip themselves with knowledge in order to be innovative in an age of climate change and other disasters."

**Anthea Albanie-Philander**
**Administration Clerk**

Anthea has always been able to view the conservation of natural resources from a big-picture point of view. “I believe the environment, and agriculture in turn, contribute towards economic opportunities through job creation and social development. By means of capacity building and generating awareness of conservation issues through Junior LandCare campaigns, and by addressing food security by encouraging the creation of food gardens at schools, we’ve been able to make a long-term difference.”

“Our youth should constantly be made aware of the after effects of negligence in terms of the preservation of our natural resources.”

**Johan van der Merwe**
**LandCare official**

For some people, a job keeps them occupied from 9am to 5pm daily. For Johan, his position as a LandCare official was a calling to upskill others in sustainable agriculture and natural resource management.

Johan has guided dozens of mentees through the department's mentorship programme and succeeded in creating an atmosphere conducive to learning and skills transfer through close one-on-one relationships with all mentees. More than 1 400 children have also benefitted from his Junior LandCare camps. "I was fortunate to be able to invest in young people's lives, to assist them to be well-balanced individuals," he says. "I have always enjoyed my work, but with the LandCare programme I found my passion."

"Facilitating food gardens within prisons in the Cape Winelands area was especially rewarding," he says. "Providing prisoners with new skills by teaching them to care for a vegetable garden, simultaneously ensured that they have a new skill upon leaving prison."

**Hans King**
**Soil Conservation Engineer**

During more than three decades at the department, Hans built a reputation of being reliable and highly professional. Joining government after a stint in the private sector, professionalism was non-negotiable, a conviction that resulted in the designing and institution of norms and procedures for a highly professional level of planning and reporting.

Many would agree that Hans's biggest legacy was the innovative designing of structures for river stabilization. After realising that this is an urgent need for many farmers, Hans embarked on extensive research to mimic groyne structures used to guide the course of rivers in Europe. Since then, many river stabilization projects have been successfully implemented, and to date more than R200 million have been spent across the province. One such river stabilisation project in Calitzdorp, which employed local people, won an Impumelelo Innovation award for marrying resource conservation with innovative design and poverty alleviation.

Hans is a well-known presenter on the topic at farmers' information days, published several papers on the subject and co-authored a book on river rehabilitation which was published by the Water Research Commission.

Hans believes that the work of Sustainable Resource Management is meaningful, to say the least: "Not only do we help current farmers to farm more profitably, we also help farmers of the future by ensuring that the available farmland does not decrease or its production potential diminish."

# Sustainable Resources - Taking Responsibility

One of the programmes within the Western Cape Department of Agriculture is that of Sustainable Resource Management (SRM). With its own clearly defined area of responsibility, it serves the wider agricultural community in close conjunction with the other departmental disciplines – always with sustainability as their compass. The four sub-programmes, namely Engineering Services, LandCare, Land Use Management and Disaster Risk Management, provide solutions and methodologies, pro-active and in answer to calamities, to clients and partners.

The following summary serves as an introduction to the various services and act as a glossary of terminology you might find in dealing with Sustainable Resource Management.

## ENGINEERING SERVICES

The agricultural engineering section offers specialised agricultural engineering services to clients, as well as to all the department's research farms in the Western Cape.

**Irrigation systems** design and evaluation, and technology transfer related to scheduling and

> Evaluation of sub-division and resoning applications are viewed in terms of principles of sustainable agriculture: social acceptability, economic viability, ecological feasibility, and long-term sustainability.

operation, towards more effective utilisation of irrigation water. The flagship project, Fruit-Look, uses satellite technology to improve water use efficiency.

**Mechanisation** planning and the effective utilisation of farming implements and equipment, as well as technical advice and support to farmers in the change-over from conventional to conservation farming practices.

**Farm structure planning** and design for animal housing and handling facilities, and animal waste disposal, as well as labour accommodation and water reservoirs.

Technical advice regarding on-farm **food processing and value adding** to products, including drying, cooling, canning and other value-adding processes.

Planning and design of **soil conservation** and erosion protection structures such as gabions, groynes, waterways and culverts.

## LANDCARE

LandCare, a sub-programme within the SRM programme, is a community-based natural resource management initiative aimed at restoring sustainability in rural and urban areas.

LandCare is community based and community led and seeks to achieve sustainable livelihoods through capacity building and related strategies.

**LandCare services:** Resource conservation projects (following the regulations of the Conservation of Agricultural Resources Act, 43 of 1983) include the planning, survey, design and control of works to prevent the degradation of agricultural resources and proposing sustainable utilisation of the resources.

**LandCare projects** promote the sustainable use and management of natural resources by engaging in community-based initiatives that support social, economic and environmental sustainability, and lead to greater productivity, food security, job creation, and creation of SMME's in rural communities.

**Area wide planning projects** strive to sustain and create healthy and fully functioning agro-ecosystems through an integrated natural resource management approach where the broader community pro-actively contributes towards the creation of a desired and sustainable plan for an area.

## LAND USE MANAGEMENT

This sub-programme provides comments on applications for sub-dividing and/or rezoning of agricultural land to ensure, despite significant pressure for development, that agricultural land is protected.

## DISASTER RISK MANAGEMENT

This team aims to lessen the impact of natural disasters and related risks through an integrated and co-ordinated approach.

Institutional capacity building towards proactive disaster risk management.

Implementation of disaster risk reduction measures as required by the Conservation of Agricultural Resources Act (Act No. 43 of 1983).

Declaring disasters in collaboration with Provincial Disaster Management and assisting farming communities to benefit from disaster relief funding schemes.

Facilitating and administrating disaster relief funding schemes, including financial relief pay-outs in real time.

Implementation of measures to build resilience and strengthen the vulnerability of people, animals, infrastructure and the environment against possible disasters e.g. drought, floods and fire.

# ACKNOWLEDGEMENTS

## Petro van Wyk, Author

Joyene Isaacs, Head of the Western Cape Department of Agriculture, had a vision of telling the good stories in agriculture that do not always reach the front pages. Her vision came to fruition in the *Abundant Harvest* coffee table book series. The importance of natural resources and agriculture's dependence on the sustainability thereof, lies close to her heart. Raising awareness for the preservation of these resources in an era of climatic disasters was the ideal topic for the seventh book in this series.

This book was done in the spirit all work gets done at Sustainable Resource Management – team work. I would like to thank the following people for the role they played in growing this book from an idea to the latest edition in the *Abundant Harvest* series.

Ashia Petersen, Director: Sustainable Resource Management, for her direction and clear vision. The four sub-programme managers, Peter Keuck, Cor van der Walt, Francis Steyn and Jody Wentzel for their invaluable input, commitment and patience. Also, their staff who did not mind checking facts or arranging for photographs to be taken. Dr Caren Jarmain and Ruben Goudriaan for sharing their expertise and wisdom on *Fruit-Look* and their patience to read and reread till I got all the facts correct. Phyllis Pienaar for the immense value she added to the *KOUP* story and not minding answering emails after

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Writing a book is not only about research, silence and sitting down to get it done. There is also a good deal of administration involved. I was very privileged to have a number of people at my disposal who lightened this burden for me with a smile. Giselle Terblanche, Assistant Director Communication, who was my go-to at the department. Brigitte van den Bergh, Personal Assistant for the subprogramme Engineering Services who made sure that venues for interviews were booked and that I had every contact detail of every person that I wanted to interview. Gaynor Samuels, Personal Assistant for the programme Sustainable Resource Management, who always stood ready whenever I needed her and was the perfect liaison between Ashia and myself. Najma Adams, a candidate engineering technician and Gizelle van Wyk from Communication Services who gallantly assisted with all the photo sessions and made sure that we captioned all the pictures correctly.

It was an honour to capture the life changing work Sustainable Resource Management does. They are all environmental warriors working tirelessly to make sure that we still have a planet left to give to our children.

Petro van Wyk
Author

# REFERENCES


## ALIEN CLEARING

www.groundup.org.za/article/aliens-are-greatest-threat-cape-towns-water-security/
www.capenature.co.za/care-for-nature/conservation-in-action/integrated-catchment-management/alien-vegetation-management/
www.sanbi.org/wp-content/uploads/2018/03/invasive-alien-species-strategy-greater-cfr.pdfwww.environment.gov.za/projectsprogrammes/wfw
www.greenagri.org.za/assets/documents-/SmartAgri/Executive-Summary-published-version.pdf
Heather D'Alton, "The 'Aunty' who became a leader"

## JUNIOR LANDCARE

www.nda.agric.za/docs/landcarepage/Junior-Care.htm
Abundant Harvest: Growing Talent
www.elsenburg.com/sites/default/files/ebooks/2015-04-28/11167M_BOOK_INSIDE_2.pdf

## FLOODS

www.environment.gov.za/sites/default/files/reports/ltasbook3of7_perspectivesfordisasterriskreductionandmanagement.pdf.
Engineering with nature to help reduce flooding

Posted by:Andy Croxford, Environment Agency, UK Government. Posted on: 20 October 2015 - Categories:Climate change, Fisheries and biodiversity, Flood environmentagency.blog.gov.uk/2015/10/20/engineering-with-nature-to-help-reduce-flooding

## WC FIRES

www.elsenburg.com/sites/default/files/services-at-a-glance-forms/2017-12-13/drought-fact-sheet-final.pdfwww.capenature.co.za/fire-prevention/
workingonfire.org/fire-in-the-south-african-landscape/
"Ecological impacts of fire on the Cape Peninsula", Dr Jasper Slingsby, Vegetation Scientist, SAEON Fynbos Node, 2015 www.saeon.ac.za/enewsletter/archives/2015/april2015/doc01
The relationship between fynbos and fire. Gillian van Wyk, 2016 www.kbrc.org.za/news/fynbos-and-fire/

## BALES OF HOPE

Agriprobe Vol 15 No 1 p 6 -9, Forces of Nature, Bianca Capazario www.elsenburg.com/drought/?p=954www.wwf.org.za/water/?25441/Agricultural-water-file-Farming-for-a-drier-future
www.elsenburg.com/news/veld-assessment-conducted-determine-where-drought-relief-required-r17-million-drought-relief

## SUBDIVISION

Draft policy on the preservation and development of agricultural land, DAFF, 2016 www.nda.agric.za/doaDev/sideMenu/LUSAM/docs/Draft%20policy%20document%20on%20the%20Preservation%20and%20Development%20of%20Agricultural%20Land%2007%20092016.pdf
www.bfap.co.za/wp-content/uploads/2018/08/BFAPBaseline-2018.pdf
www.ruraldevelopment.gov.za/phocadownload/spatial_Planning_Information/Simplified_Guideline.pdf

## AGRO-ECOSYSTEMS

Sustainable Agriculture by: Brodt Sonja (UC Sustainable Agriculture Research and Education Program and Agricultural Sustainability Institute), Six Johan (Department of Plant Sciences, UC), Feenstra Gail (UC Sustainable Agriculture Research and Education Program and Agricultural Sustainability Institute), Ingels Chuck (University of California Cooperative Extension, Sacramento County) & Campbell David (Department of Human and Community Development, UC) © 2011 Nature Education
www.nature.com/scitable/knowledge/library/sustainable-agriculture-23562787

en.wikipedia.org/wiki/Agroecosystem#The_future_for_farming?

The 10 elements of agroecology guiding the transition to sustainable food and agricultural systems – FAO www.fao.org/3/i9037en/i9037en.pdf

## VELD ASSESSMENT

AgriProbe, Vol 16, No. 1, 2019, p 48 Impak van droogte op veldweiding, Nelmarié Saayman,
www.elsenburg.com/sites/default/files/services-at-a-glance-forms/2017-12-13/drought-fact-sheet-final.pdf
www.conserve-energy-future.com/causes-effects-solutions-overgrazing.php

## LEEU RIVER WEIR

Is the drought over when most of the dams are almost full? Abri de Buys www.saeon.ac.za/enewsletter/archives/2018/december2018/doc03
Water sources and water availability www.fao.org/3/u5835e/u5835e03.htm

## LOWER OLIPHANT

http://www.dwa.gov.za/Projects/WUE/Documents/LORWUA_WMP_Final.pdf

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