SOUTH AFRICAN

fruit journal

DIE JOERNAAL VIR DIE VRUGTEBEDRYF IN SUID-AFRIKA **AUG/SEPT 2021**

Disease risk **monitoring tool**

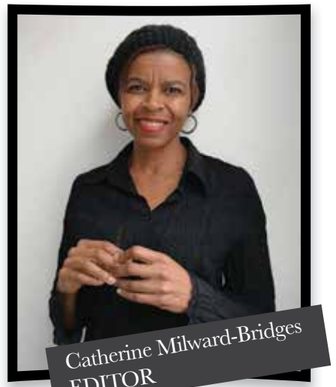
Ken jou koue modelle

Adoption of IPM in citrus

Women's MONTH warranted recognition

Grapefruit "COOK-OFF"

on page 114


Catherine Milward-Bridges
EDITOR

WOMEN
We see you

According to the World Health Organisation, one in three women around the globe have been subjected to either physical or sexual violence in their lifetime. Oxfam International further confirms that "every day, in every country around the world women are confronted by discrimination and inequality – at home and in their wider communities".

In the context of women's rights, the agricultural sector is certainly evolving. "Women: warranted recognition" on page 7 features (amongst others) an excerpt of a survey done by FreshFruitPortal.com amongst women from around the world who work in the sector; as well as findings from the 2020 Women in Agriculture Report produced jointly by SIZA and the Western Cape Department of Agriculture.

And for some girl-power fun, our Chef Pete Goffe-Wood goes up against Chef Jocelyn Myers-Adams for a spring grapefruit "cook-off" on page 114. We hope these recipes add a new dimension to your kitchen creations. Other features in this edition include "A disease risk monitoring tool", "Adoption of integrated pest management in citrus", "Ken jou koue modelle", and "Driven by gratitude: Karabelo Motsei". And as Anton Rabe rightfully points out in the foreword, (and I'm paraphrasing) the industry already has an abundance of strategies in its arsenal; what's needed now is implementation.

From a South African perspective – like in many countries worldwide – the COVID-19 pandemic remains a grave concern (no pun intended). At the time of writing, President Ramaphosa had just announced an extension of adjusted level 4 lockdown, until 25 July. The announcement came against the backdrop of the Delta variant of the pandemic continuing to wreak havoc, with the total number of deaths in SA having reached 64 289. Ramaphosa also confirmed that a new "historic agreement" would speed up the delivery of Johnson & Johnson vaccines to SA and the rest of Africa, and that the company has agreed for SA to, in time, manufacture its vaccines under licence.

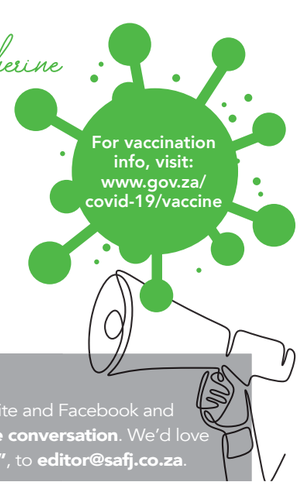
En as dit by die markte kom, hou die vrugtebedryf eenvoudig aan om indrukwekkende produksie-volumes te toon.

In the context of women's rights, the agricultural sector is certainly evolving.

Dis júis hoekom die verwoestende sosiale en ekonomiese impak van die onlangse onluste in KZN en Gauteng so ontmoedigend is. Maar ons is ons produsente wat aanhou deurdruk, innig dankbaar. En dis ongeag al hulle ander uitdagings, soos fitosanitêre vereistes en vertragings by die hawens – veral in Durban (ten tyde van die skrywe).

Vir ons vroulike produsente en al die ander vroue in die bedryf sê ons gelukkige Vrouemaand! Mag julle vernuf en harde werk aanhou om jul reputasie vooraf te gaan.

Catherine



SOUTH AFRICAN fruit Journal

@sa_fruitjournal @SAFruitJournal

The *SA Fruit Journal* is excited to announce the recent launch of its revamped website and Facebook and Twitter accounts. Do pay us a visit online, and **follow us on social media to join the conversation**. We'd love to hear from you. Alternatively, please send your letters titled **"Letter to the editor"**, to **editor@safj.co.za**.

contents

FOLLOW US HERE:
@sa_fruitjournal @SAFruitJournal

ELKE UITGAWE | EVERY ISSUE
01 Editorial and letters to editor
02 SA Fruit Journal Board of Directors
04 Foreword

IN CONTEXT | In Konteks
07 Women: warranted recognition
10 Plastics: no popularity contest

BEDRYFSNUUS | INDUSTRY NEWS
SA Table Grape Industry (SATI)
12 Harvest report
16 SA table grapes in China
18 Student bursaries

Citrus Growers' Association (CGA)
22 Precool storage
24 XSIT: sustained growth
26 Grapefruit game changer
28 Succession stories in the citrus industry
32 Citrus industry stakeholders visit black farmers
33 Update on Citrus Academy e-learning programmes

Hortgro
34 Hortgro 1662 Industry Award recipients
36 Elke Crouch: why things go wrong
38 Nuwe US-Navorsingsleerstoel
40 Emerging farmers reach commercial status
42 Concessional loans and tailor-made funding solutions
44 Young and old working together
47 Grow your people, grow your business
54 Die 2021-kernvrugseisoen
59 Pollination
60 Licence to do research
62 Hail is hardly a storm in a teacup

Fresh Produce Exporters' Forum (FPEF)
64 Driven by gratitude: Karabelo Motsei

RESEARCH AND TECHNOLOGY | NAVORSING EN TEGNOLOGIE
Hortgro
67 Winterdormansie
72 Ken jou koue modelle
76 Die fundamentele gebreke van koue-modelle
79 Wat vertel koue-modelle ons van bot?
82 Research on rest-breaking agents

Citrus research international (CRI)
88 Extension briefs for August and September
95 A first record of two spider species

Citrus Growers' Association (CGA)
99 Adoption of IPM in citrus

SA Table Grape Industry (SATI)
102 CC user experience feedback
106 A disease risk monitoring tool
110 Soil enzyme activities

KOS | FOOD
114 "Cook-off" Chef Pete Goffe-Wood and Chef Jocelyn Myers-Adams

ADVERTORIALS | PROMOSIE
43 DNA Plant Science
46 FruitLook
52 MBFI
58 InteliGro
70 Tessenderlo
81 Blue North Appels
86 Farm Costing Solutions
116 Citrosol

SOUTH AFRICAN fruit journal
DIE JOERNAAL VIR DIE VRUGTEBEDRYF IN SUID-AFRIKA

VOLUME 20 | PART 4
SAFJ (SA Fruit Journal) is also available in electronic format on our website.
SAFJ (SA Vrugtejoernaal) is ook elektronies beskikbaar op ons webtuiste.
www.safj.co.za

Shareholders
Fresh Produce Exporters' Forum
Private Bag X5, Century City 7441
Tel: 021 526 0474 I www.fpef.co.za
Citrus Growers' Association
PO Box 461, Hillcrest 3650
Tel: 031 765 2514 I justchad@iafrica.com
www.cga.co.za
Hortgro
Tel: 021 870 2900 I 258 Main Street, Paarl
PO Box 163, Paarl 7620
info@hortgro.co.za I www.hortgro.co.za
South African Table Grape Industry
63 Main Street, Paarl 7646
Tel: 021 863 0366 I info@satgi.co.za
www.satgi.co.za

To subscribe, contact: Filda Booysen
filda@hortgro.co.za I 021 870 2900
Design and layout by Megan Merifield
Printed and bound by Novus Print

Implementation

A catalyst for change

By Anton Rabe

Anton Rabe
Executive Director, Hortgro

The recent quieter winter months – from a deciduous fruit perspective – provided an opportunity to reflect on the past season and to align planning and processes towards the 2021/22 harvest. At least, some of us also managed a little winter holiday break (with full Covid compliance, of course) during what seemed like an inevitable third wave at the time of writing.

We experienced a bumper deciduous fruit production year for all fruit types. Plums, especially, reached an all-time record crop after a severe drought, which is still prevalent in many arid parts of the country, including the Little Karoo and parts of the Langkloof. Despite some hail, late frost damage early in the season, and wind damage in some of the pome fruit areas, the industry recorded record crops for all fruit types, except for apricots. But apricots too, virtually doubled in volumes since the 2019/20 season, albeit still well below the volumes produced prior to the onset of the drought.

There are, however, deciduous fruit producers, their workers, and their families who still experience extreme hardship. We pray that another wet, cold winter will bring relief for them too. But looking at the hardship in other agri sectors, regions, and the economy at large, the fruit industry is blessed and extremely grateful, indeed.

At industry level, the good crops (despite some logistical hiccups and tight market conditions) imply that we have the financial means and opportunity to fast-track some of the key enablers to ensure long-term viability and growth for our industry. In this regard, it is very clear that collaborative efforts between the industry bodies within the Hortgro group, and in alliance with like-minded entities and structures where sound plans and strategies are effectively implemented, are key in providing an enabling environment for commercial activities to prosper.

The partnership between various fruit bodies within FruitSA to share services and capacity relating to information and market intelligence, logistics and market access, is vital for the delivery of cost-effective joint activities. Such capacity is closely linked to the reality and synergies of the seasonal peaks and demands from the various sectors.

This is equally true for effective public-private partnerships where a successful track record between Hortgro and the Western Cape Department of Agriculture (WCDoA) has created and unlocked huge value for emerging producers. We have a long way to go, but memorandums of understanding (MoUs) were recently signed between Hortgro's Deciduous Fruit Development Chamber (DFDC) and other provinces, to work collectively on similar programmes elsewhere. Thus, the table has been set for another chapter of effective implementation of empowerment projects within the value chain of our industry.

> We don't need any more plans or strategies, merely implementation.

This is the only logical way to ensure that limited resources, expertise and capacity are harnessed optimally at the level and functional domain where it can make the biggest difference.

Similarly, the latest national effort towards a holistic strategic plan – the Agri and Agri-Processing Master Plan (AAMP) – encapsulating the strategic pillars of the National Development Plan (NDP) and previous sector plans, the pooling of resources and expertise between the private and public sectors could undoubtedly lead to a vastly improved environment for our industries to prosper and grow.

In the last 20 years we have made various plans and introduced new strategies that are currently gathering dust. I believe it is safe to say that we don't need any more plans or strategies, merely implementation.

This needs to be done within a public-private construct. On behalf of Hortgro and the industries and stakeholders we represent, I once again unreservedly pledge our commitment to such a joint programme. This would be a catalyst for real change: to finally get to a point where the public and private sectors can join forces and combine resources to ensure action.

Warranted recognition

Women around the world are not asking for any special privileges. They're simply asserting their right to what they deserve economically and otherwise – their fair share. By Catherine Milward-Bridges

Though certain gaps remain, women are being acknowledged and celebrated more and more in the agricultural sector, putting paid to the notion that the sector continues to nurture patriarchal confines.

On International Women's Day this year Fruitnet.com announced the launch of the Woman of Impact and EmpowerHER Company Awards. These awards are the brainchild of Global Women Fresh (GWF), an international network for women in produce aimed at celebrating the role of women in that sector.

Exemplary leadership, inspiration, and a sense of purpose characterise recipients of the Woman of Impact Award, while the EmpowerHER Award annually recognises a single company that "paves the road to empower women in leadership roles".

And in the same month, prompted by the low participation of women in management and leadership positions in agriculture, FreshFruitPortal.com ran a survey among women in different positions in the industry around the world. The goal was to get their view on the evolution of women's role in the industry and what future changes still need to be made.

Below are some of their paraphrased answers.

Mayda Sotomayor-Kirk, CEO, Seald Sweet (U.S.)

The produce story is one of health and humanity's future. I see women evolving into a higher position, helping to develop a company's strategy and culture.

Nissa Pierson, Sales and Marketing Director, Crespo Organic Mangoes (U.S.)

I still see the produce industry as extremely difficult terrain for women. I don't think the industry is changing, women are. Unlike men, women's strength and power are rarely as celebrated, never mind financially rewarded.

Though certain gaps remain, women are being acknowledged and celebrated more and more in the agricultural sector.

Globally, the call for the recognition of women and for them to get their fair share of the economic pie, is getting louder.

Carolina Cruz, president of the Research Commission for the Development of Table Grapes - Uvanova (Chile)
We have already been participating in the changes within agriculture. In the particular case of fruit production in Chile, the support of the female sector is unquestionable.

Flavia Santoro, President of trade promotion agency ProColombia (Colombia)
For other women who want to enter the industry, there is a very promising future and there are current signs that indicate that we are on a positive path.

Closer to home, findings in the "Women in Agriculture" Report produced by SIZA and the Western Cape Department of Agriculture in 2020, provide an objective glimpse for brands and suppliers as to how women are represented in SA's agricultural sector. Also, how they have been emancipated and where the gaps remain.

The report provides a quantitative snapshot that shows a marginal decrease nationally in the variation between the total number of male and female employees; that the age of most women working in agriculture is 26 years and older; and that respondents prefer to employ women, with salaries of the senior female workforce well above the industry pay benchmarks.

Increased adoption of new technologies has also served to exempt women from the unspoken prerequisite of physical strength for entry into the agricultural sector.

Qualitatively, empathy, problem-solving skills and effective communication are amongst the reasons cited by respondents for a larger female workforce in agriculture. And self-confidence, perceptions, and education and training count amongst the barriers to entry.

As for the preservation of women's dignity, respondents recommended raising awareness of gender equality among men, women and children; raising awareness of training and employment opportunities for women; creating safe channels to report discrimination; and conducting interviews with women at all levels, to better understand their needs.

The report goes on to state that according to preliminary research, women empowerment has the potential of increasing productivity[1].

With its impressive production growth margins and 60% of produce being exported to more than 100 countries worldwide, the fruit industry requires a competent workforce. And the women are certainly earning their stripes in this respect. The industry boasts a diverse female workforce that defies gender norms by women simply proving their mettle – whether in the orchards, packhouses, laboratories or offices. And what's particularly encouraging – especially in terms of the industry's transformation goals – is the growing number of young women entering the industry.

Indeed, the ongoing fight for women's rights extends far beyond our shores.

Globally, the call for the recognition of women and for them to get their fair share of the economic pie, is getting louder. Therefore, seeing women and girls prioritised in the G7 2021 context, in the form of the G7 Declaration of girls' education, raises hope.

During the G7 Foreign and Development Ministers' meeting these ministers from Germany, Italy, France, Canada, Japan, Brittain and the US shone the spotlight on the impact that COVID-19 has had on women and girls, and have committed to prioritising gender equality and empowerment, placing these "at the heart of our work to build back better".

Amongst the issues highlighted were those emanating from pandemic related school closures, resulting in girls dropping out of school to care for family members; child marriages; conflict, displacement; and natural disasters.

Two new ambitious objectives for Sustainable Development Goal 4 (SDG4) – the education goal – were added, rallying the international community to deliver by 2026:

- a 40 million increase in girls in school, in low and lower-middle-income countries
- 20 million more girls reading by age 10 or the end of junior school, in low and lower-middle-income countries.

The rest of the world should take its cue from these seven richest nations: women and girls deserve to be prioritised, for inclusive, sustainable growth.

Fortunately, the fruit industry largely recognises this and continues to support women in this vibrant industry.

You may access the Women In Agriculture Report here: https://siza.co.za/women-in-agriculture-project/

[1] Diiro GM, Seymour G, Kassie M, Muricho G, Muriithi BW (2018) Women's empowerment in agriculture and agricultural productivity: Evidence from rural maize farmer households in western Kenya. PLos One 13(5): e0197995. p 22, https://doi.org/10.1371/journal.pone.0197995.

PLASTICS

No popularity contest

The demand for plastic packaging continues to grow in parallel with an increase in anti-plastic measures being instituted globally. But the fruit industry knows better than to jump on this bandwagon. By Catherine Milward-Bridges

The allure of cost saving along with its durability and versatility are what make plastics the go-to for packaging of fruit and vegetables, confirms the Fruit Logistica Trend Report 2020. It also highlights an increase in the last decade, in the share of fresh fruit sold in packaging, which ranges from 3% in China to 20% in the US, 47% in the UK and 56% in Germany. "The trend for packaged fresh produce is driven by consumer trends like convenience and healthy snacking."

Interestingly, the report further states that notwithstanding the much higher share of paper packaging being recycled into new packaging, "its production has, for example, a higher carbon footprint than plastic packaging."

The fruit industry of SA has its eyes set on penetrating additional international markets, hence its serious stance on compliance. And when it comes to plastics, the industry continues to work closely with the SA Plastics Pact, of which it is the first supporting member amongst the country's agricultural industries. With the Pact being a part of a global network, SA's fruit industry is kept abreast of critical global guidelines and best practices.

But members of the fruit industry also operate as regular members of the public. In this vein, the SA Plastics Pact shares these practical preventative measures to mitigate against the environmental impact of plastics.

Mind the marine life

More than 8 million tonnes of plastics enter our oceans. And turtles often mistake plastic shopping bags for jellyfish floating in the sea. They eat the entire bag, with dire consequences. So, rather use reusable bags.

Beware the disposable coffee cup

Over 100 billion single-use cups are discarded annually around the world. Since the plastic coffee cup lid and its inner plastic lining are both non-recyclable, carry your own reusable coffee mug when buying coffee.

Straws

Plastic straws count amongst the most prolific litter items on SA's beaches, and have been found to kill seabirds when swallowed. Not to mention getting lodged in turtles' nasal cavities. So, choose from the many available alternatives, or simply don't use a straw.

Water bottles

The glass bottle vs plastic debate rages on. So in the meantime, for a reduced environmental impact, let's seek to adopt multiple use of our (suitably designed) bottles before recycling them.

Bottle tops

It takes more plastic to produce bottles with push-pull drinking spouts than it does for those with conventional screw-on lids, and the additional clear plastic cover simply adds to littering.

So, as a consumer, don't get drawn into the popularity of plastics usage. Let's rather summon – as an industry and as ordinary South Africans –many more alternatives that will serve as eco mitigators.

So, as a consumer, don't get drawn into the popularity of plastics usage.

The SA Plastics Pact | PLASTICS PACT

SA Table Grape Industry 2020/21

Harvest Report

The 2020/21 table grape harvest ended on a new volume high with over 74.8 million cartons (4.5 kg equivalent) inspected for export (intakes). By Jacques Ferreira

Intake volumes

The new volume high represents a 10% increase on the previous highest intake of 67.6 million cartons in 2016/17, and a 13% increase on intake volumes year on year (Table 1). Table 2 shows the four crop estimates that were issued during the season.

The necessity for four crop estimates was mainly due to a combination of lower volumes packed in the Orange River after heavy rain in week one, and higher volumes packed in the Western Cape regions due to above average weather conditions experienced. Again, this highlighted the advantage of the geographical diversity of the five table grape production regions in SA to continue to supply the weekly demands of the industry's markets, should one or more of the regions lag due to bad weather.

All regions, except the Orange River region, packed significantly higher volumes than the previous season (Figure 1), ending with the highest volumes packed to date for four of our five production regions. The same four regions all managed to realise higher actual intake volumes than the first crop estimate of the season. Other than the above average weather experienced in the three Western Cape production regions, another contributing factor for the higher than expected intakes is the increase in planting of new higher yielding cultivars that are continuously coming into full production.

Packing in the Northern Provinces started about two weeks later, and although a new volume high of 7.88 million cartons were packed, some quality issues on arrival were reported, possibly due to above average rain in this summer rainfall area.

Packing in the Orange River also started about two weeks later than the previous season but was then disrupted and delayed in week one due to heavy rains in the Northern Cape. Damage to the later cultivars after the rain was less than initially estimated, and producers packed with great caution to pick up the better-than-expected volume despite the setback.

The mid to later-producing regions of the Western Cape, namely the Olifants, Berg and Hex River that also started packing about two weeks later, all experienced excellent ripening and harvesting conditions. The crops were very promising, both from a volume and quality perspective. This created a positive outlook due to mostly continued good weather, enough water availability after last winter's rainfall, large berry sizes and the overall good quality of grapes.

The geographical diversity of the five table grape production regions in SA enables a continued supply of the weekly demands of the industry's markets.

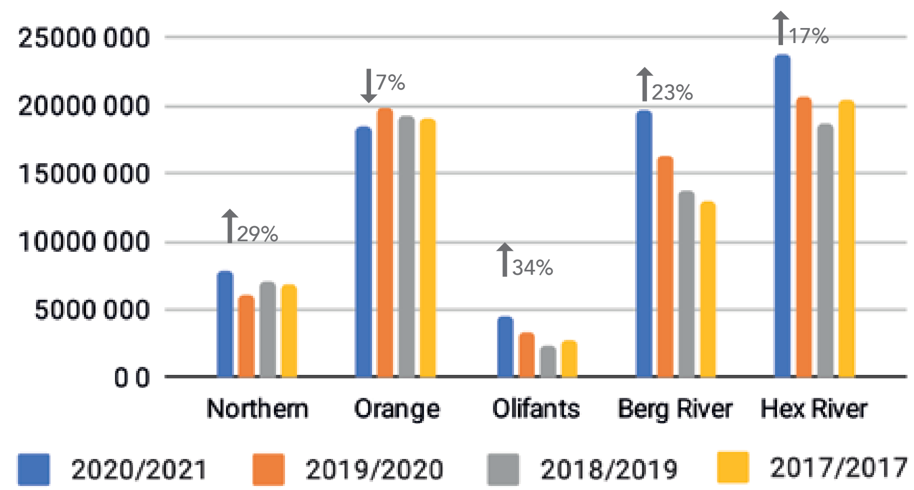


Figure 1. Graphical display of intakes per region over the last four seasons

Table 1. Intake volumes (4.5 Kg Cartons) per region over the last four seasons

Region/season	2020/21*	2019/ 20	2018/ 19	2017/18
Northern Provinces	7 881 591	6 100 383	7 120 756	6 828 762
Orange River	18 508 777	19 859 013	19 207 361	19 015 641
Olifants River	4 443 619	3 319 516	2 366 503	2 802 436
Berg River	20 061 729	16 274 501	13 788 759	13 052 616
Hex River	23 997 667	20 596 570	18 649 830	20 365 295
Totals	74 893 384	66 149 984	61 133 209	62 064 750

Table 2. Four crop estimates issued during the 2021 season

Region	2020/21 CROP ESTIMATES			
	Fourth - 2 March '21	Third - 2 Feb '21	Second - 12 Jan '21	First - 27 Oct '20
Northern Provinces	7.8 - 7.9	7.5 - 7.8	6.9 - 7.4	6.9 - 7.4
Orange River	18.3 - 18.5	18.0 - 18.3	15.0 - 16.0	18.5 - 19.9
Olifants River	4.0 - 4.2	3.7 - 4.0	3.7 - 4.0	3.5 - 3.8
Berg River	16.5 - 17.3	15.5 -16.7	15.5 -16.7	15.5 -16.7
Hex River	20.6 - 23.0	20.6 - 23.0	20.6 - 23.0	20.6 -22.0
Totals	67.0 - 70.9	65.3 - 69.8	61.7 - 67.1	65.0 - 69.8

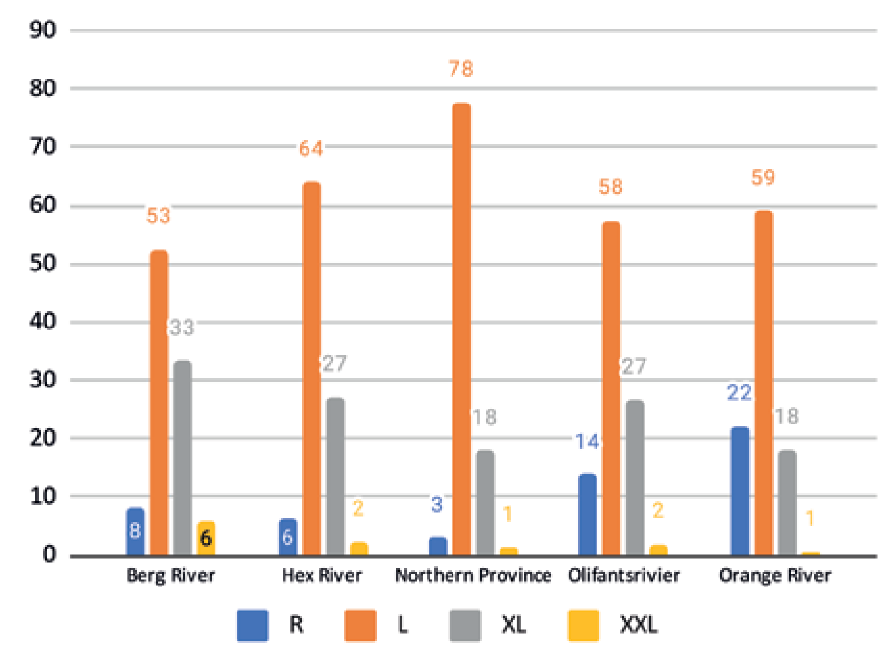


Figure 2. Berry Size proportions in the different production region for 2020/21

Table 3. Percentage year on year change in berry sizes for the 2020/21 season, for each region

Berry size/ region	Berg River	Hex River	Northern Provinces	Olifants River	Orange River	National
R	-6	-3	-4	-2	4	-3
L	0	-6	-1	-1	-2	-3
XL	5	8	4	2	-3	4
XXL	1	1	1	1	0	1

Berry sizes

Figure 2 displays the different berry sizes of the intake volumes in the different production regions. These sizes were compared to the previous year's sizes and the percentage changes for each size category (R, L, XL, and XXL) are displayed in Table 3 below. According to this comparison the biggest increase in berry size compared to the previous season was experienced in the Hex River region with an 8% increase in XL berries, followed by a 5% increase in XL berry sizes in the Berg River region. The Northern Provinces and Olifants River regions showed a 4% and 2% increase respectively in berry size while the Orange River region was the only region to show a decrease in XL berries compared to the previous season.

Exports

Table 4. Export volumes (4.5 kg cartons) of the last three seasons compared

Export region / season	2018/19	2019/ 20	2020/ 21	Year on year percentage change
European Union	30 416 320	31 328 223	38 545 648	23%
United Kingdom	14 319 561	15 779 666	15 762 524	0%
Canada	2 854 674	4 221 802	3 974 228	-6%
South East Asia	2 933 244	2 877 254	3 440 899	20%
Middle East	3 151 650	2 902 863	3 199 225	10%
Far East	3 263 959	2 951 181	2 735 356	-7%
United States	201 975	491 559	1 081 545	120%
Russian Federation	846 227	1 214 67	1 076 271	-11%
Africa	778 088	859 961	1 037 452	21%
Asia	297 875	190 457	302 476	59%
Indian Ocean Islands	357 647	273 715	270 899	-1%
Totals	**59 421 219**	**63 091 351**	**71 426 522**	**13%**

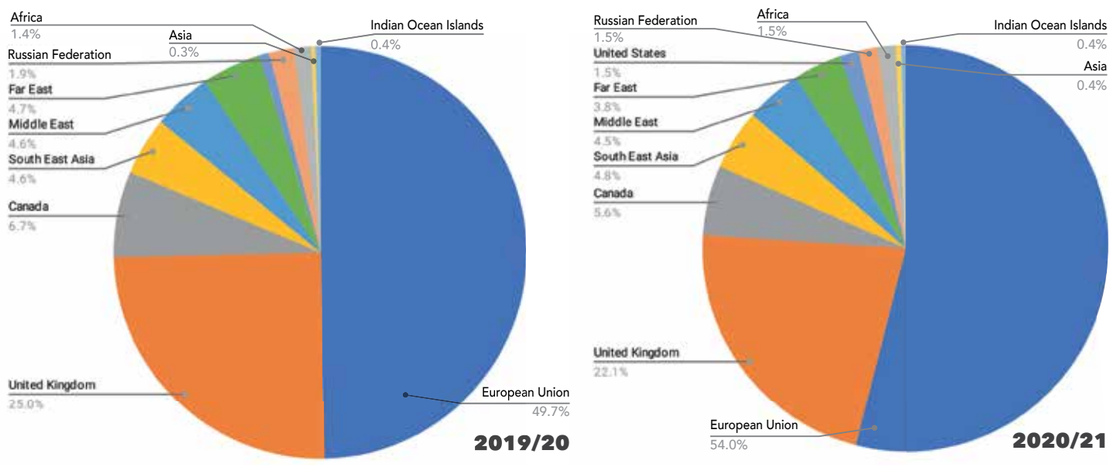


Figure 3. Export split of SA table grapes per export market for 2019/20 vs. 2020/21.

South African table grapes in China

Celebration in Shanghai caps successful season

SA Crimson grapes at Shanghai launch

SA's range of high-quality table grapes was in the spotlight in the China market during their spring (March to April), thanks to the active promotional work of the South African Table Grape Industry (SATI) in partnership with the Western Cape Government and leading Chinese importers and retailers.

On April 29 SATI celebrated the successful 2021 South African table grape season in China through an event held with importer Joywoo and distributor Yibo, at the Shanghai Huizhan Fruit and Vegetable Wholesale Market.

The event brought together representatives from the fresh fruit industry supply chain, including Shanghai Huizhan Fruit and Vegetable Wholesale Market Vice General Manager Lin Zhehao, Joywoo General Manager Zheng Yi and Yibo General Manager Xu Gang. Aside from speeches, performances and interactive activities, the event also included a tasting of SA's world-class wines.

A highlight of the event was the participation of Mpho Hlahla, SA's Consul General in Shanghai, and Mashudu Silimela, Counsellor for Agriculture at the South African Embassy in Beijing. The presence of these officials demonstrated the effective cooperation between SA's industry and government to strengthen exports of the country's world-renowned fruit products.

"We hold hands today as the South African Consulate-General in Shanghai, the Western Cape Department of Agriculture, the South African Table Grape Industry, as well as you, our esteemed importers, further promote our table grapes in the China market," said Hlahla. "Today's event should not be a once-off effort to promote South African table grapes in the local market. Let us continue to work together to expand the consumer base and grow the volumes to reflect the strong trade relations between our two countries."

This season was the first in which SATI has actively promoted South African table grapes on the China market since the product received market access in 2014. After kicking off the season's promotion at Guangzhou's Jiangnonghui Fruit Wholesale Market on April 1, SATI worked together on the campaign with partners including Joywoo and two of China's leading fresh fruit import and distribution companies, Joy Wing Mau and Goodfarmer. The promotional campaign included retail promotions and trade advertising and outreach.

The retail activities took place in the high-end Shanghai supermarket chain City Shop and Sam's Club outlets around China. They highlighted SA's diverse green, red and black table grapes, which include many new-generation varieties. Some of the varieties promoted on the market in 2021 included Crimson Seedless, Sweet Globe, Sweet Sapphire and Sweet Joy. In total, the retail promotions covered 12 major cities: Beijing, Shanghai, Shenzhen, Guangzhou, Shenyang, Dalian, Tianjin, Suzhou, Chengdu, Wuhan, Chongqing and Zhuhai.

Despite challenges such as a global shipping container shortage and delays caused by increased inspections aimed at ensuring that a healthy and safe product reaches the consumer, exports of South African table grapes to mainland China in the 2021 season increased.

Historically, more than three-quarters of SA's almost $1 billion worth of annual table grape exports have gone to the EU and the U.K., where they have been warmly received by consumers. Now, SATI has set the ambitious goal of increasing its export of table grapes to China by 10 million cartons over the coming five years. As part of this effort, SATI has developed an exclusive "China Specification", which ensures that the best possible South African table grapes are provided to this highly discerning market.

"China is an enormously important market to SATI's strategy for future diversification and growth," said Willem Bestbier, CEO of SATI.

Shanghai launch panel

"China is an enormously important market to SATI's strategy for future diversification and growth."

"And we are committed to continuing our active generic promotion campaign for South African table grapes in China over coming seasons. Indeed, we look forward to more and bigger activities in the future. Although the 2021 season may be complete, our work in the China market is never finished. We look forward to hearing from potential partners in China's fruit industry, in order that next season will be an even bigger success for South African table grapes in China."

Student bursaries

Extending industry community

The South African Table Grape Industry (SATI) believes that part of transformation is the improvement of the skills and knowledge of black professionals within the industry. By **Wilton September**

The SATI bursary fund targets individuals who aspire to a career in the table grape industry. The study fields supported are at primary production level and within the value chain.

Bursaries

In the 2020 academic year SATI supported nine black students with their tuition fees, study material, accommodation and living expense to the value of approximately R450 000.

Table 1: Students supported by the SATI bursary fund in the 2020 academic year

2020			
Student	**Race**	**Gender**	**Study programme**
K. Toolo	B	F	MSc Agric Viticulture
M. Sadikge	B	M	MSc Soil Science
M. Mahlo	B	F	MSc Wine Biotechnology
A. Sigadla	B	M	M-Tech
S. Govindasamy	I	F	Advanced Diploma Horticulture
T. Buxeka	B	M	PG Diploma Agronomy
M. Skippers	C	M	National Diploma Farming Management N4-N6
L. Cloete	C	F	BSc Agric Food Science
L. Phahlamohlaka	B	M	Research Methodology (Module)

Congratulations to Silicia Govindsamy (Advanced Diploma Horticulture), Tandile Buxeka (PG Diploma Agronomy) and Ms Lesley Cloete (BSc Agric Food Science) who qualified in 2020.

For the 2021 academic year the transformation portfolio supports a group of students (11 of them black) with a total cost of approximately R750 000. These young men and woman attend different tertiary institutions of their preference in SA. Their respective qualifications range from Master of Science degrees in viticulture and soil science to Bachelor of Science degrees, post-graduate diplomas and national diplomas in horticulture.

SATI bursary applications remain open until September 2021

Apply online for SATI bursaries at: www.satgi.co.za/support/bursaries/ before the end of September 2021.

The SATI bursary fund is available to any qualifying individual, but preference will be given to the previously disadvantaged and impoverished, especially those already involved in the table grape industry and/or forming part of a table grape empowerment initiative; and farmworkers in the table grape industry and their children.

Applications that will be considered:

a) Tertiary education (TE) and/or further education and training (FET) studies in programmes/courses relevant to the table grape industry and its value chain, including but not limited to: Viticulture, Horticultural Science, Plant Pathology, Entomology, Soil Science and Agricultural Economy.

Application criteria include:

- South African citizenship
- Individuals looking to pursue a career in the table grape industry and/or its value chain
- For TE studies: individuals with a minimum qualification of grade 12 or equivalent under the South African Qualification Authority (SAQA)
- For FET studies: individuals with a minimum qualification of grade 8 or equivalent under SAQA
- Above average academic results obtained
- Applicants who have secured a partnership with a career mentor (visit the SATI website)
- Applicants with proof of acceptance or registration at an accredited TE or FET institution, or who have been accepted within an industry related research project.

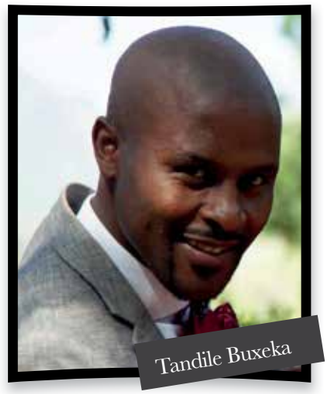
Unless otherwise stated, the bursary fund will allow for a portion, if not all, of the following study-related costs:

- Study fees, study material and accommodation
- An allowance of maximum R2400 per month for living expenses (including meals or groceries)
- Other expenses (to be specified and motivated).

The rest of the criteria, terms and conditions, and information related to mentorship can be found on the SATI website.

For the 2021 academic year the transformation portfolio supports a group of students (11 of them black) with a total cost of approximately R750 000.

SATI is proud to introduce the following individual bursary holders by means of their own personal stories.



"I am **Tandile Buxeka**, born and bred in the Eastern Cape (eNgcobo). I am a wedded husband to Sibabalwe Buxeka with one lovely daughter (OweNkosi Pleasure Buxeka), and we are currently residing in Stellenbosch, Kayamandi.

I obtained a Diploma in Agriculture at Elsenburg Agricultural Training Institute in 2016 and furthered my studies at the Central University of Technology towards an Advanced Diploma in Agricultural Extension in 2017. I did not study in 2018 and 2019, but in 2020 I was accepted at the University of the Free State (UFS) to study towards a Postgraduate Diploma in Sustainable Agriculture (NQF level 8) for which I was funded by SATI. I specialised in both plant and animal production and I made SATI proud by producing best-earned results at the end of that academic year. Last year, when I was still studying, I applied for a Master's Degree in Sustainable Agriculture at UFS and I was accepted. Again, SATI has committed to fund my master's degree. If it was not for SATI, I would not have studied last year and wouldn't be studying this year. It is for that reason that I am so grateful for what SATI has done, and is doing for my family and me as a person. Furthermore, I extend my gratitude to the entire industry and table grape farmers in particular for funding SATI programmes. This in turn, assists us as bursary fund beneficiaries and builds professional leaders out of students. My long-term plan is to obtain a PhD in Rural Development related studies in the table grape industry, and to be a fit-for-purpose researcher of this century. SATI's support means the world to me as far as my academic life and profession are concerned."


Lesley Cloete

My name is Lesley Cloete from Atlantis in the Western Cape. I began my studies back in 2017 when I enrolled for a BSc Food Science course at the Stellenbosch University (SU). For the first two years of my studies, I had no funding. My parents who are working-class, had to pay for my accommodation, books and monthly food allowance. I received a recruitment bursary that paid for my tuition fees for my four-year course, which made my financial burden a little bit easier. The extra expenses that my parents had to cover put a lot of strain on my studies, mental health, and my parents.

My financial assistance breakthrough came in the beginning of 2019 during my third year of study. I got a bursary from the South African Table Grape Industry (SATI) for the remaining two years of my studies. The bursary covered my accommodation, books and monthly food allowance. It helped in ways I could not have imagined. This opportunity allowed me to focus more on my studies and worry less about where the next funding will come from.

I graduated in December 2020 as a BSc Food Scientist. I am currently unemployed, hoping to be enrolled in a graduate program where I can utilise my skills and knowledge appropriately. I am eternally grateful for SATI for giving me the opportunity to be one of their bursary beneficiaries and for their support.


Mashoto Mahlo

My name is Mashoto Mahlo. A community is how I would describe SATI. I came across this acronym at the beginning of 2016 during passive research. I was in my second year of a BSc Agric. degree majoring in soil science at UFS. At that time, I only had a merit bursary when I realised SATI also has a bursary program, but I was too late to apply for that year, so I waited to apply for the subsequent year. I received the acceptance letter in January 2017, but I was not excited because I thought it was spam. As much as I'd hoped for good news with every application, in my experience bursary companies do not reply, let alone send an acceptance letter with allocated funds. SATI is different, they believe in students and they see and nurture potential. The communication I was eagerly waiting for to ensure that it was not spam began shortly after the acceptance letter and it has not stopped till this day. As a student, tuition bills weigh you down. I went through my third and fourth year with ease, because financially I had nothing to worry about. All I had to do was study hard and forward those stressful e-mails to SATI.

Since January 2019 I have registered at SU for my MSc with the SATI bursary. Everyone at SATI is willing to help with just about anything from just a mere a conversation to making sure none of their students are evicted from their accommodation. With SATI I also had table grape industry exposure – I went on farm visits, conferences, block competitions and they also made sure I had vocational work during one of the long holidays. I will forever be grateful to SATI for not only lifting my financial burden, but for believing in all their bursary holders and making sure goals are achieved.

Precool cold storage

State-of-the-art cold storage facility opened

March 2019 saw the launch of the Precool cold storage facility project, which came about when Maersk heard of Precool's plans to expand their capabilities for storage, mainly for the rapidly increasing need for extra cold rooms for the citrus industry. By **Gloria Weare**

Above: Staff on site visit. Left: cold room with mobile racking system.

For a long time congestion down at Durban harbour has resulted in hundreds of trucks arriving in quick succession, and having to queue to offload, with long turnaround times hampering the efficiency of the cold chain.

The Citrus Growers Association (CGA) became very active in relevant discussions, as CGA Logistics Development Manager Mitchell Brooke saw the benefits of having an increased storage facility away from the congested port, but still in close proximity to the N3 freeway, which is the main artery linking the rest of Africa to the Durban port.

Precool Cold Storage CEO, Manny Dos Anjos, was approached by Maersk, and after combining their respective business proposals they reached a favourable outcome for both parties and the agreement was concluded. Manny Dos Anjos, whose experience in the cold storage arena spans more than 20 years, oversaw the development with the assistance of the appointed architect and engineers. He also specified the requirements of the refrigeration and electrical systems for the project.

The expansion (11 000m²) increased the capacity of the current operations substantially, allowing Precool to now handle in excess of 12 500 pallet spaces between the two facilities in 11 different chambers, with a temperature range of between ambient and -25°C. The size of the new facility was based on the direct correlation and maximum utilisation of the space available and can now also accommodate an additional 7 500 pallets of commercial refrigerated product, as well as 2 500 steri-slots for fruit requiring specialised cooling.

There are now seven additional loading bays that can accommodate in excess of 100 trucks daily. All loading bays lead to a temperature-controlled holding area where product is held, before being moved into dedicated temperature controlled storage rooms to ensure the cold chain is maintained.

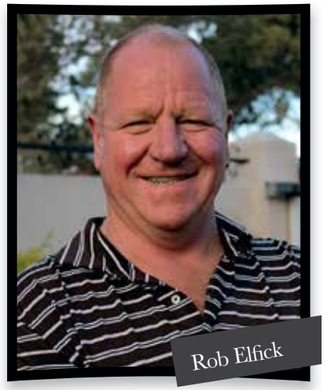
The facility will also be used as a model in the Maersk expansion strategy and its successful operation will result in it being rolled out to other sites throughout SA.

The design specification for the refrigeration system is an energy-efficient, multi-temperature transcritical CO^2 system that takes the important factors around global warming and environmental impact into account. Both Precool Cold Storage and Maersk strive for a minimal carbon footprint. The virtually climate neutral CO^2 is one of the refrigerants of the future, boasting a global warming potential of 1. This transcritical CO^2 installation is the biggest in Africa. Another unique feature is that the facility can handle both fresh fruit and out-of-season fruit, and can switch over room-by-room quite quickly to frozen storage of -25°C. Multi-temperature facilities such as this are very rare.

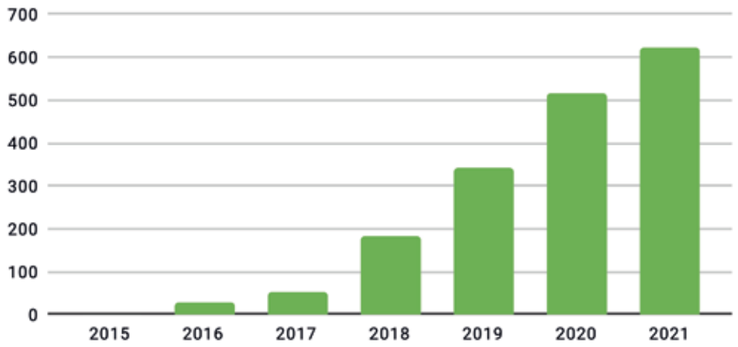
This article was written with permission from Precool Cold Storage. For more details on this facility, please visit www.coldlinkafrica.co.za (March/April 2021 edition) or contact Precool Cold Storage directly at 031 732 2587, Manny on 082 555 1914 or email carlos@precoolcoldstorage.com

Sustained growth sets the platform

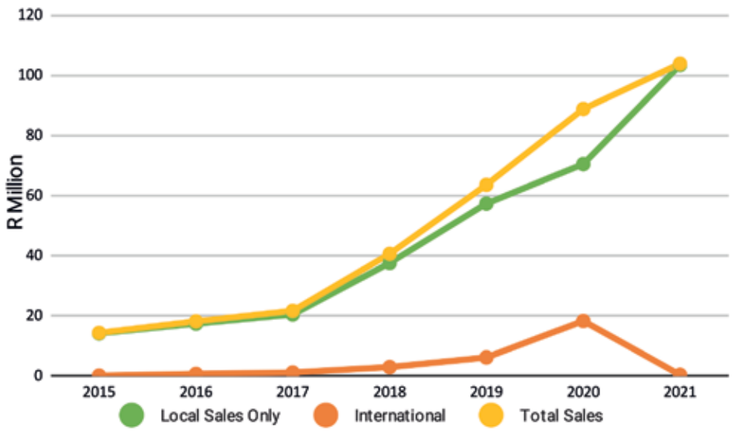
As a supplier of crop protection inputs and service, River Bioscience (RB) was counted as an essential service provider within the COVID-19 state of emergency legislation. By **Rob Elfick**



River Bioscience (RB) Financial Results to March 2021
Cumulative Turnover Growth Percentage



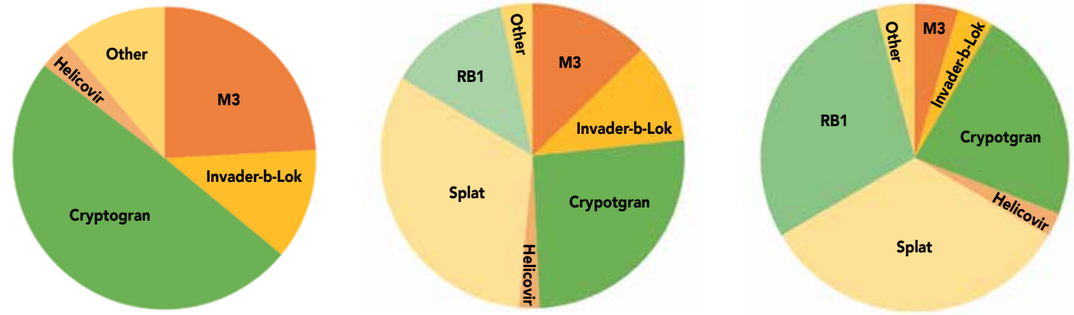
Local & Export Sales



Being counted as an essential service provider meant that RB could continue its operations unabated from day one of lockdown and this, along with a very good citrus season, precipitated very encouraging financial results for the financial year to March 2021.

The RB turnover has increased by over 600% since 2015 and reached the R100 million mark for the first time this past year (despite limited sales into West Africa) when compared to previous years, due to COVID-19 and realignment of priorities in this region.

Our footprint has increased due to a growing portfolio of products and services guided by a holistic approach to pest management programmes. This has made a significant contribution to the growth of RB. With this exponential growth we continue to focus on building capacity to support and retain our current volumes, whilst anticipating further growth, as more new products are registered.



2014 /15 Season **2018 /19 Season** **2020 /21 Season**

Portfolio development by key product

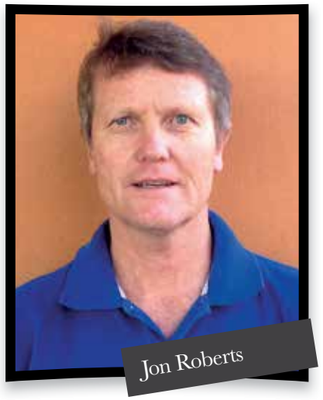
The above portfolio development has reduced risk through diversification and is an enticing base on which to seek collaboration with other companies and service providers to expand our package-based offering to the benefit of the industry.

RB further developed its basket of goods this year with one major label change and one new registration approved. Our future pipeline is also key and two new registrations were submitted over the same time period. The future is in "our hands" with everyone pulling together and the pipeline in place looks very exciting.

fruit

Grapefruit game changer

An article titled "Grapefruit and Drugs: a Conversation" caught my attention recently. By Jon Roberts



The article, written by Ernie Neff in the *Florida, Citrus Industry News*, was intriguing not only because of its interesting title – associating grapefruit with drugs – but also because I suspected that the grapefruit being discussed may be Florida 914, which it was.

We imported this variety in 2014 after I had tasted it at a fruit tasting day at CREC, Florida University, Lakeland. Initially my main interest was the fantastic, sweet grapefruit flavour without the strong bitter naringin aftertaste of a grapefruit. Only on further enquiry, did I find out from Prof Gmitter, (featured in this article), that the cultivar, a grapefruit hybrid, had by default in the breeding process, ended up with a very low furancoumarin content.

The reference to drugs in the article is regarding the negative effect of taking certain prescriptive drugs with normal grapefruit due to the presence of furancoumarin. There is now a growing list of medications that come with a warning regarding the consumption of grapefruit soon after taking medication.

In the last decade market research has shown a flattening demand for grapefruit worldwide. The fruit is, generally speaking, enjoyed more by the older population. It is also this demographic that is more likely to be on the kind of drugs that could be dangerous with consumption of grapefruit.

Initially it was thought that only statins such as Lipitor were dangerous but the list has grown over the years and medications for heart rhythm; some antibiotics such as Erythromycin, some chemotherapies, pain relievers and sedatives have been added to the list.

Normal processes in one's liver break down the medication, reducing the levels in the blood. The compound furancoumarin found in grapefruit disrupts this process and actually increases the blood levels to sometimes dangerous levels. Many articles are available online, just type in grapefruit and medication (though the *SA Fruit Journal* cannot vouch for the scientific legitimacy of each one).

The Florida 914 red grapefruit is therefore not only a superior-tasting fruit compared to current grapefruit, but has levels of furancoumarin equal to mainstream varieties of mandarin and oranges, putting it into the same safety and health bracket.

Above and below right: Grapefruit tasting in South Korea

These two very important factors make Florida 914 a potential game changer for the grapefruit industry. Based on the article I read, Prof Gmitter had further thoughts about UF 914 (a hybrid grapefruit):

"My emphasis is on the excellent eating quality," he said. "We tested UF 914 with consumer focus groups a few years ago. The groups were divided into grapefruit lovers and haters. The 'haters' said that if grapefruit always tasted like this, then they would buy it and eat it. The 'lovers' stated things like, 'The best grapefruit I have ever tasted' and 'If I could buy this, I wouldn't need to put sugar on my morning grapefruit.'"

Having tasted it, I believe many younger folk and even children will be enticed into trying this citrus type.

Without the furancoumarin, the health benefits far outweigh the dangers. The grapefruit diet has shown good results in weight loss diets over many years. Researchers believe that the naringenin antioxidant in grapefruit helps the liver burn fat instead of storing it after eating, while increasing the production of insulin. This mimics the process in long periods of fasting where fatty acids are broken down instead of carbohydrates. "Remarkably, naringenin is a dietary supplement with a clear safety record," said study researcher Yaakov Nahmias of Hebrew University. "Evidence suggests it might actually protect the liver from damage."

Sadly, due to the serious damage caused to the Floridian citrus industry by HLB, they have not been able to plant significant quantities of 914. Being a large citrus exporter, SA is well placed to become a serious player in helping Florida get this variety on the map. And as a counter-seasonal producer to Florida, SA will not affect their markets and may ironically even grow market recognition for their variety, for the day when their scientists crack ways to treat HLB and its vector, D. citri.

We have waited a very long time for the variety to pass through quarantine, but finally it is in the last stages of clean-up and will shortly be released to the Citrus Foundation Block, where it will undergo true-to-type testing and then multiplication for field trials.

As a large citrus exporter, SA is well placed to become a serious player in helping Florida get the 914 grapefruit variety on the map.

The referenced article can be accessed here: https://citrusindustry.net/2020/11/30/grapefruit-and-drugs-a-conversation/

Succession stories in the citrus industry

The Button family

The Button family's Island View Farm spans 400 ha with approximately 120 ha of citrus and a beef division comprising 200 breeding cows. By **Gloria Weare** (adapted from **Louise Brodie**)

The rolling hills of southern Kwazulu-Natal were beautifully described by Alan Paton in the opening lines of his novel *Cry, the Beloved Country*: "There is a lovely road which runs from Ixopo into the hills. These hills are grass covered and rolling, and they are lovely beyond any singing of it."

It has been 70 years since this famous novel was published but this remains a fitting description of the magnificent landscape where Peter and Jenny Button live with their family, south of Ixopo in their beautiful homestead at Island View Farm near Umzimkhulu. The Button family has deep roots in the region as Peter's family has been living and farming in the area since 1860. Peter was one of five siblings and grew up on his parents' farm near Umzimkhulu.

Peter and his son Paul Button manage the farm together. The Button family were the first farmers to plant and export citrus from southern KwaZulu-Natal (then known as Natal). As citrus had been produced at his parents' farm, located only about 4 km away across the river from Island View Farm, they knew that citrus grew well in the area.

Paul is responsible for citrus and Peter for the beef division on the farm. They work closely together and discuss the citrus management on an on-going basis. The farm produces navels, lemons and more recently mandarins.

"Our son Paul is married to Holly and they live on the farm with their two daughters. Our daughter Robyn is married to Cliff Gilson, who works for the timber industry in our area. They live in a home adjoining ours here on the farm and have two young sons. Our third child Jane, lives and works in Cape Town," says Peter.

"Our children were always very involved with the farm and the farming lifestyle, but we never pushed them to join the family business," says Jenny . Robyn agrees and added: "For people with our farming background and history, it is the norm to want to be involved in farming, especially if you've grown up the way we did."

"I knew from an early age that I wanted to farm," says Paul . "I enjoy farming, with all its challenges and my father and I manage the farm very well as a team. Paul was at school at Michaelhouse and then attended Saasveld Agricultural College at George. He completed his BTech degree in Agricultural Management in 2011. This included a year's practical work experience at Crookes Brothers in Grabouw, Western Cape. Paul joined the farming business in 2012.

"We suggested that he should go into the agricultural field and learn the theory. This turned out to be a good decision as today he knows a lot more than I do," says Peter with a laugh. As the wife and mother of the two farmers, Jen pointed out that for the family business to work and preserve the relationship between the family members, good communication is absolutely vital for sustained success.

"In order to secure succession, a farmer needs both resilience and good luck," stressed Peter. "It helps to have the right crops at the right time. We spread our risk by farming with citrus as well as beef cattle and cash crops." Peter added that when Paul joined the business, he arrived with new ideas and positive energy. The citrus development has grown considerably since Paul joined the business. "Paul and I work well together and I would like to remain involved in the farm for a few more years," says Peter.

The Button family were the first farmers to plant and export citrus from southern KwaZulu-Natal (then known as Natal).

Nhlakanipo Mkize (Head of Irrigation), Zama Ngcobo (Junior Manager), Paul Button (Senior Manager), Peter Button (Director), Siziphiwe Chia (Chemicals and Store)

We do not allow the uncertainty around land ownership to stop us from continuing to develop our farming business.

"As a mixed farming business we were not really focussing on anything in particular. It made sense for us to consolidate and focus on producing citrus, and as a result we have significantly expanded our citrus productions since then."

Peter explained that other farmers in the area had also started planting citrus some years ago and this has led them to the formation of a company, Carisbrooke Valley Citrus, a communal packhouse consisting of eight grower members. The area has subsequently been subject to a number of land claims and some of the farmers have sold their farms to the government. This has seen a change in the area, and subsequently some of the citrus orchards are no longer productive and the resultant reduction in volumes has had a negative impact on the Carisbrooke packhouse.

Island View has 40 permanent staff members and provides regular skills development training for its staff members. This is done mostly through training courses offered at the Carisbrooke Valley Citrus (CVC) packhouse, which is the hub for training in the area.

"I am actively involved in the Harry Gwala Agri (Pty), a non-profit company which is supported collectively by four local farmers' associations in the Southern KwaZulu-Natal region (Ingwe, Highflats-Ixopo, Mount Currie and Zwartberg)," explains Peter. "As commercial farmers, we assist emerging farmers to start and grow their businesses through mentorship and other support structures." The local FET College in Umzimkhulu has an intake of 60 agricultural students every six months. Once these students have completed their theory, they have to do 18 months of practicals as part of their qualification, and finding an agricultural business that will provide them with this opportunity is difficult. Harry Gwala Agri (HGA) has received sponsorship to assist these students and helps to place them on commercial farms for this important part of their studies. Hopefully through HGA and CGA Grower Development Company we can get the land claimed orchards productive again."

As part of environmental stewardship Peter and Paul take care of the environment and implement sustainable farming practices. The farm also participates in the Ground Hornbill awareness project which is managed by the University of KZN. Island View includes a considerable amount of natural veld that supports local wildlife. Unfortunately they have a problem with poaching and stock theft.

"Paul is the fifth generation of our family to be farming in this area," says Peter. "History is important to us and we hope to continue farming here. Although we are concerned about the future, we do not allow the uncertainty around land ownership to stop us from continuing to develop our farming business."

Citrus industry stakeholders visit black farmers

During the 2020 season the citrus industry was hailed for its exceptional production and exports at the outbreak of the COVID-19 pandemic – the most trying of times (economically and socially) worldwide. By Nomonde Ntloko and Zama Njili

The citrus industry exported 146 million cartons in the 2020 season, with black growers increasing their production output by 40%. There are currently 150 black citrus growers, with 75% of these growers exporting their produce to global markets. These growers have further increased their output to domestic markets by 55% in the 2020 season. This is a significant increase from the previous season with estimates showing that farmers are expected to have another record season this year.

The phenomenal growth achieved by black citrus growers can be attributed to the support received from the industry as well as stakeholders such as Fruit SA, the National Agricultural Marketing Council (NAMC), Department of Agriculture Land Reform and Rural Development (DALRRD), as well as the AgriBEE Charter Council. This has helped to move the citrus industry into a transformative lane, enabling black citrus growers to flourish and grow into commercial citrus entities.

A visit to two citrus farmers in the Peddie and Fort Beaufort area in the Eastern Cape was undertaken by members of the abovementioned entities to receive first-hand knowledge from the farmers on the success they have achieved thus far in their entities, the challenges they experience, how industry has assisted so far in mitigating these challenges and what additional assistance they require.

NAMC, GDC, AgriBEE Chamber, Fruit SA, DALRRD and Ripplemead farm owner Mr. Mgadle

Ripplemead

The first visit was to Mr Lawrence Mgadle of Ripplemead farm. His introduction into the citrus industry was as an employee of a previous owner of the land he currently owns. He received his 62 ha farm through a Land Redistribution for Agricultural Development (LRAD) programme in 1993. He began his farming journey having inherited old trees that were yielding low quality fruit and with very limited infrastructure. The other challenge he faced was the process of obtaining his title deeds, which took approximately 23 years. Over the past few years, the farm has received support from the industry and it's developing into a sustainable and profitable long-term enterprise.

With the aim of becoming a commercial farmer, Lawrence has managed to improve his orchard production through replanting old orchards, improved management practices and citrus production and business administration skills development. He exported over 51 000 cartons from 58 ha in the previous season – an increase of approximately 11 000 cartons from his 2019 season. Lawrence exported to major markets such as the EU, China, Canada and Uruguay.

However, this number would have been potentially higher had it not been for the damage to the quality of his fruit in transit to the port. This is one of the many challenges that the farmer voiced during the stakeholders' visit.

In his five-year plan, Lawrence aims to expand his production by planting varieties that are adaptable and highly competitive in the export market.

Oakdene

The second farm visited was Oakdene Citrus, situated approximately 20 km outside Fort Beaufort. Oakdene Citrus currently has 55 ha of citrus in production and is owned by Mr Headman Manyota. Mr Manyota was previously an extension officer at Fortcox.

He left his full-time job when he started leasing the Oakdene Citrus Farm with an option to buy, on condition that he utilises the land productively. He managed to meet the said conditions and bought the farm in 2013, but struggled to obtain his title deeds.

Headman faced further challenges with old unproductive citrus trees and unmarketable pomegranate varieties. He further mentioned that the inability as a black grower to have his own infrastructure made it quite difficult for him to execute his farming activities timeously. This has had a ripple effect on the end product, as quality is paramount in the citrus industry.

With continuous support from industry and industry stakeholders as well as his extensive farming knowledge, Headman's farm has turned into a productive citrus farm that exported over 46 000 cartons from 55 ha in the 2020 season. Headman exported to well sought after markets such as the EU, USA, Japan and the Philippines. He has also purchased a further 10 ha of land in order to expand his production before the end of 2021.

Although black growers are faced with various challenges, they too acknowledge the role stakeholders within the industry play in their development and have urged that they continue. The attending stakeholders acknowledged the challenges met by farmers and committed to, in their respective roles, continue to strive to support the process of transformation within the citrus industry, as well as the agricultural sector as a whole.

NAMC, GDC, AgriBEE Chamber, Fruit SA, DALRRD and Ripplemead farm owner Mr.Manyota

Update on citrus academy e-learning programmes

Since the launch of the online platform just over a year ago, the Citrus Academy e-learning programmes have proven to be a valuable added instrument in the academy's toolkit of skills development resources. Desiree Schonken

While e-learning can never replace traditional learning interventions such as workshops and classroom training, the online programmes do fulfil an important complementary function.

E-learning programmes are specifically aimed at those who wish to complete training but are unable to interrupt their work schedule to attend a workshop, or find themselves in remote locations far from the nearest training centre. The Citrus Academy provides the online platform, user support and necessary resources to enable learners to complete courses in their home or office, or in any other location of their choice.

The only requirement is for learners to have access to a smart device, reliable internet and to have an email address. The e-learning certification programmes such as the Phytosanitary Monitoring and Inspection are particularly suited to completion on smart phones, making it a very practical solution for workers who are field-based and do not necessarily have a high level of computer literacy.

Participation in the online courses has steadily increased over the past 12 months, partly due to lockdown and subsequent cancellation of training workshops. The Citrus Academy is committed to continuous improvement of its online value offering by responding to the industry's needs and constantly developing new programmes.

For more information about new courses, or to register for an existing course, please visit our website, www.citrusacademy.org.za.

HORTGRO 1662 Industry award recipients

The formidable duo, Buks Nel and Henk Griessel, are this year's recipients of the coveted Hortgro 1662 Industry Award for their invaluable contribution to the South African deciduous fruit industry. By **Elise-Marie Steenkamp**

CARMÉ NAUDÉ

Apple historians and industry experts, Buks Nel (left) and Henk Griessel, receive the coveted 1662 Industry Award

The 1662 Award was inaugurated in 2019 when horticulturist Koos Lötter received it for the first time. In 2020 Joyene Isaacs, former Head of the Western Cape Department of Agriculture, became the second person to receive the award.

The 1662 Industry Award was initiated by Hortgro to celebrate the first two Witte Wijnappels that were picked at the Company's Garden on 17 April 1662, and to recognise the humble beginnings of the deciduous fruit industry on the southern tip of Africa. Every year on this day Hortgro honours individuals who have gone above and beyond what is required for the industry.

Hortgro Executive Director, Anton Rabe said that individuals/groups acknowledged through the 1662 Industry Award are synonymous with words like excellence, fearlessness, visionary leadership, competence and a "do-it-yourself" mind-set. "We, at Hortgro, believe these words describe our industry and are also echoed in Hortgro's culture, ethos and effective delivery of industry services and functions to our members.

"It is therefore a great honour to present the Hortgro 1662 Industry Award to two worthy recipients, Buks Nel and Henk Griessel. And in so doing recognise their enormous contributions to a wide range and scope of issues, and over an extended period of time. Individually and collectively, they vastly contributed to the success of our industry with innovation and visionary leadership with, amongst others, new cultivars and plant material – contributing to the world-class industry we are."

Rabe said Nel and Griessel have a combined 85 years of experience within the deciduous fruit industry, as well as service to it. Their natural curiosity and shared passion for apple cultivars resulted in the publication of two delightful books: *Apples in the Early Days at the Cape and The Newcomers and their Friends*. In these two books they explore the early days of fruit production on the African continent and the change in varieties that resulted in what is known today as the super varieties.

Apart from their writing feats, the duo also managed to locate the original Witte Wijnappel plant material in the Netherlands. In a joint effort by Tru-Cape and Hortgro, the plant material was imported and grafted into baby trees after the quarantine period. In 2019 these trees were planted in three locations in the Western Cape: the Heritage Garden at Oak Valley Estate, Babylonstoren, and the Company's Garden in Cape Town. Last year saw the first Witte Wijnappels being picked again on South African soil. Thus ensuring that future generations will be able to taste this historic variety.

"Tru-Cape Fruit Marketing Managing Director, Roelf Pienaar said: "Henk and Buks have over the many years made an immeasurable contribution to not only Tru-Cape and our growers, but also to the industry at large. Collectively they hold the key to past, present and future answers about

CARMÉ NAUDÉ

Industry celebrations: Angelo Petersen, Anton Rabe, Buks Nel, Henk Griessel, Andre Smit and Nicholas Dicey at the award ceremony

apple and pear growth and storage in SA, and through the publication of their books and the collegiate relations they generously share in SA and around the world. I know that everyone at Tru-Cape and all of our growers joins me in congratulating them."

Nel, who grew up on a farm in the Little Karoo, graduated from Stellenbosch University (SU) in 1961 with Entomology and Zoology as majors. Thereafter, he worked extensively in the crop protection sphere. He was a founder member and former chairman of the IPM (Integrated Pest Management) group, where he actively served for 15 years. In 1983 he published Deciduous Fruits and Vines: Pests and diseases and their control. This was followed by two fun books about wine: Sips for Wine Lovers and More Sips for Wine Lovers.

He joined the Tru-Cape fruit marketing team as a New Variety Consultant in 2000, and is on record for his great enthusiasm for the development of new pome fruit varieties. In this regard he found the full-red Gala mutation Bigbucks, the full-red Fuji mutation (now under the name Fuji Royal), and the full-red Spur-type Fuji mutation currently being developed locally and in Italy, named Shortie.

Griessel graduated from (SU) with an MSc in Horticulture in 1992 with a thesis titled: "The Influence of Hormone and Mineral Applications on the Peel Chlorophyll Content and Green Colour of Granny Smith Apples". His expertise spans technical requirements of exporting deciduous fruit, postharvest storage and handling of fruit, deciduous fruit production, quality systems, managing intellectual property rights of plant material, propagation of woody perennials, and greenhouse production.

Over the years Griessel's career has made several pit stops, journeying into academics where he lectured in horticulture at SU for six years before he joined Unifruco and later Kromco/Tru-Cape as Quality Control Manager. The list of his academic publications is too long to mention here. But many colleagues can attest to Griessel's ardent contribution and devotion to quality fruit produced for the deciduous fruit industry. He's been an advisor to the Hortgro Science postharvest programme since 2004.

The 1662 Industry Award was initiated by Hortgro to celebrate the first two Witte Wijnappels picked at the Company's Garden on 17 April 1662, and to recognise the humble beginnings of the deciduous fruit industry.

Elke Crouch

Why things go wrong

Dr Elke Crouch, newly appointed Postharvest Physiology Research Chair in Deciduous Fruit at Stellenbosch University (SU), thoroughly enjoys her job in the fruit industry.

By Engela Duvenage

HORTGRO
Growing Fruit IQ

ELISE-MARIE STEENKAMP

Dr Elke Crouch

Dr Elke Crouch, newly appointed Postharvest Physiology Research Chair in Deciduous Fruit at Stellenbosch University

In November 2002 Dr Crouch packed her car for a solo trip to the Winelands, taking the first steps to becoming a postharvest researcher and lecturer of note.

For one, it allows her to work closely with the people who have become her surrogate family over the past two decades. She finds fulfilment in teaching students the finer details of the physiological makeup of fruit, in nurturing the bright future research stars of the fruit sector, and in bringing people from different spheres together to resolve problems. Above all, her job has allowed her to decipher many industry conundrums. To her credit, many troubleshooting guidelines that she has helped write are effectively implemented, and have had a positive impact on the industry's bottom line.

And then there's the thrill of the hunt.

"I love finding out why things go wrong. I like to understand the 'why' behind fruit turning brown inside, or its peel developing scald," Dr Crouch explains.

She reflects on her early days in the fruit sector: "When I was younger, I handled some claims cases for packhouses. No one else really wanted to do it, but I loved finding out exactly why fruit was rejected, and what went wrong in the process of handling and storage."

In such matters, she has since become quite the expert, having studied the physiology of especially apples and pears inside and out since joining SU in 2002.

Crouch has since provided not only the "why" on the occurrence of mealiness in Forelle pears, but also the "how" to sidestep its occurrence. Her research group has also provided world-class guidelines on the harvesting, postharvest handling, and CA (controlled atmosphere) storage of Fuji and Cripps Pink to curb internal browning in these apple cultivars. Currently, her team is looking into why Granny Smith apples often suffer from unsightly superficial scald. This will hopefully lead to practical guidelines on the optimal conditions to keep the cultivar in CA storage.

No wonder her two sons have in the past introduced her to teachers as "an apple doctor". In fact, so is her husband, Dr Ian Crouch, a seasoned and respected fruit researcher at Experico. And their Grade 5 and 8 sons are already quite the experts on what constitutes tasty fruit with great texture – and what doesn't.

The couple met during her MSc years, thanks to a faulty gas chromatograph. "My MSc supervisor said that I should phone a specific number should something go wrong with the equipment."

When that day came, she promptly dialled the number. On the other side of the line was a very patient Ian who, she subsequently learnt, shared her passion for investigating fruit matters and for photography.

Dr Crouch grew up in a German farming community near eMkhondo in Mpumalanga in the 1970s, at a time when the town was still called Piet Retief. As a youngster, she often accompanied her father, the local vet, on his rounds in the farming district. Both her father and her grandmother loved tending vegetables and fruit.

As an undergrad in horticultural studies at the University of Pretoria, she found a library book on the physiological changes that fruit undergo postharvest and the resultant issues.

"I was enthralled and wanted to know more."

By then, she already had some experience under the belt doing pollination trials and surveys on mango farms in Limpopo during university holidays.

Then, SU was the only university investigating the postharvest aspects of fruit in SA. Crouch phoned Prof Gerhard Jacobs, then chair of the Department of Horticultural Sciences, and during their conversation, he offered the enthusiastic student a plane ticket to visit Stellenbosch.

She immediately felt at home. In November 2002 she packed her car for a solo trip to the Winelands, taking the first steps to becoming a postharvest researcher and lecturer of note. Her postgraduate studies were supported through Hortgro bursaries.

She was mentored in the finer details of the study field by Prof Marius Huysamer and did her MSc on mealiness in Forelle pears under the guidance of Dr Deidre Holcroft, and her PhD on cell walls under Prof Huysamer. Then a few months at the University of California Davis in America provided an invaluable opportunity to hone her research skills.

In 2003 Crouch was appointed in a position as lecturer at SU with a specific focus on postharvest physiology, one that has been funded by the Molteno and Lombardi Trusts since 1984. Hortgro and initiatives such as the Post-Harvest Innovation Fund have since funded most of her projects.

Dr Crouch has since had her finger on the pulse of industry needs. Those in the know say she gets things done – and the many late-night emails with reports attached attest to that. Her postgraduate students hold her in high regard, with one once acknowledging her as such in his thesis: "Thank you for giving me a chance and for setting an example to always strive to become better in everything I do, and for always smiling."

The research chair is an extension of the Molteno and Lombardi Trusts' on-going support, with Hortgro providing further funding to make its inception possible.

Research on postharvest issues related to the physiology of apples and pears will be done, and increasingly studies on the impact of climate change and netting on postharvest fruit quality too. Crouch hopes to do so alongside enthusiastic students and a growing network of national and international collaborators, including the University of Leuven.

More about Dr Elke Crouch:

- Qualifications: BScAgric (Hortological Sciences), University of Pretoria (1999); MScAgric (in 2002) and a PhD degree (in 2011) from Stellenbosch University
- Teaches postharvest physiology and technology to SU final year BSc (Agric) Horticultural Science students
- Member of the Hortgro Science Peer Working Group, the Packhouse Action Group, and the Store-It Group since 2003
- Executive committee member of Pink Lady SA
- Began the first short-course in postharvest physiology in SA in 2008
- Main organiser of the 14th International Pear Symposium, Stellenbosch, 2023
- Former board member of the South African Society for Horticultural Sciences.

Die bekendstelling van dr. Elke Crouch (derde van links) se Naoes Fisiologie Navorsingsleerstoel in Sagtevrugte aan die Universiteit Stellenbosch se Departement Hortologie is bygewoon deur (van links) mnr. Linde du Toit (lid van Hortgro Science se adviesraad en raadslid van die Kernvrugprodusenteraad), mnr. Hugh Campbell (Hortgro Technical: algemene bestuurder), prof. Wiehann Steyn (Hortgro Science: algemene bestuurder), mnr. Nicholas Dicey (voorsitter van Hortgro en Hortgro Pome) en prof. Karen Theron (Leerstoel in Toegepaste Voor-oes Sagtevrugtenavorsing aan die US)

ENGELA DUVENAGE

Nuwe US-Navorsingsleerstoel
Hupstoot vir vrugtebedryf

Die werksaamhede van die nuwe Naoes Fisiologie Navorsingsleerstoel in Sagtevrugte staan onder leiding van dr. Elke Crouch, 'n senior lektor aan die Universiteit Stellenbosch (US) se Departement Hortologie. Deur **Engela Duvenage**

HORTGRO
Growing Fruit IQ

Die Naoes Fisiologie Navorsingsleerstoel in Sagtevrugte is 'n inisiatief wat ons kennis oor die hantering van sagtevrugte nadat dit geoes is, wesenlik gaan help verbeter. Dit sal uiteindelik vir produsente én verbruikers tot groot waarde wees. So sê leiers in die Suid-Afrikaanse vrugtebedryf oor die daarstelling van hierdie beduidende ontwikkeling.

Dr. Crouch fokus op maniere waarop fisiologiese probleme uitgeskakel kan word wat soms intree wanneer appels en pere, nadat dit gepluk is, ryp word of opgeberg word. Dit sluit interne verbruining en vlekke op die skil van vrugte in. Sy soek ook na maniere om vrugte se kwaliteit te handhaaf na afloop van die oes daarvan totdat verbruikers dit kan geniet. Haar werk fokus ook toenemend op kondisies wat ontwikkel terwyl vrugte nog aan die boom is.

"Vir my lê die interessante daarin om uit te vind hoekom iets verkeerd loop, en dan maniere te vind om dit reg te stel," verduidelik sy die ingesteldheid waarmee sy haar navorsing benader.

Dr. Crouch beklee sedert 2003 'n pos aan die US oor verwante na-oes navorsing. Dié word reeds sedert die 1980's befonds danksy 'n belegging wat sy begin het uit 'n skenking deur die vrugtebedryf se Molteno- en Lombardi-trusts. Hortgro, die bedryfsliggaam vir sagtevrugte in SA, het ook vanjaar begin om 'n bydrae tot die pos te maak. Dié besluit het uiteindelik tot die daarstelling van die leerstoel gelei.

Vir dr. Crouch is die leerstoel nie net 'n geleentheid om waardevolle, praktiese navorsing te doen nie, maar ook een waardeur sy toekomstige industrieleiers kan oplei en selfs groter interaksie met die vrugtebedryf en ander plaaslike en internasionale navorsingsgenote kan verseker.

Sy beklemtoon: "Die toekoms van navorsing is beslis om toenemend oor grense heen te werk. Ons moet saamwerk in ons soeke na oplossings vir byvoorbeeld die impak wat klimaatsverandering op die gehalte van vrugte kan hê, en die hantering en analise van groot datastelle daaroor."

Belang vir die bedryf

Volgens prof. Wiehann Steyn, algemene bestuurder van Hortgro Science, is die bedryfsliggaam se ondersteuning van die nuwe leerstoel maklik gegewe die hoë gehalte van praktiese navorsing wat dr. Crouch reeds jare lank aan die bedryf lewer. Hy hoop dit sal haar loopbaan as senior akademikus bevorder.

Hy beskryf dr. Crouch as 'n passievolle, gedetailleerde navorser "wat altyd 110% gee en daarby ook 'n baie goeie dosent is wat al 'n generasie van studente begeester het om 'n loopbaan in naoesverwante aspekte in die vrugtebedryf te volg".

"Naoesfisiologie is 'n kritiese kennisarea, maar daar is min plaaslike kapasiteit daarin. Deur die leerstoel te ondersteun wil Hortgro verseker dat die bedryf op genoegsame kapasiteit deur middel van kenners en kennis kan staatmaak om tergende bedryfsprobleme aan te spreek," vertel prof. Steyn, wat benewens sy betrokkenheid by Hortgro Science ook 'n buitengewone mede-professor aan die US Departement Hortologie is. Samewerking met kennisvennote soos die US deur gesamentlik poste en geleenthede te befonds, versterk beslis ons doelstelling rondom verwante inisiatiewe

"Ek kan nie aan 'n beter voorbeeld van gebruiksgeïnspireerde basiese navorsing dink as juis hierdie nuwe leerstoel in die Departement Hortologie nie. Hierdie vennootskap tussen 'n belangrike sektor soos die vrugtebedryf en die US ondersteun basiese en toegepaste navorsing om kennis op 'n spesifieke gebied suksesvol en betekenisvol uit te brei," sê prof. Eugene Cloete, Viserektor: Navorsing, Innovasie en Nagraadse Studies aan die US.

> Die Naoes Fisiologie Navorsingsleerstoel in Sagtevrugte is 'n inisiatief wat ons kennis oor die hantering van sagtevrugte nadat dit geoes is, wesenlik gaan help verbeter.

Melerigheid en verbruining

Dr. Crouch, haar nagraadse studente en bedryfsvennote se navorsingswerk het reeds gelei tot talle verslae wat praktiese riglyne vervat. Dit sluit in een oor die korrekte metodes rondom die langdurige berging in beheerde atmosfeer koelkamers van Cripps Pink en Granny Smith appels. 'n Ander kyk weer na hoedat die hoeveelheid skadu wat Forelle-pere kry melerigheid in die vrugte veroorsaak.

Sy het reeds in haar eie PhD-studies bevind hoedat melerigheid by Forelle ontwikkel. Daarna het navorsing oor maniere om dit uit te skakel gevolg.

Dr. Crouch het ook riglyne help daarstel vir die oes en naoesbestuur van appelkultivars soos Fuji en Cripps Pink om interne verbruining dramaties te voorkom.

"Dis 'n onaangename verrassing om in 'n skynbaar perfekte vrug te byt en dan te sien dat die binnekant verbruin het. Dit proe ook sleg. Die koste daarvan vir ons bedryf is enorm, beide in terme van verlies aan inkomste en verlies aan markreputasie," verduidelik prof. Steyn die belang van hierdie navorsing.

Tans word dr. Crouch se navorsingsgroep deur Hortgro befonds om oppervlakkige brandvlek op kultivars soos Granny Smith-appels te ondersoek, en maniere te soek om dit te beheer. Dié suiwer kosmetiese vlekke doen nie afbreuk aan hoe 'n vrug proe nie, maar verbruikers trek maklik hul neuse daarvoor op. Die optimale kondisies waaronder vrugte gestoor moet word om enige naoes verliese uit te skakel word ook bestudeer deur gebruik te maak van die jongste beheerde atmosfeer koelkamers se tegnologie.

Dr. Crouch het in 2008 die eerste kortkursus in naoes-fisiologie vir die SA varsproduktebedryf ingestel. Dit vind vanjaar weer tussen 6 en 8 Julie 2021 plaas.

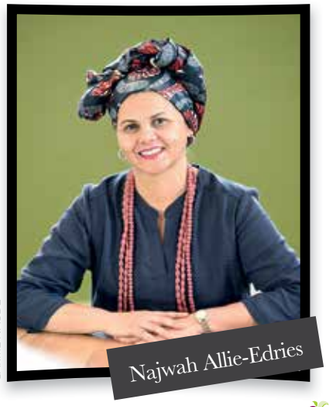
Dr. Esmé Louw, voorsitter van die US Departement Hortologie, sê die leerstoel bied aan dr. Crouch bykomende loopbaangeleenthede deurdat sy sterk nagraadse studente na haar navorsingsgroep kan lok, en wyer skakeling met relevante navorsingspanne wêreldwyd kan bewerkstellig.

Dr. Crouch bestudeer tans saam met die toonaangewende naoesnavorsingspan van die Universiteit van Leuven in België gasdiffusie binne appels en pere, sodat verskeie naoesdefekte in die vrugte beter verstaan en aangespreek kan word. Onder haar plaaslike vennote tel kollegas aan die US, ExperiCo Agri-Research Solutions, die Landbounavorsingsraad en die Universiteit van Wes-Kaapland.

Economic reform

Emerging farmers reach commercial status

Transformation and economic reform in agriculture are some of the biggest challenges that SA faces today and that is why the Deciduous Fruit Development Chamber's commercialisation programme, the Jobs Fund Project (JFP), is such a beacon of hope. By **Elise-Marie Steenkamp**



CARMÉ NAUDÉ

HORTGRO
Growing Fruit IQ

The JFP recently came to an end and the trials and tribulations were celebrated by all stakeholders at a function that was held at Houwhoek, outside Grabouw. A total of 21 emerging farming entities have reached commercial status through the project.

The JFP has its roots in the modest Boompie-projek that was initiated in 2009 by Hortgro and the Western Cape Department of Agriculture (WCDoA), and through which 760 new hectares were planted over a seven-year period. In November 2015 Hortgro, recognising the transformation potential of the Boompie-projek, collaborated with the WCDoA and the Jobs Fund to launch the four-year JFP with the aim to graduate a group of smallholder farmers to commercial status by 2020.

Jobs Fund Head Najwah Allie-Edries says that for too long in our history smallholder and emerging farmers have been excluded from the commercial value chain, stuck and struggling to survive at the primary production level. "Today's celebrations are about the specific actions that had been taken to change the farming trajectory of farmers that participated in this programme."

Allie-Edries said that the Jobs Fund launched dedicated agri funding in 2015 to catalyse change and break down the barriers to entry for emerging farmers. "The Jobs Fund wanted to support innovative initiatives that would begin to catalyse systemic change in the agriculture sector. The DFDC's commercialisation programme responded well to our call to action, and the programme's objectives were closely aligned to our own. The establishment and success of 21 entities, despite a severe drought during the implementation phase, is testament to the grit of the participating farmers."

According to Allie-Edries, the programme has been instructive in demonstrating the importance of strategic partnerships that work on farm level. "The JFP showed the value of mentorship and the willingness to adopt new ideas. This has helped to build a pipeline of future farmers. A lot more work is required from all of us, and the road ahead will not be easy, but let that not stop us from reflecting on the incredible achievements of this programme and the valuable work that has been done. The efforts of the men and women who worked tirelessly towards a more inclusive agriculture sector."

Dr Mogale Sebopetsa, Head of Department of the WCDoA, applauded the farmers and the industry collaborators. "Agriculture is the sunrise sector. It can bring jobs and economic stability to our country. It is well-placed to lead the economic recovery of our country from the front. The ending of the project is not the end of the collaboration. We invite you to bring more projects of this calibre. We are ready to partner again."

Deciduous Fruit Development Chamber (DFDC) Chairman Ismail Motala said that SA has one of the best deciduous fruit industries in the world. "Although the project was not without faults, we have learned and we are ready for more challenges. Climatic conditions in the Western Cape are putting pressure on us and we have to expand the industry to other provinces and share our knowledge with them. The growth potential for deciduous fruit in the rest of the country is huge."

Mariette Kotzé, Hortgro's Group Operations Manager, said that in her own reflection two key concepts spring to mind regarding this ambitious programme. "The first being disruption in forever changing the way that economic development initiatives are planned and rolled out, making the farmers more responsible and accountable. And secondly, opportunity. Opportunities to grow and develop at an individual and also on an organisational level."

JFP Manager Chrismaine Abrahams said that the four-year project reached most of its targeted outputs, despite the drought that had a big financial and emotional impact on everyone. The JFP set out to create whole-farm development with technical and mentorship assistance. In some regards the replacement and establishments of new orchards as well as job creation and increased market access integrated into the whole value chain. "We are incredibly proud of everyone's momentous efforts," Abrahams said. "The actual outcomes speak for themselves."

The JFP's success is also reflected in the accolades and awards that several of the farmers received over the years.

Raymond Koopstad from La Vouere won the DFI's (Deciduous Fruit Industry) New Generation Award in 2019 for his exceptional performance and intelligent decision-making as a new entrant to the deciduous fruit industry. Errol April from Amanzi won the same award in 2017. And in the Toyota New Harvest competition, JFP beneficiaries have over the years overshadowed other competitors. Former winners include Ricard Myburgh (2017), André Cloete (2016), Jacky Goliath (2015), and Trevor Abrahams (2014).

According to Chrismaine Abrahams, the overall challenges that the project faced included ineffective management on some farms, cash flow constraints, inability to meet project targets in terms of job creation, poor communication and a lack of ownership and participation. "We have learned a lot and that will guide us with future projects", Abrahams said. Some of the learnings include constant re-evaluation of assumptions made during the planning phase, the importance of strategic partnerships, sufficient provision for maintenance of young orchards, determining other sources of funding, planning for the unexpected, allowing for flexibility in the implementation plan to adapt to changing conditions, and the duration of the implementation period was too short to create the desired impact.

The DFI, through its various industry associations and structures, developed and adopted a transformation agenda in 2001. At the time, this agenda was agreed on by a range of stakeholders and was based on economic, social, community development, training and the provision of industry capacity and funding to support and execute activities in this sphere. This agenda has since been revisited on a number of occasions and forms the backbone of the industry's current (2019 - 2023) four-year strategic framework required to motivate and utilise statutory levies.

The culture and ethos that run in the DNA of the South African DFI embrace the challenges that transformation brings, and these are echoed in Hortgro's vision: inspiring, inclusive growth and mission: to create an enabling environment to enhance equity, sustainability, profitability and competitiveness.

Snapshot:

- 21 beneficiaries were assisted with 18 farms in the Western Cape and three in the Eastern Cape.
- 309 ha were established over the four year period.
- The permanent job creation target was revised from 355 to 241. Total job creation was 1709 with the following split: 184 permanent jobs, 878 seasonal jobs, 647 short term jobs.
- Approved budget was R120 million with actual spending of R137 million. The remaining shortfall was bankrolled by the deciduous fruit industry and the WCDoA.
- The farmers themselves contributed an additional R52 million, resulting in an almost R200 million project.

Jobs Fund Head Najwah Allie-Edries says that for too long in our history smallholder and emerging farmers have been excluded from the commercial value chain.

CARMÉ NAUDÉ

CARMÉ NAUDÉ

Pictured here at the function, Above: Elton Jefhtas, Dr Mogale Sebopetsa and Below: Jacky Goliath and Ismail Motala. Jefhtas and Goliath run the very successful De Fynne Nursery outside Paarl.

CONCESSIONAL LOANS
And tailor-made funding solutions

The fruit industry is a capital-intensive industry with a long-term investment horizon. But inhibited access to finance continues to be a growth barrier in the agricultural industry in general. By Dr Thembi Xaba


Dr Thembi Xaba

The challenge around access to finance is worsened when there is an investment plea from a long-term investment commodity. We also find deciduous and other fruit commodity producers in the funding "missing middle".

Are we in a position to continue to raise capital for producers as a collective?

Granted, the "fruit basket" itself comprises different commodities. However, we face similar funding constraints while working in parallel, chasing the same funding partners, but with limited returns.

In order to further stimulate development in the fruit industry, certain realities need to be taken into account. Current economic conditions signal the prevailing low investment appetite, but let's not refrain from exploring other means of providing funders with a return on investment. After all, investment is in the DNA of business sustainability.

If we engage on the concept of "rising powers in African agriculture" premised on agriculture, new approaches to financing and concessional loans is what one would advocate for. The rationale is concessional loans are attractive both from a time horizon for repayment, as well as interest rates below the market rate. The funding model is premised on "favourable terms" compared to those in the open market. It captures the extended definition of concessional finance from the Development Finance Institution working group as funding principled on "(i) maturity, grace period, security, rank or back-weighted repayment profile that would not be accepted/extended by a commercial financial institution; and/or (ii) providing financing to borrowers/recipients not otherwise served by commercial financing".

This is fundamental for the development of finance institutions, moreover on the mandate of social impact as return on investment. On the commercial lending space, inclusive growth should be embedded in their market outreach. In this regard, banks can complement the mandate of the development finance institutions principle. There should be no market that displaces the other. Generally, a three to four year payment holiday period can reduce the pressure from producers, taking into account non-bearing costs that are found to affect producers' cash flows negatively, to the extent that it impacts negatively on the "ability" to service debt. We do, of course factor in the volatility in export earnings, and the rand strengthening linked to export sluggish returns.

At macro level we need a policy position that will encourage funders to commit funding to the unbanked and the "missing middle".

Based on asymmetric information that tends to make commercial funders shy away, as commodity associations we can assist producers to package funding applications, and propose tailor-made funding solutions to funders. This new paradigm, capitalises on the collective, with a neo-classical window that promotes inclusive growth. Whilst each individual business is assessed on merit, tailor-making a funding solution that speaks to the type of commodity, producer type, investment cycle, non-bearing funding costs and loan repayment aligned to a production curve can be packaged at a high level through collective application. Funding proposals at a collective level can also defer default risk and more so if the funder and industry provide post-investment support.

Empirical evidence has also argued on the positive effects of concessional debt finance. On the return front, there is improved productivity and increased farmer income levels. One cannot then overemphasis the positive spin-offs of the impact and sustainable business operations that can equally sustain or create new jobs.

At macro level we need a policy position that will encourage funders to commit funding to the unbanked and the "missing middle". Equally so, as an industry we need to continue to equip producers to become "finance ready".

This is an opinion piece written in the personal capacity of Dr Thembi Xaba

Also read:

- **CASA report: https://www.casaprogramme.com/wp-content/uploads/CASA-Concessional-Finance-Impact-Evidence-Report.pdf**
- **World Bank report: https://documents1.worldbank.org/curated/en/221851613400323474/pdf/Joint-Report-2020.pdf**

Reference:

Scoones, I., Cabral, L., & Tugendhat, H. (2013). New development encounters: China and Brazil in African agriculture. IDS bulletin, 44(4), 1-19.

Young and old

Working together

More and more young people, many of whom have no farming experience, are drawn to the agriculture sector.

By Elise-Marie Steenkamp

HORTGRO
Growing Fruit IQ


Tristan Dorfling


Mthokozisi Sishuba

We spoke to four youngsters who have found an accidental home in agriculture: Tristan Dorfling (28) from Durbanville, Anika Kock (24) from Belville, Mthokozisi Sishuba (29) from the Eastern Cape, and Chad van Wyk (27) from Cape Town.

Mtho has been appointed as an intern at Provar, while Tristan, Anika and Chad are horticulture students all studying towards their master's degree at Stellenbosch University (SU). All four are currently working on an industry-funded project about fruit-type adaptability and evaluation under the watchful, experienced eye of Dr Iwan Labuschagne from Provar and Dr Esmé Louw from the Department of Horticultural Science, SU.

Q What do you like about your current work?

A **Tristan:** I am involved in the adaptability project for apples, currently investigating the drivers of adaptability for certain apple cultivars. We investigate the tree architecture and other traits and try to understand how different cultivars grow in different environments, and how the genotypes adapt to that specific area. For instance, we use metrics to understand the cold units supplied in an area and to determine the interactions that occur between the tree traits and cold accumulation. It is very exciting to put all the pieces together and create an understandable science story.

Mtho: I work on table grapes and table grape rootstocks and assist the others with their projects and evaluations. The work is very interesting and satisfying – I learn a lot every day.

Chad: I work on cherries – a high-value commodity. So, everything new that we learn is important for the industry.

Anika: Dit is 'n groot voorreg om deel te wees van hierdie projek. Die werk wat ons doen is eintlik maar net die fondasiefase van 'n heelwat groter, agtjaarlange projek. Mettertyd gaan ander studente by ons oorneem en die projek verder ontwikkel. Ons gebruik byvoorbeeld statistiese indekse om te kyk hoe sekere kultivars vir verskillende omgewings aangepas is. Dit is baie opwindend om reeds as 'n student deel te wees van so 'n groot projek wat hopelik tot groot voordeel vir die hele bedryf gaan wees.

Q Why did you choose agriculture?

A **Tristan:** Initially I studied sound engineering. The job market for that was saturated and I decided to study something different. You could say my venture into agriculture was a "head shift". I have always enjoyed growing things and decided to see what it would be like to study plants and understand the way things work in life. I am also very fond of hiking and studying horticulture satisfies both those passions. I am fascinated by the scientific approach and the application of science in agriculture and want to really understand what happens and how to get the plant to respond to what you want it to do.

Mtho: I think agriculture is a great and exciting career. I grew up in a rural area in the Eastern Cape in a farming community. Our family grew maize and tended livestock. So it all started there, but my love for agriculture really developed when I obtained my crop production diploma and started working in the industry. I have learned a lot about the technical side of fruit production, starting out at Raisins SA.

Chad: I kind of stumbled into the horticulture programme by chance. I also started out studying towards a different degree and then switched to the horticulture programme and immediately fell in love with it. The lecturers at the department are so inspirational, not just in what they teach, but the way they interact with students. I like being surrounded by people who inspire me. And, of course, agriculture is the backbone of our country.

Anika: Ek het eers ingenieurswese studeer, maar het redelik gou agtergekom dat dit nie is wat ek wil doen nie. Ek het begin rondkyk na ander kursusse en het onder andere met prof. Karen Theron van die hortologie departement by US gaan gesels en sy het die belang van die studie van plantkunde vir my uitgewys. Aspekte soos voedselsekuriteit, en die volhoubare en veilige produksie van kos vir die groeiende bevolking het met my geresoneer. Ek is nog altyd intrinsiek aangetrokke tot plante en die wetenskap, en het besluit ek wil deel word van die oplossing om volhoubare voedsel te produseer. Hortologie en landbou is daarom baie belangrik.

Q How do you see the future of agriculture in SA and the world?

A **Tristan:** I think agriculture needs to embrace and understand big data and the capacity and importance that it brings. Younger people are important in agriculture because it is easier for us to use technology, and that could grow the general knowledge base for the future.

Mtho: We need more time to do proper research and to do things differently. As a country, we have to work together to improve agriculture. Also, politics could destroy agriculture – we have to leave politics out of agriculture. I think the youth have to be open-minded about agriculture. Their expectations should be realistic. You don't become a farmer and then get a big salary. You have to work hard and have the right mind-set to farm, otherwise, you will lose interest. But farming is a great opportunity for our youth.

Chad: It is more of what I hope to see. I want to see agriculture change and really use the applied sciences to make more of an impact. I want to see the industry change its often old school methods, to really connect on a global scale and apply technology and science to ensure larger outputs. Agriculture is science and there are so many exciting opportunities, not just in production, but also in IT, legislation, communications and other fields. People don't always know how wide the sector is.

Anika: Ek wil ook graag by Mtho aansluit en stem saam dat die jeug 'n belangrike rol kan speel om landbou vorentoe toe vat. Mens moet oopkop wees, gretig wees om te leer, dan is daar baie geleenthede.

More and more young people, many of whom have no farming experience, are drawn to the agriculture sector.

Ek leer elke dag iets nuuts. Daar is ook nog 'n wanpersepsie dat net mense wat van plase af kom landbouers kan wees. Dit is nie so nie. Enigeen kan 'n landbouer word, jy moet ervaring kry en selfvertroue opbou, deursettingsvermoë kweek en karakter ontwikkel. Landbou is 'n langtermyn ding. Ek wens ook dat leerders op skool meer blootstelling aan die verskillende geleenthede binne landbou kan kry. Dat jy op skool reeds begin dink oor hoe goed groei, hoe werk 'n boom en waar kry jy jou kos vandaan. Landbou het 'n uitstekende toekoms, want die bedryf groei en pas die heeltyd aan. Daarom is navorsing ook so belangrik. Ek sou graag wou sien dat die jeug en die ouer generasie meer saamwerk in landbou. Daar is baie geleentheid en maniere hoe die verskillende generasies mekaar kan aanvul en by mekaar kan leer. My hoop vir die landboubedryf is dat ons minder, en meer volhoubaar, hulpbronne sal gebruik. En dat landbouers die wetenskap sal gebruik en vertrou, want so kan ons ons ekonomie groei.

Q Your opinion about the impact of agriculture on climate change?

A **Tristan:** I think we have to optimise what and where we use materials and protect our natural resources. And use the applied sciences to fine-tune farming practices.

Mtho: A lot has been written about climate change, and I think agriculture and the private sector should sit down and discuss how to prevent it. All the sectors need to work together. But it shouldn't just stay with talking, we also need implementation. Action.

Maar klimaatsverandering is almal se probleem. Almal moet 'n verskil maak en hulle deel doen, al is dit hoe klein.

Chad: Climate change has a big impact on agriculture, there is no doubt about that. But it is bigger than just agriculture. Maybe agriculture should focus on smaller production units and produce for local communities first. Use fewer chemicals and plant cultivars that have adapted to a certain environment.

Anika: Ek dink daar moet balans wees. Bevolkingsgroei beteken meer mense moet eet. Maar klimaatsverandering is almal se probleem. Almal moet 'n verskil maak en hulle deel doen, al is dit hoe klein. Landbou moet spesifiek daarna streef om minder hulpbronne te gebruik en te luister na die wetenskap om produksiemetodes effektief toe te pas.

Grow your **people** grow your **business**

Why should an orchard supervisor need to know how pollination and fruitset work on apple and pear trees? Or the difference between "kruisbestuiwer" and "bestuiwer"? Or how much an apple costs in Europe? Or the significance of "kouebehoefte" and "rusbreekresepte"? By Elise-Marie Steenkamp

HORTGRO Growing Fruit IQ

Why develop critical thinking skills at all when most of your day is spent following instructions and trying to get your team of workers to do the same?

For more than 40 years well-known pome fruit technical advisor Chris Jurisch has seen the same default patterns on farms over and over again. The supervisor (and sometimes his work team too) are given instructions on what to do in the orchard. The reason for an instruction and the hoped-for outcome are seldom understood. The result is distorted communication and the effect is frustration, dissatisfaction, demotivation. The result and effect limit the growth of the supervisor's potential and that of the work team. And it directly impacts the grower's profitability, given that labour costs are 50% or more of total production costs per hectare.

Chris believes that developing the reason behind what we do in our orchards will go far in helping our growers and their workers fulfil the true potential of their farming businesses. He created a training course to arm orchard supervisors with knowledge so they can develop confidence, critical thinking and leadership skills; and pass on their "new" knowledge to their teams.

1

The reason for an instruction and the hoped-for outcome are seldom understood.

The programme, aptly called "Ontwikkeling van Boordleiers" (Development of Orchard Leaders), is a three-year modular course (19 modules in the first year, 12 modules per year in the second and third year). Each module consists of a theoretical discussion in a "classroom", followed by a demonstration and further discussions in the orchard. Supervisors and their production managers attend the classes together.

Although there are no tests, each supervisor is allocated three "troetelbome" (pet trees) in the first year. For the duration of the course, and until the pet trees have developed from non-bearing to bearing, the supervisors have to apply their knowledge to the "troetelbome". This, without interference or help from anyone. "That is a daunting task in itself," says Chris, "but over time their 'troetelbome' help the supervisors develop a sense of ownership, pride and confidence." Chris credits Buks Nel for planting the "troetelboom" seed many years ago when he and Buks were both still "jong bome".

Some of the supervisors have limited schooling, but for Chris, that is not a problem. He says what is important is the eagerness to learn and quotes Einstein: "Education is what remains after one has forgotten what one learned at school." That is why complex concepts such as apical dominance, planting density, photosynthesis, genetics, cultivar differences and many other aspects of fruit growing are discussed in the first year. "With a bit of effort and humour, you can explain difficult concepts so that everyone can understand it," says Chris.

2

3

He also takes the groups on orchard tours to different farms and on outings that include nurseries, plant breeders and university laboratories. This helps to broaden their horizons and helps them understand how they fit into the apple and pear world.

Albert Rust from Glenbrae, Elgin has been attending the course with his team of supervisors for the past three years. "The course resulted in many benefits on the farm," he says. "The students became engaged workers. Productivity increased. They could now connect what they saw in the orchard with the theory and discussions in class. Their confidence grew and they have pride in their work."

Albert says that the classroom discussions are invaluable, as they result in innovation and sharing of ideas. It also makes the worker feel valued. "I have known some of the workers for most of my life. But, discussing concepts in a classroom has brought forward aspects of their personality that I have never seen before. And they don't back off, we discuss and argue about certain things."

Albert also points out that the workers that have gone through the development course share their

1: Growing knowledge – Frikkie Jacobs and his team at Queen Anne, Bo Radyn.
2: Chris Jurisch, Danny Blom and Albert Rust on Witvlei Farm during the orchard discussion.
3: The Witvlei Farm group in a classroom session.

4

"Education is what remains after one has forgotten what one learned at school." - Albert Einstein

newfound knowledge with other workers on the farm. "They become their teachers. Their enthusiasm is tangible and creates a positive work atmosphere on the farm."

Witvlei farm manager, Danny Blom, is in his second year of the Boordleiers course. He most values the social interaction with the workers. "There is team spirit. Joining the course makes one realise how much miscommunication happens in the orchard. And misunderstandings cost money."

Langkloof producer, Brian Zondagh from Southern Fruit Farms, says the course's biggest value for their business was that it brought about uniformity in production practices. "We have several farms across a wide area that were previously owned by different farmers. Each team had its own way of pruning and doing production work. Chris' course brought a unified level of skill that resulted in improvisation across the board. Even though they have finished the course, the workers still refer to Chris' methods and he is seen as the benchmark of what good orchard practices should be."

Brian says that apart from orchard skills, worker morale lifted and self-confidence grew. "The reassurance that they were doing the right thing was there, and this motivated them further."

Frikkie Jacobs, farm manager at Queen Anne, Bo Radyn, says there was great value in having a diverse group of students in the same classroom. In their group, some had degrees and theoretical knowledge, whereas others had limited schooling but more practical experience. The resultant information exchange benefitted everyone.

According to Frikkie, the "troetelbome" was another example of out-of-the-box learning. "Everyone got three trees in a young block at the start of the course. Over the next three years, they had to apply critical actions at precisely the right time to the trees. By year three they learned that having a long-term perspective is a critical skill of an orchardist. If you didn't do in year one what you were supposed to do, the "troetelbome" very clearly showed it by year three."

The fact that the course was conducted on the farm, in the orchards was a major advantage, Frikkie says. "The students were in their own environment – relaxed and eager to learn."

From a business perspective, the changes he saw in the students were impressive. They started to take ownership of their work, they were more productive and engaged. So much so, that one of the students has been appointed as a junior farm manager on new land that the business recently acquired.

One of the students had this to say: "I now have the ability to make better and informed decisions. I understand the bigger picture of the work that I do.
I now realise that what I do has long-term consequences and that my work has meaning."

5

6

4: New knowledge: workers from Southern Fruit Farms in the Langkloof. 5: An eagerness to learn. 6: Chris Jurisch, master teacher in action.

For more information about the course, contact Chris Jurisch at Arbor Tech: christj@mweb.co.za

New biologicals, is the future here?

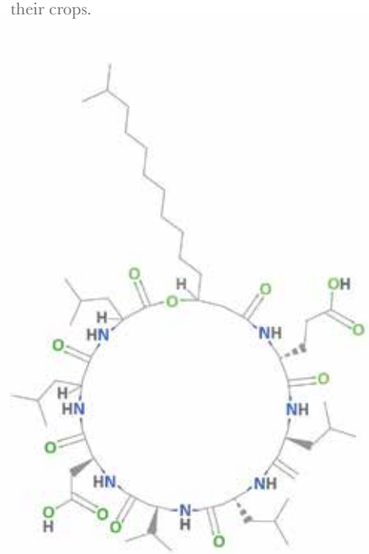
Incite was developed, bearing in mind the importance of bacterial strain selection on product effectiveness.

Although members of the genera *Bacillus* are renowned for their contribution to plant productivity and plant protection, each isolate differs in its mode and intensity of action. Therefore, the aim was to isolate a superior strain in terms of its survival under harsh environmental conditions, and its ability to effectively suppress a range of plant pathogenic fungi and bacteria.

MBFi is proud to announce that we have isolated a superior strain of *Bacillus methylotrophicus* locally in SA, adapted to our unique environmental conditions. The active ingredient in Incite, *Bacillus methylotrophicus*, produces two broad spectrum fungicidal lipopeptide antibiotics (Iturin and Fengycin) as well as a bactericidal antibiotic (Surfactin), which affords this product success in suppressing both fungal and bacterial plant pathogens. These lipopeptide antibiotics integrate into the plasma membrane of the pathogen and disrupt its normal structure. Since the main function of the plasma membrane is to act as a selective permeable membrane, disruption of this structure will either result in cells accumulating fluids and bursting or losing important cellular fluids, causing dehydration and ultimately cell death. The produced antibiotics also play a role in increasing the resistance of the host plant, thereby priming the plant for potential fungal attack. The unique growth medium and production strategy of Incite allow for the release of high amounts of these lipopeptide antibiotics, and for the formation of a high concentration of extremely resistant endospores. The antibiotics present in Incite start working as soon as the product is applied to the plant/fruit surface to create an initial knock-down effect, while the endospores germinate, colonise the plant/fruit surface and secrete more antibiotics in the presence of a plant pathogen.

The wide range of activity of the lipopeptides against numerous fungi and bacteria gives Incite a very broad spectrum of use in the control of plant pathogens. One of the main targets of Incite is for the application on berries for the control of powdery mildew and Botrytis, two of the most devastating diseases to a berry farmer. The extensive trial work done with Incite on the control of powdery mildew on berries showed constant exceptional high results with Incite, providing control of up to 100% on blueberries, strawberries and table grapes with dosage rates of 2.5 - 5ℓ/ha. With these exceptional results, the biocontrol capabilities of Incite have been tested against Botrytis on strawberries and table grapes. Incite is showing great promise with control levels above 90% on strawberries and table grapes comparable to traditional synthetic fungicides. The high concentration of lipopeptides in the formulation ensures an immediate knock down effect of disease present in the field, with the live endospore germination ensuring a residual action. Incite is approved for use in organic farming with a zero maximum residue level (MRL), meaning it is safe to use at any point during the production of berries or any other crop.

The expert team of local MBFi agronomists is able to assist every producer with the correct dosage rates and application timing for their fields and orchards to ensure optimal performance, unlocking the full potential of their crops.



MBFi
Leaders in Science. Partners in Growth.

For more information visit www.mbfi.co.za or contact Christo Kritzinger at christo@mbfi.co.za, Francois Brink at francois@mbfi.co.za, Nico Olivier at nico@mbfi.co.za or your local NEXUSAG agent.

Die 2021 kernvrugseisoen **in kort**

HORTGRO
Growing Fruit IQ

Hoogtepunte uit vier produksie-areas. Deur Anna Mouton

Met die laaste appels wat tans gepluk word, is dit 'n goeie tyd om oorsig oor die kernvrugseisoen te kry. Ons het gaan kers opsteek by die bedryf in Ceres, Elgin-Grabouw-Vyeboom-Villiersdorp, die Langkloof en Wolseley-Tulbagh.

'n Goeie jaar vir die hele Ceres

"Ons het 'n baie uitgerekte blomtyd gehad as gevolg van te min winterkoue," sê De Kock Hamman, tegniese raadgewer by Ceres Fruit Growers, "en dit het veroorsaak dat daar nou, met die oesproses, baie verskillende generasies vrugte aan 'n boom sit."

Die gebrek aan voldoende winterkoue het ook die uitdun van vrugte moeilik gemaak. Hamman verduidelik dat hulle tot drie appels aan 'n tros moes los om genoegsame tonne te oes. "Dan sit jy weer later met 'n probleem, soos nou met die Pink Ladies, dat die appels nie almal sonlig kry nie, en nie so goed kleur nie. En met oestyd is dit baie makliker om net een appel te pluk."

Alhoewel die jaar so 10 dae laat begin het, het die later kultivars op hulle normale tyd ryp geword. Dit het die produsente en die pakhuise onder druk geplaas.

"Ons infrastruktuur het maar swaar getrek, die kratte en koelkamers, en selfs die produsente se infrastruktuur op die plase. Die ouens het maar gesukkel om genoeg mense te kry om die groot oes af te haal," vertel Hamman. Gelukkig het COVID-19 nie sy kop uitgesteek nie.

Ten spyte van die uitdagings, skat Hamman dat hulle ongeveer 10% meer vrugte ingeneem het as verlede jaar. "Dis nou vrugte wat in 'n karton gepak word vir die vars mark – ek sluit nie sapgraadvrugte hierby in nie."

Sover lyk die houvermoë van die vrugte uitstekend. "Veral die Gala-tipes en die Jazz-appels, hulle pak fantasties uit," sê Hamman. Hy het wel sonbrand opgemerk op van die vrugte, en skryf dit toe aan uiterste warm dae, veral in die Warm Bokkeveld. "Ek sien baie bitterpit ook vanjaar by van die variëteite."

Hamman is dankbaar vir die wonderlike plukweer wat hulle geniet het, maar hy is bekommerd oor die uitwerking van nog 'n laat winter. Wat betref die seisoen wat tot 'n einde gekom het, is hy egter baie tevrede. "'n Goeie jaar vir ons boere beteken 'n goeie jaar vir die hele Ceres-gemeenskap."

Die Langkloof loop deur onder hael

"Die afgelope seisoen het maar sy uitdagings gehad met haelskade," sê Johan Kotze, Oos-Kaap direkteur van Dutoit Agri. Meeste areas in die Langkloof is tussen Desember verlede jaar en middel-Mei op een of ander stadium deur hael geaffekteer.

"Daar's areas wat op hulle totale oes 50% - 70% skade gehad het, en dan's daar areas wat rondom 30% - 50% skade gehad het. Dit was 'n bietjie van 'n moeilike jaar vir die omgewing."

Aan die positiewe kant het die Langkloof lanklaas 'n COVID-19-geval gehad. "Ons het eintlik relatief gemaklik deur die afgelope seisoen gekom, en vir oestyd was ons baie geseënd gewees."

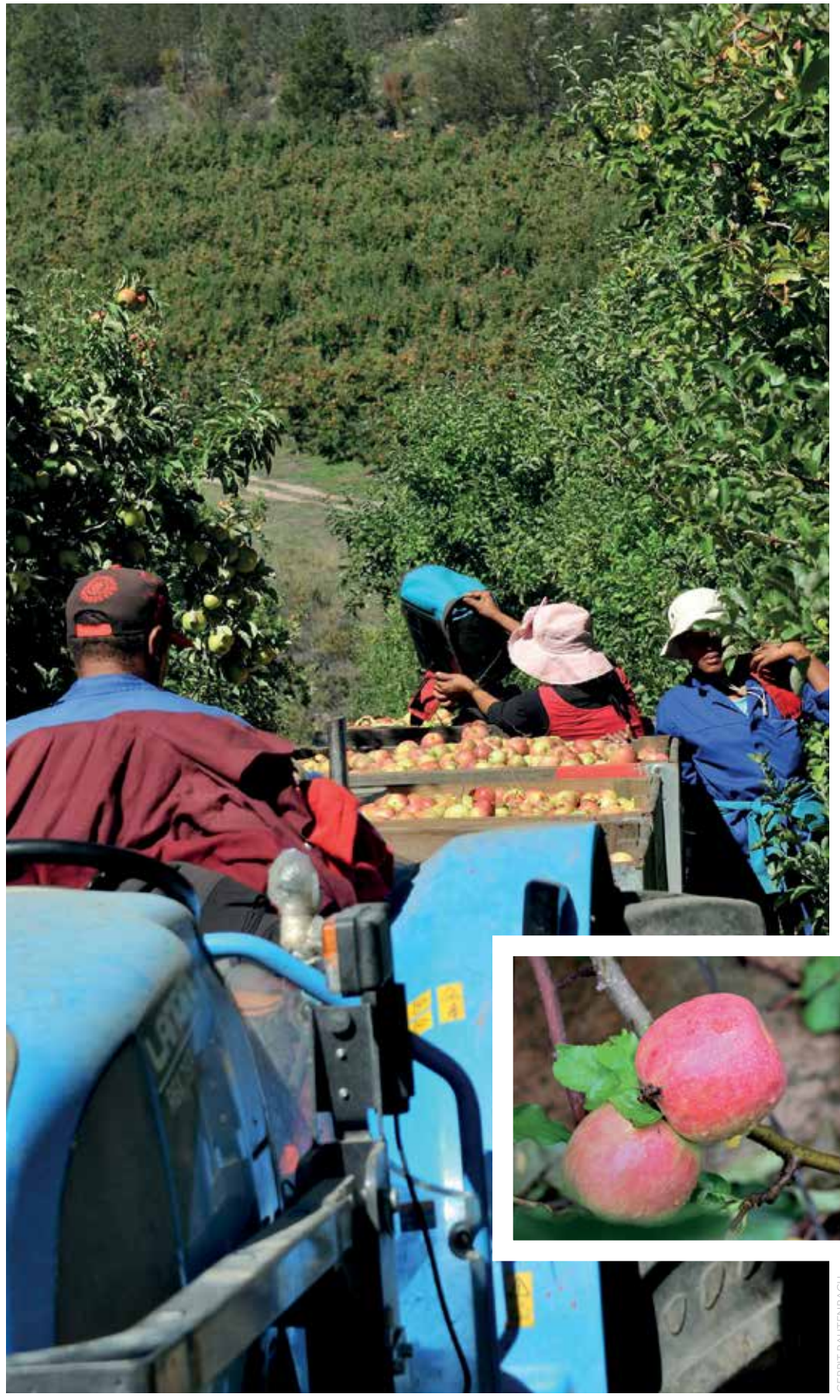
Oesvolumes was soortgelyk aan verlede jaar, met enkele uitsonderings. "Ons het in sekere areas, veral op appels, 'n swakker set gehad as wat ons verwag het," sê Kotze. "Op party plekke het ek gevoel dat die bome miskien te vinnig gevorder het van beginblom tot volblom."

Alhoewel dit voordelig is wanneer blomtyd kort is, is daar minder kans vir bestuiwing – enige dae wat die bye nie kan werk nie het 'n groter impak, verduidelik Kotze. Daarby kan die magdom blomme moontlik die bome se reserwes uitput.

Die uitblinker kultivar vir die seisoen was Packham-pere. "Die Packhams het vir my uitgestaan in terme van vrugkwaliteit," rapporteer Kotze. Die Forelle-oes was naastenby dieselfde as die vorige twee jare, met goeie vruggroottes en vrugkleur, terwyl vruggroottes op die vroeë Bon Chrétiens beter was as die vorige jaar.

Die vroeë appelkultivars, insluitende Fuji, het ook goed gekleur, danksy matige temperature in die eerste kwartaal. "Aprilmaand het ons 'n paar hittegolwe gehad wat 'n bietjie sonbrand-skade op die Pink Ladies en die Cripps Red veroorsaak het en die kleur negatief beïnvloed het."

Alhoewel die Langkloof se vrugte deur Coega uitgevoer word, het die Oos-Kaap



ELISE-MARIE STEENKAMP

GERRIT RAUTENBACH

Above: Pink Ladies, from a farm outside Villiersdorp, patiently awaiting to turn the right colour before harvesting. Left: Apple harvesting in the Langkloof.

Die jaar het so 10 dae laat begin, maar die later appel kultivars het steeds op hulle normale tyd ryp geword.

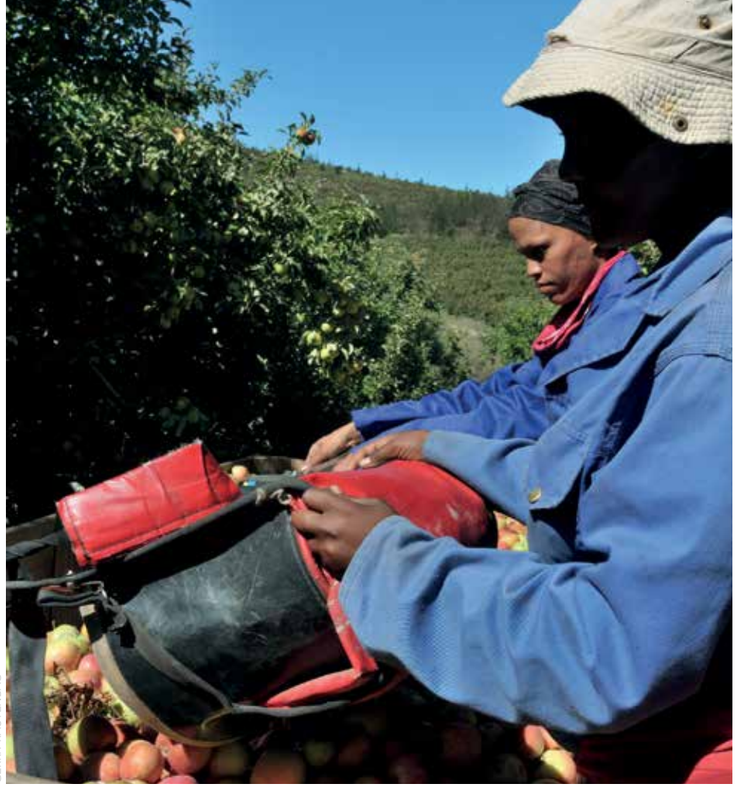
ook logistieke probleme ervaar. "Die houer-tekort het maar sy angel hier ook ingesteek," sê Kotze.

A big crop for Elgin-Grabouw-Vyeboom-Villiersdorp

"This year we had a really big crop and fantastic fruit size for what we consider the norm in our area," says Keith Bradley, general manager of agri-services at Fruitways Farming. "If I take the basket of all pears, we're up 8% on the pear crop, and if all goes according to plan, apples will be up 19% on last year."

With the harvest of Cripps Pink and Cripps Red still to be completed, a few days of cold weather in early May were welcome, even though picking was disrupted. "It really assisted in the colour development," comments Bradley. "And if you have two

Apple harvesting in the Langkloof



GERRIT RAUTENBAC

fruit hanging next to each other, the one that meets the colour standard is worth three times that of the one that doesn't."

Pears account for about 15% of their volume, compared to 85% apples. "Our biggest pear variety is Packham, which had an unbelievable crop: 28% up from the previous year. We had the cleanest pears, and fantastic pack-outs – it's been one of the best Packham crops on record."

Forelle is their second biggest pear cultivar. Unfortunately, the strong winds in March came at the worst possible time for Forelle. "They were literally at the cusp of harvesting, and they drop easily," says Bradley. The winds actually blew the fruit off the trees, leading to a 34% drop in volume compared to last year.

According to Bradley, the whole growing season was ideal, culminating in a long picking window. "Even with this big crop, our fruit size and quality have been very good, so the pack-outs have been higher than normal."

When pressed to choose a negative for the season, Bradley names the exchange rate. Last year, during the initial outbreak of COVID-19, the weak rand favoured exporters. "It's difficult for marketers to return the same income to growers back on a bin-by-bin basis when you've had this strengthening of the rand. But more bins per hectare, and the better pack-outs, will hopefully make up for the shortfall of the currency against last year."

Packhams presteer in Wolseley-Tulbagh

"Die ster op die oomblik by ons groep is Packhams," sê Christo Strydom, algemene bestuurder van Wolfpack. Wolfpack verpak slegs pere, en Packham-pere is ongeveer 44% van hul oesvolume.

"Ons het amper 25% meer Packhams geoes en die uitpakke is ongeveer 15% beter as verlede jaar," berig Strydom. Verlede jaar se Packham-uitpakke is benadeel deur netagtige verruwing wat deur ongunstige weer ná blom veroorsaak is. Hierdie jaar was dit die Bon Chrétiens se beurt vir netagtige verruwing. "Nie 'n goeie oes nie, want baie van die vrugte het kosmeties nie mooi gelyk nie. Hulle was natuurlik wel geskik vir verwerking."

Netagtige verruwing in Bon Chrétien-pere was nie uniek aan Wolseley-Tulbagh nie. Meeste produksie-areas is geaffekteer.

Die tweede belangrikste peerkultivar vir die area is Forelle. "Daar het ons definitief bietjie minder vrugte as verlede jaar geoes, maar ons het blomtyd al gesien die Forelle-bome het baie swak geblom," sê Strydom. "Alhoewel Forelle 'n laer koue-behoefte het, dink ek hy word partykeer meer geaffekteer deur 'n warm herfs as party ander kultivars." Beide Cheeky en Rosemary het meer windskaafmerke as wenslik gehad, maar die volume van die Cheeky-oes was meer as verlede jaar. Abate Fetel het 'n baie mooi oes gelewer, veral in vergelyking met verlede jaar, wat 'n af jaar was.

"In totaal, in ons area, vir ons groep, is ons peer-oes so 10% meer as verlede jaar," sê Strydom. "Kartonne is moeilik om te sê, want ons het nog net die helfte van die oes gepak, maar ons skatting is dat dit so 12% meer gaan wees as verlede jaar." Die grootste bekommernis, synde Strydom, was kapasiteit van kratte en koelkamers. "Ons probleem was, waar gaan jy genoeg kratte en koelkamers kry? Wat mos nou vir jou sê daar's 'n goeie oes."

> Alhoewel dit voordelig is wanneer blomtyd kort is, is daar minder kans vir bestuiwing – enige dae wat die bye nie kan werk nie, het 'n groter impak.

Pollination
and the deciduous fruit industry

The deciduous fruit industry is almost entirely dependent on a healthy honeybee population and a viable beekeeping industry.

By Elise-Marie Steenkamp

HORTGRO
Growing Fruit IQ

Therefore, it is important that beekeepers and the industry regularly engage and share future challenges and growth projections. Mariette Kotzé, Hortgro's Group Operations Manager, recently spoke at the Western Cape Beekeepers Association's annual general meeting, sharing with beekeepers the industry's data and growth projections.

According to Kotzé, pollination is a critical component of integrated orchard management practices. Obtaining an optimal fruit set requires the correct orchard design (selection and positioning of pollinisers), flower management (pruning and thinning), control of alternative forage, as well as the proper introduction and usage of adequate strength honeybee colonies. "It is important that growers understand how pollination works and why it is important to only use registered beekeepers to ensure good pollination practices."

Kotzé said that the deciduous fruit industry comprises 54 294 ha of fruit trees of which 69% is pome fruit and 31% stone fruit. "The important fruit types that require annual pollination are apples, pears, fresh apricots and plums. Altogether 43 999 ha (81% of the total pome and stone fruit plantings) require pollination."

According to Hortgro's calculations the entire industry currently requires around 91 000 hives for pollination. "That is 1.5 pollinations per hive. Over the next five years we expect an increase in excess of 100 000 hives," Kotzé said.

The cost of pollination for the 2019 season was R141 317 292. "If we look at pollination costs as a percentage of direct pre-harvest costs, it is estimated to be around 3%." The average cost per hive for 2019 was R980. The number of hives per hectare needed for apples was 2.5, pears five, apricots (fresh) two and plums six. Between 70 - 90% of the deciduous fruit industry is dependent on pollination.

Kotzé said that one of the biggest problems beekeepers around the world face is habitat destruction. This, while agriculture intensifies and more and more bees are dependent on smaller and smaller pieces of land for foraging. Due to climate change, agriculture has seen a shift to new cultivars and alternative crops being grown in the Western Cape. As agri-intensification steamrolls ahead, so does the demand for more bees. It is important that the two industries align their needs and expectations, Kotzé said.

There are many challenges for both, such as the use of chemical vs. biological control of pests, climate change and drought, the removal of eucalyptus trees that are an important food source for bees during the dry months, new production technologies such as the use of nets and an increased demand for contract pollination.

As growers are paying more and more for healthy, vibrant hives, some have even turned to beekeeping themselves. Kotzé pointed out that by law, anyone who owns a hive has to be registered as a beekeeper. She also urged producers to formally confirm bookings of pollination units well in advance to avoid disappointment and to manage risks.

"It is important that growers understand how pollination works and why it is important to only use registered beekeepers to ensure good pollination practices."

In March Hortgro and Provar launched "Fruit tasting in the orchard" exhibitions in Ceres and Grabouw. By Elise-Marie Steenkamp

HORTGRO Growing Fruit IQ

Science to do research

Wiehann Steyn and Iwan Labuschagne visiting the Pro-Hort trial sites in the Koue-Bokkeveld

The Pro-Hort programme and the future of the deciduous fruit industry

The goal with the "Fruit tasting in the orchard" exhibitions was to give producers a chance to taste and experience new cultivars that are currently being evaluated by Provar.

The future success of the deciduous fruit industry lies, among other things, in the planting of new and adapted cultivars, says Dr Iwan Labuschagné from Provar. "Therefore, we must be prepared to present producers with objective and relevant data and information on new cultivars."

The fruit exhibitions are an attempt to support this need and will become an annual institution for the fruit producer to attend. According to Thea van Zyl, Hortgro's event coordinator, the fruit tastings were well attended with around 113 people taking the time to visit the exhibitions. A similar event took place in the Langkloof on 18 May, and a mid to late season pome fruit exhibition was held in Ceres and Grabouw towards the end of May.

"What stood out for me during the recent fruit exhibitions was the great need of producers and stakeholders, including the licensees and owners of the cultivars, to be able to view and experience the new cultivars at an independent event, but also to socialise and stroll around in the evaluation orchards," says Labuschagné.

Apart from the fruit tasting exhibitions, an eight-year research project is underway at some of the Pro-Hort sites, to develop an index to evaluate the adaptability of apples, plums and cherries.

Apart from the fruit tasting exhibitions, an eight-year research project is also well on its way at some of the Pro-Hort sites. According to Prof Wiehann Steyn, Hortgro Science General Manager, the project aims to develop an index to evaluate the adaptability of apples, plums and cherries. This initiative brings together Hortgro, Provar, academics and students from the department of horticultural science at Stellenbosch University (SU).

The drivers of adaptability for a range of cultivars will be investigated. To achieve the goal, the team will assess tree architecture and other traits to understand the interaction between cultivars and climate. The students will be measuring bud break, how long it takes from initial bud break until last bud break, tree architectural properties such as branch angles, thickness and distribution of branches, as well as fruit size, production volume, and ripeness variables.

Trees for each fruit kind were planted on three sites with variable cold units. Apples at Nooitgedacht, Oak Valley, and Klipboschlaagte. Plums at Nooitgedacht, Klipboschlaagte and Boland Landbouskool and Cherries at Nooitgedacht, Lushof and Klipboschlaagte. "A lot of data will be collated in order to establish which cultivars work best in which area. For instance, a cultivar may excel in one area, but prove disappointing in another area. Some cultivars are all-rounders and fare well in different areas."

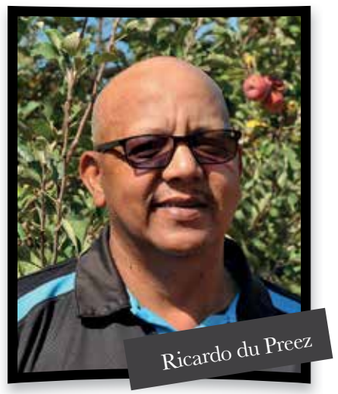
Labuschagné said that they are very excited about the project, which will take eight years to complete. Large amounts of data are collected that will identify different characteristics, which will point out drivers for adaptability and stability. "The ultimate goal is to develop an index that will enable us to test adaptation of new cultivars in support of independent evaluation."

According to Steyn, another project, the pheno-phase project, has been developed as an extension of the adaptability project. This will be run by Dr Esmé Louw from the Department of Horticultural Science at SU. Louw will use the bud break data from the adaptability project and match that to various cold models that are currently available.

"Cold models have been developed all over the world," says Steyn. "Most producers are familiar with the Utah model and the Daily positive chill model, while some might also know about the Dynamic model. Each model tries to improve on aspects of an older model that were not working, so the information Esmé and the team are going to collect can then, for example, tell them which model fits best with the rest-break data. The best-case model may, for instance, correlate 70% with the rest-breaking results you get in our regions. This can then become the best cold model to use. Different models may also work better for different fruit types or in different areas. In addition, we might be able to further fine-tune the best model for our particular climates. The same sites are therefore used for dual purposes which unlock a lot of value," he says.

Labuschagné said that a lot of science will go into both projects. "The students are in the orchards, come rain or sunshine." It is also great exposure for the students who get to work on a project that will benefit the industry in the long run. "In the end, this is a team effort between Hortgro, Provar, and SU. We are looking forward to the next couple of years and the solutions the data will bring."

The Pro-Hort programme was launched in 2019 and is a collaboration between Hortgro and Provar. Pro-Hort aims to empower producers by generating independent and accurate information on which to base cultivar selection for commercial planting.
Read more about the pheno-phase project in the June edition of the *Fresh Quarterly*.



Hail is hardly a storm in a teacup

In January, one of the worst nightmares for any fruit farmer – the destruction of a hailstorm – became a harsh reality in the Langkloof. By Gerrit Rautenbach

The calamity of the Langkloof hailstorm impacted farmers in varying degrees – with some crops even getting wrecked by the falling ice. Ricardo du Preez from Langfontein near Misgund in the Langkloof lost 95% of his crop. The question is, how does one recover from a disaster of this magnitude?

Losing 95% of your crop effectively means losing it all. Because trying to salvage the remaining 5% of your undamaged fruit is just too impractical, and uneconomical. The entire crop has been processed for cider or fruit juice. A meagre consolation compared to the anticipated export turnover. And yes, there is the umbrella of insurance, but between the juice and the pay-out, you are still not where that bumper crop would've got you.

The Langkloof, which produces 20% of SA's apples, is a unique and somewhat enigmatic pome and stone fruit production area. Up until the hailstorm, the entire Langkloof had endured a scorching seven-year drought. And when water finally came in January, it came in the form of hail.

On that fateful Tuesday in January, Ricardo du Preez was standing on his porch, cup of coffee in hand, looking out over his apple orchards on Langfontein. He felt good, blessed. He'd never had such a bumper crop. In fact, he almost felt intimidated by the quality, quantity and size of the fruit hanging on the trees.

"Three minutes. After a whole season of day-by-day dedication, nursing, pruning, helping those trees, the blossoms and budding fruit, it only took three minutes. All gone. Have you ever seen a red ripe Fuji being hit by a hail stone? There's a hole in that apple, and it goes black. Pitch black. I was sinking into that black hole. In fact, as I was standing there, looking at this destruction, the only thing I did was blaming God. Giving me my best crop ever, then just ripping it away. With hail stones as big as golf balls. The biggest one I picked up was the size of a tennis ball, the size actually of many of these apples …"

The speed at which hail travels before it strikes the ground or the apples (terminal velocity) varies, and depends on the size and weight of the hailstone. The terminal velocity of a hailstone of 1 cm in diameter falls at a rate of 9 m per second (32 km/h), while stones the size of 8 cm in diameter fall at a rate of 48 m per second (176 km/h). So the hailstone, the size of a tennis ball (6.87 cm), that blasted through Ricardo's apples was destroying at a speed of around 150 km/h. Extreme destruction.

> Three minutes. After a whole season of day-by-day dedication, nursing, pruning, helping those trees, the blossoms and budding fruit, it only took three minutes. All gone.

This is what an apple looks like that has been hit by hail

> Up until the hailstorm, the entire Langkloof had endured a scorching seven-year drought. And when water finally came in January, it came in the form of hail.

"I've had - like almost everyone else farming here - my fair share of hail damage, but mostly 5 to 15%, maybe 20%, but never like this."

After such a disaster, how do you survive? How do you recover?

"The one advantage is that, while the fruit was destroyed, the trees did not get structural damage. On the long term, there is minimal damage. Being positive, thunder storms and especially hail introduce a lot of nitrogen into the soil which will help the trees with good growth in spring. The good with the bad, as they say. Fortunately my nectarines were harvested before the hail and my Rosemary's had only about 3% damage," explains Ricardo, demonstrating the never-ending positive belief and attitude of these farmers who, after being hammered, just get up again and again.

However, with the crop gone, one has to make a plan to get to the next crop on the way. Ricardo is positive that he has the right backers to help him pull through. A group of investors who have seen the farm thrive. They understand that the hail wreckage was a natural disaster, not bad farming practice. Also, Langfontein Farm and Ricardo have a pristine track record.

Being a farmer in SA is not always easy, especially not in the Langkloof, some might say. On the southern side of the Kloof, you have the Tsitsikamma mountains, a key catalyst for water supply in the area, offering a good catchment area for rainfall. However, hail is also much more common along mountain ranges exactly like these because mountains force horizontal winds upwards (a phenomenon known as orographic lifting), thereby intensifying the updrafts within thunderstorms and making hail more likely. But then again, the water in liquid form or an iced unwelcomed form might just stay away completely, causing drought: a different farmer's nightmare all together.

Having processed his emotions around this disaster, Ricardo does not blame anyone anymore. He believes that he understands it all now: "Yes, there was this bumper crop. But maybe, just maybe, I was not able to hold my own against such a crop. Maybe it's a case of having to eat some humble pie. 'Getting down to earth'. You see, the thing that I learnt from this disaster is to change my attitude. I was referring to it beforehand as my crop. But it was never mine. It wasn't ours. We are just the custodians, responsible for looking after it. I've made peace with the fact that it was taken away.

"Therefore, next time, I will be ready for making it happen."

Driven by gratitude

Karabelo Motsei

fpef fresh produce EXPORTERS' FORUM SOUTH AFRICA

The Fresh Produce Exporters' Forum (FPEF) reached out to Karabelo Motsei for a glimpse into her journey of success as a young agri role-player. By **Johannes Brand**

Towering above the rest of her attributes is Karabelo's grasp of the power of gratitude, and how it drives her to keep on keeping on. This Ideafruit Export Account Manager has her feet firmly on the ground and her sights set high.

Q Tell us a bit about your role and main focus areas

A I report to Pieter Oelofse, the General Manager: Wholesale and Programmes, ensuring that the markets that we export to (Middle East, Far East and Asia, Rotterdam, and Russia) are optimally serviced.

Q What drew you to agriculture?

A I wasn't drawn to the sector at first. In fact, I studied BCom Economics and obtained my postgraduate qualification in Business Administration. I had no idea I would end up in the agricultural industry.

I have learnt so much within the years I have been at Ideafruit. I like that it's not monotonous. Every day comes with a new challenge, which excites me and gives me an opportunity to learn.

Q You've really excelled in your role. What motivates you?

A I have been fortunate to have received great guidance from Ideafruit, particularly from the CEO, Oliver Wood and Pieter Oelofse. They've really given me the space to grow. And my mother, Dr Sara Motsei (my biggest motivator), has taught me to always approach all tasks with a sense of excellence.

Q What do you think it takes to thrive in the fruit industry, especially for women?

A I have been quite blessed to have amazing leaders to guide me.

To thrive in the industry, one needs to have the right attitude: being open to accepting challenges and tackling tasks that drive continued growth. In essence, working hard and doing your best no matter how small the task.

Q What do you wish you knew when you first entered the industry?

A Knowledge is indeed power. I wish I had known more about the fruit industry, the terms used and all the background information. However, everything happens for a reason, I appreciate my learning journey from when I started my internship.

Q What is the most valuable lesson you've learnt in your role/the industry?

A To work hard in any given task and to be committed. Every experience adds value, if we pay attention.

Q Please also share the main lesson(s) you've learnt through the COVID-19 pandemic.

A My sister was recently diagnosed with COVID-19. When it hits so close to home, you realise the impact of this pandemic. I've learnt the importance of protecting myself, not just for me but for others around me. The pandemic has also taught me that gratitude is a powerful state of mind.

Q What is the funniest experience you've had in your role?

A I am grateful to be working in an environment where my colleagues are always joking around, even on stressful days.

However, a funny experience I had was recently when I tried learning how to speak Arabic (basically, how to greet). But one of our Arabic clients then decided to have a lengthy conversation in Arabic. Needless to say, Google translate was of very little help, at which point I resorted back to English. Both the client and I had a good laugh.

Q What do you do to relax ("chill")?

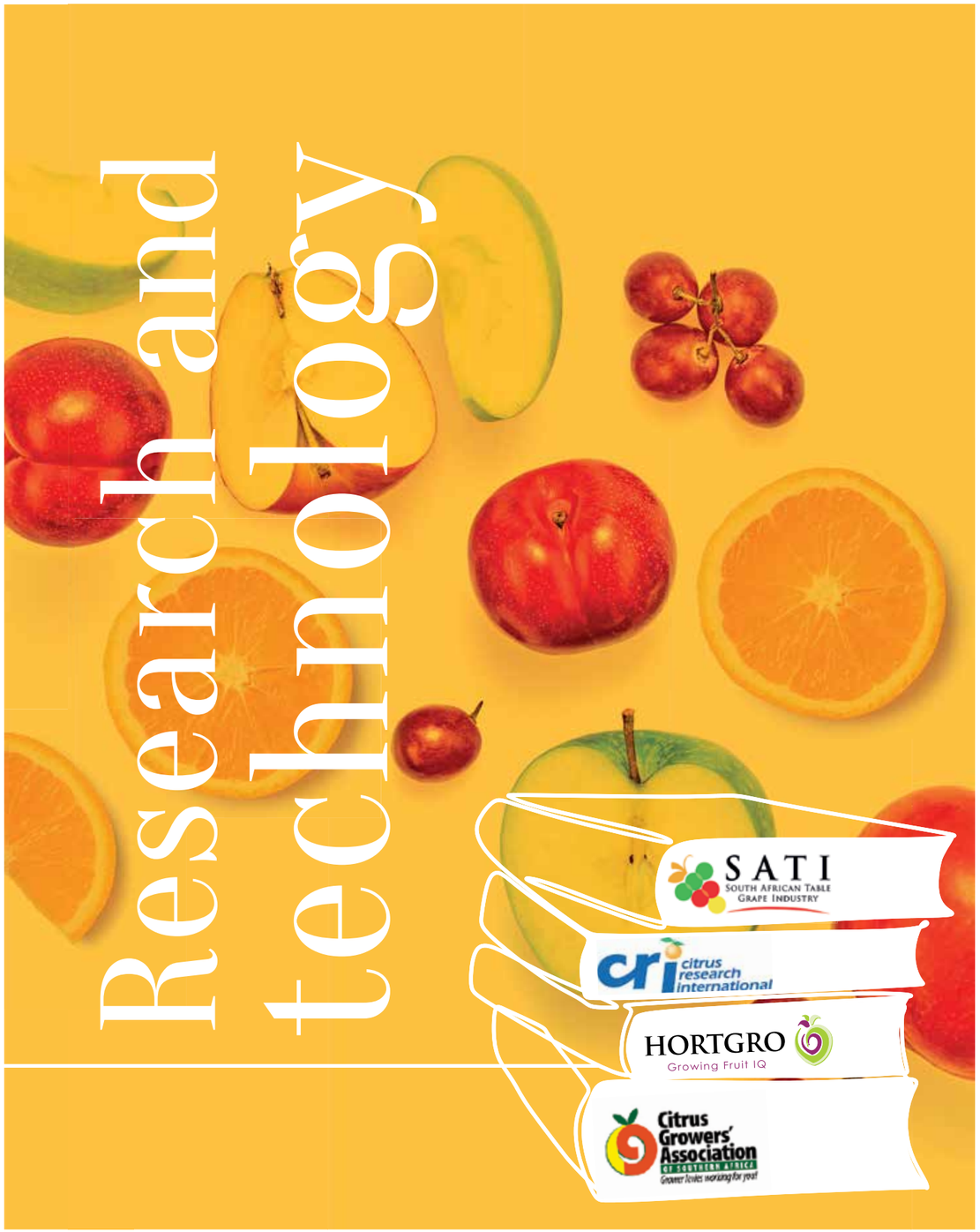
A I usually listen to music after a long day. I've also started taking walks in the evening to relax.

For me, success is ...

... knowing that hardships and proverbial mountains will arise, but having the courage to continue, regardless.

One of my favourite quotes is, "Success is where preparation meets opportunity".

To thrive in the industry, one needs to have the right attitude: being open to accepting challenges and tackling tasks that drive continued growth.



Hoe werk dit en hoekom maak dit saak?

Die voorvaders van moderne appels is waarskynlik afkomstig van een of ander snerpende helling op die grense van Kazakstan – nie uit die tuin van Eden nie. Hulle het winterdormansie ontwikkel om ysige koue te oorleef. Deur **Anna Mouton**

HORTGRO
Growing Fruit IQ

Baie bladwisselende plante maak staat op dormansie om ongunstige seisoenale toestande te trotseer. Maar wat gebeur wanneer ons hulle in ander klimate wil vestig?

Alle steen- en kernvrugte wat kommersieel in Suid-Afrika verbou word, is bladwisselende bome uit die noordelike halfrond. Hulle ondergaan almal winterdormansie, en vereis winterkoue in 'n mindere of meerdere mate. Dit is dus belangrik om te verstaan hoe winterdormansie werk – en wat gebeur wanneer dit nie so goed werk nie. Lees verder vir 'n oorsig van die kernpunte.

Wat is dormansie?

Dit is die tydelike staking van groei van enige deel van 'n plant wat 'n meristeem het. 'n Meristeem is 'n groep selle wat kan verdeel om nuwe weefsels en organe te vorm. Groeipunte bevat meristeme.

Bladwisselende bome beskerm die dormante meristeme in hulle lote deur knoppe te vorm. Verskillende knoppe, op dieselfde boom en op dieselfde tyd, kan in verskillende vlakke van dormansie verkeer.

Die rusperiode van bladwisselende vrugtebome tydens die winter staan bekend as endodormansie, en word deur groei-inhibeerders binne die knoppe self veroorsaak. Endodormansie word deur spesifieke seine in die knop aangevoer en opgehef. 'n Endodormante knop sal nie weer begin groei tensy dit die regte stimulus ontvang om die endodormansie te lig nie.

Koue gee dikwels aanleiding tot endodormansie. Verdere koue is daarna noodsaaklik om die endodormansie weer op te hef. Kortstondige warm weer sal nie 'n endodormante knop laat uitloop nie. Hierdie strategie beskerm plante – dit is beter om rustend te bly tydens 'n paar warm dae as om gevoelige nuwe bloeisels en blare aan daaropvolgende koue bloot te stel.

Die verloop van winterdormansie

Koeler herfsweer spoor bome aan om te begin gereed maak vir die kans van lewensgevaarlike koue in die winter. Korter dae mag moontlik ook deels aanleiding gee tot dormansie in steenvrugte. Bome hou op groei, en begin reserwes stoor om hulle deur die winter te

Bladwisselende vrugtebome beskerm hulle meristeme teen winterkoue deur knoppe te vorm

Dit kan partymaal moeilik wees om te oordeel of bome reeds ten volle endodormant is.

onderhou en in die lente aan die gang te kry. Skubblare vorm om die sensitiewe meristeme teen lae temperature te beveilig.

Winter breek relatief vinnig aan in die areas waar steen- en kernvrugbome vandaan kom. Daar raak die bome spoedig dormant, en die begin van dormansie val grootliks saam met blaarval. Hier in Suid-Afrika is die warmer herfs en winter problematies – die bome neem langer om ten volle tot rus te kom, vanwaar koue hulle weer uit endodormansie sal bring. Sommige vorder nooit eens so ver as om al hulle blare af te gooi nie. Dit kan partymaal moeilik wees om te oordeel of bome reeds ten volle endodormant is.

Bome wat ten volle endodormant is, moet 'n sekere hoeveelheid koue – gemeet in koue-eenhede – ervaar voordat hulle knoppe sal reageer op omgewingsfaktore wat groei stimuleer. Die optimale temperatuur vir die akkumulasie van koue in appelbome is 7.2 °C. Geen koue akkumuleer by temperature benede vriespunt óf bo 16.5 °C nie. Hoër temperature kan selfs die effek van koue wat reeds aangesamel het, tot niet maak.

Koue-behoefte verskil tussen spesies en kultivars. Appels het meestal 'n hoër koue-behoefte as steenvrugte, met die uitsondering van kersies.

Bome moet ten volle endodormant wees om koue-eenhede te akkumuleer. Koue voor volle endodormansie dra niks by tot die voorsiening van koue-behoefte nie. Die probleem is dat daar geen maklike manier is om te weet of 'n boom heeltemal endodormant is nie. Hoe dan gemaak om te bepaal hoeveel koue-eenhede die boom geakkumuleer het?

Knoppe kan uitloop sodra temperature gunstig is nadat hulle koue-behoefte bevredig is. Bot en blom word deur hitte bevorder. 'n Warm lente gee bome wat nie genoeg winterkoue gehad het nie 'n hupstootjie. Daarteen sal bome wat voldoende koue geakkumuleer het aan die groei kom selfs in 'n triestige lente.

Te min teenoor genoeg koue

Die bladwisselende vrugtebome wat in Suid-Afrika geplant word, kan sonder winterkoue oorleef. Ongeag die omgewingstemperature sal hulle nog steeds die kringloop van aktiewe groei en dormansie voltooi, maar dit sal 'n langsame proses wees. Sulke bome sal nie hulle natuurlike groeiwyse kan volg sonder bestuursinsette nie, want hulle knoppe sal nooit sinkroniseer nie.

Normale winterdormansie wat deur genoegsame koue opgehef word, sinkroniseer die knoppe op die boom. Byvoorbeeld, die terminale knop is dominant in 'n appelboom wat genoegsame koue akkumuleer het, en die groeipotensiaal van die ander knoppe aan die loot neem af van die punt tot by die basis. Na 'n normale rusperiode in die winter is die bot sterk en geskied binne 'n kort tydperk.

Onvoldoende winterkoue lei tot vertraagde en uitgerekte bot. Minder knoppe loop uit as normaal. Dié knoppe wat wel uitloop vestig sommer vinnig dominansie oor die stadiger knoppe. Dit het implikasies vir beide vrugset en boom-argitektuur.

In die meer gematigde steen- en kernvrugproduksie-areas van Suid-Afrika is daar gewoonlik genoeg koue in die herfs en winter vir bome om ten volle endodormant te raak, maar nie altyd genoeg vir die opheffing daarvan nie. Sommige knoppe sal verder uit endodormansie gevorder het as ander teen die tyd wat omgewingstoestande begin om groei te stimuleer. Die knoppe kry nooit die voordeel van 'n herset nie.

Gebrekkige winterkoue kan die differensiasie van blomme negatief beïnvloed, met abnormale blomme wat op verskillende stadiums van ontwikkeling mag aborteer. Maar die hoof korttermyn-effek van onvoldoende winterkoue is verminderde vrugproduksie en gemengde ryphede in die navolgende seisoen.

Vrugproduksie is eerstens minder as gevolg van minder blomknoppe van swakker kwaliteit. Daarby onderdruk dominante strukture wat uit knoppe ontwikkel wat vroeër bot die vrugte wat later set – meer vrugte kan ook val. Die vrugte wat agterbly gaan verdere frustrasies veroorsaak deur op verskillende tye plukryp te word. Probleme met na-oes defekte is bykans verseker.

Bome met vertraagde en uitgerekte bot is ook moeilik om te bestuur omdat die blomme en vrugte nie almal gelyk op dieselfde stadium van ontwikkeling is nie. Hoe besluit mens byvoorbeeld wanneer om chemiese uitdunners te spuit?

Onvoldoende winterkoue beïnvloed boonop die produktiwiteit en argitektuur van bome oor die langer termyn. Minder knoppe wat uitloop lei tot kaal nekke en minder spore – dus minder posisies waar die boom kan vrugte dra. Wanneer minder knoppe uitloop kan die laterale lote sterker groei, wat dan die dominansie en groei van die leier inkort. Die boom gedra hom soos 'n struik – hy toon sogenaamde basale dominansie – en sukkel om sy spasie in die boord te vul.

Uiteindelik boer vrugteprodusente met lig. Boomhoogtes moet 80%–100% van rywydtes wees om soveel lig as moontlik te onderskep en optimale produktiwiteit te behaal. Bome wat nie hierdie hoogte bereik nie verteenwoordig verlore inkomste.

Laastens kan die verskillende koue-behoeftes en reaksies tot koue van verskillende kultivars daartoe lei dat blomtye van kruisbestuiwers nie oorvleuel nie. Dit kan een van die redes wees vir die swak vrugset in Japanese pruime in die laaste paar jaar.

Wat om te doen oor warm winters

Die klimaat in van Suid-Afrika se vrugte-areas is nie heeltemal koud genoeg vir sommige steen- en meeste kernvrugkultivars nie. Produsente kan van die uitdagings met vertraagde en swak bot aanspreek deur rusbreekmiddels te gebruik. Rusbreekmiddels is reeds onmisbaar in baie areas, en produsente sal waarskynlik ál meer daarop steun soos wat die impak van klimaatsverandering toeneem.

Endormansie is veronderstel om knoppe te beskerm deur te verhoed dat hulle te gou bot – soms werk dit nie

Dormansie en koue-modelle

Onvoldoende winterkoue is toenemend 'n uitdaging vir produsente, en die gebruik van rusbreekmiddels raak al hoe meer algemeen. Korrekte toediening van rusbreekmiddels maak staat op koue-modelle – maar hoe betroubaar is die beskikbare modelle? Hierdie reeks artikels oor dormansie en koue-modelle het oorspronklik in die Junie 2021 uitgawe van *Fresh Quarterly*, die tegniese tydskrif van Hortgro Science, verskyn. Vir meer tegniese inhoud, insluitende artikels oor herplantsiekte, besoek ons webtuiste by www.hortgro-science.co.za/fresh-quarterly/ en laai jou gratis kopie af.

Die hoof korttermyn-effek van onvoldoende winterkoue is verminderde vrugproduksie en gemengde ryphede.

Rusbreekmiddels werk deur die boom te stres – die boom se oorlewing word bedreig en sy reaksie is om wakker te skrik. Die risiko is dat sterk rusbreekbehandelings die boom kan beskadig. Ongelukkig is dit nie altyd so eenvoudig om te oordeel wat die ideale aanwending is vir 'n bepaalde seisoen nie.

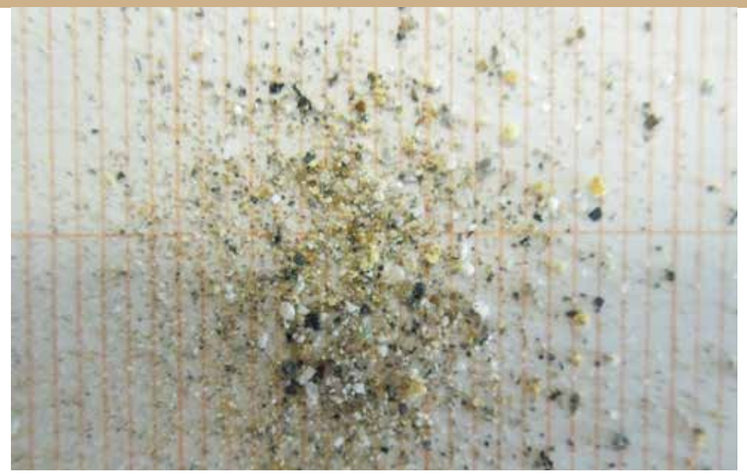
Produsente bestuur ook die effek van warm winters op boomargitektuur deur verbouingspraktyke soos snoei en buig. Die bykomende bestuurspraktyke wat toegepas word in warmer gebiede verhoog produksiekoste. Dit kan uiteindelik laer winsgewendheid van boorde in areas met onvoldoende koue meebring.

Die teel van kultivars met laer koue-behoeftes is die mees belowende oplossing vir warmer areas. Koue-behoeftes van steen- en kernvrugte is oorerflik – dit kan die grondslag wees vir seleksie in teelprogramme. Daar is reeds kultivars beskikbaar wat laer koue-behoeftes het. Dit is egter belangrik dat die kultivars met laer koue-behoeftes moet kan kers vashou by gevestigde kultivars as dit kom by vrugkwaliteit en bergingsvermoë.

Onvoldoende koue gaan 'n ál groter probleem raak danksy klimaatsverandering. Produsente sal winterkoue in ag moet neem wanneer daar besluit word oor kultivarkeuses en boordbestuur. Die volgende artikel in hierdie reeks bespreek die voor- en nadele van die verskillende modelle vir die bepaling van koue-eenhede.

Compromising on water-soluble fertiliser quality can be costly

For optimal result, and to avoid problems, only the best quality water-soluble fertilisers are suitable for use in drip irrigation systems. Yet the quality of products offered to growers varies dramatically. Do you really know the quality of the products you are buying?



Insoluble material will block the drippers and filters

As water scarcity increases, many growers in Southern Africa are investing in drip irrigation systems to improve water use efficiency. Using such systems, fertilisers can be applied in precise doses at exactly the right time for the plant, using the technique of fertigation. This is when water-soluble fertilisers are dissolved in the water and delivered directly into the rhizosphere with the irrigation water. Many cash crops have a high requirement for potassium, hence water-soluble sulfate of potash (SOP) is a popular source of potassium. However, there are many producers using different manufacturing processes and as a result the quality of water-soluble SOP can vary widely from one source to another.

Tessenderlo Kerley International who market their popular SoluPotasse® water-soluble SOP, have sought to determine the most important quality factors for water-soluble SOP. When questioned about these, growers and distributors list various chemical and physical characteristics that they believe are important in distinguishing between a high-grade superior product and one of poor quality:

- **Potassium content:** It goes without saying that, besides the sulfur content, a water-soluble SOP product should also have adequate potassium content. Ideally, above 42.5% K (typically, SoluPotasse® contains 43%).
- **Chloride content:** Many cash crops are chloride sensitive and chloride also increases the risk of salinity, particularly in regions with less water availability. Water-soluble fertilisers should have less than 1% Cl (typically, SoluPotasse® contains 0.6%).
- **PH:** Having a slightly acidic form of water-soluble SOP like SoluPotasse® brings a double advantage. A slightly acidic solution will help prevent the build up of deposits in the irrigation system, keeping it clean. The acidic solution will also regulate the pH level in the rhizosphere, optimising the uptake of the full range of plant nutrients.
- **Sodium content:** Like chloride, sodium is linked to salinity problems; therefore, levels should be minimised. Water-soluble SOP should have less than 1% Na (typically, SoluPotasse® contains 0.34%).
- **Insolubles:** The level of insolubles in a water-soluble SOP are critical, as these particles will potentially block the drippers and filters, leading to costly and time consuming cleaning operations. Ideally, levels should be less than 0.1% (typically, SoluPotasse® contains only 0.02% of insoluble material).
- **Dissolution speed:** Time is money, so growers want a form of soluble SOP that dissolves rapidly. Under normal conditions, 90% of SoluPotasse® is dissolved within three minutes.
- **Maximum solubility:** Having a higher maximum solubility means that growers can get a higher concentration of K2O in the mother solution. Although the maximum solubility is to some extent an inherent property of the fertiliser (in this case SOP), levels do vary significantly. For water-soluble SOP, products should ideally have a maximum solubility above 110 g/ℓ. For SoluPotasse®, this is typically 120 g/ℓ.
- **Dust:** When preparing the fertigation solution growers will gradually empty the content of bags of water-soluble SOP into the tank. If the product is dusty, the operation can become very unpleasant and imprecise. Ideally, dust levels should be below 0.2% (SoluPotasse® typically contains less than 0.05% of dust).

SoluPotasse® (left) dissolves rapidly and completely to give a clear solution, unlike poor quality water-soluble SOP products (right)

Based on these eight important parameters, Tessenderlo Kerley International has developed a quantitative scoring system to benchmark its class-leading SoluPotasse® water-soluble SOP against competitor products. In the system the above parameters are weighted according to importance and any SOP sample can score from 0 - 200, depending on how its properties shape up to the reference values in the quality assessment system. SoluPotasse® consistently scores above 160, outperforming the competition. For use in modern drip irrigation equipment, only a product with a score above 140 will perform optimally. Lower quality forms of soluble SOP may present problems, particularly in conditions where water quality is poorer. Products scoring below 100 should not really be classified as soluble SOP at all. Such products are difficult to dissolve and contain significant levels of insoluble materials, resulting in a high risk of blockage of the filters and drippers, as well as inefficient plant nutrient uptake.

Growers should also be wary of the standard grade SOP powder that some companies unscrupulously sell as 'water-soluble'. Standard powder SOP is used for compound NPK manufacture and is not at all suitable for use in modern drip irrigation systems. The manufacturers of drip irrigation equipment often express their frustration that growers who have invested in expensive, efficient equipment damage it by not using high-quality water-soluble fertilisers such as SoluPotasse®, of which the properties are enhanced to give first-class performance for high-tech fertigation, with high nutrient uptake in both open field and protected cultivation.

When it comes to buying water-soluble SOP, growers should carefully consider the trade off between the price of a bag and product quality, its consistency, and uptake efficiency. For water-soluble SOP, as for many other products, most of the time you get what you pay for. So, for trouble-free fertigation and a maximum return on investment, it is worth investing in high-grade products like SoluPotasse® that warrant investment in drip irrigation equipment, and ensure the effective uptake of a high concentration of nutrients by the plant.

For more information, please contact: tessenderlokerley@tessenderlo.com
We will gladly refer you your local SoluPotasse® distributor in SA.
SoluPotasse ® is a registered trademark of Tessenderlo Group NV

Ken jou koue-modelle

Die uitdagings rondom die berekening van koue-eenhede

Die bot van bladwisselende vrugtebome word grootliks bepaal deur hulle blootstelling aan winterkoue.

Deur **Anna Mouton**

HORTGRO Growing Fruit IQ

Onvoldoende koue lei tot bladwisselende bome wat traag is om te bot en te blom – produsente kan sulke bome aanhelp met rusbreekmiddels. Maar hoe weet mens watter bome dit gaan nodig hê, en hoe sterk die aanwendings moet wees?

Dit is waar koue-modelle kan help. Koue-modelle gebruik temperatuurdata om te bereken hoeveel winterkoue bome ervaar het. Produsente kan die resultate van koue-modelle oorweeg om beter besluite oor rusbreekbehandelings te maak. Koue-modelle is ook nuttig wanneer daar oor kultivars vir die vestiging van nuwe boorde besin word.

Om die voor- en nadele van bestaande koue-modelle beter te verstaan, het ons gesels met prof Eike Luedeling, leier van die Tuinboukundige Groep binne die Instituut vir Gewaswetenskappe en Hulpbronbewaring by die Universiteit van Bonn. Luedeling is ’n deskundige in die modellering van die uitwerking van temperatuur op vrugtebome.

Die koue-ure-model

Die koue-ure-model was een van die eerste pogings om ’n model te skep wat gegrond is op temperatuurdata. Niemand is seker waar hierdie model vandaan kom nie. ’n Artikel deur Weinberger, 1950, word gewoonlik aangegee as die bron, maar Weinberger verwys terug na ’n voorlegging by ’n kongres in 1932, gelewer deur ’n plantpatoloog. “So hy het gewerk op siektes, nie op koue nie,” sê Luedeling.

Om koue te kwantifiseer met die koue-ure-model, tel eenvoudig die aantal ure waarvan die temperature tussen 0 en 7.2 °C was. In Suid-Afrika word koue-ure gewoonlik getel vanaf 1 Mei tot 31 Augustus.

“Dis maklik – enigeen kan dit doen met ’n Excel-sigblad,” sê Luedeling. “Die probleem is dat dit nie regtig ’n model is nie. Dis meer soos ’n skatting.”

Luedeling wys daarop dat die oënskynlik presiese waarde van 7.2 °C eintlik net ’n omskakeling is van 45 °F. “’n Ander probleem is dat daar hierdie harde afsnypunt is. Wanneer jy 7.2 °C het, kry jy jou koue-uur, maar wanneer jy 7.5 °C het, kry jy niks. Dit is nie hoe biologie werk nie.”

Alhoewel die koue-ure-model steeds gewild is in die noordelike halfrond, is dit nie baie bruikbaar in Suid-Afrika nie. Die model maak nie voorsiening vir koue wat akkumuleer bo 7.2 °C nie. Dit neem ook nie die negatiewe uitwerking van hoë temperature, of die positiewe uitwerking van matige temperature ná koue, in ag nie.

“Die goeie nuus is, as jy hierdie model gebruik het om die effek van klimaatsverandering te beraam, dan is jou skatting waarskynlik te pessimisties,” sê Luedeling. “’n Klein bietjie verwarming kan ’n reuse-effek hê op die resultate van hierdie model.”

Die Utah-model

In 1974 het Richardson en medewerkers ’n nuwe model gepubliseer in ’n poging om van die tekortkominge van die koue-ure-model aan te spreek. Hulle het dié model die Utah-koue-eenheid-model genoem, maar baie Suid-Afrikaners verwys daarna as die Richardson-model.

Die Utah-model verskil van die koue-ure-model deurdat dit geweegde koue-eenhede gebruik eerder as ure. Elke uur by temperature tussen 1.4 en 12.4 °C tel, maar die aantal koue-eenhede hang af van die temperatuur. Byvoorbeeld, vir elke uur by 1.5 - 2.4 °C sal daar 0.5 koue-eenhede akkumuleer, teenoor 1.0 koue-eenheid vir elke uur by 2.5 - 9.1 °C.

Nog ’n verfyning van die Utah-model is die insluiting van negatiewe koue-eenhede om die negatiewe uitwerking van warm temperature in berekening te bring. Byvoorbeeld, vir elke uur by 16.0 - 18.0 °C, word 0.5 koue-eenhede afgetrek van die totaal.

“Ek dink die Utah-model is ’n verbetering indien die temperatuurgrense werklik korrek is,” sê Luedeling, “wat ons nie weet nie. Die olifant in die kamer is altyd dat ons met verskillende spesies te doen het. Kan ons dit werklik regverdig om dieselfde grense en dieselfde modelle vir almal te gebruik?”

In SA word koue-eenhede dikwels bepaal van daaglikse temperature vanaf 1 Mei. Dit is egter nie die korrekte toepassing van die Utah-model nie, want dit lei tot die akkumulasie van ’n groot aantal negatiewe koue-eenhede aan die begin van die winter. Richardson en sy medewerkers het hierdie probleem oorkom deur te spesifiseer dat die berekening elke jaar gekalibreer moet word vir elke weerstasie.

Hoe werk die kalibrasie? Die lopende totaal koue-eenhede word vanaf die begin van die winter elke dag op ’n grafiek aangeteken. Aanvanklik sal die lyn afwaarts loop, as gevolg van die akkumulasie van negatiewe koue-eenhede, maar mettertyd sal die tendens verander soos wat die weer kouer raak. Die draaipunt is waar bome begin koue akkumuleer, en dit word as die nulpunt geneem. Koue-eenhede behoort slegs vanaf die nulpunt getel te word.

’n Gewysigde weergawe van die Utah-koue-eenheid-model is in 1994 deur Linsley-Noakes en kollegas gepubliseer. Hulle het hul model die daaglikse-positiewe Utah-koue-model genoem. Daar word algemeen daarna verwys as die Infruitec-model of die daaglikse-positiewe model.

Die daaglikse-positiewe-model is meer akkuraat as die oorspronklike Utah-model in areas met matige winters. Om koue-eenhede met die daaglikse-positiewe-model uit te werk, tel eerstens die koue-eenhede vir die dag. Indien die totaal positief is, tel dit by die lopende totaal. Indien die totaal negatief is, word dit geneem as nul – met ander woorde dit word nie van die lopende totaal afgetrek nie. Die uitset van die daaglikse-positiewe-model kan gevolglik nooit ’n negatiewe totale aantal koue-eenhede wees nie.

Die dinamiese model

“Ek is verbaas om te hoor dat Suid-Afrikaners die Utah-model gebruik,” sê Luedeling, “want dit is lankal gevind dat dit nie goed werk by julle nie.” Hy reken dat die dinamiese model huidig die beste opsie is vir die kwantifisering van koue.

Die dinamiese model is in Israel deur Erez en medewerkers ontwikkel in 1987. Hulle het veronderstel dat koue in twee stappe akkumuleer. Lae temperature veroorsaak eerstens die vorming van ’n oorgangsproduk. Die oorgangsproduk kan deur hitte vernietig word, maar sodra daar genoeg oorgangsproduk gevorm het, verander dit in ’n stabiele dormansie-opheffende faktor wat nie deur hitte vernietig kan word nie. Hierdie tweede stap geskied by effens warmer temperature as dié waarby die oorgangsproduk vorm.

Die dinamiese model hou tred met

Dis hoe koue moet lyk!

die vorming van die oorgangsproduk, en bereken wanneer dit in die stabiele dormansie-opheffende faktor omgesit word. Die resultaat word in koue-dele aangegee. Sodoende spreek die dinamiese-model die effek van hoër temperature meer realisties aan as die ander modelle.

"Daar is 'n klomp aannames met die dinamiese-model," sê Luedeling, "maar biologies is hierdie model baie meer oortuigend. Dit is gebaseer op 'n groot aantal beheerde temperatuurproewe. En wanneer ek – en ander mense – modelle vergelyk het, het die dinamiese-model nog altyd die beste presteer."

Luedeling beklemtoon dat die dinamiese-model oorspronklik gegrond is op data van perskes, net soos al die ander modelle hierbo bespreek. Die ontwikkelaars van die dinamiese-model het uitdruklik genoem dat die model vir ander spesies, en selfs ander kultivars, gekalibreer moet word. Luedeling sê dat hierdie aanbeveling meestal op dowe ore geval het, omdat kalibrasie so moeilik is.

"Die model is ingewikkeld, en ek kan definitief verstaan hoekom dit nie dadelik opgeneem is na dit gepubliseer is nie," sê Luedeling. "Maar dis nie asof ons die wiskunde met 'n pen en papier doen nie – ons is nie meer beperk tot eenvoudige-modelle nie."

Luedeling het 'n statistiese hulpmiddel, chillR, ontwikkel vir die analise van temperatuurdata en die berekening van koue-ure, koue-eenhede, en koue-dele. Die chillR-sagteware kan gratis afgelaai word, maar gebruikers moet vertroud wees met die statistiese program R, en gemaklik wees met programmering.

Hitte-modelle

Winterkoue is 'n kragtige drywer van bot, maar so ook is hitte. Sekere groeiprosesse, soos blom, mag slegs bo 'n spesifieke minimum temperatuur plaasvind. Soos wat temperature bo hierdie minimum styg, versnel die prosesse. Teoreties behoort dit moontlik te wees om die datums van fenologiese stadiums soos blom te voorspel met behulp van 'n hitte-model.

Hitte-akkumulasie word gewoonlik bereken deur hitte-eenhede – sogenaamde termiese tyd of gradedae – bymekaar te tel vanaf die einde van dormansie. Ouer hitte-modelle neem aan dat die bome 'n reglynige respons het tot temperatuur, sodat die aantal dae vanaf rusbreek tot blom eenvoudig 'n omgekeerde verhouding tot temperatuur het. Nuwer-modelle neem aan dat knoppe meer gevoelig raak vir warmte nadat hulle aan meer koue blootgestel was. Na 'n koue winter sal knoppe uitloop by laer temperature, en vinniger groei, as na 'n matige winter. Dit is waarom 'n warm lente bome kan aanspoor tot aksie, ten spyte van 'n warm winter.

"Daar is min vergelykings van hitte-modelle," sê Luedeling, "of vrae oor hulle." Hy dink dat bome wat aktief groei baie anders op temperatuur gaan reageer as bome wat dormant is, en dat bestaande-modelle nie voldoende ag slaan op hierdie verskille nie.

Tans neem koue-modelle nie hitte in aanmerking nie. Luedeling werk aan 'n nuwe raamwerk vir modelle wat wel hitte insluit, maar terselfdertyd waarsku hy teen die doel van die oefening vergeet. "Produsente het nie heeltemal presiese kennis oor elke dingetjie nodig nie. Ons moet nie verlore raak in die kleinighede nie – ons het hulpmiddels nodig wat werk. Ons moet 'n oplossing vind wat mense in staat stel om aan te pas by die veranderinge wat voorlê."

Modelle vir die toekoms

"Jy moet onthou dat dit baie moeilik is om koue-modelle te maak," sê Luedeling, "want jy het 'n knop aan 'n boom wat heel winter dieselfde lyk. Daar gebeur baie binne-in die knop, ons weet dit, maar jy kan dit nie sien nie." Hy reken dat verskillende prosesse in dormante knoppe waarskynlik op verskillende temperatuurseine reageer, en dat dit dalk nie korrek is om 'n enkele koue-model toe te pas regdeur die hele winter nie.

Daar is verskeie maniere om 'n model te staaf, verduidelik Luedeling. "Jy kan kyk of dit werklike gebeurtenisse voorspel – dis wat almal doen. 'n Beter manier sou wees om te kyk of die prosesse wat ons weet plaasvind, ingesluit word in die model." Laasgenoemde verg dat ons die biologie van vrugtebome beter verstaan as wat ons tans doen.

'n Ander moontlike bron van foute met modelle is temperatuurdata. Koue-modelle gebruik uurlikse temperatuurdata, maar daar is dikwels nie uurlikse lesings beskikbaar nie, so die data word van daaglikse minimum en maksimum lesings afgelei.

Ten spyte van hierdie uitdagings is Luedeling vol vertroue dat modelle beide bruikbaar en nuttig kan wees. Hy is tans besig om 'n artikel te publiseer wat handel oor die toepassing van die dinamiese-model op verskillende kultivars. Hy het die voorbeeld gevolg van Erez, die hortoloog wat betrokke was by die ontwikkeling van die oorspronklike dinamiese-model.

"Erez het saam met 'n fisikus – Fishman – gewerk en ek dink sy is die brein agter die wiskundige vergelykings," vertel Luedeling. Hy het ook 'n fisikus-vriend ingespan vir die wiskundige kant.

Navorsers het destyds streng-beheerde eksperimente gedoen om data te genereer waarop hulle die dinamiese-model kon grond, maar deesdae is dit moeilik om befondsing te kry vir sulke studies. Luedeling maak staat op rekords van langtermyn waarnemings uit verskillende wêrelddele, insluitende Suid-Afrika. Hy werk saam met Dr Esmé Louw van die Departement Hortologie by Universiteit Stellenbosch. Hulle het 'n nuwe projek begin om 'n temperatuur-fenofase-databasis saam te stel. Lees meer oor hierdie projek op bladsy 79 van hierdie uitgawe.

Luedeling bestudeer ook klimaatsverandering, en hy beklemtoon die rol van modelle in voorbereiding vir die toekoms. "Ons het hulpmiddels nodig vir beplanning. Wanneer jy rusbreekmiddels gebruik, is daar jaar-na-jaar bestuur wat belangrik is. Maar daar kom ook 'n tyd wanneer jy nuwe bome moet plant. En wat plant jy wanneer die bome vir 30 jaar daar gaan wees? Daar kan baie verwarming in daardie tyd plaasvind.

"Daar's 'n geleidelike toename in die risiko van ernstige probleme – elke jaar raak die kanse so 'n bietjie erger. Daar gaan 'n punt kom wanneer produsente moeilike besluite moet maak. Jy wil nie ontdek dat iets nie meer werk nie, wanneer jy alreeds 10 jaar belê het om bome groot te maak."

Koue-modelle gebruik temperatuur-data om te bereken hoeveel winterkoue bome ervaar het.

Die fundamentele gebreke van koue-modelle

Waarom hulle struikel in Suid-Afrika

Koue-modelle moet betroubaar wees – daar is gevolge wanneer hulle verkeerd is. Deur Anna Mouton

Produsente in areas met matige winters maak op koue-modelle staat om rusbreekbehandelings te bestuur. Onjuiste bepalings van koue kan lei tot onvoldoende óf oormatige toepassing van rusbreekmiddels. Koue-skattings is ook 'n oorweging in die keuse van kultivars vir die vestiging van nuwe boorde. Die plant van 'n ongepaste kultivar is een van die duurder foute wat 'n produsent kan maak.

Die uitdaging vir Suid-Afrikaanse produsente is dat koue-modelle nie so goed werk in ons klimaat nie. Plaaslike produsente maak meestal staat op die Utah-koue-eenheid-model, óf op die daaglikse-positiewe Utah-koue-model, beter bekend as die Infruitec-model, wat 'n aanpassing is van die oorspronklike Utah-model. Maar ons boorde is nie in Utah nie. Hoe beïnvloed dit die akkuraatheid van die modelle? Dr Nigel Cook, plantfisioloog en hortologiese konsultant, verduidelik.

Begin by die begin

Die Utah-koue-eenheid-model is deur Richardson en medewerkers in 1974 gepubliseer. Sommige Suid-Afrikaners noem dit die Richardson-model, en verwys na Utah-koue-eenhede as Richardson-koue-eenhede. Die Utah-model ken koue-eenhede toe gegrond op die gemiddelde uurlikse temperatuur – sien tabel 1.

Koue-eenhede word opgetel vir elke uur in die dag. Die totaal vir die dag word by die lopende totaal getel. Figuur 1 wys die lopende totaal koue-eenhede vir vier maande vanaf 1 Mei tot 31 Augustus, vir twee verskillende jare. Die vol strepe wys die koue-eenhede soos bereken met die Utah-model, en die gebroke strepe wys die koue-eenhede soos bereken met die daaglikse-positiewe-model, ook bekend as die Infruitec-model.

Tabel 1: Koue-eenhede toegeken by verskillende temperature

Temperature in °C	Aantal koue-eenhede per uur
Onder 1.4	0
1.5–2.4	0.5
2.5–9.1	1.0
9.2–12.4	0.5
12.5–15.9	0
16.0–18.0	-0.5
Bo 18.0	-1.0

Op warm dae sal die totale aantal koue-eenhede per dag, bereken volgens die Utah-model, negatief wees. Die lopende totaal van Utah-koue-eenhede sal ál hoe meer negatief raak met opeenvolgende warm dae. Hierdie situasie is kenmerkend van laat herfs of vroeë winter in gebiede met matige winters. Wanneer die weer uiteindelik koud raak, raak die totale aantal Utah-koue-eenhede per dag positief – dit skep 'n draaipunt op die grafiek. Die draaipunt kan teen einde Mei van jaar 2 in figuur 1 gesien word.

"Wat Richardson gesê het, is dat die draaipunt jou begindatum is," sê Cook. "Dit is waar die plant begin koue aanteken. Maar hierdie begindatum wissel van jaar tot jaar. Richardson sê jy moet elke weerstasie elke jaar kalibreer om sy beginpunt te vind."

In Suid-Afrika is dit gebruiklik om koue-eenhede te begin tel op 1 Mei. Die gevolg is gewoonlik dat die totale aantal koue-eenhede soos bereken vir die seisoen, laer is as die werklike aantal koue-eenhede, omdat daar aanvanklik 'n spul negatiewe koue-eenhede opbou. "Jy kan nie net na willekeur die begindatum 1 Mei maak nie," beklemtoon Cook. "Deur sulke data te rapporteer, kan jy uit wees met soveel as 200 eenhede."

Die risiko van 'n verkeerde begin

Die Utah-model werk goed in koue klimate waar die aanvang van dormansie vinnig is. "Dormansie het 'n ingang en 'n uitgang," sê Cook. "In koue klimate is die ingang vinnig, maar in warmer areas is die ingangsproses problematies. Daar is geen korrelasie tussen koue-eenhede en die vlak van dormansie in die plant tydens die ingangsfase nie."

Steen- en kernvrugbome ondergaan 'n reeks veranderinge om dormant te raak, maar daar is nie 'n praktiese manier om te bepaal wanneer die proses voltooi is nie. In warm areas kan die ingangsproses weke neem, selfs die grootste gedeelte van die winter. Intussen teken die bome nie die koue aan nie – hulle begin slegs koue akkumuleer nadat hulle ten volle dormant is.

Die Utah-model werk goed in koue plekke juis omdat die ingangsproses só kort is. Dis veilig om koue-eenhede te begin tel gegrond op die draaipunt van 'n grafiek. Cook dink nie hierdie aanname geld noodwendig onder Suid-Afrikaanse toestande nie. "Dit lyk asof die Utah- en die daaglikse-positiewe-modelle die akkumulasie van koue baie swak kwantifiseer in die ingangsfase, veral in warmer areas."

Deur nie te weet wanneer om te begin koue-eenhede tel nie, loop mens die risiko dat die aantal eenhede óf oorskat, óf onderskat word, afhangende van die area en die spesifieke seisoen.

Koue-eenhede sal daarby opgejaag word as hulle getel word nadat die bome reeds hulle rus gebreek het. Koue word dikwels aangegee vir die periode 1 Mei tot 31 Augustus. Dit kan duidelik nie van pas wees vir bome wat vroeg blom nie, waarvan sommige reeds aktief groei in Julie.

Bring hitte in berekening

Een van die verbeteringe met die Utah-koue-eenheid-model was die insluiting van negatiewe koue-eenhede. Intussen dui verdere navorsing daarop dat die uitwerking van hitte toeneem by temperature bo 21 °C, en dat die Utah-model ooreenkomstig aangepas behoort te word.

"Dit word nie in enige van die modelle ingesluit nie," sê Cook. "Ons het nie Utah-weergawe 2 nie, ons het slegs Utah-weergawe 1."

Cook spekuleer dat kort periodes van baie hoë temperature in die middel van die winter plante moontlik uit dormansie kan lig. Sulke bome sou dalk hulle dormansie-siklus moes oor begin, met die verlies van enige koue wat hulle geakkumuleer het. Die gebrek aan 'n metode om dormansie te meet maak dit moeilik om bome uit te ken wat 'n onrustige winter beleef het.

Dit gaan ál hoe belangriker raak om hitte in ag te neem danksy klimaatsverandering. "Almal vra, hoe gaan aardverwarming ons raak?" sê Cook. "Maar die eerste vraag wat ons moet antwoord is, is dit warmer as normaal? Daar's geen twyfel dat dit warmer is nie – skrikwekkend warmer."

Temperatuurdata vir Elgin toon dat daar in nege van die afgelope 10 jare minder koue geakkumuleer het as die langtermyn gemiddeld. Die afgelope drie jaar was die warmste in die laaste 30 jaar, en verlede jaar was die warmste op rekord.

"Hierdie was altyd 'n 700 – 800 koue-eenhede area," sê Cook, met verwysing na die Utah-model. "Nou is dit 'n 400-uur area. Die groot vraag is, watter koue-model moet ons gebruik? Of is dit tyd om 'n nuwe model te skep?"

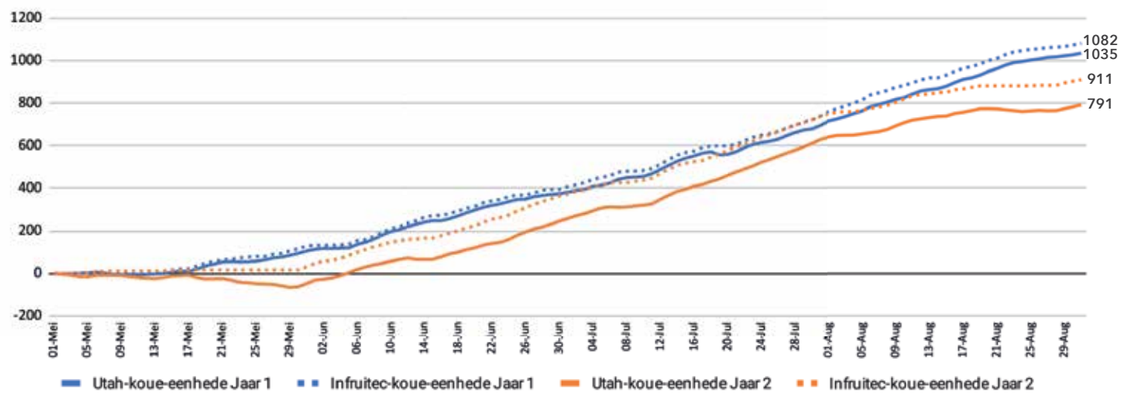
Hoe lyk koue-modelle in die praktyk?

Die vol strepe in die grafiek verteenwoordig die lopende totaal koue-eenhede soos bereken met die Utah-model. In jaar 1 is die model korrek gekalibreer, so eenhede word vanaf die draaipunt getel, wat toevallig 1 Mei was. In jaar 2 word koue-eenhede ook vanaf 1 Mei getel, maar die draaipunt is eers aan die einde van Mei.

Die gevolg is dat negatiewe koue-eenhede oploop gedurende Mei van jaar 2, wat die totaal verkeerdelik afbring.

Die gebroke lyne in die grafiek verteenwoordig die lopende totaal koue-eenhede soos bereken met die daaglikse-positiewe of Infruitec-model. Dit is duidelik dat hierdie model 'n hoër totaal gee – omdat 'n negatiewe aantal eenhede vir enige spesifieke dag as nul aangeteken word.

In jaar 1 is die verskil tussen die uitsette van die Utah- en die daaglikse-positiewe-modelle gelyk aan 47 eenhede. In jaar 2 is die verskil 120 eenhede. Die hoofrede vir die groter verskil in jaar 2 is die verkeerdelike insluiting van negatiewe koue-eenhede in die totaal vir die Utah-model, omdat die eenhede nie vanaf die draaipunt getel is nie.



Vergelyking van koue-eenhede uitgewerk met verskillende modelle

Wat vertel koue-modelle ons van bot?

Die antwoorde lê in die skepping van 'n fenofase-temperatuurdatabasis

HORTGRO Growing Fruit IQ

Die doel van koue-modelle is om te voorspel hoe bome hulle rus gaan breek in die lente.
Deur **Anna Mouton**

Gaan bome vinnig wakker skrik en ywerig aan die blom kom? Of gaan hulle traag bot en rusbreekmiddels benodig? Die hoeveelheid koue wat die bome deur die winter gehad het behoort vir mens te sê – in teorie.

"Ons kyk na die koue-eenhede en om eerlik te wees, weet ons nie altyd wat enigsins die waarde van die modelle is nie," erken prof Wiehann Steyn, algemene bestuurder by Hortgro Science, "want ons weet nie of hulle regtig korreleer met die rusbreking wat ons kry nie." Hortgro het in 2019 'n nuwe projek geloods wat sal poog om hierdie onsekerheid aan te spreek.

Kwantifisering van koue

Die belangrikheid van koue temperature om dormansie teweeg te bring en weer op te hef word nie betwyfel nie. Meeste steen- en kernvrugprodusente in areas met warm winters is deeglik bewus van die probleme wat deur té min koue veroorsaak word. Produsente maak meestal op chemiese rusbrekers staat om hierdie situasie te bestuur. Maar die korrekte aanwending van rusbrekers is afhanklik van voorwete – hoe sterk gaan die bot wees in die lente?

"Jy verwag meer probleme in die jaar met min koue-eenhede teenoor die jaar met 'n klomp," sê Steyn, "en breedweg gesien is dit so. Maar daar is party jare wat jy relatief min koue-eenhede het en dan is jou bot nie so swak as wat jy gedink het nie. En dan's daar jare wat jou koue-eenhede eintlik relatief goed was, maar die bot is nie so goed as wat jy gedink het dit sal wees nie."

"Jy moenie jou blind staar teen die hoeveelheid koue wat jy gekry het nie," verduidelik dr Esmé Louw van die Departement Hortologie by Universiteit Stellenbosch. "Dit hang af wanneer jy daai koue gekry het – die herfs- en lente-temperature. Hierdie skouerseisoentjies maak ook 'n verskil, veral in 'n warm area."

Louw is een van die leiers van die nuwe projek, saam met dr Iwan Labuschagne van die onafhanklike kultivar-evaluasie-maatskappy, Provar. Louw glo dat daar nie té veel klem gelê moet word op koue-modelle nie. "Wat belangrik is op die ou einde van die dag is of daar genoegsame, gesinkroniseerde bot is – dis die blomme en die oes wat jy gaan hê. Wat jy eintlik moet meet is die plant se respons. En jy moet dit probeer koppel aan dit wat gebeur het die vorige seisoen."

Steyn stem saam. "Ons meet koue-eenhede elke liewe jaar maar min mense hou tred van rusbreek. Met 'n goeie datastel vir rusbreking sou ons rusbreek kon korreleer met verskillende koue-modelle, en kyk in watter mate die modelle beskryf wat ons sien. Ons kon selfs potensieel die modelle probeer verbeter."

> "Jy moenie jou blind staar teen die hoeveelheid koue wat jy gekry het nie. Dit hang af wanneer jy daai koue gekry het – die herfs- en lente-temperature. Dit maak ook 'n verskil, veral in 'n warm area."

Die fenofase-temperatuurdatabasisprojek

Die skepping van die databasis wat Steyn beskryf is presies dit wat die nuwe fenofase-temperatuurprojek ten doel het. Die projek het in 2019 begin, en sal loop tot 2025. Temperatuurdata sal vanaf herfs tot lente versamel word, saam met data oor die rusbreekgedrag van kommersiële appel- en pruimbome.

Een deel van die projek sal volwasse bome in bestaande boorde in areas met kontrasterende klimate moniteer. Vir pruime is daar 'n Laetitia- en 'n Angeleno-boord in beide Franschhoek en Robertson gekies. Vir appels is daar 'n Golden Delicious- en 'n

Bome wat by die Pro-Hort perseel op Klipboschlaagte evalueer word

IWAN LABUSCHAGNE | PROVAR

Granny Smith-boord in beide Elgin en die Koue Bokkeveld gekies.

'n Ander deel van die projek sal jong bome volg wat geplant is vir aanpasbaarheidsproewe. Hierdie bome is in 2019 op die Pro-Hort-evaluasiepersele gevestig. Tien pruimkultivars wat die spektrum van vroeg- tot laatblom dek, is geplant op persele in Paarl, Robertson, en die Koue Bokkeveld. Tien appelkultivars wat die spektrum dek van lae tot hoë koue-behoefte is geplant op persele in Elgin, Robertson en die Koue Bokkeveld.

"Ons sal kan sien, was dit 'n uitgerekte bot, was die bot naby aan mekaar en wat was die persentasie bot," sê Louw, "en ons gaan dan probeer om dit te verbind met temperatuur en met die modelle." Die navorsers beplan om die fenologiese stadiums, soos knopvorming, blaarval, knopswel, bot en verskillende blomstadiums, insluitende die opening van die eerste bloeisel, volblom en die einde van blom aan te teken.

Die eerste jaar van die projek was 'n toetslopie om die verskillende metodes van dataversameling te beproef. Dataversameling begin in erns hierdie lente.

Modelle onder die loep

Temperatuurdata vanaf die verskillende proefpersele sal met behulp van bestaande koue-modelle – koue-ure, Utah, Infruitec, en dinamies – verwerk word, sodat die verwantskap tussen die voorspellings van die modelle en die gedrag van die bome ondersoek kan word.

> "Ek dink dis eintlik 'n reuse-oorsig dat daar nooit so 'n studie was nie."

"In watter mate beskryf dit die koue-modelle wat jy sien?" vra Steyn. "Watter een van hulle werk die beste vir watter streek? En vir watter kultivars?" Die projek gaan gebruik maak van die vakkennis van prof Eike Luedeling, leier van die Tuinboukundige Groep binne die Instituut vir Gewaswetenskappe en Hulpbronbewaring by die Universiteit van Bonn. Luedeling geniet internasionale aansien vir sy modellering van temperatuureffekte in vrugtebome.

Meeste Suid-Afrikaanse produsente gebruik tans óf die Utah-model, óf die Infruitec-model. "As die dinamiese-model beter is, dan moet ons daarnatoe beweeg," sê Steyn. "En as van die nuwe aanpassings wat deur Luedeling-hulle gedoen is nog beter is, dan moet ons dit gebruik. Maar vir nou weet ons nie."

Steyn waarsku dat 'n skielike verandering in die manier waarop koue-eenhede uitgewerk word dalk produsente kan verwar. Hulle sal nie die aantal koue-eenhede wat met verskillende modelle bereken is, direk met mekaar kan vergelyk nie. "Ons hoop om 'n klomp historiese klimaatsdata in die hande te kry en die modelle daarop te pas. Dan kan jy 'n tabel hê vir die verskillende streke, en dan kan produsente sien wat die verskille is teenoor die inligting wat hulle in die verlede gekry het."

Die nuwe projek maak ook voorsiening vir die ontleding van historiese temperatuurdata met die verskillende koue-modelle, om verskillende scenarios van toekomstige koue-akkumulasie, gegrond op verskillende vooruitskattings van klimaatsverandering, te skep. Een doel is om 'n idee te vorm van toekomstige koue-akkumulasie in steen- en kernvrugproduksie-areas. Die ander doel is om te bepaal hoe goed bestaande koue-modelle in die toekoms sal werk.

"Ek dink dis eintlik 'n reuse-oorsig dat daar nooit so 'n studie was nie," sê Steyn. "As iemand rekord gehou het, en ons het nou 'n 20–30 jaar rekord gehad van rusbreking, dan sou jy geweet het wat jou rusbreking dryf, en die vermoë gehad het om beter vooruitskattings te doen. Maar daar's nooit 'n beter tyd as nou om te begin nie."

Research Inventory

A list of research projects and publications related to dormancy funded by Hortgro.

Completed projects

- 2003. Costa C. The control of delayed foliation in apples and pears.
- 2007. Cook N. Manipulation of the winter-chilling requirement of apple trees.
- 2008. Cook N. The role of phenolic compounds in apple-bud dormancy.
- 2011. Cook N. Development and testing of a new chilling model for low chill conditions – apple, pear, plum, peach/nectarine.
- 2012. North M. Apple rest-breaking linked to dormancy model.
- 2013. Allderman L. Effect of fruit removal on entrance into bud dormancy in apples and plums.
- 2013. Allderman L. The progression of endo- and paradormancy in apple buds as affected by different climatic regions.
- 2015. Allderman L. Determining the chill requirement of important apple and pear rootstocks available to the South African fruit industry.
- 2015. Allderman L. The efficacy of rest-breaking chemicals on apples, pears, and plums as a function of cultivar, chill-unit accumulation, time of application, and temperature, under laboratory condition.
- 2016. Allderman L. Investigating the seasonal progression of bud dormancy as a function of temperature.
- 2016. Allderman L. Determining the chill requirement of important stone-fruit rootstocks available to the South African fruit industry.
- 2016. Kotze W. Establish the effect of rest-breaking agents on vegetative and reproductive development of apples in the Koue Bokkeveld and Witzenberg Valley.
- 2017. Louw E. Using the shoot assay to screen combinations and sequential application of existing and possible new rest-breaking agents in apples.
- 2018. Louw E. Determining the dormancy progression of commercial apple cultivars and clones available to the South African fruit industry.
- 2019. Siboza X. Evaluate rest-breaking programs for warm winter regions.
- 2020. Louw E. Physiological dynamics of dormancy in apple buds grown in areas with insufficient cold.
- 2020. Louw E. Investigating the effects of different autumn temperatures on endodormancy progression.

Current projects

- Louw E. Quantifying the impact of insufficient winter chill on apple fruit quality.
- Louw E and Allderman L Investigating the effect of different autumn/winter/spring scenarios on bud-break in apple trees.
- Louw E and Allderman L. Validation of the shoot assay as a proxy to determine progression of dormancy in intact apple trees.
- Louw E and Labuschagne I. Adaptability indexing of new pome (apple) and stone fruit (plum) genotypes in diverse South African growing areas.
- Louw E and Labuschagne I. Investigating the significance of temperature on bud-break by establishing a South African apple and plum phenophase-temperature database.
- Siboza X. Evaluation of alternative rest-breaking agents for apple trees.

Research on rest-breaking agents

Results of trials in apple trees

Dr Xolani Siboza of Hortgro has been leading a research project on rest-breaking agents in apple trees. Dian Craven is the master's student involved in this project, and he is co-supervised by Prof Karen Theron, Hortgro Chair in Applied Preharvest Deciduous Fruit Research at Stellenbosch University. The project is funded by Hortgro. By Anna Mouton

HORTGRO Growing Fruit IQ

Siboza is seconded to the Department of Horticultural Science at Stellenbosch University, where we caught up with him to hear about their preliminary results.

The cyanamide conundrum

"In South Africa, growers can't farm without hydrogen cyanamide," states Siboza. Cyanamide is the active ingredient in several products that are registered for promoting bud-break and foliation in deciduous fruit. These so-called rest-breaking agents help growers to overcome the effects of insufficient winter chill on their trees.

"Hydrogen cyanamide is a very successful rest-breaking agent," explains Siboza. "The problem that we're facing is that hydrogen cyanamide has been banned in many countries."

"If you miss the phenological window, it becomes dangerous to the tree to spray."

Cyanamide has lost approval for use as a plant growth regulator in the European Union and the United Kingdom. It is toxic to humans and other animals. But, interestingly, a cyanamide salt is used to treat alcoholism, as people who take it cannot consume alcohol without feeling seriously ill.

Cyanamide works by increasing oxidative stress, inhibiting certain enzymes, and reducing respiration in the plant. Oxidative stress occurs when reactive oxygen molecules overwhelm the antioxidant capacity of tissues, leading to cell damage. Cyanamide can have phytotoxic effects when more is applied than is called for in a specific season.

Oils, especially mineral oils, are also used as rest-breaking agents, often in combination with cyanamide. The oils reduce respiration by limiting gas exchange.

The aim of this project is to test potential alternative rest-breaking agents, including cytokinins, gibberellins, potassium nitrate, sodium nitrite, and mineral oil, in the hope that these agents can either reduce the concentration of cyanamide required, or replace it altogether.

Some of the products tested were identified as potential rest-breaking agents by Dr Esmé Louw of the Department of Horticultural Science at Stellenbosch University during an earlier laboratory-based study. Louw and her team assessed bud-break on excised shoots under controlled temperatures.

Testing the alternatives

Trials have been conducted in a commercial Fuji orchard, in Vyeboom, and a commercial Rosy Glow orchard, in Elgin, over more than one season. Both areas experience insufficient winter chill for apple trees to complete a normal dormancy cycle.

Table 1 summarises the rest-breaking treatments that were assessed in 2017 and 2019. Not all treatments were applied in all seasons. The researchers tested each treatment on several trees. On each tree, they tagged branches that had both one- and two-year-old shoots, and counted the dormant buds on those branches.

Siboza describes some of the challenges they faced when applying the treatments: "We need at least three days of no rain after spraying. But the buds don't say, there's rain, I'm not going to sprout, because they need to spray me now. If you miss the phenological window, it becomes dangerous to the tree to spray."

After spraying the rest-breaking treatments, the researchers monitored the trees weekly, and recorded bud-break of reproductive and vegetative buds separately. At the end of the season, they also collected fruit yield and maturity data. Lastly, they gathered data on the return bloom in the following spring.

Table 1: Rest-breaking treatments tested in 2017 and 2019

Cultivar	Season	Rest-breaking treatments
Fuji	2017 + 2019	3% cyanamide[1]
	2019	3% mineral oil[2]
	2017 + 2019	0.5% cyanamide[1] + 3% mineral oil[2]
	2017	0.5% cyanamide[1] + 3% mineral oil[2] + 2% urea + 2% potassium nitrate
	2017 + 2019	0.5% cyanamide[1] + 3% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]
	2019	3% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]
	2017	10% potassium nitrate + 3% mineral oil[2]
	2019	3% potassium nitrate + 3% mineral oil[2]
	2017 + 2019	3.4% sodium nitrite + 3% mineral oil[2]
Rosy Glow	2019	1% cyanamide[1]
	2017 + 2019	1% cyanamide[1] + 4% mineral oil[2]
	2017 + 2019	4% mineral oil[2]
	2017	0.5% cyanamide[1] + 1.5% mineral oil[2] + 1% potassium nitrate
	2017 + 2019	1% cyanamide[1] + 4% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]
	2019	4% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]
	2017	10% potassium nitrate + 4% mineral oi[2]
	2019	3% potassium nitrate + 4% mineral oil[2]
	2017 + 2019	3.4% sodium nitrite + 4% mineral oil[2]

Products used: [1]Dormex [2]Budbreak [3]Promalin

Treatment performance in two seasons

In 2017, total bud-break in Fuji was similar for all treatments, except 3% cyanamide, which induced less bud-break, both initially and after three weeks. The results showed that 0.5% cyanamide in combination with other rest-breaking agents gave better results than 3% cyanamide on its own, and that treatments without cyanamide were equally effective.

The poor total bud-break with the 3%-cyanamide treatment was due to reduced reproductive bud-break. Vegetative bud-break percentage was similar for all treatments. Cyanamide had a phytotoxic effect on reproductive buds, according to Siboza. He explains that over-application of cyanamide may reduce yields if reproductive buds are damaged, but with more return bloom the following season.

Yields were reduced and fruit size was increased in the 3%-cyanamide treatment relative to the other treatments.

In 2017, total bud-break in Rosy Glow was similar across treatments – there was no high-concentration cyanamide treatment in 2017. Fruit size was also similar for the various treatments, except for the 1% cyanamide + 4% mineral oil treatment, which showed significantly larger fruit, but not an increased total yield.

In 2019, total bud-break in Fuji was similar across treatments, with no significant differences in final bud-break percentages, or in fruit yield or quality. There were also no significant differences in final bud-break percentages and fruit yield for Rosy Glow.

Testing the timing

In 2019, the effect of treatment application at different intervals — five, six, and seven weeks before full-bloom — was also evaluated. The treatments are listed in table 2.

The experiments were done on Fuji. "We saw that with 3% hydrogen cyanamide, it doesn't matter whether you apply it five, six, or seven weeks before full bloom, you break the dormancy effectively," says Siboza. However, this treatment had the lowest final reproductive bud-break percentage.

For the other treatments, application at seven weeks before full-bloom stimulated significantly less total bud-break than later applications, except for 0.5% cyanamide + 3% mineral oil + 100 mg/ℓ [6-benzyladenine + gibberellins], which had the same effect whether applied at seven or at six weeks prior to full-bloom.

Total percentage bud-break also increased when applications were done five weeks before full-bloom, compared to six weeks before full bloom, for treatments with 0.5% cyanamide + 3% mineral oil, and 0.5% cyanamide + 3% mineral oil + 150 mg/ℓ [6-benzyladenine + gibberellins].

Table 2: Rest-breaking treatments tested at five, six and seven weeks before full-bloom

Cultivar	Season	Rest-breaking treatments
Fuji	2019	3% cyanamide[1]
		0.5% cyanamide[1] + 3% mineral oil[2]
		0.5% cyanamide[1] + 3% mineral oil[2] + 50 mg/ℓ [6-benzyladenine + gibberellins][3]
		0.5% cyanamide[1] + 3% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]
		0.5% cyanamide[1] + 3% mineral oil[2] + 150 mg/ℓ [6-benzyladenine + gibberellins][3]
		3% mineral oil[2] + 100 mg/ℓ [6-benzyladenine + gibberellins][3]

Products used: [1]Dormex [2]Budbreak [3]Promalin

Conditions immediately after application can also have a significant effect on bud-break performance.

In general, the researchers conclude that the application of rest-breaking agents five weeks before full-bloom resulted in more reproductive bud-break than applications six or seven weeks before full-bloom. However, more research is needed to confirm these findings.

Conditions immediately after application can also have a significant effect on bud-break performance. If cold and wet weather is forecast for the most optimal timing of rest-breaking treatment, it might be better to treat trees earlier. Treatment with strong products closer to bud-break could cause phytotoxicity.

So far, it appears that 0.5% cyanamide + 3% mineral oil + 100 mg/ℓ [6-benzyladenine + gibberellins] is the most consistent alternative to 3% cyanamide for Fuji. The better option for Rosy Glow seems to be 1% cyanamide + 4% mineral oil + 100 mg/ℓ [6-benzyladenine + gibberellins]. But more data is required to establish whether adding 6-benzyladenine and gibberellins confers a real benefit over using only a combination of cyanamide and oil.

"It would be good to use treatments without hydrogen cyanamide," concludes Siboza, "but we can at least reduce the concentration of hydrogen cyanamide." Fruit growers are encouraged to consult a technical adviser each year when deciding on their rest-breaking programme for the upcoming season.

Young Farmer of the Year uses Farm Costing Solutions to manage labour expenses

Alexander Gibson of Doornkraal Agri – an apple and pear grower in the Witzenberg Valley – was named Agri Western Cape and Santam Agriculture's Young Farmer of the Year in May. The judges commended Gibson's strong focus on technology and innovation over the past decade. From pallet-tracking and carton-scanning software to a sophisticated irrigation control system, Gibson has introduced several cutting-edge technologies to enhance the efficiency of the business.

When it comes to managing its workforce, Doornkraal has implemented the Farm Costing Solutions (FCS) system to electronically capture and manage labour costs. Doornkraal depends on FCS to monitor time and attendance together with piecework. When workers arrive in the morning, they swipe a radio-frequency identification (RFID) tag against an FCS reader device that records the exact time. When they leave in the afternoon, the tag is swiped again. All this information is sent to a central database that can be accessed at any time.

For piecework – such as pruning and harvesting – Doornkraal groups its workers into small teams. FCS is used to track each team's output and wages are calculated based on the productivity of the team, as opposed to individual performance. In the morning, workers clock in at the orchard and are assigned to a team by swiping their tags against an FCS portable reader. Managers select the allocated block number activity and choose the relevant fruit variety directly on the FCS reader. Throughout the day the FCS system keeps track of the number of bins filled and splits the wages accordingly among all team members. The filled bins are then dispatched to Doornkraal's modern packing facility.

At the packhouse, employee time and attendance is still managed manually because the facility needs to adhere to BRC standards, which doesn't allow workers to carry loose items such as FCS tags, as they do elsewhere on the farm. The manual roll call system takes 15 minutes each morning – time that could be spent on productive activities. Working with the FCS team to streamline this system, Doornkraal is about to introduce fingerprint-readers at the packhouse turnstiles to track entry and exit from the facility.

Lourens van der Merwe, FCS Technical Manager, recalls the day Gibson visited the company to discuss his pending expansion and related requirements.

Gibson confirms that he has looked at numerous systems over the past decade and believes FCS is ahead of its competitors in terms of managing labour-related costs, particularly piecework. He also describes FCS's after-sales service and support as "quick and efficient".

Doornkraal Agri
Think different. Think Perfection.

Farm COSTING SOLUTIONS

For more information about how your business can benefit from FCS, contact Marilyn at: 072 896 6801 or marilyn@tms.za.net
You may also visit www.farmcostingsolutions.com

Extension briefs for

August and September 2021

By J.J. Bester, Mathys Pretorius, Wayne Mommsen and Catherine Savage (Citrus Research International)

Integrated pest management

Citrus thrips (T.G. Grout)

Suppressing citrus thrips populations on the spring growth flush will assist in lowering populations experienced at petal fall. On younger trees a methamidophos or acephate (Spectra Stem) stem treatment is a useful option for this. An alternative may be an organophosphate that cannot be sprayed after petal fall, but sprays should be completed before flowers open to reduce any impact on honey bees. If mealybug requires control, the organophosphate could be sprayed at full cover. These treatments will also reduce developing populations of citrus psylla. Avoid using abamectin at this time because it will be needed for citrus thrips control in summer, and only three applications are permitted per season.

Mealybug (S.D. Moore and T.G. Grout)

Once again, mealybug infestation levels appeared to be high in several regions of the country last season. This could have been exacerbated by high thrips pressure, leading to disruptive applications of thripicides well into the season, and by the disappearance of buprofezin as a corrective treatment for mealybug. As preventative treatment of mealybug is almost twice as effective as corrective treatment, when in doubt, it is strongly advised that a preventative treatment for mealybug is applied. This can be done pre-blossom or closer to petal drop, using an organophosphate, as described for thrips or using buprofezin, or one of the newer options, such as Closer, Tivoli or Lesson if just for mealybug. If mealybug was problematic in the last season, two early sprays 4 - 6 weeks apart should be considered. Treatments must be applied as high volume, full cover film sprays, which can only be achieved if trees have been pruned and the spray machine is properly calibrated. Where a parasitoid augmentation programme is being followed for mealybug, the earlier in the season releases are initiated, the more effective they are. This might be a problem where early thripicides are detrimental to the parasitoids. Good ant control will be required where parasitoids are being released, to prevent disruption of the natural enemies.

False codling moth (S.D. Moore)

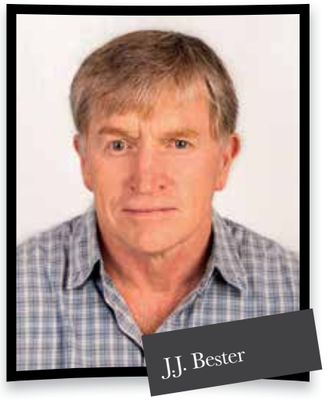
It may be very tempting to neglect orchard sanitation in winter, as false codling moth (FCM) levels are usually low and Valencias being harvested at this time, are generally less susceptible to FCM than some of the earlier season cultivars. However, this would be a big mistake. It has been shown that Valencias can fulfil an overbridging role for FCM from one season to the next. The most effective way in which to ensure the lowest FCM inoculum possible at the start of a season, is to diligently continue sanitising orchards until the previous season is truly over. Most importantly, growers must ensure that no fruit whatsoever, remains on trees or on the orchard floor after harvesting is completed. In the warm northern areas of the country, FCM activity starts a lot earlier than in the Cape regions. Consequently, it may be beneficial to initiate mating disruption earlier in the season than usual. Check with your agrochemical supplier if the product registration permits you to do so.

Bollworm (S.D. Moore)

Depending on the region of the country, which influences temperature and blossom phenology, bollworm may begin invading orchards as early as September, or even in August. Growers should therefore begin weekly blossom inspections for bollworm eggs and larvae no later than early September. Particularly if a biological product such as DiPel, Helicovir or Bolldex is going to be used, sprays should be applied as soon as eggs begin to hatch. This can only be determined through vigilant and regular scouting. Honeybee populations will benefit if sprays need to be applied during bloom because these products are harmless to bees.

Citrus flower moth (S.D. Moore)

Moths of the citrus flower moth (also known as the lemon borer moth), *Prays citri*, are attracted to lemon blossoms. Growers should inspect these blossoms in spring to determine if they are infested with larvae or pupae. These can be identified by their colouration, which is usually greenish, as well as by the association of webbing with pupation. Even if the damage to, and loss of blossom is not considered sufficiently severe to justify control measures, no intervention may allow the development of a second generation. It is the moths of this second generation that lay their eggs on the lemon fruitlets. Hatching larvae can potentially cause severe damage. It is therefore essential to control the first generation if one wants to prevent damage to the fruit. An experimental threshold for intervention based on pheromone delta trap catches has been set at 150 moths per trap per week. However, there is no trapping system registered yet. This equates to an infestation level of 5% blossom clusters with larvae and pupae, which will lead to approximately 5% fruit damage. No plant protection products are registered for use against the lemon borer moth. However, there are a number of pesticides that are registered for other pests on citrus that are effective, including Bt (DiPel) and mevinphos.



Crop and fruit quality management (P. Cronjé)

General: It is important to keep managing and monitoring fruit pickers throughout the harvest season in order to reduce cull of export fruit, caused by picking injuries. Pruning of early-and mid-season cultivars should commence as quickly as possible after harvest, to allow ample time for flower induction.

Maturity indexing: Maturity indexing is done to predict the rate of change in fruit maturity, in order to harvest fruit at a maturity that would maintain optimal commercial shelf life. The aim is to define changes or rate of change in acids and sugars and to build up a database over a number of years for comparisons. Random sampling of fruit every week from each of 10 representative trees should start 4 - 6 weeks before the expected harvest date. Titratable acidity is determined by titration with sodium hydroxide. Sugar content (Brix) is determined using a refractometer and the sugar to acid ratio calculated. Fruit colour should be read from a colour chart. The aforementioned data should be plotted on a graph in order to determine the optimal picking window. Growers should adhere to the time and temperature protocols for each citrus type to ensure optimal shelf life of the fruit (Cutting Edge No. 99). It is important to maintain good records of the maturity indicators over a number of years, in order to identify and possibly manipulate possible problems associated with internal and external quality parameters.

Degreening and postharvest rind disorders: The two publications *Common Defects Associated with Degreening of Citrus* by Andy Krajewski and Tim Pittaway, and *Postharvest Rind Disorders of Citrus Fruit* by Paul J.R. Cronjé are a must-read for any grower. Both are available from CRI. Contact Bella Thulare at 013 759 8000 or bella@cri.co.za.

Pruning: Pruning of early and late cultivars should be done as soon as possible after harvest. All of the following should be removed during pruning: old, broken and dead shoots/twigs; weak and entangled shoots crossing each other; and rootstock regrowth (water shoots). Removal of all dead wood is important to reduce fruit blemishes and to reduce the inoculum of latent pathogens, which cause postharvest decay. A light intensity level of at least

30% of full sunlight is necessary for optimal photosynthesis and sufficient light intensity levels also improve fruit colour development. In dense and old trees, light intensity inside the tree canopy can drop to below 30% and adversely affect fruit set and size. At least one "window" cut should be made to allow for adequate light distribution to improve bearing wood within the tree canopy. An increase in photosynthesis and light distribution will promote increased fruit size and internal fruit quality, better fruit colour, increased rind condition and less variation in fruit quality within the canopy. Pruning should be used as a thinning technique by pruning more heavily after a light crop (if a heavy crop is expected in the subsequent season) and if the orchard has a history of alternate bearing. A follow-up of regrowth management in the summer is critically important to maintain light management throughout the season. Proper pruning also improves spray penetration, leading to effective control of target pests and diseases. This is especially important for the effective control of phytosanitary pests and diseases. Pruning tools should always be sanitised on a regular basis with a 10% Jik solution, to prevent spreading of viral diseases, and should be done at least after each row, and when moving from one orchard to another.

One or two pre-bloom foliar urea applications (low biuret urea at 1%) should be applied for uniform flowering and fruit set, especially when leaf N levels are low and a light blossom is expected. If leaf N levels are sufficient, consider replacing the foliar urea application with a 1.5% KNO_3 application, only if leaf K levels are below optimum.

Fruit set: Treatments according to cultivar requirements need to be applied. A general guideline cannot be given as fruit set treatments differ by cultivar and, in many cases by orchards, depending on the previous crop load. Specific treatments include the application of gibberellic acid (GA3) and trunk or branch girdling, especially for weakly parthenocarpic cultivars that have a poor set. Girdling during full bloom improves set, as the removal of bark temporarily restricts carbohydrate allocation to roots and allow for utilisation by flowers. Be careful not to girdle too deep into the trunk, or to remove a strip of bark. Moisture stress should be avoided at all costs during full bloom, fruit set and early fruit growth, as these periods are characterised by the cell division stage of fruit development, during which water supply is of critical importance.

Geïntegreerde bemesting (P. Raath)

Stikstofbemesting van sitrus

Aan die einde van die groei-seisoen

1. Blaar en grondmonsters moes aan die einde van die groei-seisoen geneem gewees het (Februarie tot Mei).
2. Resultate van die blaar- en grondontledings tesame met boordinligting (ouderdom van bome, onderstam, kultivar, verwagte opbrengs, ens.) word gebruik vir bemestingsaanbevelings.

Waar mikro-spuite of enige ander stelsel behalwe druppers gebruik word:

1. Begin met stikstoftoedienings in Julie met die uitsondering van die Wes-Kaap en Hartswater wat in Augustus begin.
2. Afhangende van die klei-inhoud van die grond word die stikstof tussen 1 - 4 toedienings verdeel.

Waar druppers gebruik word.

1. Begin met die stikstoftoedienings in Julie met die uitsondering van die Wes-Kaap en Hartswater wat in Augustus begin.
2. Verdeel die volumes wat per maand aanbeveel is in ten minste weeklikse toedienings.
3. Stikstoftoediening geskied volgens die fenologiese stadium van die boord. Gebruik gerus die breë riglyn hieronder.

Periode	Fenologie	N (% van totale toediening)
Jul	Seldifferensiasie en seldeling	25
Aug	Knopbreek, blom en vrugset	25
Sept	Vrugset en selgroei	25
Okt	Vruggroei	15
Nov/ Des	Vruggroei	10

Blaarbespuitings:

1. Dien ureum toe as ń blaarbespuiting in Julie om vrugset te bevorder, of na Oktober vir stikstof-aanvulling.
2. Die kritiese vereistes vir suksesvolle blaarvoeding is die kontaktyd waartydens die blare nat bly, druppelgrootte en die konsentrasie van die voedingselement in die spuit-oplossing.

Om die loging van stikstof te beperk kan die volgende gedoen word:

1. Dien stikstof in die middel van, of aan die einde van die besproeiingssiklus toe.
2. Voorkom ń oormaat van stikstof in die grondoplossing. Stikstofkonsentrasies wat hoër is as 150 - 200 mg/ℓ het geen addisionele voordeel nie. ń Oormaat stikstof lei tot moontlike loging van die stikstof en moontlike probleme met vrugkwaliteit.
3. Stikstoftoediening moet verkieslik aan die einde van die groeiseisoen gestaak word, sodat die stikstofinhoud in die grond gedurende die wintermaande kan afneem.
4. Die regte hoeveelheid water moet toegedien word tydens besproeiing. Dit is onvermydelik dat ń sekere hoeveelheid stikstof geloog word tydens besproeiing, maar oorbesproeiings versnel die proses en ń groot hoeveelheid stikstof kan verby die wortelsone geloog word. Reënval moet ook in ag geneem word tydens besproeiingskedulering.

Nitrogen fertilisation of citrus

At the end of the growing season:

1. Leaf and soil samples should have been taken between February and May.
2. Results from the soil and leaf analyses with additional information such as tree age, tree vigour, expected yield rootstock, etc. are used to compile a fertiliser programme.

When micro-jets or any other system, except drippers, are used:

1. Start with nitrogen fertilisation in July with the exception of the Western Cape and Hartswater, which should start in August.
2. Split the nitrogen application in one to four portions, depending on the clay content of the soil.

When drip irrigation is used:

1. Start with nitrogen fertilisation in July with the exception of the Western Cape and Hartswater, which should start in August.
2. Split the volumes recommended per month into at least weekly applications. Ensure that the water and fertilisers do not penetrate deeper than the upper root zone (30 - 40 cm).

Period	Phenology	N (% of total application)
Jul	Cell differentiation and start of cell division	25
Aug	Bud break, flowering and fruit set	25
Sept	Fruit set and cell growth	25
Oct	Fruit growth	15
Nov/ Dec	Fruit growth	10

Foliar spray of nitrogen:

1. Spray the urea in July to improve fruit set, and after October to supplement nitrogen.
2. The critical requirements for successful foliar sprays are contact time, droplet size and concentration of the nutrient element in the spray solution.

Four measures can be used to prevent or minimise the downward movement of nitrate:

1. Inject nitrate in the middle of, or late, in an irrigation event.
2. Avoid excessive concentrations of nitrate in the soil solution. Nitrate concentrations greater than 150 - 200 mg/ℓ don't provide any additional benefit, and supplying more N fertiliser simply increases the risk of leaching by successive irrigation or rainfall events. Oversupplying N can also lead to fruit quality issues.
3. Complete the N supply programme by the end of the growing season to allow depletion of nitrate in the soil by winter.
4. Ensure that only the right amount of water is applied. Some movement of nitrate may be inevitable with each irrigation cycle, but overwatering is likely to speed up that process and move nitrate beyond the root zone. Allowing for expected rainfall when calculating the depth of water to apply will also help reduce the likelihood of leaching.

Grondgedraagde siektes (M.C. Pretorius en J. van Niekerk)

Aalwurms

Grond- en wortelmonsters kan in die lente getrek word en na die Diagnostiese Sentrum in Nelspruit gestuur word vir ontleding, sodat die aalwurmpopulasie in die wortels bepaal kan word. Die resultaat sal dien as ń bestuurshulpmiddel om ń kostedoeltreffende aalwurmbeheerstrategie daar te stel.

Die gebruik van chemiese aalwurmdoders vir die beheer van die sitrusaalwurm word nie aanbeveel voor ten minste 30 mm reën geval het nie. Elke aalwurmdodertoediening behoort met ń behoorlike besproeiing opgevolg te word om te verseker dat die middels deeglik deur die grondprofiel gewas word. Toedienings behoort slegs volgens etiketaanbevelings toegedien te word. Afwykings van die geregistreerde dosisse om kostes te bespaar, lei tot oneffektiwiteit. Dit is belangrik om 'n program te volg van twee of drie toedienings met twee maande intervalle, behalwe vir Velum. Volg etiket inligting van die betrokke produk; afwyking van hierdie aanwysings kan lei tot oneffektiewe beheer.

Phytophthora

Phytophthora-wortelvrot – die gebruik van fosfonaatprodukte is 'n uiters effektiewe

en bekostigbare beheermaatreël wat suksesvol deur produsente gebruik word. Dit is van uiterste belang dat die etiket deeglik bestudeer word asook die waarskuwings voordat die produk gebruik word om effektiwiteit te verseker en fitotoksisiteit te voorkom. Om effektiewe werking van die fosfonate te verseker behoort opvolgtoedienings, ten miste twee, maar verkieslik drie toedienings, twee maande uit mekaar toegedien word. Indien kraagvrotletsels voorkom kan 'n stamverf of blaarbespuiting aangewend word (drie aanwendings per seisoen met agt weke intervalle). Vir wortelvrotbeheer word drie blaarbespuitings (met agt weke intervalle) aanbeveel. Die eerste bespuiting behoort direk na blomblaarval gedoen te word – nie tydens blom nie aangesien dit die moontlikheid van blom-blaarval kan verhoog. Dit word sterk aanbeveel om nuwe aanplantings en nie-draende bome op 'n fosfonaat-program van drie aanwendings per jaar, twee maande uitmekaar, te hou om gesonde wortel-ontwikkeling te verseker. Produsente word gemaan om seker te maak dat bome nie oorbesproei word nie.

Fruit and foliar diseases (P. Moyo)

Alternaria core rot

Alternaria core rot (also known as navel-end rot or black rot) is caused by the fungus *Alternaria alternata*, and occurs in all areas of southern Africa. The disease is most prevalent on citrus cultivars, such as navels and Clementines, which are characterised by the presence of a secondary fruitlet called the navel. The navel develops at the stylar end of the fruit and varies in size.

The formation of the navel-end opening and its size is influenced by climatic conditions during fruit set. Under cool weather conditions, the secondary fruit style successfully fuses with the style of the primary fruit such that both the secondary and primary style abscise, during petal, resulting in a closed navel-end. However, under extreme weather conditions (e.g. warm, dry and windy conditions), the primary fruit style abscises prior to fusion with the secondary fruit style resulting in the formation of a cavity between the primary and the secondary fruit. Such cavities provide entry points for fungi, such as *A. alternata*, to penetrate and form infections which remain quiescent until favourable conditions stimulate further growth of the fungus. Alternaria core rot is linked to fruits with large or malformed navel ends.

Score (50 ml/100ℓ water) and Folicur (80 ml/100ℓ water) are registered for control of the disease.

Botrytis on lemons

The role played by *Botrytis* and the damage that it can do to lemon fruit drop and the formation of ridging of the rind is still not clear. Damage can be caused during blossom on lemon petals when prolonged wetting and cool weather occur simultaneously. Producers in the Eastern Cape enlisted on the Adcon system can make use of their early warning forecasts for *Botrytis*. Benomyl is the most effective fungicide to control this fungus and should be sprayed at the balloon stage during blossom which can also form part of the black spot control programme.

Postharvest pathology – waste prevention (W. du Plooy, L. Mamba and C. Savage)

By this time of the citrus season, all processes are in full motion. The strain of the season may be taking its toll on management and this may lead to poor management of critical control points. Below are a few suggested critical control points that should be well-managed.

Critical control points for improved postharvest disease management

- Monitor the incidence of insect activity in the orchards and institute appropriate measures to reduce their populations, especially fruit fly and false codling moth numbers that could increase with hotter weather
- Monitor orchard sanitation:
  - Advise the orchard managers and producers if sanitation is being improperly managed or neglected, as this can also fulfil an overbridging role for FCM from one season to the next, it is important to follow the FMS correctly
  - Removal of rotten and fallen fruit is crucial to keep sporeloads down and reduce the risk of postharvest decay
- Monitor injuries to fruit during picking, handling and transport to the packhouse. Advise orchard managers and/or producers accordingly
- Keep the time from harvest to the first fungicide treatment to a minimum, it is strongly recommended to treat at least within 24 hours after picking
- Ensure that all fungicide applications are replaced frequently as per protocol and kept clean
- Keep the fruit dumping site where fruit will enter the packhouse as clean as possible
- Ensure proper removal of any rotten fruit before sanitising and treatment of the fruit
- Have a sanitation action between fruit sorting and the first fungicide application
- Ensure that fruit are dry before entering the fungicide treatment
- Manage the concentration of imazalil in the fungicide treatment by doing regular titrations
- Do not wax wet fruit – this could result in a severe risk to fruit quality
- Apply the correct amount of wax onto the fruit (i.e. 1.0 - 1.5ℓ per ton of fruit) and ensure even spread of the wax over the whole fruit
- Reduce the time from harvest to cold chain storage
- Packhouse sanitation should be a continuous process and not just a once a day or week activity
- Store fruit destined for the juicing factory as far away from the packhouse as possible and

have them removed as soon as possible.

Below is a quick checklist for the critical measurements for the chemical applications:

Checklist for chemical application

- Chlorine application
  - Solution pH: 6.5 - 7.5
  - Chlorine concentration: 75 - 100 ppm (free active chlorine)
  - ORP: 800 mV
- Fungicide dip tank
  - Imazalil concentration: 500 ppm
  - Solution pH: not higher than six
  - Exposure time: 1 - 3 minutes in a solution at pH3 or not longer than 45 seconds in a solution at pH6
  - Maintain the concentration by following the advised imazalil top-up protocol or according to regular titrations.
- Wax application
  - Fruit should be dry when they reach the wax applicator
  - Wax load should be between 1.0 and 1.5ℓ per ton fruit depending on manufacturers' recommendations
    - Over-application can lead to MRL exceedance
    - Under-application will lead to poor fruit quality and poor disease control
  - The wax solution should be agitated continuously (24 hours a day, 7 days a week)
    - Thiabendazole tends to precipitate to the bottom of the wax drum and cannot be fully re-suspended
  - Drying tunnels after the wax applicator should not be overheated
    - Obtain the optimal temperature for the specific wax from the wax manufacturer
    - The correct drying of the wax is crucial to ensure that the desired effect is gained.

Spinning a new story in citrus

A first record of two spider species

Spiders fulfil a critical function in a variety of ecosystems. By **Tamryn Marsberg**, **Mellissa Peyper** and **Sean Moore**, Citrus Research International, Gqeberha (formerly Port Elizabeth)

The majority of spider species are known to be useful generalist predators of various invertebrates, particularly insects (Dippenaar-Schoeman 1998; Haddad et al., 2003). Until the late 1990s, 21 families of spider were recognised In South African citrus orchards, including 72 genera and 82 species (Dippenaar-Schoeman 1998), most of which were collected from Burgershall in Mpumalanga Province (Van den Berg et al., 1992). A more extensive survey was subsequently conducted over two years in four different citrus growing areas, revealing up to 219 probable species of spider in 33 different families (Stephen et al., 2000).

Recently, Citrus Research international (CRI) conducted a two-year survey of citrus pests under nets in the Sundays River Valley, finding a significantly higher occurrence of spiders under nets than in open orchards, with the spiders mainly situated amongst the fruit. Specimens were collected and morphologically identified by arachnid specialist Prof Charles Haddad (University of the Free State). Two species were identified, namely *Badumna longinqua* (Araneae: Desidae), also known as the grey house spider (Figure 1) and *Chresiona invalida* (Araneae: Amaurobiidae), also known as the African tangled nest spider (Figure 3).

The grey house spider is a medium-sized spider that originates from Australia and can now be found in many countries around the world. It was first recorded in SA in 2010 around the southern coastal areas of the

Figure 1

Figure 1: A female grey house spider, *Badumna longinqua*

According to a recent two-year CRI survey of citrus pests under nets in the Sundays River Valley, there was a significantly higher occurrence of spiders under nets than in open orchards.

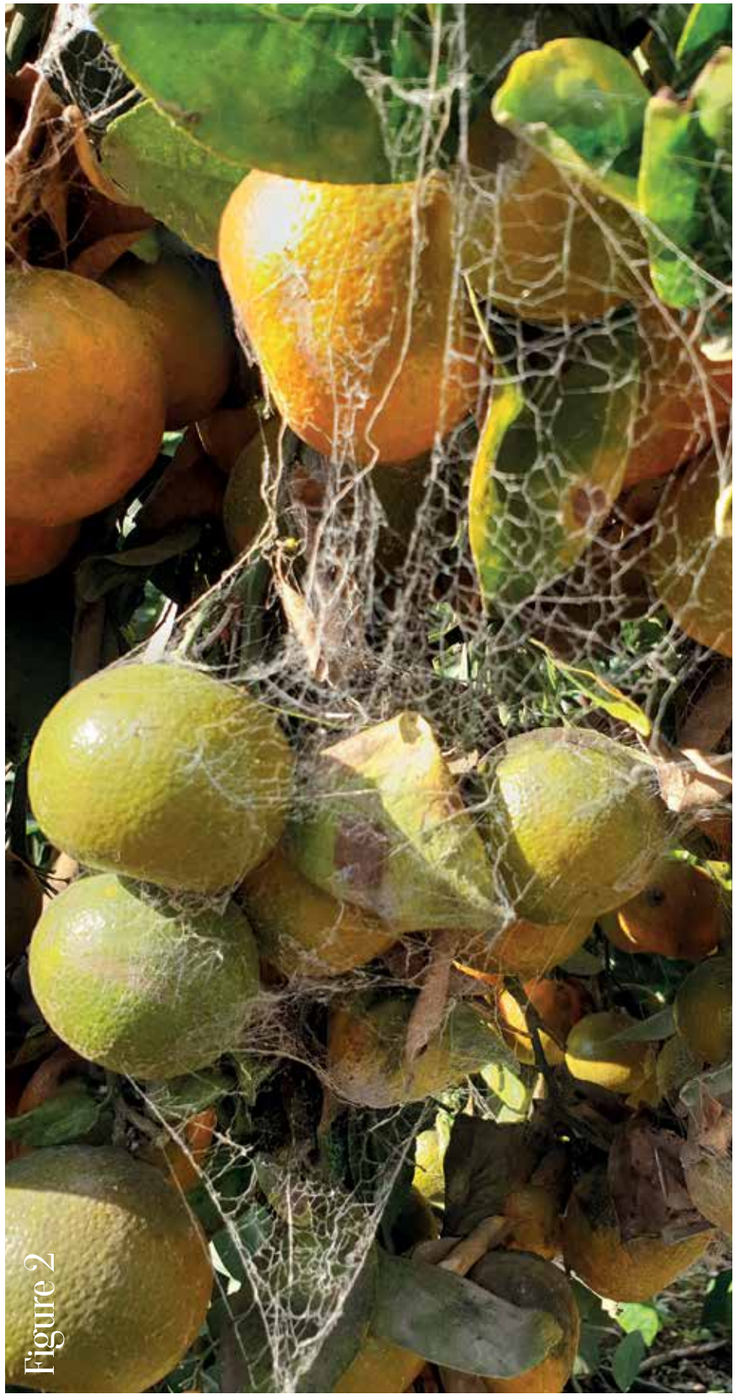


Figure 2

Figure 2: Web structure of the grey house spider around Nadorcott mandarins under nets in the Sundays River Valley

Eastern and Western Cape Provinces, as well as central Free State (Simó et al., 2015; Haddad and Vink 2016). It is a cribellate ("little sieve") spider that creates sheet webs with a tubular retreat (Figure 2) (Main 2001).The grey house spider is known to be synanthropic, which means that it lives in close association with people and benefits from their surroundings and activities. It is therefore commonly found in agro-ecosystems and urban areas (Simó et al., 2015). This is the first record of this species being associated with an agricultural crop in SA, being citrus.

The African tangled nest spider is endemic to SA and most commonly found in tree canopies of the more humid areas of SA (Haddad, personal communication). A common morphological characteristic for this spider is the dark bands on the legs (Dippenaar-Schoeman 2014). Very little is known about this group of spiders, other than that they are common ground dwellers, which are often captured in pit-fall traps. Although not the same species, the family has previously been reported on citrus in SA, albeit in very low abundance (Stephen et al., 2000).

This increase in spider presence within orchards may be good news for many growers, given that spiders have been recorded as useful predators of various citrus pests elsewhere in the world, such as citrus thrips, waxy scale, citrus red mite and citrus psylla (Dippenaar-Schoeman 1998; Stephen et al., 2000). During the CRI pest surveys, a lower level of thrips infestation and thrips damage were recorded in citrus orchards under nets, where there was a spider presence, than in open citrus orchards, where spiders were far less abundant. On the reverse side, mealybug clusters were occasionally found below the webbing

Figure 3

Figure 3: The African tangled nest spider, *Chresiona invalida*, found amongst mealybug on Navel oranges under nets in the Sundays River Valley

of the grey house spider and it is unclear whether the spiders were preying on the mealybug or obstructing parasitoid access to the mealybug.

Dippenaar-Schoeman et al., 2001 conducted a survey in macadamia orchards in the Mpumalanga Lowveld, finding a diverse range of 2778 spider species. This survey concluded that spiders form part of the natural enemy complex, as generalist predators that can keep pest populations suppressed (Dippenaar-Schoeman et al., 2001). This could also be the case for citrus if good spraying practices are followed, as explained by Dippenaar-Schoeman

Melissa Peyper

that spiders are "a farmer's best friend" (Coleman 2013). Stephen et al., 2000 reported 89% more spiders on citrus farms using minimal pesticides, as opposed to those with higher pesticide usage. Therefore, spiders could play an important role in pest suppression, but further research is required to establish their exact role and how best to conserve them.

References

- Coleman, A. 2013. The tiny terror that's a farmer's best friend. *Farmers Weekly*. (https://www.farmersweekly.co.za/agri-technology/farming-for-tomorrow/the-tiny-terror-thats-a-farmers-best-friend/)
- Dippenaar-Schoeman, A.S. 1998. Spiders as predators of citrus pests. In: Bedford, E.C.G. and Van den Berg, M.A. (eds). *Citrus pests in Southern Africa.* Agricultural Research Council, Nelspruit. pp: 34 – 35.
- Dippenaar-Schoeman, A.S., van den Berg, M.A., van den Berg, A.M. and van den Berg, A. 2001. Spiders in macadamia orchards in the Mpumalanga Lowveld of South Africa: species diversity and abundance (Arachnida: Araneae). *African Plant Protection*. 7(1): 39-46.
- Dippenaar-Schoeman, A.S. 2014. *Field Guide to South African spiders*. LAPA Publishers, Pretoria. 433 pp.
- Haddad, C. R. and Vink, C.J., 2016. First record and potential range of invasive *Badumna longinqua* in South Africa. In: Dippenaar-Schoeman, A., Lyle, R. and Haddad, C. *SANSA NEWS, Feedback on congress – 20th International Congress of Arachnology 2016*. 26: 1 -15.
- Main, B. Y. 2001. Historical ecology, responses to current ecological changes and conservation of Australian spiders. *Journal of Insect Conservation*. 5: 9 – 25.
- Simó, M., Laborda, A., Núnez, M. and Brescovit, A.D. 2015. First records of the invasive spider *Badumna longinqua* (L. Koch) (Desidae) in southern Brazil with notes on the habitats and the species dispersion. *Checklist, Biotaxa*. 11(1):1533-1536.
- Stephen, P.R., Grout, T.G. and Dippenaar-Schoeman, A. 2000. The abundance and distribution of spiders in the South African citrus ecosystem. *Citrus Research International, Annual Research Report*.
- Van den Berg, M.A., Dippenaar-Schoeman, A.S., Deacon, V.E. and Anderson, S.H. 1992. Interactions between citrus psylla, *Trioza erytreae*, (Hemiptera: Triozidae), and spiders in an unsprayed citrus orchard in the Transvaal Lowveld. Entomophaga 37: 599-608.


Paul Hardman

Adoption of IPM in citrus
Key drivers

Citrus Growers' Association of Southern Africa — Growers' lives mattering for you!

There has been an unmistakeable surge in emphasis on producing food that has less of an impact on the planet. By Paul Hardman

The shift towards more climate friendly food production is captured in policies like the EU farm-to-fork strategy, and packaged as justification for the requirements by some retailers. Therefore, it is prudent to "step back" and consider the underlying forces influencing growers' decisions on how they go about producing citrus for the export market.

What factors are influencing crop protection decision-makers?

The Citrus Growers Association of Southern Africa (CGA) and Citrus Research International (CRI) have been concerned about how following retailers' food production requirements has actually had a negative impact on sustainability, particularly when it comes to the proper implementation of integrated pest management (IPM). So how effective are these commercial requirements at producing the desired outcome for sustainable food production?

The practice of IPM seeks to use plant protection products in tandem with the natural environment, and to intervene only when the level of a pest goes beyond a specific point. The CGA and CRI have observed that growers are often compelled to adopt preventative pest control measures, irrespective of the level of the pest presence in the orchard. Such pre-programmed actions could completely undermine IPM and may be the cause of subsequent problems that require further interventions.

Furthermore, as the farm-to-fork (F2F) strategy is rolled out, the expectation is that some plant protection products will no longer be available due to their authorisation being withdrawn in the EU, or the maximum residue levels (MRLs) lowered. The F2F strategy includes trying to reduce the use of highly hazardous pesticides by 50% by 2030, and to increase organic production to 25% of agricultural production in the EU. How will this impact on future pest and disease management? How will the gaps be filled?

To answer these key questions and to understand the underlying reality faced by citrus producers, elements of the recent Citrus Sustainability Survey focused on IPM considerations. The survey was initiated at the Citrus Sustainability Forum (CSF) meeting held in February this year and was designed to gather information from key decision-makers across the supply chain.

Table 1: Factors responsible for why IPM is not adopted more widely (1 = minor importance and 10 = major importance)

	Mean	Median	Standard deviation
Phytosanitary requirements	7.58	8	2.31
Loss of key active substances helpful in IPM programmes	7.52	8	2.47
Retailer requirements	7.4	8	2.54
Lack of registrations for suitable non-chemical alternatives	7.23	8	2.3
Lack of effectiveness of non-chemical solutions	7.03	8	2.29
Higher input costs for IPM-friendly programmes	6.55	7	2.47
Practical/operational factors preventing IPM adoption	6.24	6	2.15
Lack of IPM knowledge	5.57	6	2.36
Other	4.08	4.5	2.71

Results of the CSF Citrus sustainability survey

The results from the survey provide some clear insights into the factors driving IPM adoption: 80% of the respondents indicated that the adoption of IPM principles had increased over the last decade. Of course, this is a positive development, but it does not quite resonate with the experience by CRI researchers who indicated that IPM was at its peak in the 1990s. Table 1 looks at the reasons why IPM is not adopted more widely – where a score of 1 rates the factor having minor importance and 10 having major importance.

Phytosanitary requirements top the list, indicating the imperative for growers to be compliant with the plant health regulations set by importing countries. The citrus black spot (CBS) rules in the EU are a typical example, where instances of non-compliance can result in access to the market being withdrawn for the production unit. This has significantly adverse financial and operational implications for the business – a scenario that has to be avoided. There are also potential punitive implications for the country as a whole.

Secondly, respondents believe that the loss of IPM compatible active substances has hamstrung their ability to follow IPM principles. The concern is that this pattern of losing key active substances may continue with products like Imidacloprid, currently under review in the EU. Finding alternatives that provide a high level of control and that work with the biological realities in the orchard is challenging and clearly obstructs following IPM approaches.

Thirdly, 76% of the respondents felt that retailer requirements were an important reason why IPM was not adopted (i.e. those giving this factor a score of 7 or more out of 10). There are a few possible explanations for this high scoring, including:

Table 2: Stakeholder scores on how problematic each retailer's requirements are on IPM adoption (1 = minor and 10 = major)

Retailer	Mean	Median	Standard deviation	Variance
Lild	8.75	9	1.39	1.93
Rewe	8.57	8	1.13	1.29
Kaufland	8.50	9	1.76	3.10
Tesco	8.33	9	2.25	5.07
Aldi Nord	8.25	9	2.36	5.58
Waitrose	8.17	9	2.64	6.97
Edeka	8.14	8	1.35	1.81
Aldi Sud	8.00	9	2.16	4.67
Tegut	8.00	8	1.41	2.00
Aldi Market	7.89	8	1.90	3.61
Sainsbury (js)	7.83	9	2.14	4.57
M&S	7.67	8	2.58	6.67
Morrisons	7.67	9	3.01	9.07
Dohle	7.50	8	0.71	0.50
Delhaize	7.00	6	3.00	9.00
Tengelmann	7.00	7	0.00	0.00
Coop	6.80	7	1.79	3.20
Globus	6.67	6	1.15	1.33
Norma	6.50	7	2.12	4.50
Ahold/Elbert Heijn	6.22	6	2.33	5.44
Bama	6.00	5	2.92	8.50
Metro	5.80	6	1.48	2.20
Netto	5.67	5	1.15	1.33
Asda	5.60	6	2.97	8.80
Loblaws	4.75	5	2.22	4.92

- Retailer requirements deviate from good agricultural practices (GAP) – therefore making available products less effective
- The timing of applications is compromised
- Managing pests and diseases is complex and requires an approach that takes into account all the pests and diseases, and requirements across a number of markets. Simply blacklisting a product is in conflict with the need to control the pest or disease
- The requirement is typically based on EU climatic conditions and range of pests and diseases, and does not align with the Southern African context.

Clearly, wherever the retailer requirements are not sensitive to the context in which citrus is produced, they are unlikely to promote sustainable production.

The remaining factors identified as reasons why IPM is not adopted more widely point to the lack of effective, available alternatives and the practicalities around adopting these alternatives. CRI have an ongoing programme to investigate and evaluate alternatives, especially in the postharvest arena. Unfortunately, despite all this investment, replacements for the current suite of plant protection products are difficult to come by.

The lack of IPM knowledge is also a concern, particularly given the number of potential changes in the crop protection programmes that may be required in the next few years. Together with the Citrus Academy, there appears to be scope for more technology transfer opportunities from CRI.

Table 3: Stakeholder scores on the difficulty of sustainability requirements per retailer (1 = no problem and 10 = very challenging)

Retailer	Mean	Median	Standard deviation	Variance
Rewe	8.00	7	1.41	2.00
Kaufland	8.00	9	2.55	6.50
Sainsbury (js)	7.83	8	1.94	3.77
Edeka	7.63	7	1.85	3.41
Waitrose	7.33	8	2.50	6.27
Eesco	7.14	8	2.73	7.48
Morrisons	6.71	7	2.56	6.57
Lild	6.71	7	2.93	8.57
M&S	6.67	7	3.01	9.07
Delhaize	6.67	7	2.34	5.47
Loblaws	6.60	8	3.21	10.30
Aldi Nord	6.60	6	1.52	2.30
Netto	6.33	7	1.15	1.33
Aldi Market	6.33	7	1.75	3.07
Dohle	6.25	7	0.96	0.92
Aldi Sud	6.20	6	1.92	3.70
Ahold/Elbert Heijn	6.14	7	2.91	8.48
Tengelmann	6.00	6	1.41	2.00
Bama	5.86	7	2.27	5.14
Asda	5.80	7	3.70	13.70
Coop	5.33	6	2.58	6.67
Norma	5.00	5	2.83	8.00
Tegut	4.50	5	3.54	12.50
Metro	4.50	5	2.65	7.00
Globus	4.50	5	2.52	6.33

The perceived impact of individual retailers

The data also shows which retailers have the largest perceived negative impact on IPM (see Table 2). Of the retailers that had a score of 8 or higher out of 10 (where 1 = minor and 10 = major), 80 % are based in Germany. This strongly indicates that the approach adopted in Germany has a profoundly negative impact on growers' IPM strategies. The complete results of the questionnaire will be reported at the next CSF scheduled for August this year.

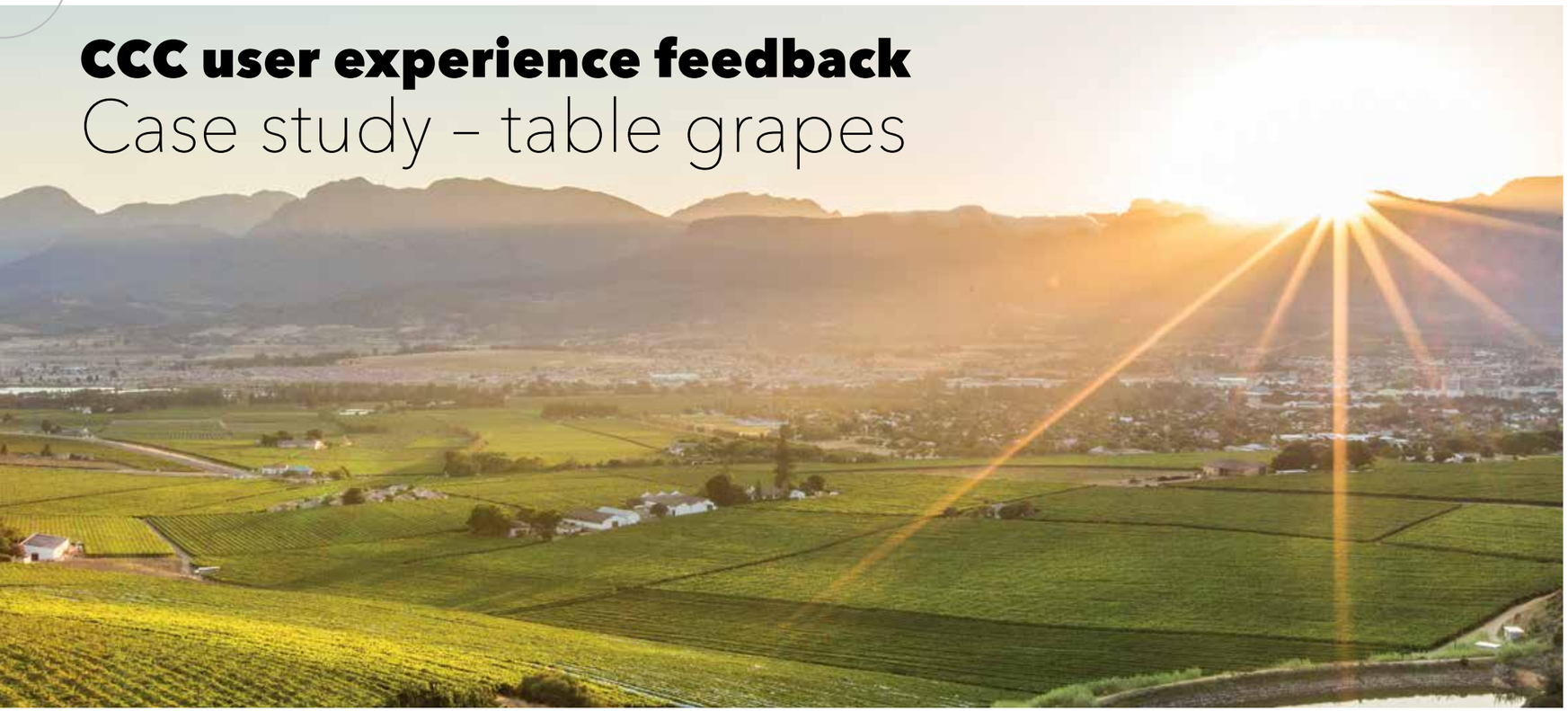
Furthermore, how retailers compare from a general sustainability perspective was also captured (see Table 3). On a scale of 1 (no problems) to 10 (very challenging) the retailers were scored in relation to general sustainability requirements (e.g. social and environmental audits, water, soil health). Of the retailers that scored 7 or more, three were from the UK and the balance from Germany, with two German retailers at the top of the list. This spread reflects the outlook adopted by UK retailers, and how their demands impact on sustainability, beyond just food safety requirements.

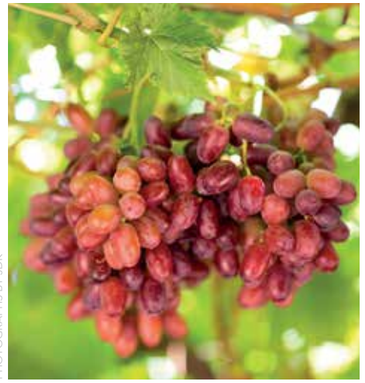
Conclusion

While growers and stakeholders believe adoption of IPM principles has increased in the last 10 years, data from the Citrus Sustainability Survey has provided evidence to uphold the view that the adoption of IPM principles on farms is largely being curtailed by external factors imposed on growers. Having to comply with phytosanitary requirements and the loss of key IPM-compatible active substances was rated as the most important factors, followed by the impact of retailer requirements. Drilling into the data shows that German retailer requirements are believed to be the most challenging for producers seeking to apply IPM, while UK and German retailers both score highly on their impact on general sustainability.

Looking ahead, there is scope to increase knowledge around IPM across all stakeholders, and this will become increasingly relevant as the crop protection landscape changes, as policies come into play that will limit options for growers. The relentless search for IPM compatible alternatives must continue.

CCC user experience feedback
Case study – table grapes





PHOTOGRAPHS BY JDK

Far left: View over a JDK farm
Left: Recycle bins on JDK farms
Below left: Table grapes produced at JDK
Below right: Organic compost heaps

JDK share their user experience feedback on the CCC carbon calculator.

The Confronting Climate Change Initiative is a carbon footprinting project, developed to support SA's wine and fruit sectors by identifying and responding to the risks and opportunities associated with carbon emissions.

The CCC asked JD Kirsten (Pty) Ltd (a.k.a. JDK), a table grape producer and one of their longstanding users to share some of their experiences with the online CCC carbon calculator.

About JDK

Family-owned South African based company, JDK specialises in the production and packing of premium quality table grapes. The Kirsten family, who own the enterprise, have been farming with table grapes in Paarl for over a 100 years after the family settled in this beautiful and historical town next to the Berg River in 1916. Currently the fourth generation is managing the business. They predominantly serve the export market, however, locally they supply to Woolworths and subscribe to Woolworths Farming for the Future.

JDK's history with CCC

Having measured their carbon footprint with the CCC carbon calculator annually since 2015, JDK will be conducting their seventh iteration this year. Back in 2014, JDK identified a need for someone to project lead sustainability and compliance within the business. In 2015, Lara Kirsten joined the business after several years in corporate retail. One of her first tasks was to look at JDK's carbon footprint, as this was something that their supplier base was very focused on. Lara then attended some of the CCC training days and the rest is history.

The company saw the CCC carbon calculator as a good tool with which to measure their carbon footprint. Of particular interest to them was the benchmarking that CCC offers – the CCC tool allowed JDK to compare their own carbon footprint to other farms in the same region. Furthermore, the idea of being able to capture and track data annually and having all their data together and online, was of real value to JDK.

Which regions participate in the CCC Initiative?

From 2011 to 2020 the CCC database (incl. graded and ungraded data) has grown to cover 9195 unique hectares of grape farms in South Africa. This represents 44% of the table grape industry in the country.

From 2011 to 2020 the CCC database (incl. graded and ungraded data) has grown to cover 9195 unique hectares of table grape farms in South Africa. This represents 44% of the table grape industry in the country.

Region	Industry Ha	CCC Ha	%
Berg River	4934	1955	40%
Hex River Valley	6563	3468	53%
Northern Provinces	2522	422	17%
Olifants River	1224	231	19%
Orange River	5857	3119	53%

JDK's sustainability projects

Their philosophy is centred around economic success, social responsibility and environmental sustainability, with innovation at the root of JDK's success. They supply to premium markets globally and in order to supply to these markets, they have to comply with the highest accredited standards.

Apart from calculating their carbon footprint, JDK also runs various social and environmental projects and recycle general waste. All funds generated from recycling goes to the farm workers. They have gone to great lengths to educate everyone living

The CCC Initiative, a carbon footprinting project, supports SA's wine and fruit sectors through identifying and responding to the risks and opportunities associated with carbon emissions.

on the farms, and the farming communities take great pride in the achievements around recycling. Other environmental projects include organic compost production and invasive alien plant clearing.

Waste handling could have a significant impact on the carbon footprint of an enterprise. For example, the recycling of waste will result in a lower carbon footprint than disposing of it at a landfill site. In this vein, JDK is working towards lowering their carbon emission through the source separation of their waste and recycling. Composting also plays an important role in soil health, which results in a myriad of benefits in terms of production, but also the lowering of carbon emissions. One such benefit would be the increase in soil water holding capacity, which will reduce the amount of water required to irrigate your crops, which in turn means reduced electricity usage for the pumping of water. Using less electricity is not only good for your pocket, it also results in a reduction in farm level carbon emissions.

CCC supports JDK in their carbon reduction strategy

In many ways the CCC tool has helped JDK to shape their broader sustainability goals for the future. Calculating their carbon footprint with the CCC tool has allowed JDK to become more aware of the impact of their inputs, and to develop an improved understanding of which inputs and activities contribute most to their overall carbon emissions.

Electricity

At some stage in their carbon reduction journey JDK considered installing solar panels on their packhouse. With the CCC tool they were able to see that their packhouse electricity use was actually not one of the main contributors to their carbon footprint, as they only pack for four months of the year. Installing solar panels would neither make financial sense nor lower their overall carbon footprint significantly.

Diesel

Since JDK has started calculating their carbon footprint, they have also looked at ways to reduce their fuel use. For example, they have gradually started replacing old tractors with more fuel-efficient models. The first step in reducing fuel consumption is to lower speed, so JDK have capped the speed on all tractors, trucks, and other farm vehicles. They also track all their vehicles to make sure no unnecessary driving takes place.

JDK

Inside JDK's packhouse

Fertiliser

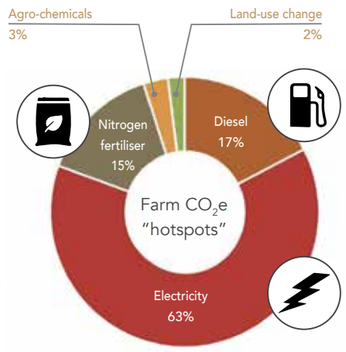
Realising that synthetic fertilisers actually contribute substantially to their carbon footprint and that these fertilisers also have several negative impacts on the soil and vineyards has helped JDK to set long-term goals to reduce the use of synthetic fertilisers. According to their latest carbon footprint report, JDK's pure nitrogen input per bearing hectare, as well as per ton fruit produced, were much lower than that of other table grape farms in the region. The fact that they are able to check fertiliser usage over a 12-month period and compare it to previous years, also helps to maintain accountability within JDK's management structure. JDK often uses their carbon footprint results in presentations to their board of directors and/or their clients.

For more information on The CCC Initiative, please visit www.climatefruitandwine.co.za, email: support@bluenorth.co.za or call 063 688 5593.

Reduce your carbon emissions at farm level by measuring and managing your hotspots!

Electricity is the highest contributor to the farm CO_2 emissions, followed by diesel and nitrogen fertiliser

- **Electricity** 5012 kWh/bearing ha
- **Diesel** 325 L/bearing ha
- **Nitrogen fertilizer** 87 kg/bearing ha



A disease risk monitoring tool for the table grape industry

The occurrence of pre-harvest decay on table grapes affects yield and the subsequent development of postharvest decay during storage. Bunch rot of table grapes is associated with *Botrytis cinerea*, *Aspergillus niger*, as well as *Cladosporium*, *Rhizopus*, *Penicillium* and *Alternaria* spp. among other pathogens (Sonker et al., 2016). By **Dr Pieter Louw** and **Dr Johan Fourie**


Dr Pieter Louw


Dr Johan Fourie

Disease complexes like soft-tissue-breakdown (STB), which include acetic acid bacteria and yeasts, can also contribute towards decay.

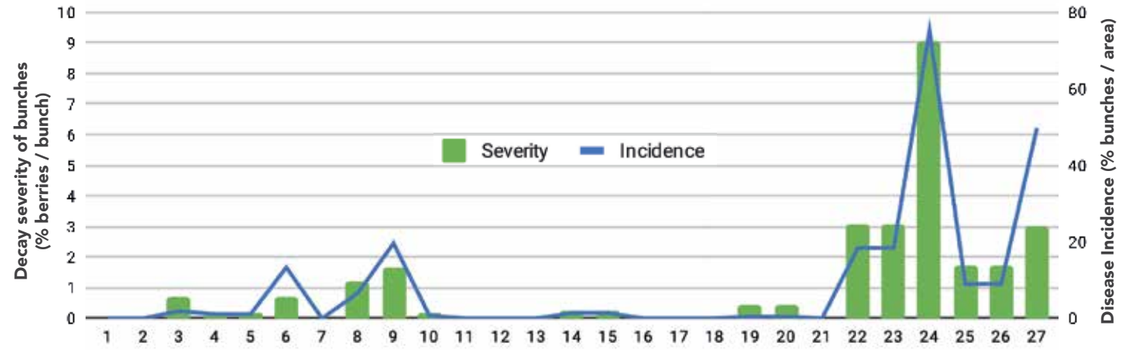
The risk of decay fluctuates throughout the table grape season. High-risk periods can be expected when environmental conditions favour infection and colonisation of pathogens, the inoculum/spore loads of pathogens are moderate to high and the fruit are at a susceptible phenological stage. Phenological stages that can be regarded as high risk include flowering and grape berry ripening (McClellan et al., 1973). Risk of decay is further increased if fruit is wounded.

Climate change has become a reality of modern times and can result – or has more frequently resulted – in conditions that complicate decay control. In this instance, management strategies need to be highly effective to ensure satisfactory protection of vines and grape bunches. Proactive measures are now available to negate risks (Sanzani et al., 2012). Research is required to understand the risk associated with disease development and severity of plant pathogens in South African table grape vineyards. Detection technologies are available to use as possible tools to improve management strategies and limit pre- and postharvest decay development (Sanzani et al., 2012).

In a SATI-funded project, ExperiCo conducted a study to develop a disease management tool, specifically for *B. cinerea* to assist the table grape industry to identify and manage risk and subsequently reduce losses. The study included investigating vineyards in Limpopo, Northern Cape and Western Cape at different phenological stages (e.g. pre-bunch closure, véraison and harvest ready) and evaluating their condition (vineyard floor, canopy conditions, and crop load and condition). Grape bunches were investigated for damage, disorders and signs of decay. Disease symptoms were described and the pathogens classed to genus level. In combination with vineyard monitoring, samples (berries) were collected and transported to the ExperiCo pathology laboratory to evaluate the sensitivity of early detection methods for *B. cinerea*. These methods included culturing on potato dextrose agar (PDA), ONFIT (overnight freezing incubation technique) and quantitative PCR (qPCR).

Based on findings from the vineyard evaluations, wounding (specifically splits and bird damage), an overgrown (dense) canopy, a high cover crop density and substantial debris on the vineyard floor were potential factors contributing to decay (Figure 1). When excessive, these and other factors result in poor vineyard conditions and combined with unfavourable weather (heavy summer rainfall) during ripening, lead to high decay levels

Figure 1: Incidence and severity of diseased/decaying table grape bunches. L 1 - 3, Limpopo producer 1 to 3; NC 1 - 3, Northern Cape producer 1 to 3; WC 1 - 3, Western Cape producer 1 to 3



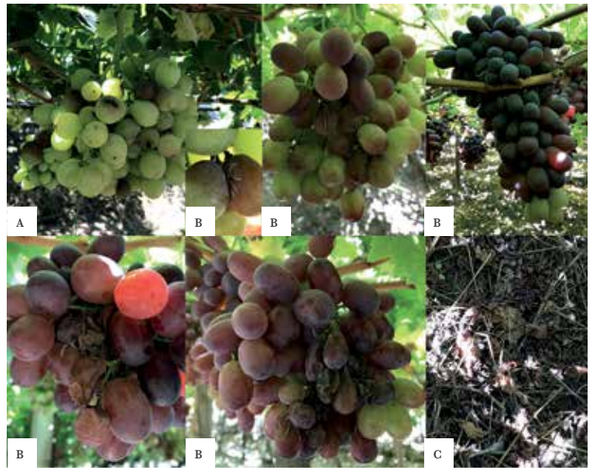
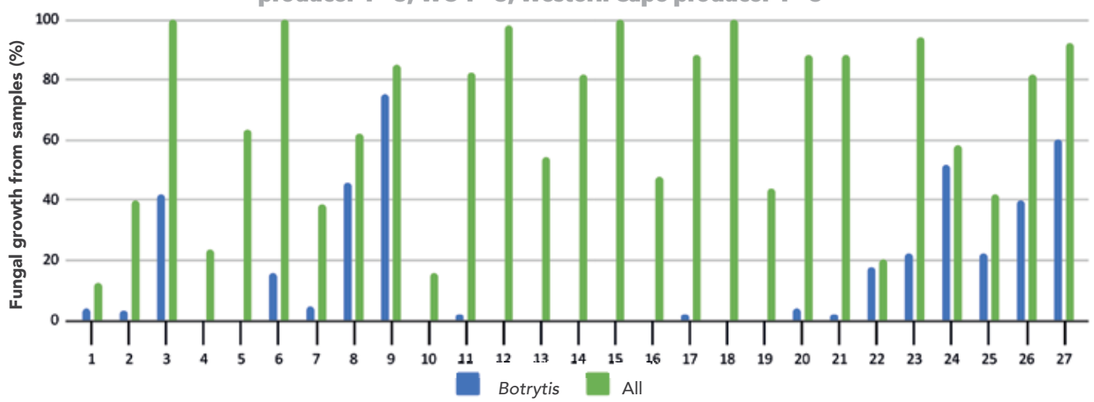


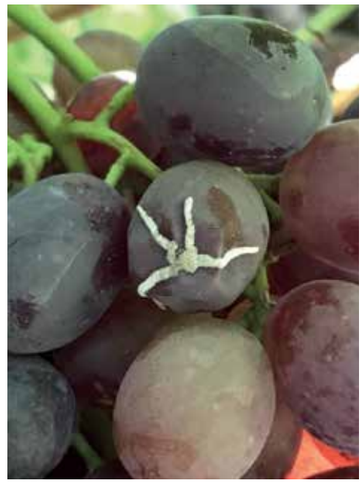
Figure 2: Decay on table grape bunches within vineyards, primarily caused by grey mould (*Botrytis* cinerea). A: Grey mould and other decay symptoms; B: Grey mould symptoms; C: Bunch cuttings with grey mould symptoms on the vineyard floor.

(Figure 2). Failure to negate the problem early enough or using inadequate control measures, especially in such conditions, could have devastating effects on the harvest. Depending on the cultivar, decay risk tends to be higher during bunch set and increases during the last three weeks prior to harvest. No conclusion could be drawn between production regions due to variances in cultural and management practices.

The ONFIT method was an easy and effective early detection method to highlight risk pertaining

Figure 3: Percentage of fungal growth from berry samples frozen (ONFIT method) and placed in humidity chambers at ±22 °C for 9 - 10 days. L 1 - 3, Limpopo producer 1 - 3; NC 1 - 3, Northern Cape producer 1 - 3; WC 1 - 3, Western Cape producer 1 - 3





Above: Vineyard
Right: Grey mould on grape

of *Botrytis* rot (**Figure 3**). The method was sensitive enough to detect *B. cinerea* in all of the problematic vineyards, but slow to deliver results. Similar to ONFIT, the plating method on PDA had a long incubation period, however, sensitivity was low. Only vineyards with high risk were identified (**Figure 4**). A duplex qPCR assay was successfully optimised and set up to quantify *B. cinerea* DNA and *Vitis* DNA in samples. The qPCR method was the most rapid and sensitive detection method (**Figure 5**). It was able to detect *B. cinerea* in healthy berries from all of the vineyards where problems were identified. The ONFIT and qPCR methods can be combined in the future to provide an improved answer.

Figure 4: Percentage fungal growth from berry samples plated onto potato dextrose agar plates and incubated at ±22 °C for 9 - 10 days. L 1 - 3, Limpopo producer 1 to 3; NC 1 - 3, Northern Cape producer 1 to 3; WC 1 - 3, Western Cape producer 1 to 3

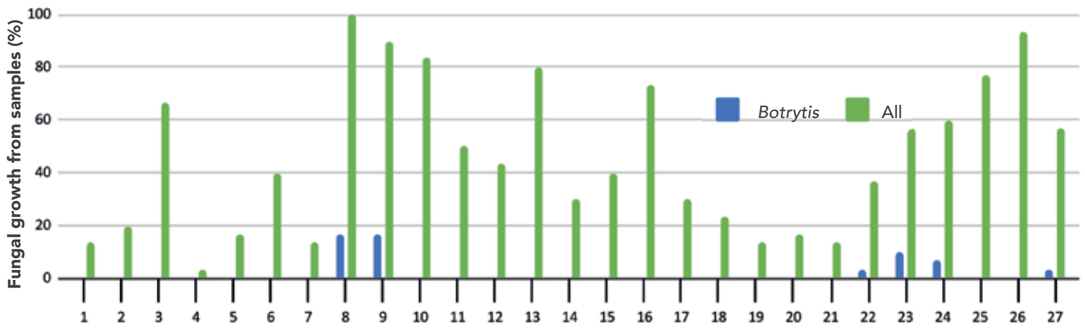
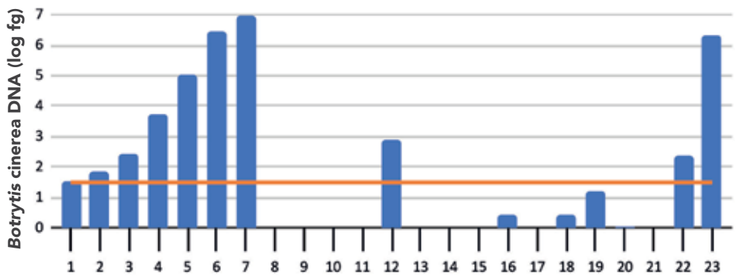


Figure 5: Example of qPCR results from different sampling points (1 - 5) in the vineyard of Western Cape producer 2 (WC2). Orange line representing lowest detection limit (bars above this line indicate positive detection for *B. cinerea*). BC, *B. cinerea* control from a culture.



This disease risk monitoring platform has developed into a service that can now be utilised by table grape producers to assist in managing and reducing risk. The extended program delivered by ExperiCo also includes disease risk monitoring in packhouses. The monitoring and detection methods can be adapted to determine the efficacy of spray programmes. Future developments include taking the disease risk monitoring tool to an online platform to facilitate feedback time and user convenience, and aim to include other fruit industries into the programme. Dr Pieter Louw and Dr Johan Fourie at ExperiCo can be contacted in this regard.

SOIL
enzyme activities
Vital to vineyard soil health

Soil is a finite resource that is dynamic and living. It serves as the interface between agriculture and the environment. Therefore, its careful management – with soil health being key – is critical to ensure its sustainability. By **André Meyer** and **Isabella van Huyssteen**, ARC Infruitec-Nietvoorbij

Soil health can concisely be defined as, "the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation" (Doran and Zeiss, 2000). Measurement of soil health provides information about how the soil is functioning with respect to a particular management goal.

Healthy agricultural soils are characterised by:

- Adequate organic matter: organic matter serves as a reservoir of slow-release nutrients that can be made available to the soil over time
- Good soil structure: organic matter causes soil to clump and form soil aggregates, which improve soil structure
- Improved water permeability: better soil structure allows improved permeability (infiltration of water through the soil)
- Improved water-holding capacity: organic matter acts like a sponge with the ability to absorb water
- Rich soil biology: healthy soils contain large populations of beneficial organisms and small populations of plant pathogens and insect pests
- Balanced chemical composition: sufficient but not excessive nutrient supply with no chemicals or toxins that may harm the crop
- Sufficient depth: for healthy plant root development
- Good soil drainage: allows water to drain at a moderate rate, without water pooling and puddling, and that provides adequate soil aeration vital for maintaining healthy plant roots.

It is well-known that mismanagement of soil can lead to widespread degradation. Examples of mismanagement in vineyards:

- Over fertilisation, which can – over time – lead to the build-up of excessive levels of certain nutrients, cause the pH to become unfavourable for the vine growth, cause the release of greenhouse gases, and contaminate water sources through deep drainage and/or runoff
- Loss of organic matter limits the soil's ability to provide the grapevine with nutrients in a more sustainable manner, and reduces the biodiversity of the soil
- Increased salinity, which causes plant toxicity (e.g. root injury); saline soils cause plants to become dehydrated and thus cause wilting or death of plants
- Over-irrigation which causes water logging and runoff
- Over-use of pesticides and herbicides can cause soil, surface and ground water contamination, may have effects on non-targeted organisms, and may alter soil fertility, nutrient cycling and metabolism
- Heavy use of farming equipment and excessive tillage practices cause compaction and erosion
- Long-term effect of copper sprays results in heavy metal contamination.

Importantly, as the quality of the soil declines, it diminishes its capacity to support plant growth. Such soils are typified as suffering from "poor" soil health. In order to address this, suitable indicators of soil health are needed.

Indicators of soil health

Soil health is an all-inclusive concept that recognises the three main components of soil, i.e. chemical, physical and biological (**figure 1**). Within each category is a subset of measurable attributes (or indicators) that are used to consider the assessment of soil health. For example, indicators such as available bulk density, soil hardness and aggregate stability are considered physical; organic matter, microbial respiration,

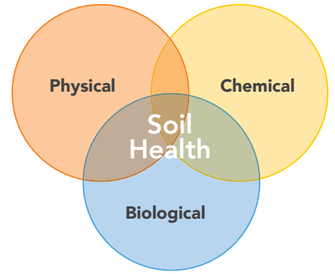


Figure 1: Chemical, physical and biological components of soil

The careful management of soil – with soil health being key – is critical to ensure its sustainability.

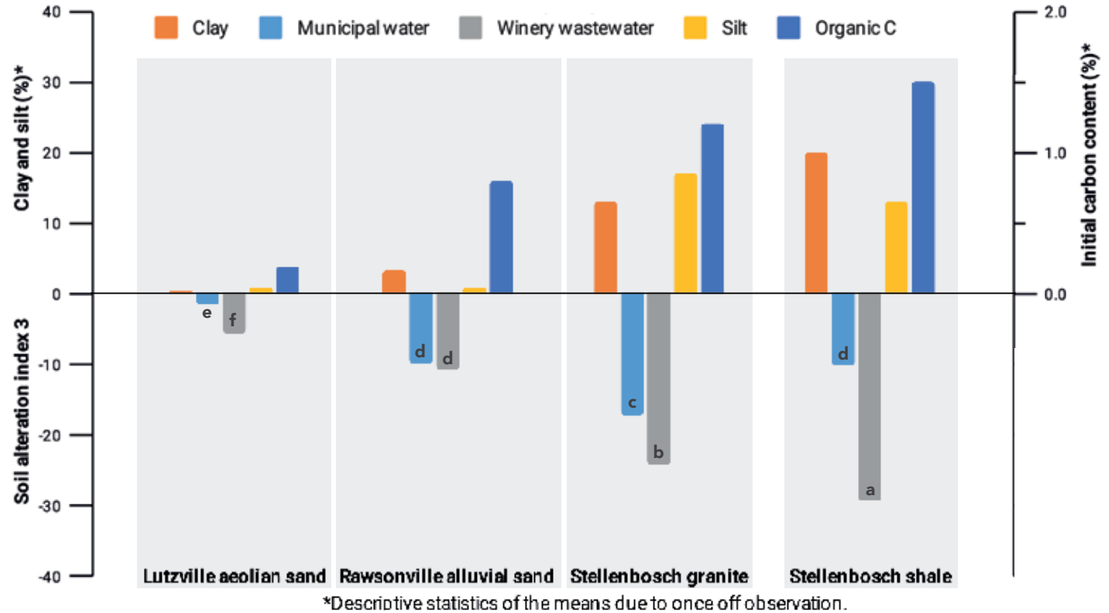


Figure 2: Soil alteration response, % clay, silt and organic carbon contents, after irrigation with diluted winery wastewater: AI3 differentiated between soil textures and correlate with soil organic carbon, silt and clay

Grape growers must weigh up the short-term input costs against the long-term economic benefits of soil improvement measures.

microbial enzyme activities and active carbon are considered to be biological; and pH, macronutrients and micronutrients, are considered chemical.

The scientific relevance of a suitable indicator is considered based on factors like its sensitivity to soil management, good correlation to beneficial soil functions, cost and ease to measure, and accuracy in measurement (Laishram et al., 2012).

Physical and chemical indicators - In the past, management-induced changes affecting soil health used to be almost entirely measured in terms of chemical and physical changes that soils undergo. Chemical changes like changes in the soil organic carbon content may nevertheless be slow and several years may pass before anything significant is detected. Physical and chemical methods are thus best used as indicators of long-term changes in soil health and are typically straightforward to measure.

Biological indicators - The biology of soil is very important to its overall health, productivity and sustainability. Biological indicators are a function of living organisms and these functions are very closely linked with both the chemical and physical properties of a soil. Importantly, they are dependent on and contribute to the fluctuations in soil parameters such as pH, nutrients, soil structure and aggregate stability. Biological indicators can effectively measure the impact of agricultural practices on soil health, at times preceding detectable changes in physical or chemical indicators. Therefore, they are best used as indicators of the short-term changes in soil health and measurements can be performed relatively easily on a routine basis.

Enzyme activities as biological indicators of soil health

Among the various biological indicators that have been proposed to monitor soil health, soil enzyme activities have great potential to provide a unique integrated biological assessment of the health of soils. Enzymes can be of plant, animal or microbial origin, but microorganisms are considered to be the main source. Microorganisms mediate metabolic processes in soils mainly through the synthesis of enzymes that catalyses biochemical reactions in soil. These processes are central to functions that soil perform and are at the basis of the cycling of key nutrients, e.g. carbon, nitrogen and phosphorus cycling in soil, respectively through the activities of the enzymes ß-glucosidase, urease and phosphatase.

Enzymatic reactions are what gives soil life. The changes that management practices may impose on the soil, for example variability in mineralisable substrates, fluctuations in soil moisture and temperature, not only affect microbial populations, but also the availability and activity of the enzymes that they produce. These changes can be accurately detected in changes in the level of soil enzyme activities and within relatively short periods (from within weeks to months to 1 - 2 years). Subtle improvements or decline in soil health can thus be anticipated long before they are detected by chemical or physical means. Therefore, soil enzyme activities could serve as early signs of soil improvement or early warnings of soil degradation.

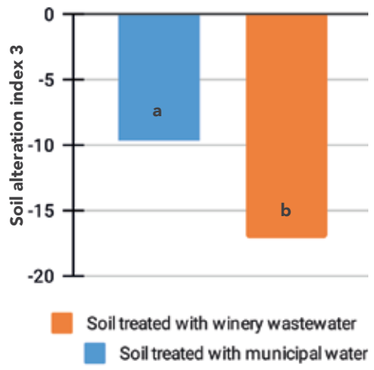


Figure 3: Soil alteration response to municipal and diluted winery wastewater irrigation in a vineyard: diluted winery wastewater benefits soil fertility due to easily decomposable organic matter

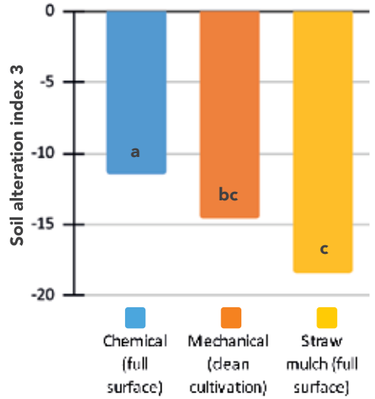


Figure 4: Soil alteration response to different cover crop treatments in a vineyard: soil health was improved under straw mulch compared to mechanical and chemical regimes

Using an integrated approach

Measuring soil enzyme activities, in certain instances, present some limitations and must be considered in conjunction with other biological, physical and chemical measurements if we are to diagnose soil health correctly, i.e. data collected can be used in a comparative manner and the information on enzyme activities can be integrated or supplemented with other physical and chemical soil properties. Because enzyme activities are closely linked to nutrient cycling in ecosystems, they typically correlate with soil organic matter content, with soil organic matter being the site of enzyme synthesis and enzyme stabilisation. In actual fact, enzymes are the direct expression of the soil microbial community to metabolic requirements and nutrient availability. They are thuss indicative of the soil's potential to sustain overall microbiological activity, while also producing relevant information on the capacity of a soil to perform certain functions that help maintain overall soil fertility and productivity.

Enzyme activity indices

Individual enzymes can vary due to (amongst others) differences in substrate specificity, seasonal differences, differences in soil types or due to the kind of land use under consideration. Thus, individual enzyme activity data can sometimes be difficult to interpret. For this reason and for ease of interpretation, multiple enzyme activities can be simultaneously expressed by combining them into single numerical values or indexes.

Research on enzyme activity indices at ARC Infruitec-Nietvoorbij

Researchers from ARC Infruitec-Nietvoorbij have been testing an enzyme-based soil alteration index (AI3) that relates to three enzymes, namely: ß-glucosidase, phosphatase and urease.

Preliminary findings have shown that the AI3 index:

- is sensitive to management-induced changes in soil properties
- correlates with soil nutrient content (in particular organic matter) in vineyard soils (figure 2)
- is applicable to vineyard soils of dissimilar textures (figure 2)
- differentiates between municipal and winery wastewater irrigation treatments in vineyards (figure 3)
- differentiates between cover crop management practices in vineyards (figure 4)
- differentiates between the top-and subsoil layers in vineyards (figure 5).

Thus, the AI3 is potentially useful for the monitoring of soil health in local vineyards. The above findings also stressed the importance of nutrient content, texture, infiltration and water holding capacity, as well as depth, as these inherent soil properties are known to have an impact on grape chemical composition.

Conclusions

- Acknowledgement of the biological component of soil as being critical to the overall productive capacity of a soil is important if we are to diagnose soil health correctly
- Using enzyme activities as indicators of soil health has definite advantages over physical and chemical methods
- Enzyme activities must nevertheless be considered in conjunction with other biological, physical and chemical measurements, using an integrated approach
- Individual enzyme activities may potentially be combined and better expressed as indices
- Grape growers can consider using biological indicators, in conjunction with physical and chemical indicators, as tools to make the "health" of vineyard soils both "measurable" and "manageable"
- Grape growers must weigh up the short-term input costs against the long-term economic benefits of soil improvement measures.

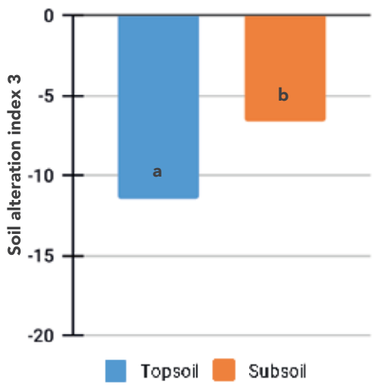


Figure 5: Soil alteration response in the top-and subsoil layers of a vineyard: soil health was improved in the top soil compared to the subsoil due to higher organic and microbial loads.

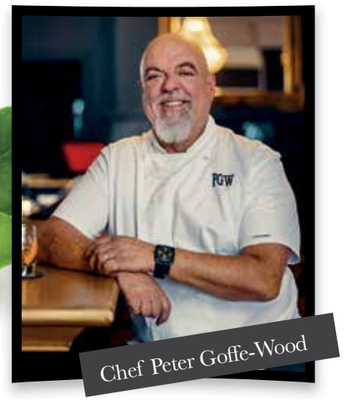
References

- Doran, J.W., & M.R. Zeiss. 2000. Soil health and sustainability: managing the biotic component of soil quality. Applied Soil Ecology 15:3–11.
- Laishram, J., Saxena, K.G., Maikhuri, R.K., & Rao, K.S. (2012). Soil quality and soil health: A review. International Journal of Ecology and Environmental Sciences 38(1): 19–37.

ARC Infruitec-Nietvoorbij (Private Bag X5026, Stellenbosch) offers a service on soil enzyme activity analyses.
For further information on soil health, soil enzyme activities and the AI3 index, the authors can be contacted at: 021 809 3100 or via email: meyera@arc.agric.za

Grapefruit "cook-off"

With Chef Peter Goffe-Wood and Chef Jocelyn Myers-Adams



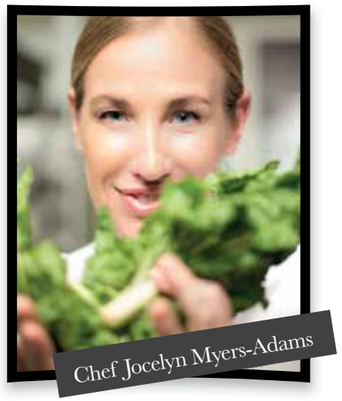
With 35 years' experience under his belt, Food Alchemist and Celebrity Chef Peter Goffe-Wood is a familiar face to most South Africans

He was classically trained at the Beverly Hills Hotel in Umhlanga Rocks and worked in London for nine years, where he cooked in some of the West End's award winning restaurants. Chef Pete (as he's affectionately known) has also cooked on the banks of the Chobe River bordering Namibia, as well as in Bangkok, Hanoi, Sydney and even Oman in the Persian Gulf. Not forgetting Paris, Budapest, Stuttgart, Istanbul, Zagreb and Moscow.

He returned to SA in 1999. Chef Pete was a judge on *MasterChef SA* on M-Net for four seasons, and on *Ultimate Braai Master* on Netflix.

And apart from writing for various publications on a freelance basis, he has also authored three cookbooks, *A Life Digested*, *Kitchen Cowboys* and *Blues Restaurant – the essence of Cape Town*.

Email: pete@pgweat.co.za
or and @petegw



With more than 25 years' experience as a chef, Jocelyn has studied both food and wine extensively, and is a partner at Food Jams.

Chef Jocelyn Myers-Adams's food journey involves farm life, yachts, fine-dining and foraging, which have taken her from Canada to London, Australia, Europe and currently Cape Town.

She runs a Cape Town-based hospitality consulting and private chef business, and serves on the South African Chef's Board.

Her impressive list of culinary achievements includes training at Stratford Chefs School in Canada, working for Chef Gordon Ramsay at his three-star Michelin restaurant, and so much more.

Upon arriving in Cape Town in 2006 Jocelyn headed up reputable kitchens like Geisha and Food Fanatics, and relaunched the food and beverage programs of various five-star hotels. She also worked as executive chef at Cape Town's Table Bay Hotel (2009 - 2018).

Chef Jocelyn has truly become a well-known and respected chef in the culinary and hospitality industry.

@chefjocelyn
@chefjocelynsa
@chefjocelyn75
@foodjams_capetown

Pink grapefruit, green peppercorn and Parmesan pannacotta, with citrus slaw avocado and grapefruit vinaigrette, and toasted bread dukkah

Serves six

Pink grapefruit, green peppercorn and Parmesan pannacotta

Ingredients

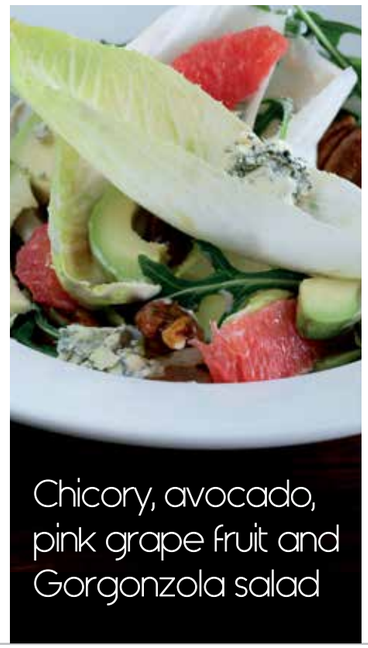
2 sheets gelatin
250 ml full cream milk
250 ml double cream
250 ml grated Parmesan cheese
1 pink grapefruit, segmented
Pinch of crushed green peppercorn

Method:

Bloom the gelatin sheets in a bowl of cold water while you make the base. Bring the milk and cream to boil in a saucepan. Add the Parmesan cheese and green peppercorns and mix thoroughly. Remove the gelatin sheets from the water and add them to the hot mixture. Stir to combine.

Pour the mixture into ramekins or glass cups, and place them in the refrigerator to set (preferably overnight, or at least for five hours).

Carefully unmould the pannacottas and top creatively with pink grapefruit segments.



Chicory, avocado, pink grape fruit and Gorgonzola salad

Serves two

Ingredients

100 g chicory
1 grapefruit segmented
30 g crumbled Gorgonzola Blue cheese
½ avocado, sliced
20 g rocket
¼ cup spiced pecan nuts
¼ cup walnuts
100 ml blue cheese dressing
5 g chives finely chopped

Arrange the chicory and rocket in a mound, interspersed with avocado slices and grapefruit segments. Add the crumbled blue cheese and scatter with walnuts and spiced pecan nuts (see recipe below). Drizzle with the blue cheese dressing (see recipe below). Top with chives.

Blue cheese dressing

Ingredients

100 g blue cheese
2 Tbsp. finely chopped onion
30 ml balsamic vinegar
100 ml cream
Salt and pepper

Method

Whisk the blue cheese, onions, garlic and balsamic vinegar into a paste. Slowly add the cream. Whip the dressing until slightly thick (note over whisking will cause it to split). Season with salt and pepper to taste.

Spiced pecan nuts

Ingredients

100 g pecan nuts
5 g finely chopped Rosemary
1 pinch cayenne pepper
1/4 cup brown sugar
1 tsp. salt
50 g melted butter

Method

Preheat the oven at 180°C. Place the nuts on a tray and roast until golden brown. Mix the herbs, spices, salt and butter together. Add the roasted nuts to the spiced butter and mix thoroughly. Enjoy!

Method

Toss spinach, cabbages, red onion, carrot and cucumber in a bowl and coat with zests and vinaigrette. Season with salt to taste. Toss the avocado with the vinaigrette (see recipe below) and drain.

Grapefruit vinaigrette

Yields ± 125 ml

Ingredients

15 ml lemon juice
30 ml grapefruit juice
60 ml olive oil
10 g shallots, minced (or 5 g white baby onion, minced)
5 g garlic, minced
3 g basil, finely chopped
3 g sage, finely chopped
3 g flat leaf parsley, finely chopped

Method

Sweat the shallots/baby onion and garlic in some oil, cook until soft. Add the rest of the oil and blend. Mix in the herbs, lemon and grapefruit juice. Season to taste. Serve immediately or refrigerate for future use.

Toasted Bread dukkah

Ingredients

125 ml cubed bread of your choice
1 Tbsp. olive oil
1 tsp. sea salt
15 g toasted, sliced almonds
10 g each toasted sesame seeds
5 g coriander seeds, toasted
5 g cumin seeds, lightly toasted

Method

In a medium saucepan, heat the olive oil. Toast the bread cubes thoroughly and season with salt. Lightly crush the almonds, bread cubes and cumin seeds. Separately crush the coriander seeds, add to existing mixture and mix (you may leave bread cubes whole if you prefer).

Plating

Carefully unmould the pannacottas onto the plates. Arrange the cabbage mixture in small mounds and place the segments and avocado around the plate. Sprinkle with cracked black peppercorns and toasted bread dukkah. Enjoy!

Plant-based coatings are now opening up the world to exporters of organic citrus produce

Until now, the absence of quality certified organic coatings has inhibited exports.

Thankfully, Citrosol's innovative range of plant-based coatings broke down such commercial barriers with last year's introduction of Plantseal® and Plantseal® Shine-free within their new product line, Biocare by Citrosol.

The range represents the first commercially available coatings to be certified for use on organic produce, and is pivotal in terms of organic citrus shipments. Therefore, Citrosol is delighted to have been granted the Vegan Seal of Approval (the "V-label"), confirming suitability for vegan consumption. The coatings are proving to work very well among operators.

Reduce food waste

"Unwaxed fruit dehydrates more quickly, suffers from greater weight loss, and is more susceptible to chilling injury," cautions Jorge Bretó, CEO of Citrosol. "With our new range of plant-based coatings, we have been able to reduce weight loss by 50% compared to uncoated fruit, and we extend the commercial life of the fruit, which is extremely important as these factors greatly help to mitigate losses at our customer's destination and, in consequence, wasted produce".

Plantseal® and Plantseal® Shine-free are composed of plant-based waxes where the active ingredients are extracted from plants, and do not undergo any type of chemical alteration. This ensures that the development of the fungal pathogens that cause decay in citrus fruit is not stimulated. In this way, citrus fruit with this type of coating enjoys an extended shelf life in supermarkets, their food safety is guaranteed, and all their flavour and freshness remain intact.

Plantseal® and Plantseal® Shine-free features

Both coatings offer a natural shine, but in the case of Plantseal® Shine-free the presence of the coating on the fruit is virtually imperceptible. From a consumer's perspective, this is a key consideration. For example, if the peel of lemons – which are widely used in cooking – has a very shiny wax coating, it may not appeal to the consumer's taste, leading to many markets and consumers opting for fruit with a more "natural" sheen.

The external appearance of organic citrus fruit protected by Citrosol's new coatings is comparable with those treated with conventional waxes. Furthermore, the preventative control of in-rind blemishes occasioned by chilling injury is excellent and prevention of weight loss is much superior to that of other common shellac and polyethylene waxes.

These plant-based coatings do not require higher temperatures to protect the fruit, thus contributing to sustainability and reduction of the climatic footprint. Nor do they need any changes in the machinery or in the customer's facilities, eliminating the need for further related investment in the packhouse.

Recently Citrosol also developed Plantseal® Tropical, the perfect coating suitable for avocados and mangoes.

CITROSOL
ADVANCED POSTHARVEST SOLUTIONS

PlantSeal®
PlantSeal®
Shine-Free

CAAE ORGANIC INPUT
EUROPEAN VEGETARIAN UNION V-LABEL.EU VEGANO

For more information, contact Schalk Visser at 083 273 5533/ swvisser@citrosol.co.za or visit www.citrosol.com You may also follow us on @Citrosol_com

GOGLOBAL
GLOBAL LOGISTICS EXPERTS
Go beyond!

Complete **One Stop Hub** Freight Logistics Management

GOREEFERS

PERISHABLES SUPPLY CHAIN EXPERTS

Our full clearing and forwarding company specialising in perishable import and export cargo, globally.

You Pick 'n Pack 'n Sell,
We Do The Rest!

GOCARGO

GENERAL CARGO SUPPLY CHAIN EXPERTS

Our full clearing and forwarding company focusing on import and export of general cargo, globally.

BUSINESS MANAGEMENT SOLUTIONS

Digital transformation consulting and implementations for your business needs.

GOSOLUTIONS

ROAD TRANSPORT

Our own fleet of trucks and App reporting on your load status.

GOROAD

HANDLING & STORAGE

Ultra modern cold store and general cargo handling facilities.

GOCHILL

QUALITY & QUANTITY ASSESSMENT

QA specialists delivering inspection, monitoring and facilities management.

GOCHECK

CUSTOMS CLEARANCE

Customs clearance assistance solution conveniently situated across Southern Africa.

GOBORDERS

CHARTER & SHIPPING

Multiple global freight solutions to optimise freight expenses and routes.

GOMARINE

AIR TRANSPORT

Multiple global airfreight solutions to optimise expenses and routes.

GOAIR

PORT TO RECEIVER

From the final port to the final receiver, customs clearing and delivering.

GOTODOOR

iRoot

iRoot is our Microsoft ERP custom-built produce import and export software allowing users to easily, safely and securely do financial administration, manage stock, bookings, sales contracts and much more all in one place.

ROOT2GO

Our live, comprehensive, mobile information and executive reporting dashboard to all the stakeholders along the journey of their cargo.

+27 21 912 5900 | www.goglobal.group

Smooth & Effortless!