Mondstuk van die Suid-Afrikaanse aartappelbedryf • Mouthpiece of the South African potato industry

CHIPS

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MARKET AGENTS REMAIN A CRITICAL LINK IN THE POTATO VALUE CHAIN

SUIDWES-VRYSTAAT KULTIVARPROEF ONDER BESPROEIING OP PETRUSBURG IN 2022

Baseline and market dynamics for the coming season

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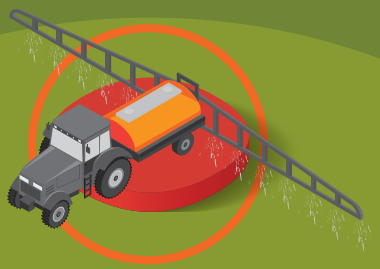
halt, stuit! 1, 2.....



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AECI® PLANT HEALTH

Hold on tight … we're in for a rough ride

By Willie Jacobs, CEO, Potatoes SA

The Potato Industry Forum (PIF) convened on 25 April 2023 to discuss issues pertaining to the theme 'Generating energy in the potato industry'. As is always the case, we took the issue head on and with the benefit of a knowledgeable panel, learned about improved photo voltaic cells, significant improvement in solar system efficiencies, alternative energy storage, and microgrids as a way to exchange or share generated energy or capacity – to name but a few!

This came amid an expected and most drastic reduction yet in the area planted to potatoes, along with the first actual possibility of seasonal shortages mostly due to risk mitigation by irrigation farmers, a situation caused single-handedly by load shedding. This situation has urged industry to take stock and make strategic changes. Once we came to realise that the current position of governmental service provision is what it is, and that we should not consider any form of restoration in the comfortable power supply position we used to enjoy, the doors start opening to all kinds of opportunities.

During the PIF discussions the message was clear: Reliable energy sources and storage not only serve to counter load shedding, but it also makes economic sense. As Faure van Schalkwyk put it: "When financial institutions start to support proper funding mechanisms behind it, the fruits are ripe for the picking."

Start investigating opportunities

While several technologies already offer a long-term pay off, they may soon become redundant at the rate at which new solutions are coming on line faster than the speed of data growth.

Private power generation is already exceeding public services in most countries. Did we misread the signs? Or maybe ignore it? Locally, there have been countless arguments by private power generators who have already developed solutions and who state that they are getting stonewalled by regulations to allow them to supply power to the grid. Essentially, this means that a significant release on the supply network will become available by doing a few simple revisions to regulations.

From an organised agriculture point of view, alongside other major industries, we have to let the voice of business, commerce and economic sustainability rise above the noise of bureaucracy and self-preservation for the privileged few. The industry is slowly making progress on issues like poor service delivery, and I believe the first significant breakthrough will be at the Tshwane Market by way of the IMASA consortium. Efforts similar to this long-running battle to regain control of the efficiencies of the market system, can be replicated in moving the colossus called Eskom into the true commercial 21st century. Our speed of energy reform will be determined by the speed of governmental reform.

Come to the party

Financial institutions also need to come to terms with the risk of these technologies and find proper funding models to assist in moving investment to critical mass. The business case has been made. Security models need to be amended to allow for funding of these solutions. Once security is replaced by expense and risk substitution, a lot more funding can flow to this sector.

While the potato industry is still forging ahead with plans to find solutions for short-term market imbalances, such as the proposed potato chip (fries) factory, these solutions now go way beyond stabilising supply, but also towards the point of market-leading, innovative water and energy solutions that will render our rural areas feasible and create livelihoods where once was believed to be limited opportunities.

Let's unite as business and take the country out of this policy doldrum.

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Give a man a seed potato ...

If you give a man a fish, you feed him for a day.
If you teach a man to fish, you feed him for a lifetime.

This is an old proverb that is often quoted to underline that fact that charity does not breed self-sufficiency. The latter can only be instilled through training and skills transfer.

Sounds easy enough, but when you have to achieve a goal such as this in a country riddled with problems, it becomes a mission – not mission impossible, but definitely mission difficult! Or is it a question of perspective?

Staying put

Recent news reports and press releases clearly show how the burden of load shedding is playing havoc with our economy, livelihoods and even our hearts and minds. Load shedding, along with numerous reports of criminality and fraud, political chaos, crumbling infrastructure, poor service delivery, and dwindling resources all add up to make us negative and downright depressed. Anxiety levels are at an all-time high and we are all wondering: What next? When will this card house finally come tumbling down?

I, and many others I know of, took a decision a long time ago not to leave our country. I personally do not believe that the grass is greener on the other side, just as I don't believe that making a life elsewhere is going to make me or my family happier. Sunshine, open spaces and the Saturday braai are in our genes. Besides, every country across the world has its cross to bear – protests, layoffs, cost-of-living crises, natural disasters – these are commonplace across the world and many have problems we don't have to contend with.

There always is a bright side

At this point in our history, it might seem as though our cross is somewhat heavier that others' to bear, but every so often you have to take a step back, take a bird's eye view and see the landscape from a different angle. The fact is, South Africa remains a land of opportunity. It is a country whose wealth lies in its citizens and their willingness to work hard, innovate and find solutions. You merely have to read this issue of *CHIPS*, especially the transformation section, to appreciate the willingness of our citizens to teach and acquire skills, and to put those skills to work in order to feed communities, entire villages and even regions. Here, it is a case of: Teach a man or woman to sow a seed or plant a seed potato, and he or she will feed themselves and those around them.

For those who believe we are on the road to nowhere – change the algorithms on your news feed by finding positive stories, and your newsfeed will deliver more of the same. There are many positive stories out there; just choose to find them.

Enjoy this issue of *CHIPS* which illustrates that, at least in the potato industry, the machine and its parts are working.

Lynette Louw, redakteur
lynette@plaasmedia.co.za

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Potato NEWS

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SAVE THE DATE

Potatoes SA Research Symposium

The 2023 Potatoes SA Research Symposium will be held in Parys from

18 – 20 JULY 2023.

The theme of the symposium will be

'Roots in the ground with the future in mind'.

Topics such as irrigation, mechanisation and loadshedding, soil health, and foliar diseases will come under the microscope.

Watch the press for more details or email **lethea@first-choice.co.za for more information.**

Consumers are paying more for potatoes

Food inflation continues to rise sharply in South Africa, with consumers having to fork out much more for vegetables compared to last year. According to Statistics SA, inflation for food and non-alcoholic beverages continued to accelerate, with prices increasing by 14% in the 12 months to last month. It said this represented the largest annual increase since the 14.7% rise in March 2009.

The Pietermaritzburg Economic Justice and Dignity Group (PMBEJD) said there have been major year-on-year increases in the price of potatoes, onions, carrots, and tomatoes. Agri SA attributed the higher prices to the impact of load shedding on food production.

Mervyn Abrahams, programme co-ordinator for PMBEJD, said there has been a massive spike in the price of basic vegetables: "Two of the most bought vegetables that we have seen increases in are potatoes and onions. We have seen a 52% increase in the price of potatoes and a 67% increase in the price of onions year-on-year. In March 2022, you would have been paying R63.70 for a 10 kg pocket of potatoes, but in March 2023, you were paying R97.12 for the same pocket." – *IOL*

Potatoes SA and Western Cape take hands

The Western Cape Department of Agriculture (WCDoA) and Potatoes SA recently signed a three-year memorandum of understanding (MoU).

According to the head of the WCDoA, Dr Mogale Sebopetsa, the MoU commits both parties to growing the potato industry to advance economic growth and increase employment opportunities. This sector employs an average of 55 000 people. The country's leading potato producing regions are Limpopo, the Free State, Western Cape, Mpumalanga, KwaZulu-Natal and Eastern Cape.

Willie Jacobs, CEO of Potatoes SA, welcomed the MoU as a significant step forward for the industry. He highlighted that the potato industry makes a significant contribution to South Africa's fresh produce turnover. "The potato industry is estimated to contribute at least R6,6 billion to South Africa's economy and contributes 30 to 50% of the fresh produce turnover in the country," he said. – *Press release, Western Cape Department of Agriculture*

Weather challenges impact weed control efforts

Potato growers in the United Kingdom (UK) are facing challenges in weed control due to delayed planting caused by a wet March, which saw 80% more rainfall than usual, according to a news report by *Farming UK*. This prevented planters from working and kept seed stocks in storage. Southwest and southeast England were the most affected, while the north faced frosts and snow.

While planting is now well underway, Corteva says main-crop potatoes are likely to have been drilled later than planned. And, where April showers have continued, residual herbicide programmes may not have been applied in a timely manner, if at all. The bulk of the weed control workload in potatoes is carried out using residual chemistry applied to ridges shortly after planting. Weeds evading the scope of residuals are tackled with a post-emergence spray, typically in May. – *Farming UK*

Egyptian potato production marks successful season

The potato season in Egypt is marked by abundant production, high demand, stable prices, and no particular challenges except for a few shipment complications. The increase in volumes is mainly due to the increase in acreage. The government has made a lot of effort in land reclamation, turning huge areas arable and available to public and private sector companies.

Egyptian potato production benefits from weak competition in the international market. Role-players claim that other origins that have export calendars at the same time as Egypt, such as Pakistan, have lower volumes. – *Potato News Today*

Aartappel NUUS

Weather-resistant potatoes on the cards

A gene-editing potato project aims to boost the rate of photosynthesis in potato crops to promote yield, water-use efficiency and drought tolerance. The project is known as PhotoBoost and focusses on a 20 to 25% increase in photosynthetic performance, which could lead to a 30% increase in plant biomass.

The European Union (EU)-funded project draws on a range of genetic engineering disciplines and focusses on six key points to improve C3 photosynthetic performance in potatoes: Optimise light reaction efficiency, engineer a photorespiratory bypass, integrate algal carbon dioxide concentration mechanisms, optimise source-sink capacity, improve water-use efficiency, and integrate an oxygen scavenging mechanism.

Dr Jonathan Menary, social scientist at the University of Oxford, stated that by combining two or more biotechnology strategies, scientists have seen rates of photosynthesis increase by at least 20 to 25%. Menary sets out the timeline for breeders to take commercial lines of potato forward, as soon as 2025. – *Fresh Plaza*

Kenya to supply KFC with potatoes

KFC and other global restaurant chains will soon be prohibited from importing pre-cut potatoes, as part of a policy change aimed at increasing the capacity of local farmers to supply these international establishments.

The Kenyan ministry of co-operatives and small enterprises has announced that the country has imported 'Memphis' potato seedlings, a variety endorsed by KFC and currently being tested in major potato-producing regions.

Co-operatives cabinet secretary Simon Chelugui confirmed that the seedlings had received approval from the Kenya Plant Health Inspectorate Service (Kephis) and the ministry of agriculture.

"Already in our possession, the seedlings have undergone Kephis procedures, gained approval, and are now been introduced to our farmers in Nyandarua, Timboroa (Baringo), Molo, and Elburgon [Nakuru]," Chelugui stated in Nairobi recently.

He added: "We foresee that all varieties of potatoes used in KFC (restaurants) and other international food chains will be sourced from Kenya in future. This will result in increased income for our farmers, conserving our dollars, and fostering our industries." – *Business Daily*

European processing potato prices at record levels

European processing potato prices have hit record highs recently, with increased competition from processors for a limited volume of uncontracted (free-buy) stocks pushing up physical prices. The Mintec Benchmark Prices for Dutch processing potatoes were assessed at €330/Mt on 18 April.

Delays in new crop plantings in Europe led to market participants suggesting that the arrival of the early crop could be delayed, increasing pressure on stocks for the remainder of the 2022/23 season. Furthermore, the volume of free-buy stocks is below average and global demand for processed products remains robust, which has resulted in increased competition between processors to secure uncommitted volumes.

For the remainder of the season, market participants expect free-buy prices to remain at or near record highs until processors take delivery of sufficient volumes of early processing varieties. – *Fresh Plaza*

Why market agents and fresh produce markets remain critical links in the potato value chain

By Susan Marais, Plaas Media

Bypassing or eliminating a fresh produce market (FPM) and its market agents might seem like a cost savvy strategy for a value chain role-player. However, the few cents saved on commission fees could wind up costing the industry its entire free market.

One could be forgiven for thinking that it is open season on FPMs, and by association market agents. After all, last year the City of Tshwane was court ordered to make good on its promises to upgrade its FPM at a cost of R18 million. Around the same time Agri SA's CEO, Christo van der Rheede, wrote a letter to the minister of agriculture, land reform and rural development, Thoko Didiza, in which he stated that the conditions at the Joburg Fresh Produce Market were atrocious, and that neglected maintenance threatened human health, as well as the livelihood of thousands of hawkers and producers.

And most recently, the Competition Commission's Fresh Produce Market Inquiry (FPMI) was officially launched at the end of March. The Commission said there were enough red flags during their preliminary research to make FPMs the pivotal point of their inquiry.

Importance of price forming

Given all this background noise, micro-chain selling – farmers selling directly to supermarkets – could seem like a sensible way to not only secure a market for their produce, but also be a way to circumvent poor municipal service delivery. But while it might seem like a good way to save on both market and agent commission, this would devastate the free-market price discovery mechanism (also known as price-forming mechanism) and ultimately harm both producers and consumers, says Wandile Sihlobo, Agbiz's chief economist.

Earlier this year Jaco Koekemoer, Potatoes SA's acting marketing manager, was erroneously misquoted by a news website in an article alleging he said the solution to easing the burden of high potato prices on consumers, was for retailers to bypass market agents and buy directly from farmers.

Koekemoer says this was a distortion of his words. "While we receive daily complaints from farmers who express their frustration over low fresh produce prices, Potatoes SA is in full support of the critical role that market agents fulfil. Their function cannot be underestimated."

Sihlobo says that while market agents do a sterling job in maintaining the free market system, it is true that all municipal markets need to improve their infrastructure, as this was creating problems at most of the country's 22 FPMs.

According to Deon van Zyl, chief commercial officer of Grow Fresh Produce Agents, it is especially markets run by municipalities that are causing a major headache. However, Van Zyl says, most municipal markets are quite functional and despite their shortcomings, FPMs offer real-life benefits when it comes to paying farmers. "Markets are the fastest paying off-take for producers, because they will receive payment within a week of delivery."

Furthermore, not only do markets supply food to the people; it also provide jobs to thousands of informal traders and wholesalers who procure their produce from the market and re-sell it to earn a living. However, the survival of markets are constantly threatened by municipalities not investing in or maintaining the markets.

"But even if municipal markets were destroyed, there would still be space for market agents in the value chain. We will probably see a rise in the establishment of private markets and virtual trading would be expanded."

Critical to supply and demand

Van Zyl said a market agent serves as the link between the producer and his/her customer, the buyer. "We are an extension of the producer's marketing arm, and we are remunerated through and *ad valorem* commission structure which is paid by the producer.

"Market agents are essential in discovering the price of the moment on all produce consigned to agents on the fresh produce markets," says Van Zyl, adding that these price formations are essentially based on factors such as supply and demand.

Sihlobo agrees. "Although consumers and producers are currently under immense financial pressure, evading essential services

such as market agents and FPMs is not the answer. Market agents and FPMs play an important role in price discovery for both producers as well as consumers."

The act of micro-chain selling – retailers buying directly from producers – would have devastating consequences in the long run, Sihlobo warns. "This will make farming very difficult, because farmers would not have a benchmark to hedge themselves against. Consumers will also suffer in the process, because there won't be a clear indication of who is paying how much at which location."

Especially smaller producers would suffer significantly if market agents were to become obsolete, because retailers would not be interested in procuring produce from every single producer, Sihlobo adds.

"It is, however, important to realise that there is space for both direct as well as indirect trading," says Van Zyl. Historically, retailers used to only purchase from the markets, but the deterioration of FPMs and the need to shorten supply chains have led to more and more retailers procuring directly.

"More than 60% of sales on markets are through the informal trade. While it may be more convenient to sell a whole shipment of produce to a supermarket, the price is still mainly determined by the FPM price. It is therefore imperative to protect our markets, and not let them go to waste."

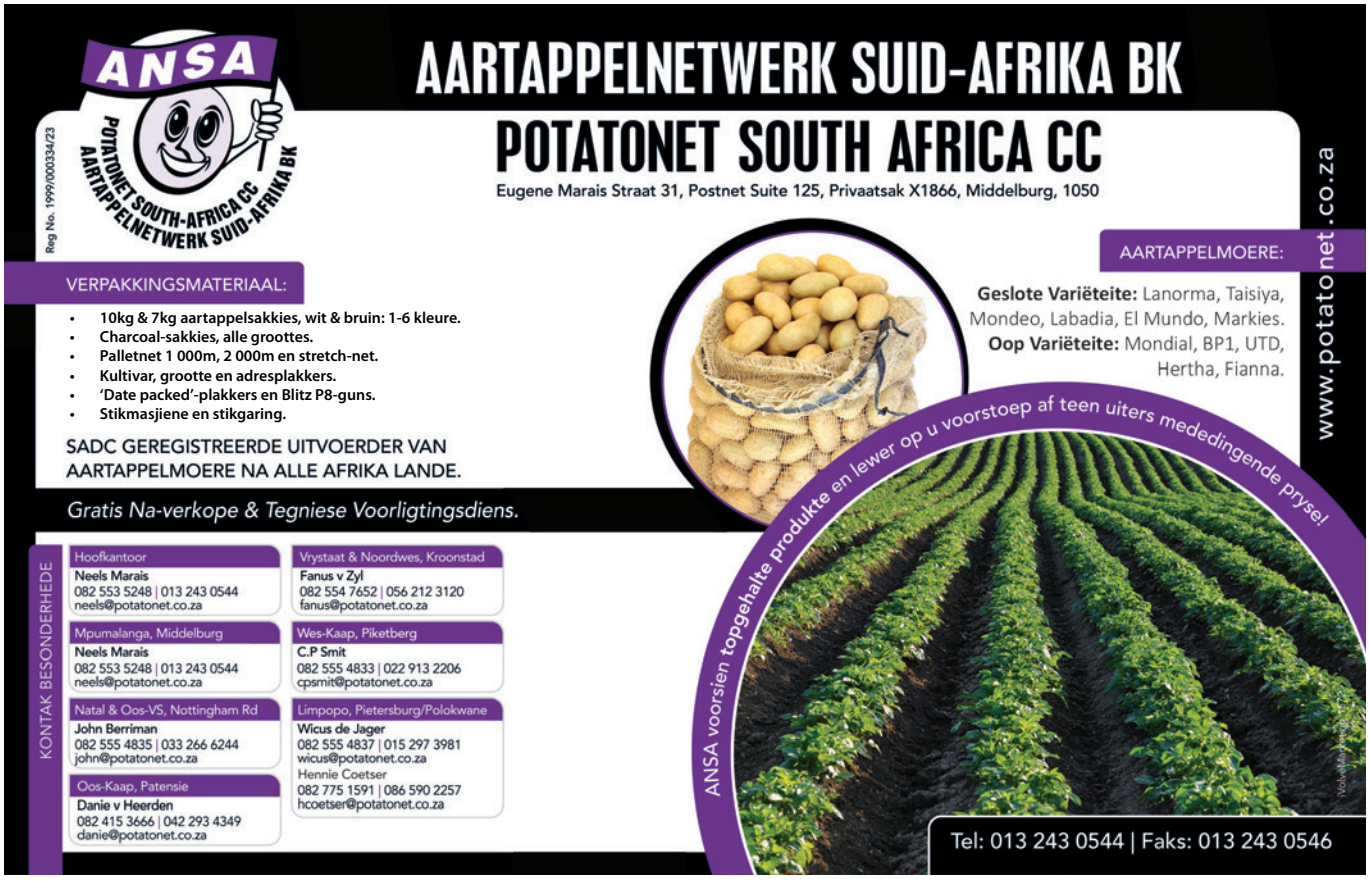
Value added commission structure

The realities of the free market are harsh: If you want to remain a role-player, you have to add value. Fresh produce markets' right of existence is that it remains the most effective price discovery mechanism at the country's disposal.

"In a nutshell: Should the direct sale of potatoes or circumvention of the markets grow out of proportion, it could have an adverse effect on price discovery, and producers would have less influence on the price, becoming price takers in the process," Van Zyl explains.

Currently, municipalities are responsible for the trading system that is used to operate markets. Initially, all sale proceeds go to the municipality or market. The market will then deduct its 5% commission and pay the balance into the agent's trust account. The agent will then deduct his or her commission from the proceeds and pay the producer from his/her trust account. The producer therefore pays 5% to the market and between 6 to 9% to the agent. Agents will individually negotiate their commission with producers.

For more information contact Jaco Koekemoer on 074 063 2090, Deon van Zyl at deon@growfreshproduce.co.za or Wandile Sihlobo at wandile@agbiz.co.za.



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Middeldeurvlei NGK Primêre Skool by Eendekuil, se opgewonde leerders.

Middeldeurvlei NGK Primêre Skool

Middeldeurvlei NGK Primêre Skool, 'n klein plaasskool wat 25 km vanaf Piketberg geleë is, was die eerste skool wat besoek is.

Die skool bestaan al 70 jaar en het tans 63 leerders en drie onderwysers. Die leergang strek vanaf graad R tot 7. Conrad Tobias is die skoolhoof en ook 'n onderwyser. Leerders maak daagliks gebruik van die voedingskema wat elke leerder van ontbyt en middagete voorsien om seker te maak hulle het genoegsame energie om te kan leer.

Van links na regs is Ilana en Erik Engelbrecht, plaaslike aartappelprodusente, Conrad Tobias, skoolhoof van Middeldeurvlei NGK Primêre Skool, en PJ Nell, streekskoördineerder van Aartappels SA.

Erik Engelbrecht, 'n plaaslike aartappelprodusent, oorhandig 'n sak aan 'n leerder.

Groenvlei Primêr

Groenvlei Primêr is 'n plaasskool wat 14 km noord vanaf Piketberg op die Elandsbaaipad geleë is. Die skool is gebou op privaatgrond wat deur die Wes-Kaapse Onderwysdepartement (WKOD) gehuur word.

Die skoolgemeenskap bestaan uit 23 omliggende plase in 'n radius van 16 km. Die skool bedien ook ongeveer 60 leerders wat in Piketberg woon. Hulle maak daagliks van die voedingskema gebruik.

Groenvlei Primêr het in 1972 ontstaan en was een van vele plaasskole in die omgewing. Sedertdien het talle ander plaasskole se deure toegemaak en leerders is na Groenvlei Primêr vervoer, aangesien dit die mees sentrale skool is. Die skool bedien vanaf graad R tot 7. Daar is agt onderwysers, een vir elke graadklas. Tans is daar 222 leerders by die skool.

Aartappels SA is dankbaar vir die geleentheid om 'n klein verskil aan hierdie kinders se skoolloopbane te maak.

Market monitor: The first 13 weeks of 2023 at fresh produce markets

By Sibabaliwe Rulumeni and Dikgetho Mokoena, Potatoes SA

The average weekly price of potatoes at fresh produce markets (FPMs) was suppressed from the second week of 2023 onwards, and started to follow a downward trend until a linear trend became evident and showed an upward trend from weeks 3 to 5. By week 13 of 2023 it had declined but remained higher than the five-year average and that of 2022, with a difference of R20.30 and R19.81 respectively.

Weekly average prices and stocks

Figure 1 indicates the weekly average price on all markets for all classes and sizes. By the end of week 13, the average weekly price was R57.82 per 10 kg bag, which represented a 2% decrease week on week. *Figure 2* indicates the daily average stock levels and daily average price.

Figure 3 compares the average stock levels of each month to that of the same month a year ago. Daily stock levels underwent an increase since February 2023 when it averaged around 565 000 bags and 754 000 bags per day in March. March 2023 reflects an increase of 188 000 bags compared to February 2023 but approximately 18 000 bags less than the same time last year. The average inventory trend supported the price trend; the price experienced downward pressure since the last week of February.

Decreased sales

During the first 13 weeks of 2023, sales on the FPMs decreased by 10% from 2022's corresponding figure, as reflected by *Figure 4*. The average price for the first 13 weeks is also depicted in *Figure 4* with 2023's average price at its highest compared to the previous five years. Sales on the FPMs after the first 13 weeks of the year are 3.2 million fewer 10 kg bags than the five-year average.

Figure 1: Weekly daily average price on all FPMs (all classes and sizes).

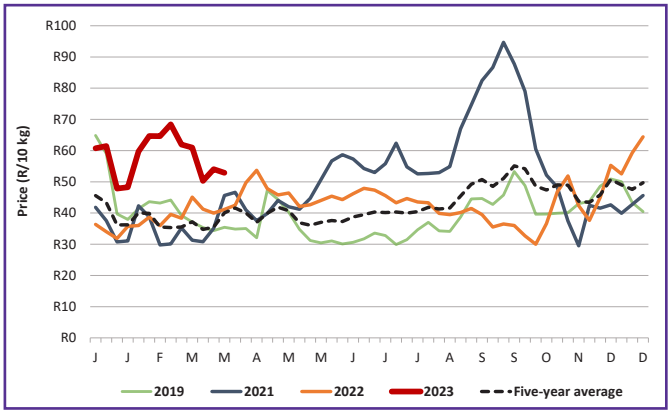

Figure 2: Daily average stock levels compared to daily average price (all classes and sizes).

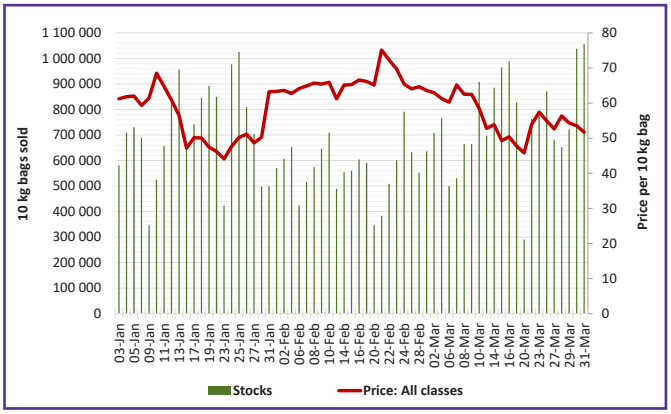

Figure 3: Average daily stock levels per month in 2022 versus 2023.

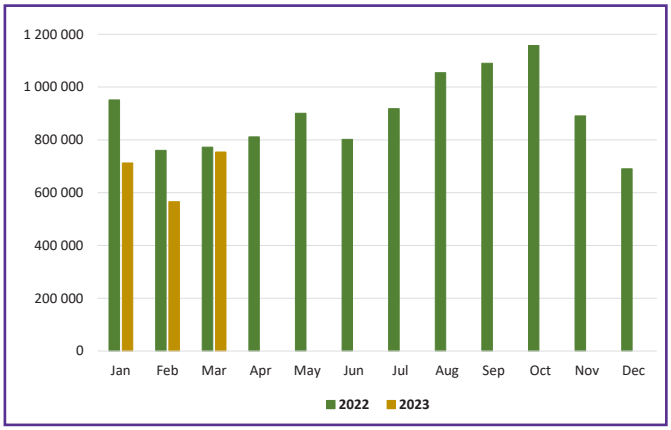

Figure 4: Cumulative number of 10 kg bags sold during the first 13 weeks (average price).

	Five-year average	2019	2020	2021	2022	2023
Number of bags sold	27 788 840.58	26 663 411	28 351 879	29 121 412	27 444 182	24 583 240
Average price	37.52292402	41.84955982	37.75556729	35.28675789	38.01169167	57.82120709

Table 1: Sales on FMPs until week 13 of 2023.

				Percentage of sales on FPMs			
Market	Number of bags 10 kg	% of total	Avg price (R/10 kg)	Class 1	Class 2	Class 3 & 4	Class 1 M
Johannesburg Market	9 883 354	40.2%	56.88	81%	13%	7%	19%
Tshwane Market	4 608 733	18.7%	56.39	67%	21%	12%	15%
Durban Market	2 346 042	9.5%	59.25	82%	11%	7%	23%
Cape Town Market	1 947 855	7.9%	61.76	78%	18%	4%	26%
Springs Market	1 316 845	5.4%	72.08	65%	20%	14%	13%
Bloemfontein Market	712 738	2.9%	60.06	59%	26%	15%	16%
East London Market	700 098	2.8%	62.09	77%	15%	7%	23%
Klerksdorp Market	675 257	2.7%	56.66	66%	19%	15%	14%
Welkom Market	658 642	2.7%	55.78	55%	30%	15%	11%
Port Elizabeth Market	602 608	2.5%	50.85	75%	18%	7%	25%
Pietermaritzburg Market	562 612	2.3%	55.11	67%	21%	11%	14%
Vereeniging Market	201 475	0.8%	53.96	75%	12%	13%	11%
Witbank Market	116 805	0.5%	54.89	70%	17%	13%	15%
Kimberley Market	112 216	0.5%	64.3	75%	16%	9%	24%
Nelspruit Market	72 806	0.3%	52	72%	18%	10%	11%
George Market	55 808	0.2%	65.08	82%	17%	1%	23%
Kei Market (Umtata)	8 418	0.0%	27.34	0%	0%	0%	0%
Total	**24 582 312**	**100%**	**57.82**	**75%**	**16%**	**9%**	**18%**

Figure 5 illustrates monthly sales on the FPMs from 2020. For the first 13 weeks of 2023, sales were above the eight million 10 kg bag mark and sales increased since January. February sales dropped to 7.7 million 10 kg bags compared to the January sales of 8.1 million 10 kg bags. In March 2023 sales increased by 841 000 10 kg bags but remained below the nine million mark compared to March 2022 when it stood at 9.2 million 10 kg bags.

Top five markets

Table 1 contains the number of bags sold at the various markets during the first 13 weeks of 2023. The five major markets during this period were collectively responsible for 82% of the country's sales. The average price (all classes and sizes) for each market also appears in *Table 1*. Out of the five largest markets, Tshwane and Johannesburg markets' average price respectively were R1.43 and R0.94 lower than the country's average price of R57.82. Johannesburg and Durban markets' total sales consisted of 81 and 82% Class 1 bags respectively, the highest of the top five markets.

Figure 6 indicates the year-on-year price change for the top five markets.

Figure 5: Monthly sales on FPMs from 2019 to 2023 (all packaging converted to 10 kg bags).

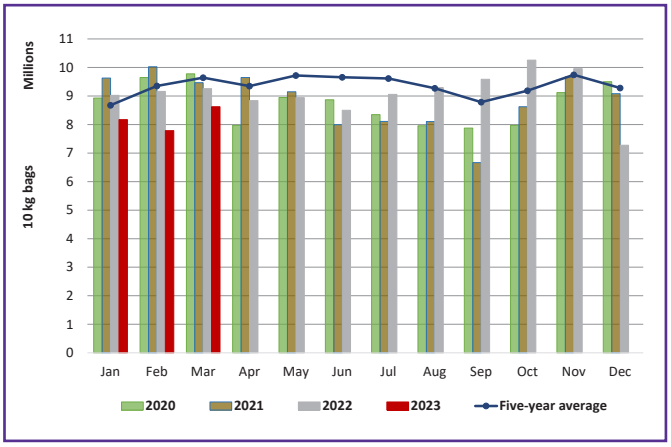

Figure 6: Year-on-year price change at top five markets.

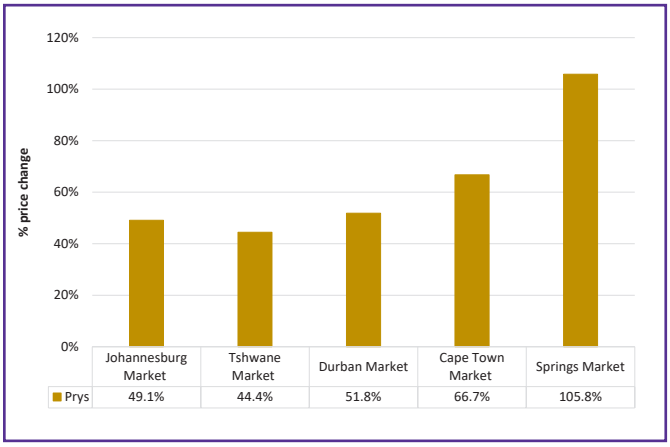


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Table 2: Sales per region on FPMs until week 13 of 2023.

				Percentage of sales on FPMs			
Region	Number of bags 10 kg	% of total	Avg price (R/10 kg)	Class 1	Class 2	Class 3 & 4	Class 1 M
Eastern Free State	5 847 257	24%	56.49	67%	18%	**15%**	12%
Southwestern Free State	3 677 408	15%	63.89	81%	10%	9%	21%
North West	3 128 451	13%	61.33	77%	14%	9%	16%
Western Free State	2 825 033	11%	55.96	80%	14%	7%	25%
KwaZulu-Natal	2 741 199	11%	56.73	78%	17%	5%	15%
Gauteng	1 531 467	6%	51.93	84%	10%	5%	22%
Limpopo	1 437 799	6%	49.52	79%	18%	3%	25%
Sandveld	1 237 284	5%	70.93	78%	20%	3%	27%
Northeastern Cape	719 197	3%	57.53	73%	20%	7%	24%
Other regions	640 044	3%	40.17	40%	49%	11%	13%
Mpumalanga	540 828	2%	52.15	66%	25%	9%	14%
Ceres	184 190	1%	70.39	72%	18%	9%	19%
Eastern Cape	40 908	0.17%	52.55	74%	20%	6%	17%
Southern Cape	24 907	0.10%	60.62	87%	4%	10%	34%
Northern Cape	5 991	0.02%	46.02	82%	11%	7%	57%
Southwestern Cape	349	0.00%	29.4	0%	0%	0%	0%
Total	**24 582 312**	**100%**	**57.82**	**75%**	**16%**	**9%**	**18%**

Figure 7: Number of 10 kg bags sold per region during the first 13 weeks of 2023.

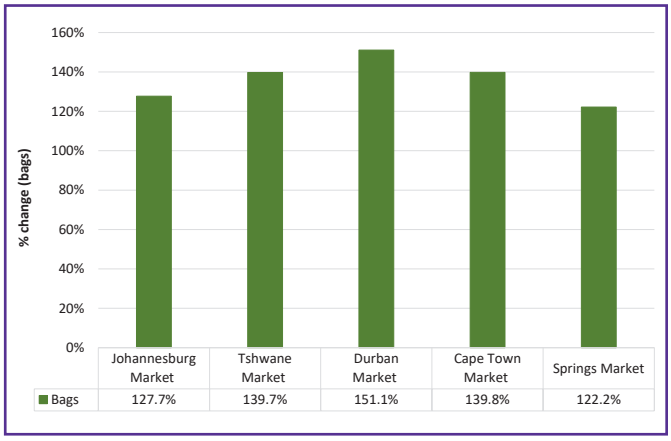
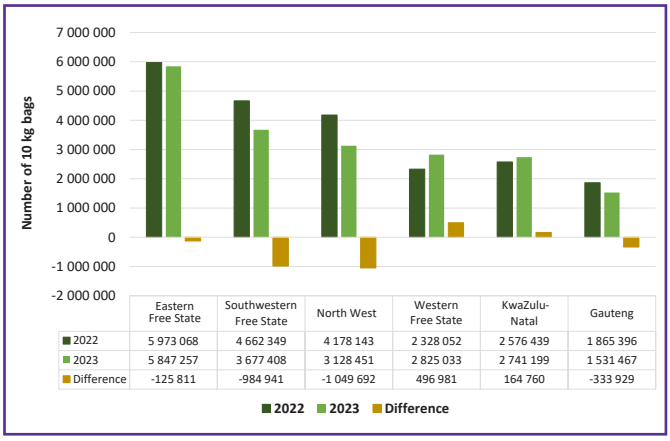


Figure 8: Number of 10 kg bags sold during the first 13 weeks per region: 2022 versus 2023.



All top five markets' prices showed an increase. Springs Market's price showed the greatest percentage expansion with a 105.8% increase in price. The volumes sold at Springs Market is at 122.2% year on year, the least of the top five markets, as shown in *Figure 7*, which supported the price increase.

Sales in largest regions

A comparison of the six largest regions' sales for 2023 with that of 2022, reveals that three regions – the Free State, North West and Gauteng – sold fewer 10 kg bags while the others sold more than during the first 13 weeks of the previous year (*Figure 8*).

The three largest regions that were in the market during the first 13 weeks of 2023, sold 52% of the potatoes on markets, as reflected in *Table 2*. *Table 2* also illustrates the percentage composition of each region's Class 1, 2, 3 and 4 potatoes supplied during this period. Five of the production regions, namely the Eastern Free State, Southwestern Free State, North West, Western Free State and KwaZulu-Natal, had a percentage of Class 1 sales above 70%. The region with the highest percentage of Class 1 was Southwestern Free State on 81%.

For more information, send an email to fpcoetzee@potatoes.co.za.

Baseline and market dynamics for the coming season

By Jodie Hattingh, Divan van der Westhuizen and Tracy Davids, Bureau for Food and Agricultural Policy (BFAP)

For any agricultural industry, there exists a series of core drivers or fundamental factors that can determine the direction of supply, demand and ultimately prices. One can also differentiate between drivers influencing an industry in the short term and the more long-term strategic drivers.

Considering such interactions simultaneously enables the generation of forward-looking projections for the potato industry, which are based on a range of assumptions and therefore represent a single plausible outcome that captures the impacts of fundamental drivers, as opposed to exact predictions of the future.

The market simulation model

These projections are generated by BFAP's partial equilibrium market simulation model, which is based on well-accepted structures and specifications of total supply (comprising production, imports and beginning stocks), and total demand (comprising consumption, export and ending stock).

The model strives to simulate decision-making by producers and consumers, based on economic factors. Demand is generally driven by income levels, together with the price of potatoes, as well as substitute products such as maize and wheat. On the supply side, area decisions are based on relative profitability between crops, while yields are determined by a combination of technological improvements and weather-related dynamics.

Potato prices are ultimately a function of all the relative supply and demand dynamics, and represent the point of equilibrium where total supply is equal to total demand. International trade is determined as a function of relative prices in South Africa and its trade partners – but the role of trade is comparatively smaller than domestic production and consumption, given that potatoes aren't typically traded in bulk.

Establishing plausible assumptions

Many of the drivers that influence potato markets are exogenous to the sector and so, one of the biggest challenges is to establish realistic and plausible assumptions relating to what the future of such factors might look like. Furthermore, interrelationships between such drivers are typically determined based on historic indications, but it must be acknowledged that relationships can change and anticipation of such changes in future is critical.

Some international factors that have injected additional dynamism into agricultural markets in recent years include the continued impact of the Russian war in Ukraine, consequent inflationary challenges and responses by most central banks of rising interest rates to control inflation.

Macro-economic assumptions

Table 1 presents the macro-economic assumptions that underpin the baseline outlook. Although international growth prospects have improved somewhat in recent months due to an improved global risk appetite and China's reopening after years of Covid-19 restrictions, expectations still reflect a substantial slowdown from 2022 and ample risks remain – mainly on the downside.

Domestic GDP growth is expected to come in at only 0.5% in 2023 compared to the preceding two years of 5.5% (2021) and 2.3% (2022). The lower growth is due to the persistent and worsening power crisis in South Africa, which is severely constraining and has led to major institutions slashing growth expectations since the beginning of 2023. The GDP growth rate is a representation of consumer income and any changes in the consumer situation has a significant implication on the demand for potatoes.

The Rand exchange rate remains exceptionally volatile, reflecting global risk sentiments and South Africa's deteriorating domestic environment, which took a further credibility knock with the grey listing announced in February, and continues to be influenced by persistently high levels of loadshedding.

At the same time, US interest rates should ease before local rates, suggesting that some appreciation could occur in 2024. The volatility and depreciation in the Rand against the US dollar will affect domestic agriculture in many ways, in particular the cost of inputs.

The international reference price of energy (natural gas and brent crude oil) has declined significantly from the highs in 2022, supporting lower costs in fertilisers and fuel. However, the weaker exchange rate since the start

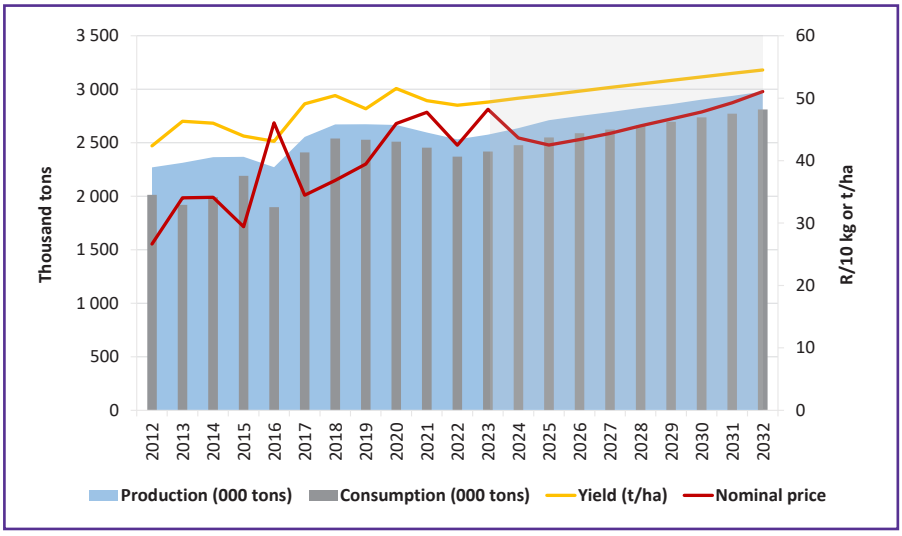
Table 1: Macro-economic assumptions for the 2023 baseline.

	2021	2022	2023	2024	2025
Exchange rate (R/USD)	14.51	16.43	17.24	16.44	16.46
Real GDP growth rate (%)	5.5	2.3	0.5	1.4	1.8
Interest (%)	7.0	10.5	11.0	10.7	10.3
CPI (%)	6.4	6.9	5.5	4.3	4.5
Brent crude oil (USD/barrel)	70.8	100.8	90.3	80.5	75.0

Table 2: Baseline summary.

	2021	2022	2023	Average annual growth 2012–2022	2030	Average annual growth 2023–2032
Area ('000 ha)	52.31	51.82	52.16	0.2%	54.62	0.4%
Yield (t/ha)	49.61	48.87	49.39	1.2%	54.52	1.1%
Production ('000 tons)	2 595	2 532	2 576	1.3%	2 977	1.5%
Domestic consumption ('000 tons)	2 453	2 370	2 418	2.5%	2 811	1.6%
Nominal market price (R/10kg)	47.75	42.48	48.23	3.8%	51.06	1.3%

Figure 1: Potato production, consumption and price: Ten-year outlook (2032).



of 2023 will counterbalance this effect locally, since South Africa is a net importer of agricultural inputs (such as fertilisers and chemicals). Despite a weaker exchange rate, the cost of fertilisers reported a decrease of 21% since November 2022.

BFAP outlook for potatoes

The projections generated by BFAP's potato partial equilibrium model are based on a set of macro-economic assumptions as well as the latest industry information.

South Africa's potato production has increased by an average of 1.3% per annum over the past decade (see *Table 2* and *Figure 1*). During this period, the potato area has remained relatively constant at an average of 52.5 thousand ha while yield improvements (1.2% average increase per annum) fuelled production increases. The rate of increase in yields is projected to decelerate marginally over the outlook period to reach an average yield of 54.5 tons per hectare by 2032. Yield gains are assumed to be primarily driven by factors such as research, cultivar development, better production practices and better plant protection products. Area under potatoes is projected to increase by an average of 0.4% per annum to reach 54.62 thousand ha by 2032, which is largely driven by a reduction of alternative crop prices and production costs.

Commodities such as maize and wheat are suitable replacement crops for some potato production regions. Local prices of these commodities increased substantially over the last two years (*Table 3*), consequently decreasing potato supply. In the short run, these substitute crop prices are forecast to return to normal, leading to a reduction in producer profitability for these crops, compared to the previous two years. This in turn is driving potato producers to return maize and wheat hectares to potato hectares.

For 2023, potato production is projected to increase by 1.7% to 2.49 million tons (see *Figure 1*). This is due to the 0.7% increase in potato area in 2023 to 52.16 thousand ha, which is associated with the relief of production costs seen in the last few months.

Domestic consumption, which includes fresh, processing and seed consumption is forecast to increase by 2% in 2023, driven by consumers' substitution of other higher-priced starches due to constrained disposable income.

The combined effect of these factors is driving the increase in nominal price in 2023 to R48.23 per 10 kg bag. In the short run, the nominal prices are expected to decrease slightly as supply responds to higher prices; however, in the long run an annual increase of 1.3% per annum is expected.

The last few years have been challenging for potato producers with unfavourable macroeconomic conditions and high input costs among only a few of the constraints faced by producers. Ample challenges still remain; however, they are mainly on the downside. Given the current economic forecast, the prospects for potato producers are looking positive during the outlook period.

Table 3: Commodity prices for 2023 baseline.

	2021	2022	2023	2024	2025
White maize Safex price (R/ton)	3 253.01	4 448.78	4 490.22	3 670.98	3 785.94
Wheat Safex price (R/ton)	5 428.00	7 113.30	6 865.81	5 770.27	5 859.58

For more information, contact Jodie Hattingh on 083 290 6479 or visit *www.bfap.co.za*.

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RSA Cape Town Market Agency
Subtropico/Spes Bona Market Agency

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Delta Market Agency
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RSA Mooketsi Market Agency

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RSA Nelspruit Market Agency
Whoopi Up Nelspruit Market Agency

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Noordeinde Market Agency

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Natalia Market Agency
Nkosi Market Agency
Peter & Co Market Agency
Subtropico Pietermaritzburg Market Agency

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African Market Agency
Algoabaai Market Agency
Gouws & Co Market Agency
Lansdell Market Agency
W Finlayson & Co Market Agency

SPRINGS FRESH PRODUCE MARKET

AM Meyer Market Agency
New Africa Market Agency
RSA Springs Market Agency
Springs Vegtable Market Agency
Subtropico Springs Market Agency

TSHWANE FRESH PRODUCE MARKET

Botha Roodt Pretoria Market Agency
Du Plessis & Wolmarans Market Agency
DW Fresh Produce Tshwane Market Agency
Farmers Trust Market Agency
Fresh Way Market Agency
Mabeka Market Agency
Noordvaal Market Agency
Prinsloo & Venter Market Agency
RSA Tshwane Market Agency
Subtropico/Protea Market Agency
Tshwane Green Market Agency

VAAL MUNICIPALITY

RSA Vaal Market Agency

VEREENIGING FRESH PRODUCE MARKET

Subtropico Vereeniging Market Agency

WELKOM FRESH PRODUCE MARKET

Botha & Roodt Welkom Market Agency
Opkoms Market Agency
Subtropico Welkom Market Agency

WITBANK FRESH PRODUCE MARKET

Subtropico Witbank Market Agency
Witbank Market Agency

OTHER

Agri Empire Market Agency
Comfy Fresh
Core Fruit
Farm Fresh Direct
Farm Market
Federated Farmers
Fruitways
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Overview of world potato markets

By Damien da Cal, Potatoes SA

The last year has been a good one for the global potato industry, with the value of potato trade soaring to new highs. The European Union's (EU) five main frozen fry exporters – Belgium, Netherlands, France, Germany and Poland – exported a record €5.905 billion in 2022; this is 42.2% higher than 2021.

The North Western European Potato Growers (NEPG) alliance is expecting greater consumption of potatoes in Germany, France, Belgium and Netherlands as buyers respond to higher contract prices.

In March this year, the EEX European futures price had recovered some of the ground it lost and prices were headed for a settlement of €300/ton (R5 898/ton), up €5/ton (R98.3/ton) on the week and the first time the price had been at that level since late January.

A larger consumption potato area is expected in the four Western European potato growing countries, but this could be at the expense of a smaller starch and seed area, which could create problems for the 2024 crop.

Demand slower as prices soared

Much higher prices led to a slight weakening in the demand for EU-5 frozen fries and other potato products in December, but annual demand increased by 7.8% to a record 6.036 million tons, despite prices rising by almost a third to €978/ton (R19 237.26/ton). By December the average price had hit €1 216/ton which was 55.6% more than in December 2021 and the highest on record.

Even though the 489 175 tons shipped during December 2022 was 1.4% less than in December 2021 and 10.3% less than the all-time record volume of 545 700 tons set in September, the value of exports was at a record €594.9 million, 53.4% more than the year before. Annual exports were worth €5.905 billion which was 42.2% more than the year before and a new all-time 12-month high.

The Netherlands

The demand for processing potatoes dropped to 334 300 tons in February after having reached an all-time high in January of 360 700 tons. Some of the previous month's intake found its way into February's output of pre-cooked potatoes. The volume of frozen fries and similar pre-cooked product exceeded January's output by 6 200 tons to reach 156 400 tons, which was 4 100 tons more than the previous February record set in 2020. The current sustained demand for higher priced fries on the international market continues to drive demand.

The good news for the Dutch industry is that this year they are continuing to source a higher proportion from domestic growers. This February some 104 300 tons of imported potatoes were used by the country's processors; this represents 31.3% of the total volume used. A year

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ago it was 114 300 tons. Demand for dehydrated potato products remains high.

France's potato production

Tight stocks are pushing up prices in France. The lack of potatoes is pushing prices to new highs, with the export market particularly strong, according to RNM figures. The benchmark Agata bulk price jumped another €20/ton to €450/ton (R8 847/ton) during mid-April, which represents a €70 increase on last month.

The only market not to have moved was the processing market. Fontane was going for €300/ton (R5 898/ton) on the free market. There is a €305/ton (R5 996.3/ton) premium on Innovator.

Shortages in Germany

The lack of German potatoes may be feeding through to the export market. Exports of ware potatoes were 26.8% lower in January than in the same month last year at 136 815 tons, with sales over the July to January period 4.9% lower at 1.168 million tons.

The Netherlands remains Germany's largest market, but has had a slowdown in orders. In January they bought 56 529 tons of potatoes, 27.4% less than in January 2022. Belgium is increasing its demand for German potatoes – exports to Belgium were more than double in January compared to January 2022 at 36 774 tons.

Slow progress in Belgium

The very first crops have been planted under fleece in the west of the country. Progress is reported to be behind normal with variable temperatures and some seed quality issues, mainly as a result of last year's hot and dry conditions at harvest. Growers are also being urged to look out for disease issues in their seed. Planting progress may be hampered due to rain.

Winter in Spain

Frost during winter will influence the size of potato yields produced in Spain. Harvesting may begin two weeks later than usual, starting in mid-April in Cartagena and mid-May in Sevilla. The area planted this year may be slightly lower than that of 2022. Dutch seed is mostly used in Spain and according to figures, less seed was planted for export to Spain.

The average ex-farm price in Spain was at €493.70/ton (R9 706.14/ton) in the week to 12 March, a 12.7% increase from the previous weeks value of €438.20/ton (R8 615.01/ton).

Low hectares in Portugal

The potato area in Portugal was only 14 000 ha last year, the lowest to date, and the question remains whether it will be able to recover.

There may be a small increase in the area planted, but there is still some uncertainty around this claim. The beginning of the potato harvest in Portugal may be delayed by two weeks, starting in the middle of May. Portugal is currently importing more than they are exporting. The average ex-farm potato price for white-skinned potatoes was €600/ton (R11 796/ton) in the week of 12 March.

United Kingdom

A €40/ton (R786.4/ton) price increase pegged back fry imports into the United Kingdom (UK) in April to 64 982 tons. This was 6 000 tons less than the previous month and 14.6% down on a year ago.

The decrease in demand may be down to price increases. The price of the UK's two biggest suppliers, Belgium and the Netherlands, has increased by 33% and 27.3% respectively over the past year.

UK fry imports were 500 tons down in December at 2 194 tons, which was still 23.1% up on last year. The Republic of Ireland continues to account for the lion's share of the market, taking 1 756 tons, 275 tons less than last month. The Irish price was €17 higher than December, but still looked good with a value of €993/ton (R19 522.38/ton), just €400 less than the Irish export price to the UK.

Sales to Brazil, the UK's second largest customer, were down 72.7% to 69 tons, despite selling at just £774/ton (US$946/t; 2 885/t). The price has risen by only 11.2% over the past year. The Dutch export price has actually fallen by 7.9% over the past year to £1 272/ton (US$1 555/t; €1 454/t). Sales remain steady at 70 tons, but over the past year this export market has contracted by 41.4% to 1 110 tons.

South Korea

A 14% rise in import prices saw a drop in imports for the month of February to 11 301 tons. Imports from the People's Republic of China (PRC) halved from 1 001 to 598 tons, while imports from the USA were 288 tons higher than the previous month at 6 889 tons.

German fries continue to gain ground in this important Southeast Asian market. February's sales of 451 tons were there highest of the year and overtook Canada's sales of 357 tons, despite having increased its price by kW176 during the month to kW2 040/ton (US$1 559/t; €1 455/t). This still meant it was the cheapest fry on the market, selling below the Belgian price, and kW517 lower than the Canadian import price. Sales of German fries for the year are up to 1 865 tons.

Philippines market recovers

December 2022 marked the final recovery from Covid for the Philippine's fry import market, with total imports for the year reaching 160 132 tons, exceeding 2019's 151 456 tons. So have the main players, with India and China taking over from New Zealand, Canada and the Netherlands. India and China accounted for 40% of 2022's imports. Back in 2019, their share of the market was just 3%.

December 2022 was a particularly strong month for Belgium imports, which fought their way back into second place with sales of 3 758 tons, more than double their November performance and a 483.5% increase on a year ago.

For more information and references, email the author at damien@potatoes.co.za.

Optimising fertiliser timing: The key to healthier potatoes and crispier French fries

By Lukie Pieterse, editor and publisher of *Potato News Today*

For farmers and researchers, a field is often like a giant chemistry set. The timing and amounts of different fertilisers needed to supply nutrients can interact with each other, the soil, and crops, writes Kaine Korzekwa in an article by the American Society of Agronomy (ASA).

For example, potassium, an essential macronutrient for crops, is often applied to a field in the form of potassium chloride. Potassium and nitrogen are the two nutrients that crops need in abundance. Past research has documented an uptake between chloride and nitrate, a form of nitrogen that crops take up. In crops like potatoes, which are high in potassium, chloride and other salts have been shown to reduce what is called tuber specific gravity.

Effect of specific gravity

Specific gravity is a quality evaluation metric used by the potato industry. Higher specific gravity increases crop value. A lower tuber-specific gravity means a potato will hold more water. While many potatoes are sold to make foods like French fries, more water in the potatoes means more time in the fryer to become crispy. Not only is this more expensive, but the fries may also absorb more fat during frying.

Sarah Light, an agronomy farm advisor with the University of California Cooperative Extension, led a study on the timing of potassium chloride in potato fields. Her work was published in *Agrosystems, Geosciences & Environment Journal*, a publication of the American Society of Agronomy, and Crop Science Society of America. Read the full paper here: *https://acsess.onlinelibrary.wiley.com/doi/10.1002/agg2.20301*

In the study, the researchers applied three different potassium fertilisers at three different application times during the season. Potassium chloride is the most common and inexpensive potassium fertiliser. They also used sulfate of potash and sulfate of potash magnesia. They applied these fertilisers to different research plots 210 days before planting (fall), 14 days before planting (spring), and 35 days after planting.

They found that the fall (autumn) application did not increase chloride in the plants. The researchers believe that this is because the chloride was leached below the root depth by the time the potatoes were planted 210 days later. However, the potassium was left in the soil to be taken up and used by the potatoes as they grew.

Role of chloride

"Fertilisers are soluble salts and leaching is the process of draining salts from the soil," Light explains. "Especially in low rainfall areas, high salt content in the crop rootzone, known as soil salinity, is a top reason that fields can become unfarmable."

Although they did find higher chloride in some of the aboveground parts of the potato plant from spring and in-season applications, it did not greatly impact nitrogen levels. They also found no significant difference in yield or quality — such as specific gravity — between the three fertiliser timings in their specific study.

The study indicated that chloride accumulates more in the stems and leaves of the potato plant, and not in the potatoes themselves.

However, after potatoes are harvested, the stems and leaves are left in the field. The chloride isn't removed from the field and may increase the risk of elevated chloride in the soil for future seasons. In this study, chloride leached below the rootzone when applied in the fall.

"Potato plants will take up chloride when it is available and chloride will accumulate in plant tissue until the potato harvest," says Light. "Though specific gravity was not affected by treatment in this research, if elevated plant chloride is of concern, applying potassium chloride in the fall is a way to reduce chloride uptake. This is because it has time to travel, or leach, deeper into the soil."

Light, who conducted this research while a graduate student at Oregon State University, says that she and her team were pleased to find that chloride can travel below the potato root zone, even in a low rainfall area. This provides a way for farmers to minimise risk of lower quality potatoes.

Increase your efficiencies

"Optimising our fertiliser applications is always a high priority in agriculture," Light says. "It is important to understand plant, soil, and nutrient dynamics in order to continue to optimise our production systems and improve our efficiencies."

The research was funded by the United States Department of Agriculture's National Institute of Food and Agriculture, with support from Compass Minerals. Don Horneck, Oregon State University Extension Agronomist, began this project before passing away in 2014. Dan Sullivan, also with Oregon State University, worked with Sarah Light on this project from 2014 onward.

For more information, email the author at lukie@potatonewstoday.com.

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The role of sulphur in improving potato skin finish

Skin finish is an important quality attribute during potato cultivation as consumers increasingly demand potatoes with a clean, attractive skin finish. For this reason, a lot of interest is afforded to understanding the connection between balanced crop nutrition, management practices, and potato skin perfection.

Managing potato skin finish

Several management practices contribute to perceived potato skin perfection. These include:

- Selecting fields free from adverse factors such as disease, poor drainage/low water-holding capabilities.
- Using quality seeds with reduced risk of disease.
- Disinfecting seed storage areas to reduce disease carryover.
- Irrigating to prevent, or minimise diseases.
- Choosing ideal harvesting conditions to avoid physical damage and disease infestation.
- Avoid liming the soil immediately before planting.

In combination with the abovementioned best practices, balanced plant nutrition reduces the incidence of skin disorders and improves the skin finish. Calcium strengthens tuber skins, providing better resistance to many diseases. Boron, magnesium, and manganese can reduce levels of common scab. Zinc can minimise powdery scab. Sulphur (*S*) plays an important nutritional role and may reduce both powdery and common scab infections.

Why sulphur applications?

Often referred to as the fourth macronutrient, *S* helps support plant functions that can affect yield, quality, and marketability. Plant *S* requirements are similar to phosphorus requirements. It can contribute to an increase in crop yields and quality in three different ways:

- Providing a direct nutritive value.
- Delivering indirect nutritive value as soil amendments.
- Improving the efficiency of other essential plant nutrients.

Sulphur is easily leachable and is therefore often deficient in acidic, sandy soils experiencing heavy rain. Continuous cropping and low organic matter levels also contribute to low *S* in soils. Even soils high in organic matter may require *S* amendments if the mineralisation process limits the plant *S* requirement.

Plants deficient in *S* initially show pale-green colouring of the younger leaves, although the entire plant can be pale green and stunted in severe cases. Leaves tend to shrivel as the deficiency progresses. Deficient *S* levels can result in poor crop growth, delayed maturity, and spindly plants.

In potato plants, adequate *S* levels offer the following benefits:

- Increased nutrient uptake and chlorophyll production.
- Promotes seed development.
- Improved stress and pest resistance.
- Boosts carbohydrate formation and vitamin synthesis.

Furthermore, trial evidence suggests that *S* applied in-furrow can substantially decrease common scab and black scurf infection in the tubers. This effect may be due to a reduction in the soil pH where elemental S is used.

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Terra-S is a new liquid suspension concentrate fertiliser for use as a soil treatment to correct or maintain *S* levels in plants and is suitable for application through irrigation systems or direct soil application. It can be applied as part of a long-term soil management plan to address *S* deficiency or used to lower soil pH in managing the production of quality potato skins.

Terra S contains 580 g/kg of liquid elemental *S* and is therefore resistant to soil leaching. The ultrafine/micronised particle size of the active ingredient boosts the product's efficacy. The dust-free, liquid format is suitable for application through irrigation systems or direct soil application at a recommended application rate of 60 to 120 ℓ/ha.

Nutrico is the proud manufacturer of various specialised fertilisers and soil amendments including Terra-S. We have a team of technical experts available to help you find the best, science-backed solution for your application. For more information visit *www.nutrico.co.za* or phone 011 392 4072 or 021 807 5922.

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WEERSTAND: Die sluipmoordenaar van plaagdoders

Deur dr Gerhard Verdoorn, bedryfs- en rentmeesterskapsbestuurder, Croplife SA

Alle spesies lewende organismes het in 'n kleiner tot groter mate van diversiteit (verskeidenheid) in hul genetika. Die goue reël is: Hoe groter die genetiese diversiteit binne 'n spesie, hoe minder vatbaar is die spesie vir grootskaalse negatiewe invloede van omgewingstressors.

Omgekeerd is dit dan ook so dat hoe minder die genetiese diversiteit is, hoe meer kwesbaar is die spesie vir omgewingstressors. Binne elke spesie is daar enkelinge wat uiters weerstandig teen stressors is, asook 'n klein persentasie wat uiters kwesbaar vir die stressors is, terwyl die oorgrote meerderheid stressors geredelik kan hanteer.

Die tipiese Gaussian-verspreidingskurwe (*Figuur 1*) is waarskynlik die beste visuele voorstelling van die sensitiwiteit van indiwidue in 'n spesie se bevolking teenoor omgewingstressors. Die gemiddelde indiwidue word deur die area tussen die twee oranje lyne verteenwoordig. Die uiters sensitiewe indiwidue lê links van die linkerkantste oranje lyn en die uiters weerstandiges lê regs van die regterkantste oranje lyn.

Plaagdoders is niks anders as 'n spesifieke vorm van omgewingstressor nie. Wanneer plaagdoders toegedien word, word indiwidue van die plaagspesie (insekte, patogene of onkruide) aan die plaagdoders onderwerp, wat dit dan onder beheer bring (doodmaak, uitwis of onderdruk).

Die indiwidue wat inherente gene besit wat die plaagdoder se werking inhibeer, oorleef die plaagdoderaanslag; die indiwidue wat uiters sensitief vir die plaagdoder is word uitgewis; en die mediaanbevolking (gemiddelde bevolking) word grootliks beheer, maar nie totaal uitgewis nie omdat hulle weerstand soms aan die meer robuuste kant lê.

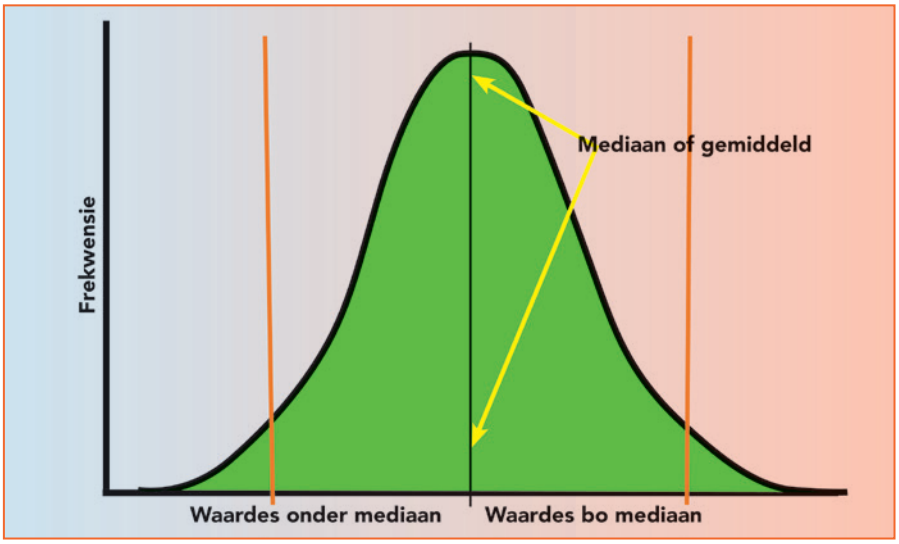
Weerstandbiedendheid

Wanneer skuif die sensitiwiteit van 'n spesie teen plaagdoders dan na die weerstandbiedende kant? Lank voordat 'n spesie heeltemal weerstandbiedend teen 'n plaagdoder is, ontstaan 'n verskuiwing in die sensitiwiteit van die bepaalde bevolking teen die plaagdoder.

Dit is dikwels koöperasiepraatjies wat daarop dui wanneer 'n produsent opmerk dat 'n bepaalde plaagdoder nie meer na verwagting presteer nie. Dit beteken dus dat die bevolking se weerstandige indiwidue in persentasie toeneem en die uiters sensitiewe indiwidue besig is om drasties in persentasie af te neem. Dit beteken ook dat die mediaanbevolking se weerstand aan die opbou is.

Juis op hierdie tydstip moet ondersoek ingestel word na die moontlike oorsake van die sensitiwiteitsverskuiwing, want dit is nog vroeg genoeg om regstellende stappe te neem. Wanneer daar geen meer vatbare indiwidue in die bevolking oor is nie, kan weerstand nie omgekeer word nie.

Figuur 1: Tipiese Gaussian- of normale verspreidingskurwe.



Dosering van plaagdoder per lewensiklus

Plaagdoders word geregistreer om teen etiketgerigte dosisse toegedien te word. Daardie etiket-instruksies is die resultaat van menige veldproewe oor lang tydperke om te bepaal wat die optimale dosis is om die plaag onder beheer te bring. Dis is nie alleen die dosis in enkele aanwendings wat belangrik is nie, maar ook die aantal kere per lewensiklus van die plaag wat in ag geneem moet word.

Sensitiwiteitsverskuiwing en uiteindelike weerstand ontstaan wanneer die korrekte dosis van die plaagdoder nié deur die loop van die seisoen toegedien word nie. 'Korrek' in hierdie verband beteken dat die dosis presies dit moet wees wat deur die etiket aangedui word en nie meer of minder as dit nie. Die biologie en chemie van sensitiwiteitsverskuiwing en weerstand werk as volg:

Oordosering

Met oordosering word meer plaagdoder toegedien as wat die etiket se instruksies aandui. Die enkele indiwidue in die plaagspesie wat sterk weerstandsgenetika besit, bly onaangeraak terwyl die uiters sensitiewe indiwidue totaal uitgewis word. In die mediaanbevolking sneuwel diegene wat min weerstand het geredelik, maar dié wat effens beter weerstand het, word minder aangetas en die mediaanbevolking se sterker (meer weerstandige indiwidue) maak nou 'n baie groter persentasie van die mediaanbevolking uit as voor die aanwending. Nou teel die meer weerstandige indiwidue met die totaal weerstandige indiwidue en sterk die weerstandigheid in die totale bevolking net verder aan.

Die daaropvolgende toediening van die plaagdoder is dan minder doeltreffend, omdat die sensitiwiteit van die plaagbevolking teen die plaagdoder afgeneem het. 'n Paar sulke opeenvolgende gebeure kan maklik 'n plaagbevolking tot totale weerstandbiedendheid dryf en die plaagdoder totaal nutteloos laat.

Oorsake van oordosering

Wanneer eenmalige bespuitings se dosis van die plaagdoder per oppervlakte hoër as die etiket-instruksies se dosis is, is dit alreeds oordosering. Nog erger is wanneer daar meer toedienings van dieselfde aktiewe bestanddeel per seisoen aangewend word as wat die etiket-instruksies aandui. Dit is veral die geval met plae soos insekte waarvan sommige spesies verskeie geslagte in een kweekseisoen kan produseer – dan is meermalige aanwending van dieselfde aktiewe bestanddeel of groep bestanddele 'n gewisse manier om sensitiwiteit te verlaag en weerstandsontwikkeling te kataliseer.

Oordosering mag ook plaasvind wanneer die spuitmengsels se volume per oppervlakte-eenheid te laag is en die aktiewe bestanddeel slegs 'n deel van die teikenarea bereik.

Onderdosering

Onderdosering is wanneer die hoeveelheid van die plaagdoder wat per oppervlakte-eenheid aangewend word, minder is as wat die etiketinstruksies aandui. Dit beteken dat die uiters weerstandige deel van die plaagspesiebevolking feitlik geen van die plaagdoder se uitwerking ervaar nie, dat die mediaangedeelte slegs 'n gedeelte van die dosis ontvang om hulle onder beheer te bring, en dat die uiters sensitiewe deel van die bevolking ook aan te min van die plaagdoder blootgestel word om almal uit te wis.

Wat dus in kort gebeur, is dat 'n baie groot deel van die bevolking aan 'n sub-optimale dosis van die plaagdoder blootgestel word en die spektrum van indiwidue wat die plaagdoder geneties kan weerstaan, sterk na die regterkant van die normaalverspreiding skuif. Met opvolgende onderdosering word die sensitiwiteitsverskuiwing telkens na regs verskuif, totdat die hele bevolking totaal weerstandbiedend teen die plaagdoder se aktiewe bestanddeel is.

Oorsake van onderdosering

Die eenvoudigste oorsaak van onderdosering is bloot wanneer te min van die plaagdoder by die spuitmengsel gevoeg word en dan word minder as die etiket se instruksiedosis op die teiken aangewend.

Tweedens is waar spuitmengsels voorberei word met ander plaagdoders wat nie noodwendig met die beoogde plaagdoder versoenbaar is nie. Dit veroorsaak dikwels antagonisme – met ander woorde, twee aktiewe bestanddele opponeer mekaar se werking en die beoogde aktiewe bestanddeel word dus teen 'n merkbare laer dosis toegedien as wat die bedoeling is. Dit is selfs moontlik dat twee aktiewe bestanddele mekaar chemies vernietig en nie een van die twee oorbly om hul werk op die teiken te doen nie.

Derdens is die effek van watergehalte soms van so 'n aard, dat swak watergehalte soos hardheid en drastiese hoë of lae pH, die aktiewe bestanddeel mag presipiteer, modifiseer, cheleer of bloot chemies vernietig. Dit sal noodwendig die aangewende dosis drasties verlaag en nie genoeg van die aktiewe bestanddeel op die teiken aanwend om sy werk te verrig nie.

Vierdens is daar ook die effek van aanwendingsmetodes wat die dosis mag affekteer. Daar is dikwels probleme met druppelgrootte wat te klein is en in die dampfase bly, en nie die aktiewe bestanddeel op die teiken aflewer nie. Verder kan die spuitmengselvolume te laag wees om byvoorbeeld insekdoders in mielies se kelk in te spoel tot waar wurmplae skuil.

Die aanwending van plaagdoders met drupbesproeiing is iets waaroor die plantbeskermingsbedryf al vir jare waarsku. Daar is geen waarborg dat die aanwending van byvoorbeeld diamied-insekdoders teen die korrekte dosis by die teikens gelewer word nie. Dit veroorsaak dat opeenvolgende generasies van die pes teen suboptimale konsentrasies van die insekdoder blootgestel word en skep die ideale resep vir sensitiwiteitsverskuiwing en weerstandsontwikkeling.

Landboupraktyke

Die laaste groot struikelblok in die korrekte dosering van plaagdoders is verkeerde landboupraktyke. Dit is welbekend dat die onwettige en ongeregistreerde gebruik van die groeistimulant, paklobutrasol, in aartappelproduksie gebruik word. Dit skep 'n baie digte aartappelstand wat verhoed dat spuitmengsels vir insekplae en swamsiektes deur die blaardak dring en die teikens bereik.

Soos met die ander uitdagings, sal die aktiewe bestanddele dus nie onder optimale toestande die teikens bereik nie en die pad na weerstand is sodoende gewaarborg.

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Houtskoolvrot: 'n Oorsig

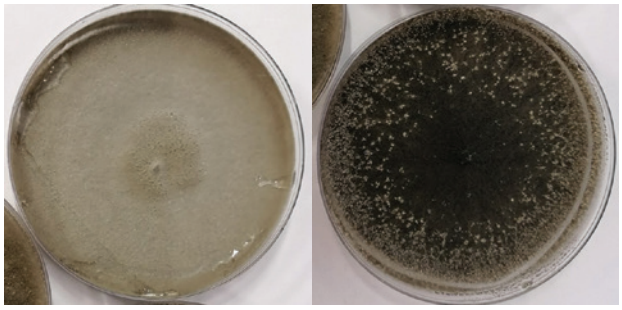
Deur René Sutherland, Mariette Truter, Elsie Cruywagen, LNR-Groente, Industriële en Medisinale Plante, Gewasbeskerming, en Estianne Retief, LNR-Plantgesondheid en -beskerming, Plantmikrobiologie

Houtskoolvrot (*charcoal rot*) word veroorsaak deur *Macrophomina phaseolina*. Simptome van houtskoolvrot sluit die verwelking en vergeling van blare in. Simptome kan maklik verwar word met *Verticillium*-verwelk of swartstam. Verwelking wat deur *Macrophomina* veroorsaak word, ontwikkel egter gewoonlik vinniger as *Verticillium*-verwelk. Houtskoolvrot kom ook meer algemeen in warm weersomstandighede voor.

Heelbo en in die middel is aartappelknolle wat met Macrophomina phaseolina geïnfekteer is en heelonder is kontrole-aartappels (nie-geïnfekteer).

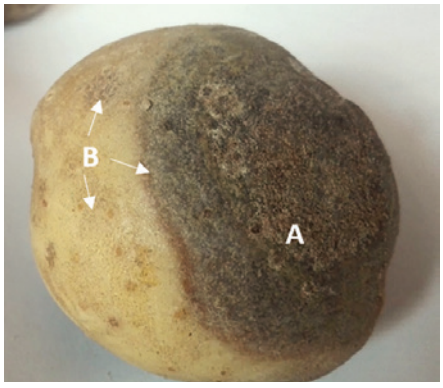
Simptomatiese knolle wat in die helfte gesny is. Verbruining van die knol kan tot in die middel daarvan waargeneem word.

Besmette stingels ontwikkel 'n sagte, donker verrotting soortgelyk aan swartstam. Met gevorderde infeksie vorm klein, swart swamstrukture (mikrosklerotia) op die stingel.



Macrophomina phaseolina-kulture op voedingsryke agar.

Knolle kan deur *M. phaseolina* geïnfekteer word en vorm vlak, waterdeurdrenkte letsels. Die knolweefsel binne-in hierdie letsels word grys en uiteindelik word die letselweefsel gevul met swart swamdrade. As knolinfeksies vinnig ontwikkel, veroorsaak dit 'n sagte vrot wat van wit na pienk en dan na swart verander – soortgelyk aan pienkvrot.



Knolle met donkerbruin weefselverkleuring. Verbruining het 'n sentrale beginpunt (A) wat oor tyd versprei. Konsentriese ringe (B) is in die bruin weefsel sigbaar.

Siekte-ontwikkelling

M. phaseolina het 'n wye gasheerreeks wat mielies, sojabone, boontjies en die pampoenfamilie insluit. Dit is dus moeilik om die siekte met wisselbou te beheer. Volgens dr Maryke Craven van die Landbounavorsingsraad (LNR), is droogtetoestande en hoë temperature gunstig vir siekte-ontwikkeling in mielies. Prof Jacquie van der Waals het gevind dat *M. phaseolina*-isolate by temperature van 45°C kan groei.

Gedurende die vroeë-afsterwingsprojek wat by aartappels in Limpopo gedoen is, is heelwat *M. phaseolina* geïsoleer. Al die isolate was patogenies en het simptome op geïnfekteerde knolle getoon. Meer inligting word egter benodig rakende siekte-ontwikkelling en kultivarvatbaarheid ten einde die siekte doeltreffend te beheer.

Vir meer inligting en verwysings, kontak René Sutherland by epos SutherlandR@arc.agric.za.

BULLETIN

Beskerm só jou aartappels teen LEPIDOPTERA-PESTE

Die Orde Lepidoptera is daarvoor bekend dat dit van die belangrike peste (snywurm, Afrika-bolwurm en aartappelmot) op aartappels insluit. Hierdie insekspesies kan groot opbrengsverliese in aartappellande regoor Suid-Afrika veroorsaak indien dit nie beheer word nie. Ander larwes soos die tamatie-valslandmeter, kool-valslandmeter, klein kommandowurm en die tamatieblaarmyner mag ook voorkom. Die korrekte insekdoderprogram is die sleutel tot die beveiliging van jou aartappelgewasse hierdie seisoen.

A34279/CSA

Hoe om Lepidoptera-peste te beheer

Geïntegreerde beheer van die aartappelmot is krities om getalle onder die ekonomiese drempel te hou, asook insetkoste te beperk. Daar is 'n verskeidenheid natuurlike vyande in Suid-Afrika en die keuse van insekdoder is dus belangrik om die impak op hulle te verlaag. Operd is noodsaaklik om die blootstelling van knolle aan larwes te verminder. Chemiese beheer moet met die nodige omsigtigheid toegedien word om die maksimum impak op die pes te hê met die minste impak op die omgewing.

Maak gebruik van die verskillende chemiese groepe om 'n volledige spuitprogram saam te stel. ***Bayer*** *het piretroïedes (****Decis® Forte*** *en* ***Bulldock® 125 SC****) en die diamied (****Belt®****) wat gebruik kan word in 'n spuitprogram. Indien die piretroïedes aan die begin en einde van die groeiseisoen gebruik word, behoort dit die minste effek op die omgewing te hê met die hoogste impak op aartappelmotlarwes.*

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Om jou aartappeloes te beskerm, vereis 'n geïntegreerde gewasbeskermingsprogram wat die spesifieke omstandighede en behoeftes van jou plaas aanspreek.

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Wat om in gedagte te hou tydens die beplanning van 'n pesbeheerprogram

Die eerste ding wat jy in gedagte moet hou as jy 'n pesbeheerprogram beplan, is om 'n duidelike tydlyn op te stel wat aandui wanneer die pes teenwoordig gaan wees om te verseker dat toediening op die regte tyd plaasvind. Dit is nie net belangrik om 'n pesbeheerprogram vir individuele gewasse op te stel nie, maar om ook die beweging van peste na aangrensende lande in berekening te bring. Verder is dit ook belangrik om van plaaslik-geregistreerde produkte gebruik te maak, volgens die venster-benadering, en om chemiese middels met verskillende metodes van werking te gebruik om die opbou van weerstand te verhoed. Dit is ook belangrik om die aanbevelings van die vervaardiger te verstaan en te volg om die effektiwiteit van die produkte te verseker.

Die beplanning van 'n effektiewe pesbeheerprogram begin vandag! Maak **Bayer** jou nommer een keuse vir gewasbeskermingsprodukte om jou aartappellande veilig te hou.

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Die oorlewing van *Ralstonia* spp. in die grond

Deur Anel Espach, Plantovita, André Wessels, Aartappelsertifiseringsdiens, en Chantel du Raan, McCain Foods

In 2021, 15 jaar na afloop van die laaste aanplanting op die proefperseel waar 'n ondersoek na die oorlewing van *Ralstonia* spp. in grond gedoen is, is daar weer aartappels geplant. Hierdie keer was die doel om vas te stel of *Ralstonia solanacearum* (RSC) oorleef het. Oorlewing sal impliseer dat huidige regulasies met betrekking tot rotasietydperke, herbesoek moet word.

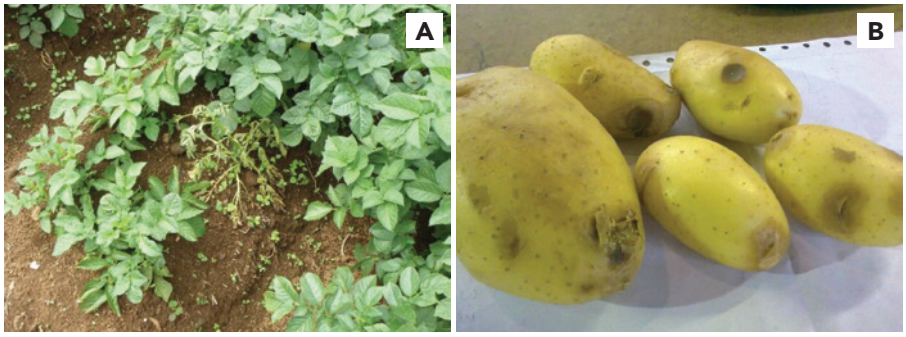
Die geleentheid het hom nog nie voorheen voorgedoen om die oorlewing van RSC in die veld op so 'n goed-gedokumenteerde wyse te bestudeer nie. 'n Wye spektrum van natuurlike omgewingstoestande word op hierdie manier by die ondersoek ingesluit om inklusiewe gevolgtrekkings moontlik te maak. 'n Geleentheid soos hierdie sal hom dalk nie gou weer voordoen nie.

Daar is besluit om aartappels oor die hele perseel onder besproeiing vir drie plantseisoene agtereenvolgens te plant. Standaard produksiepraktyke is gevolg en was so na as moontlik aan praktyke wat oor die algemeen gevolg word. Bykomend daartoe, is gereelde inspeksies gedurende die groeiseisoen gedoen om die gesondheid van die aanplanting te monitor en voortydig enige plante met verwelktipe simptome, te identifiseer en toets.

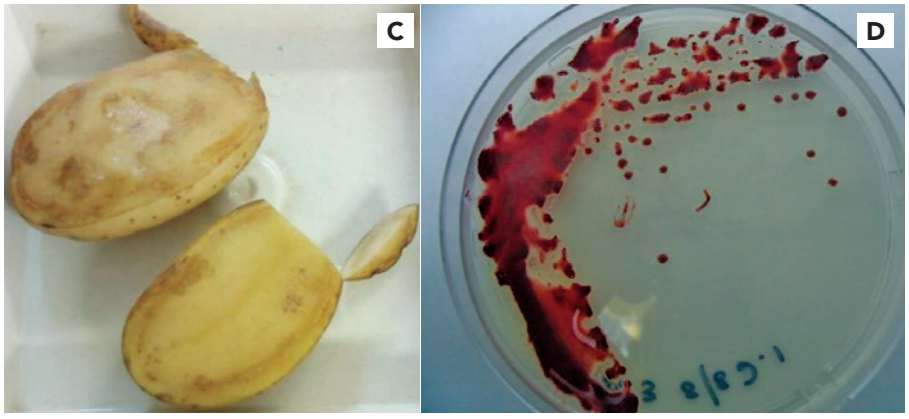
Met loofafsterwing is knolmonsters geneem en getoets vir die teenwoordigheid van *R. solanacearum*. Die oorblywende dogterknolle is van die perseel verwyder en die perseel is vir die volgende aanplanting voorberei met gesertifiseerde moere. Geen *R. solanacearum* is op enige stadium van die ondersoek uit enige knolmonster geïsoleer, of verdagte plante of onkruide geïdentifiseer en getoets nie.

Die *Ralstonia*-kopseer

Plaaslike aartappelprodusente word gekonfronteer met beperkte beskikbare en bewerkbare grond, gegewe die noodsaaklikheid van behoorlike wisselbousiklusse om volhoubare aartappelproduksie te ondersteun. Menige kwekers het al die verwoesting wat deur *Ralstonia* spp. gesaai kan word, ervaar. As gevolg van die wye gasheerreeks betrokke, word kwekers van 'n aantal gewasse geraak deur infestasies van hierdie groep patogeniese bakterieë.



Op foto A kan 'n verwelkte aartappelplant tussen gesonde plante gesien word. Foto B toon hoe die ogies op swaar-geïnfekteerde knolle simptome (soms selfs met bakteriese eksudaat) kan vertoon.



Oopgesnyde aartappelknolle om die vaatweefsel bloot te stel sodat die bakteriese eksudaat sigbaar is (foto C). Wanneer Ralstonia spp. in die laboratorium op die semi-selektiewe medium. uitgeplaat word, groei dit en vorm tipiese wit en rooi kolonies (foto D).

Wat voorheen net bekend gestaan het as *R. solanacearum*, word vandag verdeel in meer spesies as gevolg van die molekulêre tipering van hierdie diverse groep organismes. Daarom is die naam *R. pseudosolanacearum* ook vandag aan sommige bekend. Alhoewel hierdie hedendaagse veranderinge in die naamgewing van die groep organismes plaasvind en daar

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Die aanplant van gesertifiseerde moere is op die proefperseel gedoen met die hulp van die personeel van die Universiteit van Pretoria. Op beide foto's kan die blokke wat met sinkplate geskei is, gesien word.

Oorhoofse besproeiing is in die aanplanting aangewend.

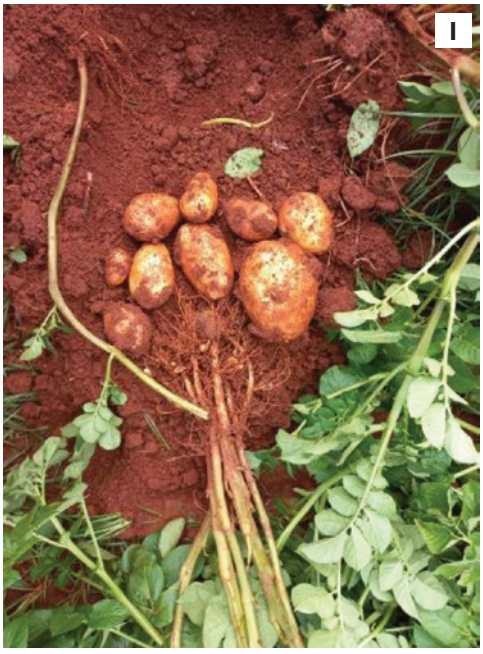
minder algemeen na die bekende biovar-klassifikasie verwys word, is die wye gasheerreeks asook die verwoesting en oorlewing van hierdie skadelike bakterieë steeds dieselfde.

Soos in die geval van verskeie ander plantpatogene, is daar 'n legio ander vrae wat kwekers en wetenskaplikes in die gesig staar rakende *Ralstonia* spp. Die mees voor-die-hand-liggende vrae wentel om die beheer van die organisme en die voorkoming van bakteriese verwelk. Wat maak hierdie organisme dood?

Oorlewingsfaktore

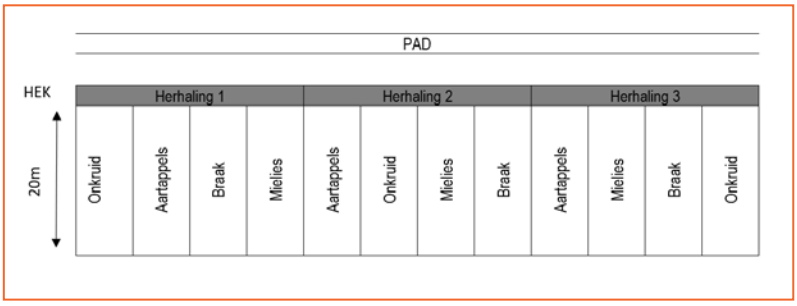
Soos met alle lewende organismes, is optimale vog, voeding en temperatuur krities. *Ralstonia* spp. het vry vog nodig en daarom verminder getalle onder droë toestande. Oor die algemeen kan die organisme oorleef tussen wye temperatuurgrense wat wissel van laag (rondom 4°C) na hoog (rondom 25°C) met 'n optimum van rondom 28°C. Hierdie wye grense is nog 'n aanduiding van hoe divers hierdie groep is en dat spesies binne die groep aangepas is vir oorlewing.

Dit is egter so dat die oorlewing van die bakterieë moeiliker raak in die afwesigheid van voedingstowwe wat deur 'n gasheer verskaf word. In gevalle waar getalle en temperature daal, maar die beskikbare vry vog voldoende is, gaan die selle in 'n sogenaamde lewensvatbare dog nie-kweekbare (*viable but non-culturable*, VBNC) staat in; hierdie staat is omkeerbaar as oorlewingsmeganisme. Sommige wetenskaplikes reken dat die latensie van die organisme hierdeur bepaal word. Wat



Die opbrengs van die aanplanting per plant (foto I). Monsterneming het geskied deur een knol per plant vir elke drie plante te neem (foto J). Indien daar te min plante per blok was, is nog knolle lukraak geneem om die totaal per blok op 110 te staan te bring.

Figuur 1: Diagrammatiese voorstelling om die uitleg van die perseel voor te stel, met 'n foto van hoe die perseel na 15 jaar van braak-lê daar uit gesien het.



uiters belangrik is van die VBNC-staat, is dat sodra toestande geskik is, die selle weer vermeerder, kweekbaar word en patogenies kan wees.

By aartappelproduksie is gewasrotasie 'n gegewe en is dit krities vir die bekamping en beheer van 'n siekte soos bakteriese verwelk. Die aanname was nog altyd dat hoe langer die patogeen sonder die gasheer bly, hoe laer daal die getalle.

By moerproduksie is 'n minimumtydperk van ses jaar se rotasie tussen aartappelaanplantings en 'n gasheer gelys in *Tabel 1* in die Suid-Afrikaanse Moersertifiseringskema, 'n vereiste vir die produksie van G1-moere, vier jaar vir G2 en G3, en drie jaar vir G4, G5, G6 en G7. Wanneer *R. solanacearum* opgespoor is in 'n aanplanting, word die plant van aartappels op daardie eenheid vir agt jaar opgeskort. Wanneer *R. pseudosolanaceaum* opgespoor is, is die plant van aartappels verbode vir die toekoms.

Maar hoe lank is lank genoeg vir 'n organisme soos *Ralstonia*? En hoe pak 'n mens 'n eksperimentele aanplanting vir dekades aan om 'n inklusiewe antwoord te kry met soveel diversiteit ter sprake? Die projek uitgevoer deur EIM Stander onder die leiding van prof PS Hammes.

Ondersoek is ingestel na die agronomiese aspekte van bakteriese verwelk in vier verskillende produksiestelsels. Dit het getoon dat *R. solanacearum* sonder twyfel langer kan oorleef was wat plaaslik aangeneem is. *R. solanacearum* is geïsoleer uit dogterknolle wat nege jaar sedert die aanvanklike besmetting geoes is. Hierdie projek het in 2008 geëindig met die laaste aanplanting van aartappels wat in 2007 gedoen is. Die scenario het die geleentheid gebied om die oorlewing van *R. solanacearum* te ondersoek oor 'n langer termyn as wat voorheen moontlik was.

Die verloop van die ondersoek

Plaaslik is die bestuur en oorlewing van RSC in die veld onder vier verskillende kultuurpraktyke tydens aartappelproduksie deur navorsers op die proefplaas van die Universiteit van Pretoria van 1994 tot 2007 (Stander, 2001) ondersoek. Die proefperseel is onderverdeel en met vier verskillende verbouingspraktyke behandel naamlik aartappelmonokultuur, mieliemonokultuur, onkruid en braak, soos aangedui in *Figuur 1*.

Die onderskeie herhalings en gewasse is met sinkplate in die grond geskei tot 'n diepte van meer as 60 cm. Hierdie uitleg is net so behou en is sedert 2007 braak gelaat. Die perseel is besoek om beplanning te fasiliteer. 'n Grondmonster is geneem vir grondontledings om die standaard bemestingstrategie te finaliseer. Monsters is van onkruide geneem om die teenwoordigheid van *R. solanacearum* te bepaal. Die grond is voorberei vir die plant van die gesertifiseerde moere.

In seisoen een is G1-moere geplant, terwyl G2- en G3-moere in onderskeidelik seisoen twee en drie geplant is. Besproeiing is vir al drie aanplantings geskeduleer vir twee ure, drie dae per week. Die aanplantings is nat gehou om enige patogeenteenwoordigheid te ondersteun ten einde die kanse vir opsporing te optimaliseer.

Aanplantings is deurlopend deur die medewerkers gemonitor sodat enige siektesimptome en afwykings voortydig geïdentifiseer, aangespreek en getoets kon word, sou dit verdag wees vir die teenwoordigheid van *R. solanacearum*. Na loofafsterwing is die aanplanting bemonster deur 110 knolle per blok te neem (een knol per plant, elke 3 m). Die knolle per blok is apart getoets deur uitplating op semi-selektiewe media by Plantovita, ná 'n inkubasietydperk van 14 dae by 30°C.

Oorlewing van *R. solanacearum*

Die onkruidmonsters wat by die perseel geneem is het negatief

Die letsels wat deur miere gelaat is, kom duidelik met die verwelkte halms ooreen.

getoets vir die teenwoordigheid van *R. solanacearum* en per implikasie vir die ander spesies in die groep. Die aanplantings was tydens besoeke gesond en slegs in die derde seisoen is simptome van vroeë roes toenemend waargeneem.

'n Interessante waarneming is gemaak toe eensydige verwelking van plante in die eerste plantseisoen, by 'n aantal plante raakgesien is. By nadere ondersoek is gesien dat miere aan die plante vreet – tot so 'n mate dat die plante verwelk. Die letsels wat deur die miere gelaat is, het duidelik met die verwelkte halms ooreengekom.

Geen *R. solanacearum* of enige ander spesies wat deel is van hierdie genus, is gedurende die verloop van hierdie projek geïsoleer nie. Nie net die statistiese knolmonsters is getoets nie, maar ook verdagte plante, onkruid en knolle met enige vreemde simptome.

Weersomstandighede

Die afgelope 15 jaar ná die vorige aartappelaanplanting, waartydens die perseel braak gelê het, het 'n verskeidenheid seisoene voorgekom. Dit sluit in uiterste hitte gedurende die somer van 2016 toe die hoogste temperatuur (42.7°C) in Pretoria aangeteken is. Die seisoen was gekenmerk deur droogte en hitte. Gedurende die somer van 2006 was die hoogste aangetekende reënval vir Pretoria, 300 mm in Januarie 2006. Net so was die mees onlangse twee jaar se reënval hoog.

Die perseel en die tipe organismes wat daar voorgekom het, was dus blootgestel aan uiterste hitte, maar ook tye van genoegsame reënval en vog. Laasgenoemde ondersteun enige populasie van die bakterieë, terwyl die aanname is dat bakteriese getalle sou daal in tye van rekord temperature en droogte. Hierdie seisoenale tendense is in baie produksiegebiede nie abnormaal nie en verteenwoordig dus 'n tipiese tydperk in die heersende klimaat.

Alhoewel die plant van aartappels vir drie agtereenvolgende seisoene nie die norm behoort te wees nie, word verwag dat dit bakteriese populasiegroei sal ondersteun en opspoorbaarheid sal vergemaklik. Tog is geen isolasies gemaak nie.

Gevolgtrekking

Na aanleiding van hierdie ondersoek, is tot die gevolgtrekking gekom dat daar steeds nie 'n plafon vir die oorlewing van *Ralstonia* is nie en kan daar dus steeds nie met sekerheid gesê word hoe lank hierdie patogeen wel in die grond kan oorleef nie.

Wat wel duidelik is, is dat die agt-jaar verbod op aartappelverbouing ná die voorkoms van *Ralstonia*, realisties is en dat dit onder geen omstandighede verkort mag word nie. Sou ander klimaatsomstandighede heers en dit voordelig wees vir die patogeen, is dit nie onmoontlik dat die oorlewing wel langer as nege jaar mag wees nie.

Vir meer inligting en verwysings, kontak Anel Espach by 012 819 8106, 082 313 1885 of anel@plantovita.co.za.

Faktore wat aartappelmotinfestasies beïnvloed

Deur Diedrich Visser, LNR Groente-, Industriële en Medisinale Plante (ARC-VIMP)

Gedurende die somer van 2022/23 het die aartappelmot (*Phthorimaea operculella*) hewige infestasies in sommige aartappelverbouingsareas veroorsaak, veral in die noordelike en noord-oostelike gebiede. In sommige gevalle is larwes van *Tuta absoluta* in groot getalle in aartappellande opgemerk. Beide die aartappelmot en *Tuta* se larwes is myners – aartappelmot tonnel of myn in die lower en in knolle in die grond en store, terwyl *Tuta* slegs die lower aanval.

Die aartappelmot is een van die belangrikste insekplae vir die aartappelbedryf, en val ook tamaties aan. *Tuta* is wêreldwyd dié belangrikste plaag op tamaties, en val ook aartappels aan. Elkeen van hierdie twee plae het dus 'n voorkeurgewas waarop hulle die vinnigste aanteel – aartappelmot verkies aartappels en *Tuta* verkies tamaties. Die faktore wat betrokke is by die groot getalle *Tuta* in aartappellande, is nog onbekend.

Eksterne faktore

Die skadelikheid van die aartappelmot word in die meeste gevalle bepaal deur eksterne faktore. Hierdie faktore, wat soms tussen jare en selfs tussen verskillende gebiede wissel, is gewoonlik die hoofrede hoekom die mot se skadepotensiaal so onvoorspelbaar is. Dieselfde gebied (of plaas) kan opeenvolgende jare van ernstige en minder ernstige oesverliese ondervind.

Dit is dus belangrik om kennis te neem van moontlike faktore wat op spesifieke plase en/of gebiede 'n rol kan speel en die skadepotensiaal van die aartappelmot kan beïnvloed.

Van hierdie faktore sluit in:

- Weerstand teen insekdoders.
- Weersomstandighede.
- Bronne van infestasie.
- Die geneigdheid van gronde om te kraak.
- Verbouingspraktyke wat gebruik kan word om al genoemde faktore te beïnvloed.

Weerstand teen insekdoders

Die opbou van weerstand teen insekdoders is 'n algemene verskynsel by vele plae op verskeie gewasse. Weerstand is egter nie altyd die rede vir swakker beheer nie. Soms speel weerstand glad nie 'n rol nie en soms is die gebruik van verkeerde middels/bymiddels of verkeerde/swak toedieningspraktyke eerder die rede vir verlaagde effektiwiteit van middels.

> Elkeen van hierdie twee plae het dus 'n voorkeurgewas waarop hulle die vinnigste aanteel – aartappelmot verkies aartappels en *Tuta* verkies tamaties.

Die enigste manier om weerstand te bewys is om motpopulasies in spesifieke gebiede te versamel en dit met 'n bekende, vatbare populasie in 'n laboratorium met erkende metodes te vergelyk. Indien 'n hoë graad van weerstand gevind word met 'n spesifieke geregistreerde middel op 'n spesifieke plaas, moet daardie middel op daardie plaas tydelik vervang word met 'n ander middel in 'n ander weerstandsgroep.

Omdat produsente in 'n spesifieke omgewing (of produksiegebied) nie altyd dieselfde middels teen dieselfde dosis of tempo gebruik nie, mag verskille in weerstand tussen plase voorkom. Dit is dus raadsaam om versigtig gevolgtrekkings te maak rakende weerstand teen 'n spesifieke middel wat al die produsente in 'n produksiegebied mag raak.

Bronne van infestasie

Dit is bekend dat warm en droë weersomstandighede die aartappelmot bevoordeel. Onder sulke omstandighede teel die mot vinniger as gewoonlik aan en sal motte in hoër getalle in landerye voorkom. Lang tydperke met warm en droë toestande, soos tydens droogtes, het al in die verlede gepaardgegaan met abnormale hoë motinfestasies. In sulke tye moet produsente voorbereid wees en alle verbouingspraktyke wat motgetalle kan verminder, opskerp.

Bronne van infestasie kan moontlik die belangrikste rede wees vir onverklaarbare hoë infestasies, veral vroeg in die seisoen. Gedurende grondvoorbereiding is daar geen motte in landerye teenwoordig nie. Indien die produsent korrekte wisselbou toepas, sorg dat daar geen opslag of onkruide (in die aartappelfamilie) op bewerkte gronde voorkom nie, en

Aartappelmotlarwes maak blaarmyne in lower, maar myn ook in knolle onder die grond.

geregistreerde saad met min of geen motbesmettings plant, dan moet die motte wat hewige infestasies veroorsaak, van buite af invlieg.

Die eerste motgenerasie wat op die nuwe land voorkom se getalle sal só laag wees, dat hulle nie opgemerk word nie. Die daaropvolgende generasies sal egter oorvleuel (motte, eiers, larwes en papies sal gelyktydig voorkom) en eksponensieel toeneem totdat 'n piek bereik word voor of tydens loofafsterwing. Dit is dan wanneer infestasie van knolle onder die grond toeneem.

Krakies as toegangskanale na knolle

Die infestasie van knolle onder die grond kan slegs plaasvind as daar krakies in die grond voorkom. Motlarwes tonnel nie self deur die grond nie en tonnel nie binne halms af na knolle onder die grond nie. Die eerste instarlarwes van die aartappelmot is die infesterende stadium en omdat hulle geweldig klein is (< 0.2 mm in deursnee), kan hulle met mikroskopiese krakies afbeweeg na knolle onder die grond. Hierdie krakies, wat nie met die blote oog sigbaar is nie, word gevorm deur gronde wat uitdroog ná besproeiing of reën, en deur voortdurende knolset gedurende die tweede helfte van die seisoen.

Die krakies wat deur knolset veroorsaak word, lei gewoonlik direk na die knolle. Afhangend van die tipe grond, sal krakies dus omtrent altyd teenwoordig wees wanneer die knolle op hul vatbaarste is vir infestasies. Hoe vlakker die knolle onder die grond gedra word, hoe makliker sal infestasies deur die motlarwes plaasvind.

Knolinfestasies tydens loofafsterwing dra by tot hewige oesverliese.

Voordelige verbouingpraktyke

Indien vermoed word dat die aartappelmot weerstand teen spesifieke insekdoders toon, kan daardie middel/s uit 'n spuitprogram onttrek word. Die beginsels van die Insecticide Resistance Action Committee (IRAC) (*irac-online.org*) moet deurentyd gebruik word om weerstand by middels te beperk. Daar moet egter op gelet word dat swak beheer nie noodwendig 'n aanduiding is dat weerstand by die mot voorkom nie. Ander faktore, soos bespreek, moet ondersoek word.

Die bronne van die eerste motte van die seisoen vir 'n spesifieke plaas of gebied, moet vasgestel en uitgeskakel word. Potensiële bronne van infestasie wat ondersoek moet word sluit in opslag en uitskotknolle wat in vorige geoeste lande en afvalhope waar aartappels gestort word, agterbly. Feromoonvalle kan gebruik word om te bepaal waar motte wat nuwe lande kan besmet, voorkom.

Indien daar 'n keuse is, moet nuwe lande so ver as moontlik vanaf 'n vorige geoeste land geplant word. Opslag kan beheer word, maar uitskot en/of klein knolle wat op die grond of net onder die grond voorkom, is soms moeilik om op te spoor. Enige afvalhope moet binne nege dae na storting met 'n grondlaag van ten minste 50 cm bedek word, om te verhoed dat volgroeide larwes tot op die grondoppervlak ontsnap en papies maak.

Pogings moet aangewend word om te verhoed dat aartappelmotlarwes die aartappelknolle onder die grond bereik. Eerstens moet die getalle van die infektiewe, eerste instarlarwes gedurende die knolsettydperk tot met loofafsterwing, laag gehou word met doeltreffende spuitprogramme.

Tweedens moet krakies in grond verminder word deur korrekte operdtegnieke. Laasgenoemde sal voorkom dat knolle te vlak gedra word en ook walle herstel na swaar reënbuie en verspoelings. Enige ander aksies wat die produsent in lande neem om krakies te verminder of te seël, selfs na loofafsterwing, sal toegang van larwes tot knolle beperk.

Derdens moet produsente, indien dit moontlik is, nie knolle vir lang tye in die grond los voor oes nie. Motte wat na loofafsterwing in lande teenwoordig is, sal hul eiers op die grond en op blaarreste lê. Hoe langer gewag word voor oes, hoe meer tyd sal larwes wat uit hierdie eiers broei hê om die knolle te bereik en te infesteer.

Ten slotte

Insekdoders is meestal doeltreffend onder normale pesdruk. Sodra getalle die hoogte in skiet, of as beheer oënskynlik as gevolg van faktore soos elders bespreek nie meer werk nie, moet verbouingspraktyke ondersoek word.

Motte kan nie lande infesteer as daar nie 'n bron van infestasie is nie. Knolle onder die grond kan nie geïnfesteer word as die larwes nie die knolle kan bereik nie. As al die bogenoemde faktore ondersoek was en die verbouingspraktyke in orde blyk te wees, kan weerstand by die mot teen insekdoders vermoed word.

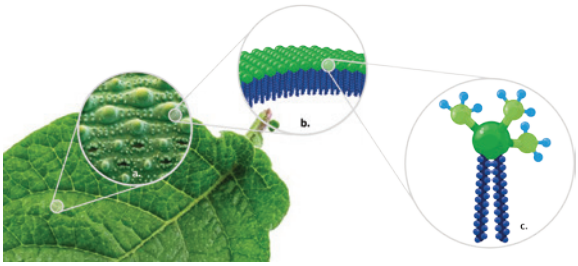
Vir inligting, kontak dr Diedrich Visser by dvisser@arc.agric.za.

GEVORDERDE GROEN CHEMIES BEHEER VAN VROË- EN LAAT-ROES OP AARTAPPELS

Agri-Cure SP™ Fungicide

GESKRYF DEUR
CLOETE ROSSOUW & JONATHAN ETHERINGTON

Vroë-roes (*Alternaria solani*) en Laat-roes (*Phytophora infestans*) op aartappels is een van die grootste uitdagings wat ons produsente in die gesig staar as dit by die verbouing van kwaliteit aartappels kom. Wêreldwyd is vroë- en laat-roes die mees prominentste probleem wat talle aartappel boere in die gesig staar. Om hierdie geharde siektes hok te slaan, word verskeie swamdoders om die beurt gebruik. Dit het nie altyd die gewenste siekte-beheer nie en laat ook soms residue agter. Hiervoor het ons by MBFi groen chemie tegnologie ontwikkel om hierdie siektes suksesvol te bekamp. Hierdie groen chemie tegnologieë is in die vorm van Agri-Cure SP.



Agri-Cure SP is 'n hoogs effektiewe kontak swambeheermiddel met beide swamdodende- en swamweerende-eienskappe. Agri-Cure SP lewer ook goeie genesingseienskappe wat gevestigde infeksies sal veroorsaak. Groen chemie is die beste antwoord op die wêreldwye regulering van plaagbeheeroorskot in die voedsel sektor. Hierdie groen chemie is effektief om geteikende siektes te beheer en goeie nawerkingstye te gee sonder oorskot. Agri-Cure SP is 'n AAAV-aktief (Algemeen Aanvaar as Veilig) wat beteken dat Agri-Cure SP 'n 0-dag weerhoudingsinterval het. Die halfleeftyd van Agri-Cure SP op die plant hang af van verskeie omgewingstoestande, maar die aktiewe bestanddeel het byna 25 dae se aktiwiteit op die gewas.

Agri-Cure SP is 'n kombinasie van metaalbikarbonaat, bevogtigingsmiddels en deurnattingsmiddels. Die aktiewe bestanddeel, kaliumbikarbonaat, is aan die einde van 2021 deur die Departement van Landbou, Grondhervorming en Landelike Ontwikkeling vir gebruik as 'n swamdoder onder Wet 36 van 1946 geregistreer op aartappels.

HOE WERK AGRI-CURE SP?

Met Agri-Cure SP het ons kontak en genesende swamdoder eienskappe as gevolg van sy veelvuldige werkingswyses. Die swamdodende en swamweerende werking is as gevolg van vyf afsonderlike werkswyses:

1. HIPERTONIESE DEHIDRASIE

Hipertoniese dehidrasie werk om die patogeen en spore te laat afsterf (swamdodend). Alle selle verkies om in 'n toestand van ewewig met hul omgewing te wees, waar die osmotiese druk in die sel gelyk is aan dié van hul omgewing (isotoniese toestand). In hierdie toestand is daar geen beweging van water in of uit die sel nie. Agri-Cure SP skep 'n hoë osmotiese druk op die blaaroppervlak in die omgewing van die sel wat lei tot die beweging van water uit die patogeen en spore wat sel-dehidrasie tot gevolg het. Deur die sel te dehidreer is daar geen lewenskragtigheid meer in die sel oor nie.

2. OSMOTIESE GRADIËNTVERSTEURING

Onder gunstige omgewingstoestande ontkiem swamspore. Tydens hierdie proses absorbeer die spoor water deur sy selwand om groei te bewerkstellig. Die selwand groei aanvanklik as 'n sferiese struktuur en vanaf die selwand van die spoor bult 'n kiembuis uit. By die groeipunt strek die selwand voortdurend om 'n lang hipale-buis te produseer. Die sitoplasma binne in die apikale-sone is gevul met talle organelle. Vir hierdie wandvesikels om die selwand te bereik is sitoplasmiese beweging van kritieke belang. Sitoplasmiese beweging is afhanklik van 'n osmotiese-potensiaalgradiënt binne in die hifes.

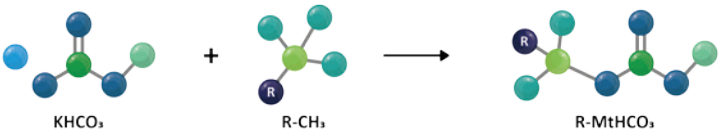
Na Agri-Cure SP se toediening is die osmotiesedruk aan die buitekant van die hifes groter as die osmotiesegradiënt wat in die hifes is. Dit lei tot die versteuring van die hipale groei en spoorontkieming (swamweerend).

3. DIE EFFEK VAN AGRI-CURE OP PH

Die interne en eksterne pH-vlakke beïnvloed verskeie belangrike strukture en funksies van swamme. Streng beheer van sitosoliese- en organel-pH is van kritieke belang vir lewensvatbaarheid van selle. Swampatogene verkies meestal 'n suur omgewing, want by hoë pH-vlakke word proteïne en ensieme afgebreek. Lipiede (vette, olies en hormone) word ook gehidroliseer sowel as DNS-bindings word gedissosieer. Agri-Cure SP verskuif die pH-balans na 8.4 wat die metaboliese veranderinge in 'n swampatogeen veroorsaak en groei staak (swamweerend).

4. METIELKARBONAAT-FILM

Sodra Agri-Cure SP in kontak kom met die oppervlakte van 'n betrokke plantgewas, sal die produk met die gewasoppervlakte begin reageer soos 'n blaarvoeding. Die reaksie vind plaas tussen die kaliumbikarbonaat in AgriCure SP en die ontblote metielgroepe van die waslaag op die lug-/blaarintervlak van die plant. Die reaksie lyk soos volg:

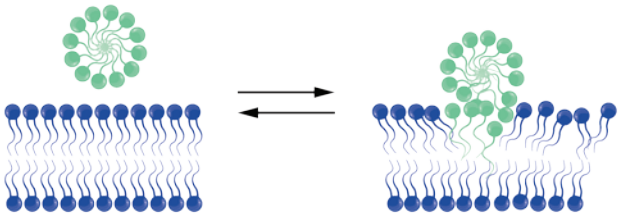


Figuur 1: Die reaksie tussen kaliumbikarbonaat en die waslaagmetielgroep om metielbikarbonaat te vorm.

Deur die reaksie word die metielgroep gekarboniseer en die bikarbonaat-ioon word in die hidrofobiese waslaag geïntegreer. Nie net het dit 'n voordeel vir reënvastheid nie, maar verduidelik ook die aanhoudende werking van Agri-Cure SP tot en met 25 dae na toediening. Die reaksie neem 12 ure om te voltooi. Die geïntegreerde bikarbonaat-ioon veroorsaak dan dat die plantoppervlak se polariteit meer negatief word wat dan 'n natuurlike swamafweereienskap tot gevolg het aangesien meeste swamspore ook negetief gelaai is.

5. DIE ANTIMIKROBIESE BYMIDDELS VAN AGRI-CURE SP

Die byvoegmiddels wat bevogtiging en deurnatting bewerkstellig het ook die vermoë om mikrobes op die plantoppervlak te onderdruk. Die byvoegmiddels bestaan uit oppervlak-aktiewechemikalieë (surfactant) wat deur die selmembraan van mikrobes kan penetreer en sodoende die selwand laat lek.

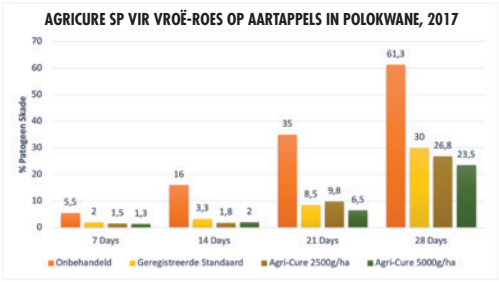


Figuur 2: Die penetrasie van Agri-Cure SP se oppervlak-aktiewes deur die selmembraan.

VELDPROEF DATA VAN AGRI-CURE SP

Vroë-roes:

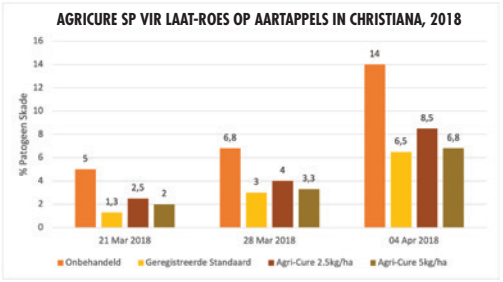
In ons veldproewe die afgelope paar seisoene in Polokwane en Christiana het ons Agri-Cure SP op die proef gestel teen die vernaamste opposisie dithiokarbamate, dithiokarbamate en kaliumfosfiet kombinasie sowel as Mancozeb. Hierdie proewe teen hewige kompeterende chemikalieë het vir ons gewys dat ons groen chemie tegnologie in Agri-Cure SP kop en skouers bo die res in die industrie uitstaan. Die volgende proef resultate skets die resultate teen vroë-roes:



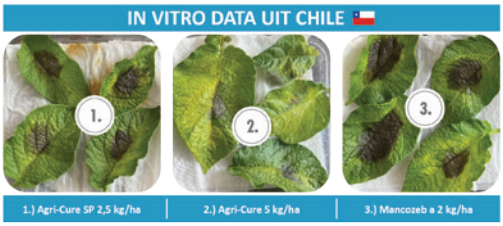
Grafiek 1: Beheer van vroë-roes op aartappels deur Agri-Cure SP

Laat-roes:

Vanuit die data kan daar gesien word dat oor 'n tydperk van 21 dae Agri-Cure SP werking bied en beter skade beheer toepas teenoor die industrie standaard. Die maksimum werking word gesien met 5.0 kg/ha na 28 dae waar Agri-Cure SP die patogeen skade met tot 75% verminder. Die volgende resultate was behaal teen laat-roes:



Grafiek 2: Beheer van laat-roes op aartappels deur Agri-Cure SP



In Figuur 1 kan die visuele effekte gesien word waar 1. Agri-Cure SP teen 2.5 kg, 2. Agri-Cure SP teen 5.0kg/ha en 3. Mancozeb teen 2 kg/ha aangewend teen Laat-roes (Phytophora infestans) op geïnokuleerde aartappelblare.

In Figuur 2 word die invloed van Agri-Cure SP as vervanger van kontak standaard aktiewes wat tans in die veld gebruik word in die spuitprogram uitgebeeld: 1. Standaard 1, 2. Standaard 2, 3. Agri-Cure SP.

Die bogenoemde data toon duidelik aan dat die groen chemie alternatief wat MBFi bied kan kers vashou met die harde chemie wat die industrie tans gebruik. Hierdie resultate wys die uitstekende sinergistiese werking tussen die uitklop- en kontak-aksie van die Agri-Cure SP. Die hipertoniese dehidrasie en Metielkarbonaat-film vorming van die Agri-Cure SP verseker dat enige infeksie van vroë- en laatroes onmiddellik in die kiem gesmoor word. Goeie sinergistiese werking tussen innoverende groen tegnologie verseker optimaale prestasie en vir ons boere die beste patogeenbeheer.

Agri-Cure SP - Ai: 850 g/Kg Potassium Bicarbonate - Reg No: L 8549 Act 36 of 1947 – Registered and trademarked of N Laboratories (PTY) LTD – Marketed and distributed by MBFi (PTY) LTD

Increase elemental nutrient uptake and efficiency with Cosmocel

By Wilhelm Schultz, technical co-ordinator, Cosmocel SA

The collective global understanding of plant nutrition has changed significantly in the past decade. This can be attributed to ground-breaking new research indicating that the nutritional requirements of plants can be almost completely fulfilled through healthy soil and, most importantly, the interactions between the plant, soil and the microbiome. The latter refers to the bacteria and fungi living in symbiosis within the plant as well as the rhizosphere.

Boost resistance and soil health

The overindulgent use of chemical fertilisers desensitises the activity and reactivity of the plant as well as the microbiome. Much like the human microbiome, the plants' interactions with natural living organisms dictate key reactions and effects on overall health. By enhancing the natural functions of plants, producers can increase natural resistance to diseases and pests and improve soil health, all while reducing financial and labour inputs.

Cosmocel's strategy for potato production aims to increase carbon nutrition while supplying the plant with accessible nutrients and energy. Increased carbon nutrition initiates the plant's resistance to stress and amplifies energy levels.

When supplying highly active carbon factions to the plant and soil environment, bacterial activity is elevated. This stimulates the release and uptake of elements and metabolites from the bacteria to the plant.

Invest in higher-yielding crops

Cosmocel's flagship products, H-85® and Biocel®, increase the plant- and soil-available carbon with specific carbon metabolites and plant phytohormones. Mainstay Ca®, Mainstay Mg® and Cosmoroot® use unique technology to increase the uptake and efficiency of elemental nutrients, even in limiting conditions.

Complementing elemental nutrients with organic compounds, these products increase the uptake, movement, assimilation and metabolism within the plant, resulting in higher-yielding crops with improved quality.

To find out more, contact Wilhelm Schultz of Cosmocel SA at 061 902 0139 or wschultz@cosmocel.co.za.

POTATO

SOIL APPLIED (Pivot or high volume boom spray)

Weeks after emergence	PLANTING	1	3	5	7	9	11	13	TOTAL KG/L PER HA
BIOCEL	1 L/Ha								1 L/Ha
COSMOROOT	4 Kg/Ha								4 Kg/Ha
BARRIKAT	2 L/Ha								2 L/Ha
H-85		1 Kg/Ha	1 Kg/Ha	1 Kg/Ha	1 Kg/Ha	1 Kg/Ha	1 Kg/Ha	1 Kg/Ha	7 Kg/Ha
MAINSTAY CALCIO		4 L/Ha	4 L/Ha	4 L/Ha	4 L/Ha	4 L/Ha	4 L/Ha	4 L/Ha	28 L/Ha
MAINSTAY MAGNESIO		2 L/Ha	2 L/Ha	2 L/Ha	2 L/Ha	2 L/Ha	2 L/Ha	2 L/Ha	14 L/Ha

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NUTRITIONAL PROGRAM

BENEFITS:

1. **Increase yield potential** by increasing stems and tubers
2. Promotes root **development and strong** growth
3. Depending on soil conditions and season, this program can supply the **majority of the plants Ca and Mg** requirements
4. Increases **soil health** and **stimulates microbial activity** and soil aggregation
5. **Increases quality and shelf life** of potatoes

For more information regarding this program, please visit out website **www.cosmocel.co.za** and get in touch with one of our representatives

The unlimited potential of waste potatoes: *We want your opinion*

By Dr Carmen Muller and Dirk Uys

Potatoes South Africa promotes excellence in research to ensure optimal production and usage of the exceptional product that we work with. To ensure that research outcomes are achieved over the various focus areas, external funding opportunities are often sought.

Potatoes South Africa, along with researchers at the University of Pretoria, were successful in obtaining research funding from the Department of Science and Innovation implemented by The Technology Innovation Agencies (TIA), Agricultural Bio-Innovation Partnership Programme (ABIPP). The project entitled 'Feasibility study of a new value chain for lower grade potatoes in the agro-processing industry' will focus on finding alternative uses for potatoes that do not meet minimum size, grade, or quality standards for the fresh produce market, or potatoes disposed of because of low market value due to overproduction, they are considered waste or 'cull' potatoes.

Initial phases

This novel project will follow a three-phased approach starting off with an in-depth market research study that will be conducted by the Bureau of Food and Agricultural Policy (BFAP). During this economic feasibility study the tonnage and monetary value, as well as nature of potatoes that are classified as losses and waste at various levels throughout the potato production chain, will be quantified.

This will entail detailed questionnaires conducted from farm to industry level to determine:

- How the industry role-player defines or views losses/waste.
- Points of loss/waste.
- Amount of loss/waste.
- Regional loss/waste.
- Seasonal loss/waste.
- Reasons for loss/waste.
- Current loss/waste uptake practices.
- Most common cultivars and sizes wasted.

Data obtained from this study can be used to determine the feasibility of secondary production systems at various points in the value chain, and to provide insight into the types of secondary industry that will provide maximum returns.

Product development phase

The feasibility study will be followed by an innovative product development project. The aim will be to create a new value chain for potatoes that are rejected for aesthetic reasons but still hold nutritional and economic value for human consumption. The developed products will comply with current market trends and will attempt to fill gaps in the emerging consumer market.

The main segments for development will be:

- Healthy snacking foods.
- Potatoes as a breakfast food.
- Potatoes as part of a ready-made frozen meal along with a protein component.

Creating a secondary market

The final portion of the project involves groundbreaking work to create a secondary market for potatoes that are not suitable for human consumption, but still hold nutritional and economic value. These tubers, although aesthetically unattractive, have the promising potential to be used as a substrate (feed) for high protein insects including black saw flies, crickets, and meal worms that in turn feed the poultry industry.

The project is proving to be highly relevant in the potato market and is on a trajectory to deliver valuable information and create secondary markets for the South African potato market.

We invite all role-players in the potato industry to partake in this research study and provide your valuable input with regards to waste potatoes. Please be on the lookout for the BFAP team who will be disseminating the questionnaire towards the middle of the year. If you would like to form part of the research project or receive more information please contact Dirk Uys at dirk@potatoes.co.za or Carmen Muller at carmen.muller@up.ac.za.

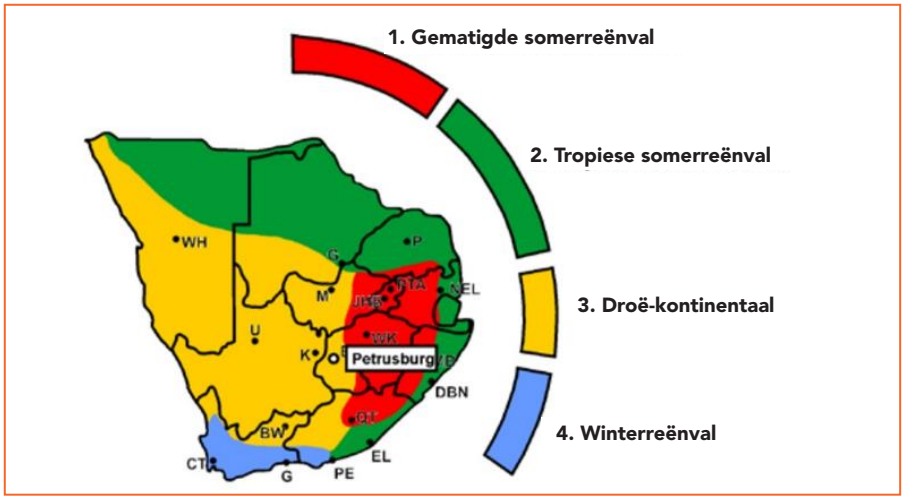
Suidwes-Vrystaat kultivarproef onder besproeiing op Petrusburg in 2022

Deur Enrike Verster en Anjé Erasmus, Aartappels SA, en Johan Odendal (produsent)

Die Suidwes-Vrystaat aartappelproduksiestreek produseer ongeveer 3% van die land se kommersiële aartappels op 1 473 ha. Die mees prominente kultivars wat vir kommersiële verbruik geproduseer word (tafel en verwerking) in die streek, se hoofoes is Sifra (80%), Innovator (9%) en Mondial (5%).

Petrusburg val in Suid-Afrika se droë kontinentale gebied (*Figuur 1*) en die plaas waarop die proef geplant is, ontvang die afgelope 22 jaar 'n gemiddelde jaarlikse reënval van 554 mm. Hierdie streek ervaar baie warm somers en koue winters, met ryp wat vanaf Junie tot Augustus kan voorkom. In 2017 is ryp selfs tot in November aangeteken.

Figuur 1: Ligging van Petrusburg in die Suidwes-Vrystaat produksiegebied.



Die kultivarproef by Petrusburg is in 'n ewekansige ontwerp met drie herhalings per kultivar uitgelê. *Tabel 1* verskaf relevante tegniese inligting rakende die proef. Grondmonsters is voor plant geneem om die grondvoedingstatus van die proefperseel te bepaal (*Tabel 2*).

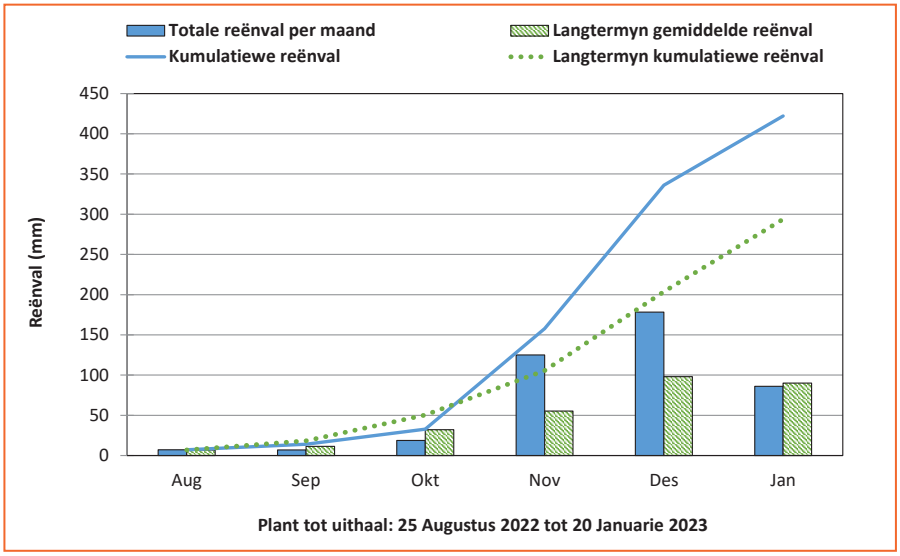
Kultivars met kort en lang groeitydperke is in die kultivarproef ingesluit en derhalwe kan groeiperiodes die uiteindelike opbrengs van sekere kultivars beïnvloed. Die lengte van groeiperiodes is onderhewig aan die aard van die seisoen, maar word gesien as die hoeveelheid tyd wat verloop vanaf opkoms tot natuurlike loofafsterwe.

Tabel 3 gee 'n uiteensetting van hoe hierdie groeiperiodes van kultivar tot kultivar verskil.

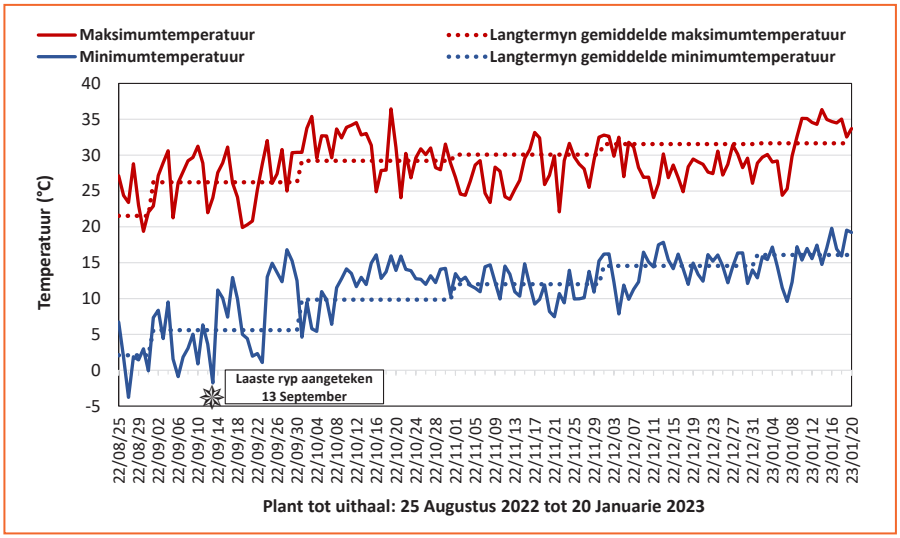
Tabel 1: Opsomming van tegniese inligting rakende proefperseel en uitleg.

Plaas	**Lushof Boerdery, Theronskop**		
Produsent	Johan Odendal		
Plantdatum	25 Augustus 2022		
Oesdatum	20 Januarie 2023		
Besproeiing/droëland	Besproeiing		
Dubbel- of enkelrye	Dubbelrye		
Loofafsterwe	Chemies		
Tussenry-spasiëring	0.75 m		
In-ry spasiëring	28 cm		
Plantestand	39 685 plante/ha		
Bemestingsprogram	**Voedingswaarde**		
	N (kg/ha)	P (kg/ha)	K (kg/ha)
Totaal	296	142	154

Figuur 2: Reënval gedurende die 2022/23-seisoenen langtermyn gemiddelde reënval.



Figuur 3: Minimum- en maksimumtemperature (°C) gedurende die 2022/23-seisoen asook langtermyn gemiddelde temperature.



Plantgereedheid van moere ten tyde van die plant van die proef, sowel as standpersentasie en halmtelling wat later in die groeiperiode waargeneem is, word in *Tabel 3* aangedui.

Klas en sorteer

Die evaluering van nuwe kultivars soos in die Petrusburg-kultivarproef, verskaf resultate rakende onder andere opbrengs- en bemarkingsindeks. Die bemarkingsindeks van die betrokke kultivars word bereken deur elke kultivar te klas en sorteer volgens gehalte en groottegroepe, byvoorbeeld klas 1 Groot of klas 2 Groot-medium.

In hierdie proef word al drie herhalings bymekaargegooi, gewas en deur die pakstoor geklas en sorteer. Dienooreenkomstige prysvergelykings word dan gemaak met markpryse soos verkry ten tye van oes. Die prestasie van nuwe kultivars kan nie net op die resultate van een bepaalde seisoen geskoei word nie, aangesien klimaat en moergehalte van een jaar na die volgende kan wissel. Juis daarom word die kultivars verkieslik oor 'n aantal seisoene getoets.

Temperatuur en water

Soos met enige gewas is temperatuur, beskikbaarheid van water (hetsy goeie besproeiingskedulering of reënval), sowel as hitte-eenhede belangrike faktore wat 'n wesenlike invloed uitoefen gedurende die aartappelplant se groeitydperk. Hierdie faktore word dus in aanmerking geneem wanneer die prestasie van kultivars geëvalueer word. Vir hierdie proef is toepaslike daaglikse data van die betrokke seisoen vanaf 'n Hortec-weerstasie verkry wat op die plaas waarop die proefperseel geleë is, geïnstalleer is.

Langtermyndata word egter steeds verkry vanaf 'n Landbounavorsingsraad (LNR)-stasie, omdat die Hortec-weerstasie op die proefperseel nog nie lank genoeg funksioneer om langtermyndata te genereer nie. Die betrokke LNR-weerstasie waarvan die langtermyndata verkry is, is 9 km vanaf die proefperseel geleë.

Die reënvaltendens vir die 2022/23-seisoen (*Figuur 2*) het, soos wat die seisoen verloop het,

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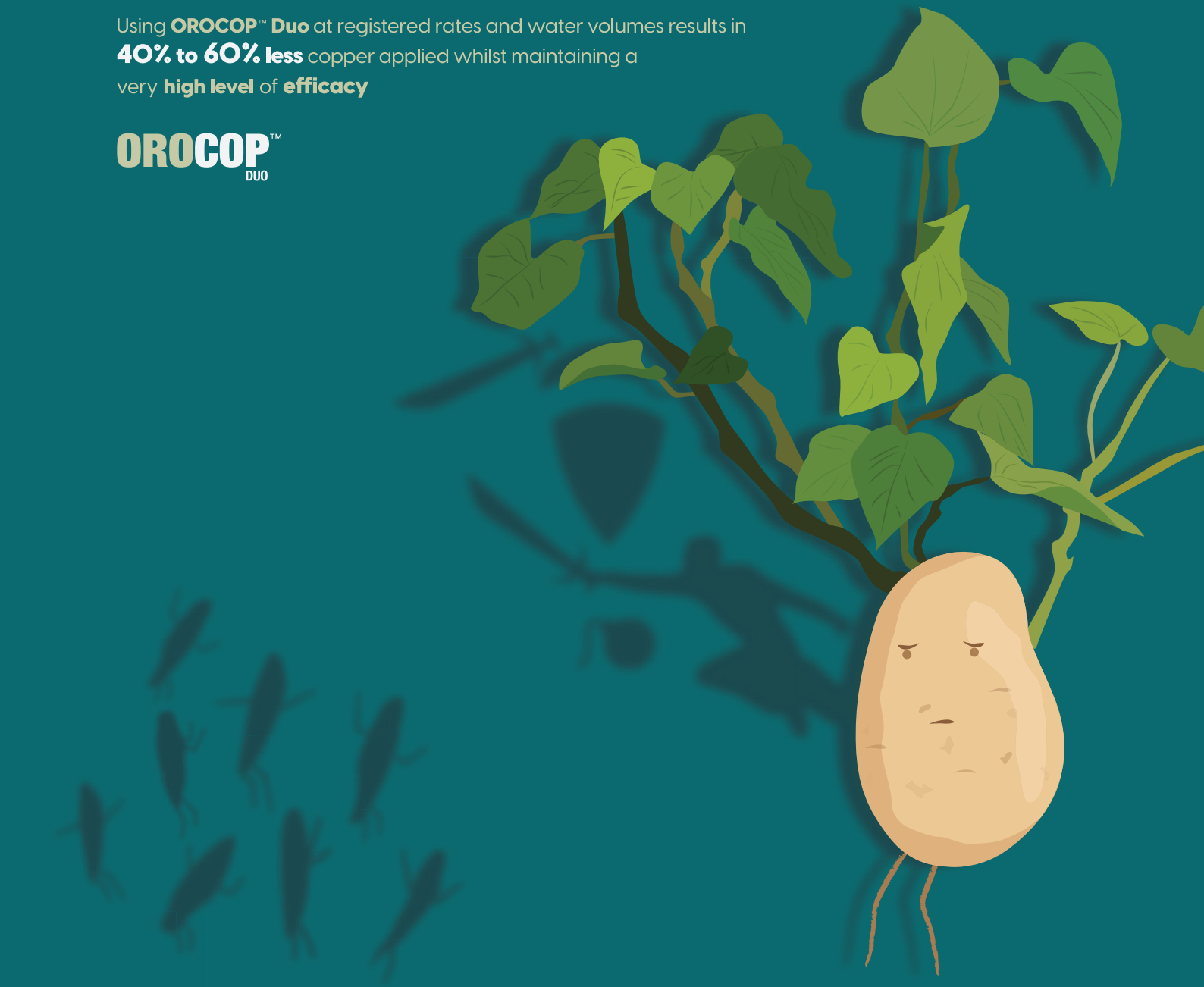

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Tabel 2: Grondvoedingstatus van proefperseel voor plant.

Brutodigtheid (kg.m^{-3})	pH (KCl)	P (P-Bray I)	K	Ca	Mg	Na	% of KUK[1] K	Ca	Mg	Na
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	%	%	%	%
1 304	4.6	12	158	222	68	6	19	53	27	1

[1]*KUK = katioon-uitruilkapasiteit*

Tabel 3: Karaktereienskappe rakende groeiperiode, plantgereedheid, stand (%) en halmtellings vir betrokke kultivars.

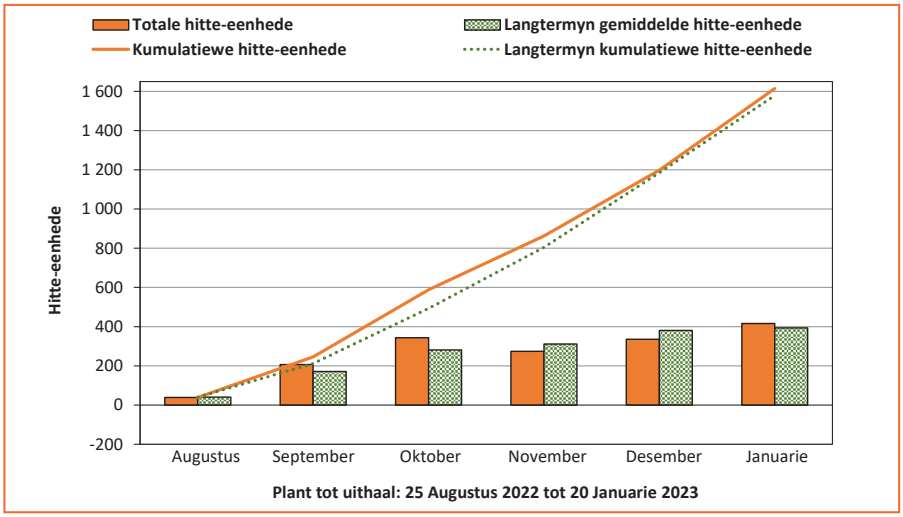
Kultivar	Groeitydperk (dae)[1]		Plant-gereedheid[2]	Stand[3] (%)	Halms per plant	Halms per ha
11Z49A1	Medium	(100)	1	100	2.3	91 276
11Z55A5	Medium	(100)	1	100	2.1	83 339
Belmonda	Medium	(100-110)	1	100	3.4	134 929
Connect	Lank	(120)	2	100	2.8	111 118
Foxy	Kort tot medium	(90-100)	2	86	4.5	95 562
Lanorma	Kort	(80-90)	1	100	2.8	111 118
Mondial	Medium tot lank	(110-115)	2	100	5.2	206 362
Noha	Medium	(100)	1	100	1.8	71 433
Noya	Kort	(80-90)	2	100	2.3	91 276
Panamera	Medium	(90-110)	3	100	3.8	150 803
Sababa	Medium tot lank	(110-115)	2	100	3.6	142 866
Sifra	Kort tot medium	(90-100)	2	100	4.7	186 520
Sound	Medium	(110)	1	100	6.3	250 015
Tyson	Kort tot medium	(90-100)	3	100	2.6	103 181

[1]*Algemene riglyne en kategorieë (dae vanaf opkoms tot natuurlike loofafsterwe, afhangend van die seisoen): Kort = 70-90 dae; Kort tot medium = 80-100 dae; Medium = 90-110 dae; Medium tot lank = 90-120; Lank = 90-140 dae.*
[2]*Plantgereedheid van moere: 1 = Vars; 2 = Effens vars; 3 = Plantgereed; 4 = Effens oud; 5 = Oud.*
[3]*Standpersentasie is bepaal deur te kyk na die herhaling van elke kultivar wat bestaan uit 36 plante per 10 m ry per plot.*

Tabel 4: Hoofredes vir afgradering tydens die 2022 Petrusburg-oes.

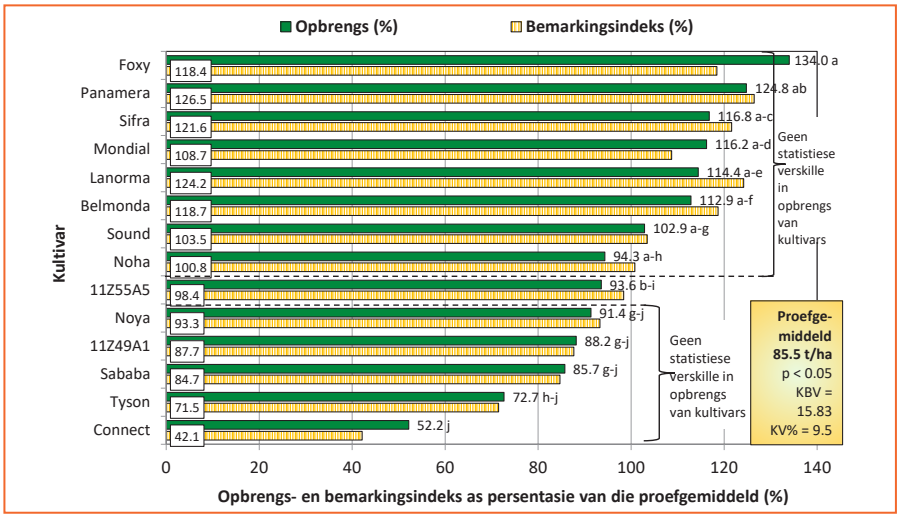
Kultivar	Los skil	Sandspleet	Antraknose	Mot	Misvorming	Vrot	Bruinskurf	Vergroening	Insek	Holhart	Bruinvlek
11Z49A1		x			x	x	x				
11Z55A5				x				x	x		
Belmonda											
Connect	x	x		x			x	x			
Foxy				x		x	x	x	x		
Lanorma	x			x	x					x	
Mondial		x		x	x			x			
Noha	x					x		x			
Noya	x			x		x		x			
Panamera				x				x			
Sababa					x	x		x	x		
Sifra	x			x		x					
Sound		x		x							
Tyson	x	x	x	x				x			x

Figuur 4: Hitte-eenhede 2022/23-seisoen asook langtermyn gemiddelde hitte-eenhede.



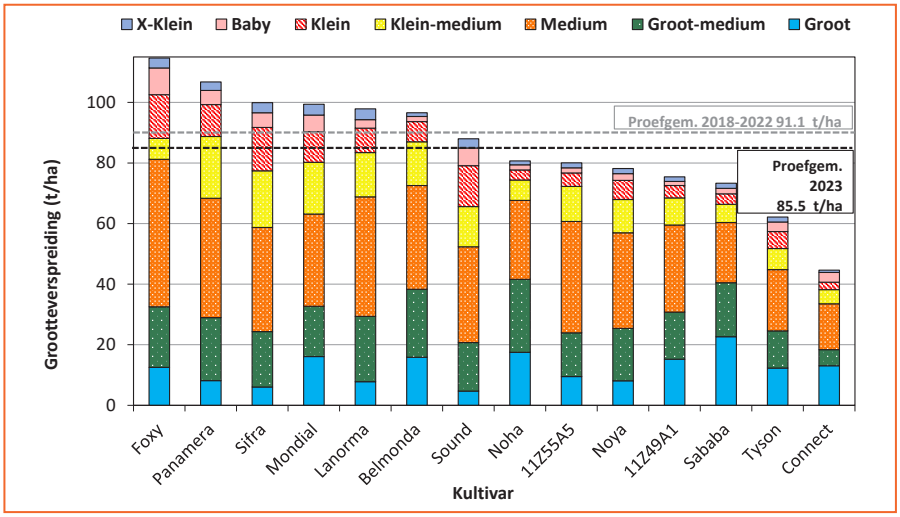
**Totale hitte-eenhede spesifiek bepaal vir aartappels (drumpeltemperatuur = 5°C) as gewas, bereken vanaf uurlikse data.*

Figuur 5: Totale opbrengs en bemarkingsindeks per kultivar as 'n persentasie van die proefgemiddeld.



**Waardes gevolg deur dieselfde letter is nie beduidend verskillend van mekaar nie.*

Figuur 6: Groottegroepverspreiding van elke betrokke kultivar.



kumulatief aansienlik meer reënval opgelewer as die langtermyn gemiddelde reënval. Veral in November is meer as dubbel die gemiddelde langtermyn reënval ervaar en Desember het ook uitermatig baie reënval ontvang.

Invloed van hitte-eenhede

Minimum- en maksimumtemperature word in *Figuur 3* uiteengesit. Die laaste sarsie ryp is op 13 September aangeteken, maar daar was geen melding van noemenswaardige rypskade aan die jong plante nie. Vir die hele groeiseisoen tot en met oesdag op 20 Januarie, is talle dae met temperature bo 30°C, maar slegs enkele dae in Oktober en Januarie naby oesdag met 'n maksimumtemperatuur van hoër as 35°C, aangeteken.

Die versameling van hitte-eenhede gedurende 'n groeitydperk is 'n belangrike faktor in die ontwikkeling van 'n plant. Die tendens van hitte-eenhede beskikbaar vir hierdie kultivarproef, was byna deurgaans laer as die tendens ten opsigte van die langtermyndata van hitte-eenhede (*Figuur 4*). Dit kan toegeskryf word aan die bogemiddelde reënval van die seisoen, wat baie bewolkte dae en dienooreenkomstig minder akkumulasie van hitte-eenhede meegebring het.

Die opbrengsindeks

Opbrengsdata wat tydens oesdag versamel is, word onderwerp aan statistiese verwerking met behulp van die GenStat®-program. Die Tukey-toets van kleinste betekenisvolle verskille (KBV) is gebruik om die gemiddelde te skei. Die kultivareffek gedurende hierdie betrokke proef (*Figuur 5*) was statisties beduidend ($p<0.05$) en die koëffisiënt van variasie was laag (9.5%). Hierdie faktore dui daarop dat die proef baie goed uitgevoer is en die resultate is derhalwe betroubaar.

Die opbrengs van elk van die kultivars word deur die proefgemiddeld gedeel (die proefgemiddeld van al die kultivars word as 100% geneem). Hierdeur word 'n opbrengsindeks geskep en word elke kultivar se prestasie in terme van opbrengs, as 'n

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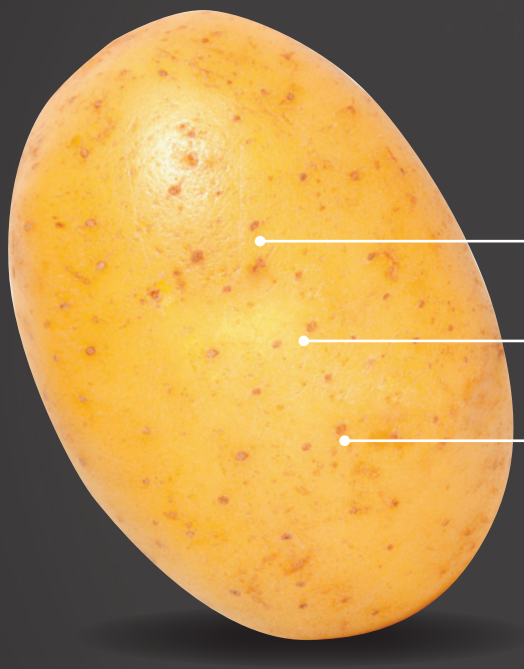

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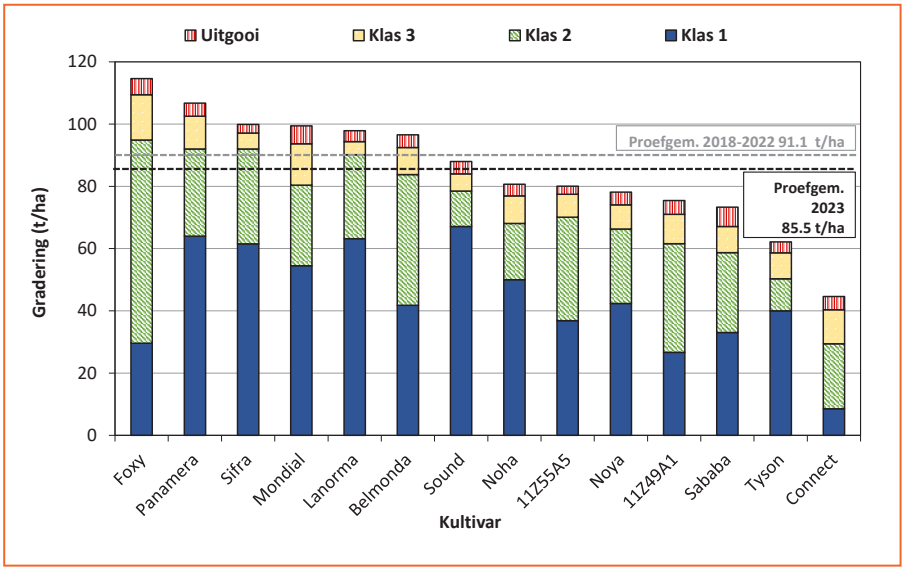
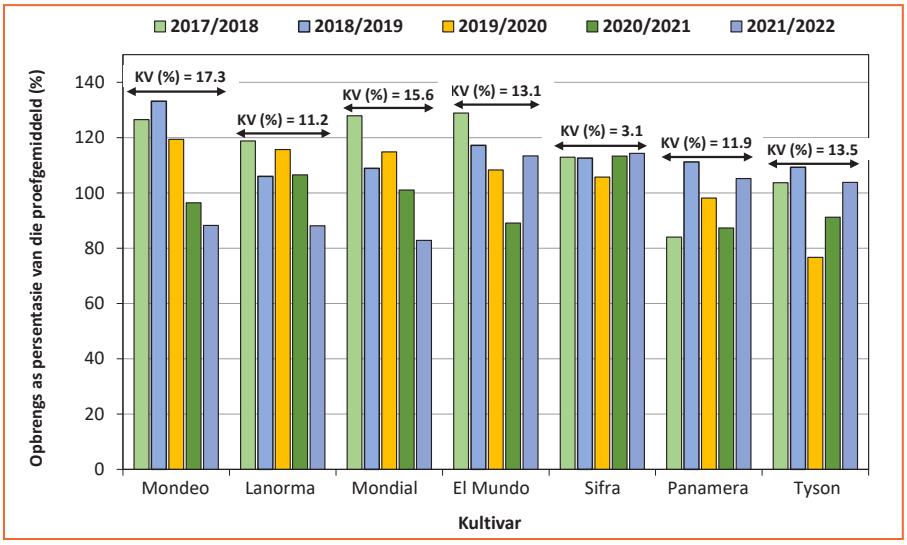
Figuur 7: Gradering van elke kultivar gedurende finale oes.



Figuur 8: Prestasie van kultivars wat vir vyf jaar in die proef ingesluit was (uitgedruk as % van proefgemiddeld).



Koëffisiënt van variasie (KV %) is ingesluit op die grafiek: 'n Waarde wat in essensie die mate van verskil in prestasie in die spesifieke kultivar oor die aantal jaar, voorstel. Hoe groter die KV %-waarde, hoe meer wissel die kultivar se prestasie oor die aantal jare aangedui op die grafiek.

persentasie van die proefgemiddeld gelees.

Proef-opbrengste

Die gemiddelde opbrengs van die proef vir die 2022/2023-seisoen is 85.5 t/ha, wat aansienlik laer is as die proefgemiddeld van die vorige drie kultivarproewe (100 t/ha) by Petrusburg (2019 tot 2022). Die vorige drie seisoene het ver meer bogemiddelde opbrengste gelewer as vorige jare.

Die afgelope seisoen se ondergemiddelde prestasie kan toegeskryf word aan verskeie faktore. Die uitermatige reënval tydens knolvorming en -vulling het die plante onder stremming geplaas. Die etlike dae van oortrokke weer het tot verminderde fotosintese gelei en die nat en bewolkte toestande het 'n ideale klimaat geskep vir roes, waaronder baie van die plante gely het.

Die kultivars Foxy, Panamera, Sifra, Mondial, Lanorma, Belmonda, Sound en Noha het almal statisties die hoogste opbrengs gelewer (*Figuur 5*). Panamera en Lanorma het die hoogste bemarkingsindeks behaal, wat toegeskryf kan word aan 'n hoër opbrengs van groot knolle sowel as goeie gehalte in die betrokke kultivars.

Aspekte by bemarkbaarheid

Groottegroepverspreiding en gradering is onontbeerlike evaluasies wanneer gekyk word na 'n kultivar se bemarkbaarheid (*Figure 6* en *7*). Redes vir afgradering word in ag geneem wanneer die aartappels geklas word (*Tabel 4*). Die grootste redes vir afgradering was motte en

Tabel 5: Prosesseringseienskappe van kultivars. (Uitgevoer deur LNR-Roodeplaat)

Kultivar	Skyfiekleur[1]	SG[2]	Droëmateriaal (%)[3]
11Z49A1	50	1.066	17.2
11Z55A5	59	1.063	16.6
Belmonda	53	1.077	25.5
Connect	51	1.072	18.6
Foxy	57	1.075	19.2
Lanorma	56	1.069	17.9
Mondial	55	1.071	18.3
Noha	55	1.072	18.6
Noya	49	1.075	19.2
Panamera	55	1.069	18.0
Sababa	54	1.065	17.0
Sifra	49	1.063	16.7
Sound	55	1.064	16.9
Tyson	58	1.065	17.1

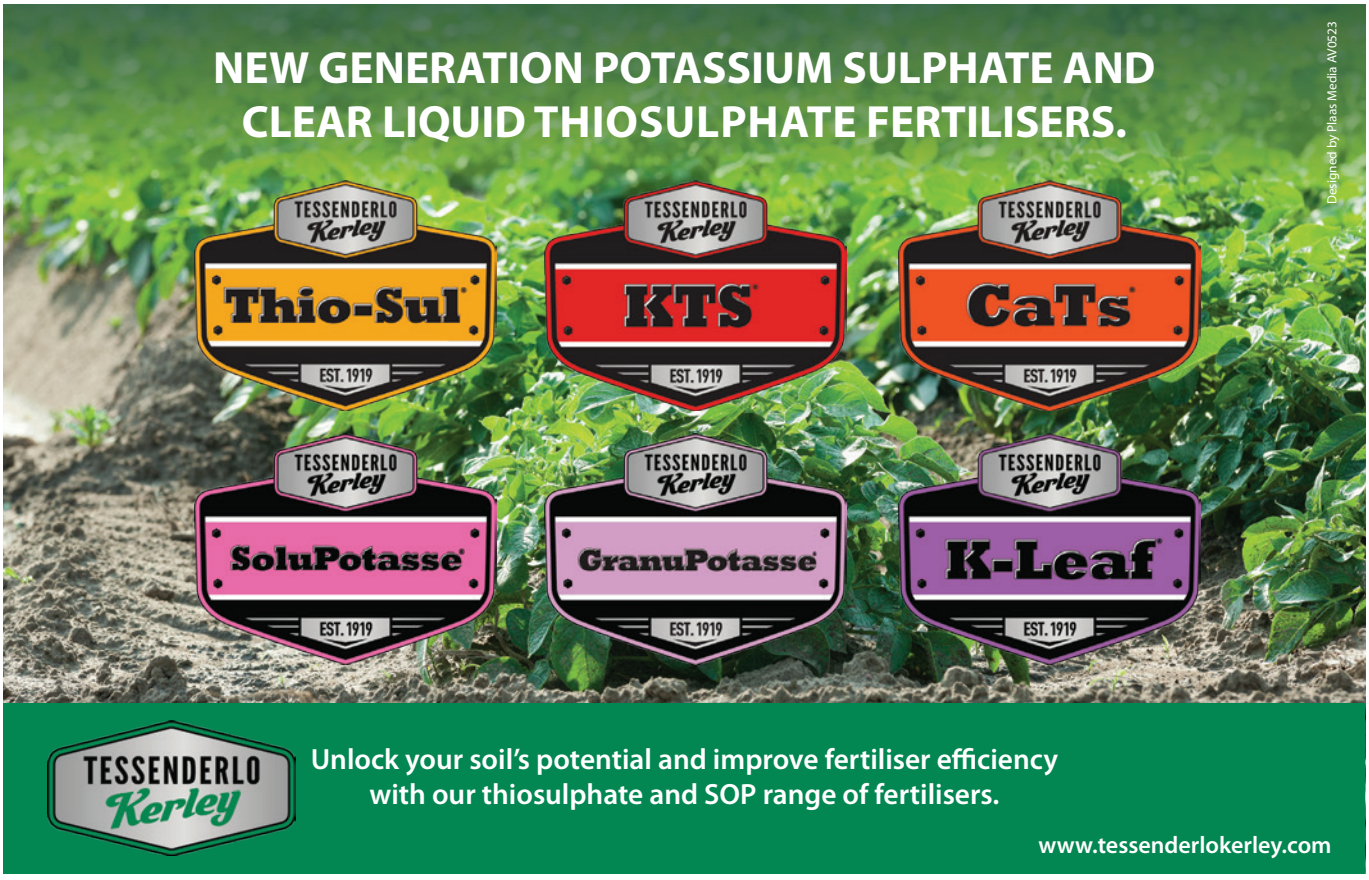
[1]Skyfiekleur met waarde >50 en sonder defekte is aanvaarbaar vir die droëskyfiebedryf.
[2]Soortlike gewig (SG) van ≥1.075 is aanvaarbaar vir die prosesseringsbedryf.
*[3]Die persentasie droëmateriaal is 'n berekende waarde: DM% = 24.182 + 211.04 * (SG-1.0988). Die werklike persentasiewaarde sal effens verskil tussen kultivars uit hierdie berekeningswaarde.*

vergroening, waarskynlik weens walle wat oopgespoel het as gevolg van baie reën. Dit het gelei tot 'n groter hoeveelheid klas 2- en klas 3-aartappels. Bruinvlek en holhart is in enkele kultivars opgemerk.

Soos die aard van seisoene is, fluktueer die prestasie van kultivars van seisoen tot seisoen. Dit is bloot omdat klimaat van een seisoen na 'n volgende nooit eenders is nie. Derhalwe is dit belangrik om konsekwente kultivarprestasie oor 'n aantal seisoene in ag te neem, pleks daarvan om besluite te skoei op net een seisoen se goeie prestasie. Sifra toon tans by uitstek die minste variasie vir 2017 tot 2022 in die Petrusburg-kultivarproef (*Figuur 8*).

Laastens, wanneer gekyk word na die interne kwaliteit van aartappels, kan prosesseringseienskappe ook geëvalueer word. Om te voldoen aan prosesseringsvereistes, moet kultivars aan 'n skyfiekleurnorm van >50 en 'n soortlike gewig (SG) van ≥1.075 voldoen (*Tabel 5*). Etlike kultivars het voldoen aan skyfiekleurvereistes en Belmonda, Foxy en Noya het aan die SG-vereistes voldoen.

Vir meer inligting, kontak Enrike Verster by enrike@potatoes.co.za of Anjé Erasmus by anje@potatoes.co.za.

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By Rendani Murovhi, transformation specialist, Potatoes SA

Potatoes are among the most consumed staple foods in the world. It is a common denominator in our national fresh produce markets while dominating the stalls at informal markets before making their way to many a hearty dish at household level.

Yet, despite its renowned health attributes and contribution towards economic development, the present constituency of potato growers remains skewed, with black producers accounting for only 1% of potato production in South Africa.

Development strategies aimed at improving inclusivity and increasing commercial growth among black producers require holistic collaboration efforts and broad-based developmental investment amongst transformation drivers, both public and private. Potatoes SA's small-grower projects are part of the developmental initiative geared towards increasing potato production knowledge, addressing food security issues, and providing tailormade recommendations on suitable potato cultivars.

In October 2022, four small-grower projects were planted in partnership with the Department of Rural Development and Agrarian Reform (DRDAR) in the Joe Gqabi district of the Eastern Cape. To showcase the project's performance and taking one more step towards empowering these growers, Potatoes SA in collaboration with local economic development agency, JoGeda, organised and hosted a farmer's information day on 30 March 2023 in Tsekong village near Maclear in Elundini municipality. The theme of the event focussed on a commodity-driven approach promoting and intensifying potato production.

Potatoes SA's transformation programme

The commercialisation of black small-scale potato producers and their progressive integration into the potato industry is one of Potatoes SA transformation mandates, presently addressed under four programmes: enterprise development, small grower development, farm-based training and tertiary skills development.

Sustainable potato production requires an extensive understanding of climate, soil, availability of seeds, irrigation water, power sources, and mechanisation. Most important is overall farm and crop management,

Ayanda Gqoboka, CEO of JoGeda (centre) with Vuyo Seteni, an agribusiness specialist at JoGeda to his right.

which has a direct impact on crop quality and yield. During the farmer's information day, Louis Pretorius, a Potatoes SA mentor, conducted a practical demonstration and interactive session to transfer practical skills relating to proper potato production and management. These components are all key learning points relating to sustainable potato production (*Figure 1*).

Stakeholder linkages and market access

The progressive growth within the farming sector, and its renowned contribution towards the country's gross domestic product (GDP), requires a holistic stakeholder approach and amalgamation of programmes aimed at strengthening the sector. One of the key values and roles of Potatoes SA is to strengthen stakeholder linkages and create an entry point for new producers.

Melinkqubo Ndabokutya of the Kei Fresh Produce Market in Mthatha, was one of the stakeholders present at the farmers' day. He unpacked some detailed information relating to market regulations, requirements, and price drivers. He strongly emphasised the importance of complying with

On the left is Melinkqubo Ndabokutya from Kei Fresh Produce Market and to the right is Nkanyiso Mahlaba from Frimax Foods, who addressed the attendees.

Figure 1: Components of sustainable potato production.

Louis Pretorius of Potatoes SA explaining some practicalities regarding potato production in the field.

From the right is potato producer Vumile Mzinze with Potatoes SA consultant and mentor, Louis Pretorius, and potato producer and mentor, Vuyani Kama.

grading and packaging standards if one wishes to enter the formal market.

Nkanyiso Mahlaba from Frimax Foods elaborated on their supplier development programmes for small-scale and commercial potato farmers, the enrolment criteria, market requirements, and cultivars. "What is important is to constantly produce best quality potatoes and ensure that your contractual obligations are met," he said.

Access to funding

Potatoes SA's transformation division was one of the stakeholders presenting information on potato production at the event. Rendani Murovhi, transformation specialist at Potatoes SA, elaborated in depth on the criteria and requirements of the organisation's enterprise development (ED) and small grower (SMG) programmes.

JoGeda CEO, Ayanda Gqoboka, shared information on their programmes, role and plans to develop and harness the economic benefits of the potato commodity in the Joe Gqabi district. Government and Elundini municipality representatives who were also present at the event, presented their developmental strategies that potato farmers can benefit from. Representatives of other developmental organisations such as the Eastern Cape Rural Development Agency and Eastern Cape Development Cooperation were also in attendance.

Access to mentorship

Mentorship and training are effective tools for skills transfer and equipping farmers with knowledge to enhance productivity and efficiency. Commercial farmers, production input suppliers, and extension services are some of the vital players fulfilling this role.

Vuyani Kama, a graduate of the Potatoes SA ED programme in Ugie in the Eastern Cape, is one of the commercial farmers providing voluntary mentorship and support to local smallholder and entry-level commercial potato farmers in the region.

Developing a strategy in the Eastern Cape

Potatoes as a commodity offers multiple economic opportunities that can address national issues such as unemployment, food security and industry reform. Reports show that per capita potato consumption in South Africa has increased remarkably in the last ten years, with the demand across the SADC region continually growing.

From an Eastern Cape perspective, this is also an opportunity to explore the intensification of smallholder potato production. The region has favourable climatic conditions including higher rainfall which makes it

Figure 2: United Nations' global sustainability goals.

ideal for rainfed potato production and reduced production costs. In addition, limited load-shedding challenges afford the area a competitive advantage.

What is next?

The shared objective of ensuring food security at local, district, provincial, and national level is a central and collaborative mission across South Africa as a whole.

Therefore, Potatoes SA has created new partnerships and strengthened existing partnerships in both the public and private sectors to ensure the sustainability of its transformation objectives.

Collaboration and partnerships aimed at sustainable enterprise development can bring about guided outputs by assisting projects with potential to expand and become economically viable potato growers.

There are a large number of initiatives currently on the ground providing support to potato farmers and addressing developmental needs. However, to ensure sustainability it is necessary to compliment the strength of each initiative, address the weaknesses, and reduce unnecessary replication. The United Nations' global development sustainability goals (*Figure 2*) should form part of all transformation initiative goals and can serve as a focal point for collaborations.

Ultimately, the Eastern Cape's potato developmental strategy hopes to unlock economic growth and employment opportunities, promote commercial farmers and support a vision of self-reliance and revitalised rural livelihoods.

For more information, contact Rendani Murovhi at rendani@potatoes.co.za.

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Lutendo's Potatoes SA bursary experience

By Rotondwa Raligidima, Potatoes SA

Lutendo Muelelwa was born and bred in Venda, in the village of Matanda in Nzhelele. She is the third of five children and completed her schooling at Matanda Primary School and Patrick Ramaano Secondary School. After grade 12 she joined the University of Free State where she completed her under- and postgraduate studies.

Lutendo is family orientated and spends as much time with her family as possible. Her passion for agriculture also developed at home. Growing up in a rural area her family, like many others, had a backyard garden where they grew staple foods such as maize and vegetables. These everyday experiences motivated her to acquire more knowledge of agriculture so that she can do her part in improving production and food security.

As part of her undergraduate studies, Lutendo majored in soil science, agronomy, and agrometeorology.

Enter Potatoes SA

The Potatoes SA bursary programme offered by the Potato Industry Development Trust (PIDT) is aimed at providing financial assistance to students in need who want to develop a career in agriculture, particularly the potato industry. The bursary is awarded to students in their second or later year of studies.

Lutendo learned about the Potatoes SA bursary from her supervisor at the University of the Free State in 2014 and successfully applied. The bursary paid for her MSc degree in Agriculture from 2015 to 2018, when she completed her degree.

Lutendo during the Potatoes SA bursary induction programme in 2015.

Lutendo planting crops inside a greenhouse at Falcorp Technologies in 2021.

Lutendo's studies focussed on the effect of climate change on potato yield and possible adaptation strategies in 12 production regions in South Africa. Her study showed that minimum and maximum temperatures are expected to increase significantly more in the interior than in the coastal regions. It also showed that warmer weather and dry spells are going to increase. Her study recommended the cultivation of suitable potato varieties and changing the planting time to improve the yield and efficiency of water usage.

Life after the bursary

Besides financial support, Lutendo was also given the opportunity to present her work at a congress held in Cape Town in 2017. During this event, she connected with fellow students and learned from other research into potato production. She also attended Potatoes SA's Research Symposium in 2015 and 2017.

She also attended the Potatoes SA induction programme in 2015, where she learned more about the organisation and its activities. During the induction, she was able to visit the Tshwane Fresh Produce Market and learned about potato quality inspection, grading, and packaging.

Currently an agricultural advisor, Lutendo aspires to continue improving her skills and knowledge. She hopes to share different climate adaptation strategies with potato producers which will allow them to enhance their yields. Lutendo gained experience working for agricultural companies such as DMT Kea Batla and Falcorp Technologies. She currently works as an assistant agricultural practitioner at the Department of Agriculture, Rural Development and Land Reform. She plans to further her studies and enrol for a PhD soon.

Start applying!

Lutendo says the entire Potatoes SA bursary experience has been a very rewarding one which allowed her to gain a lot of knowledge and skills. She encourages other students who are passionate about agriculture to apply for a Potatoes SA bursary and enjoy the exposure Potatoes SA provides. "The bursary was a worthwhile investment for me, and I can't wait to see what the future holds."

For more information about the Potatoes SA bursary programme, email nomvula@potatoes.co.za.

Adhering to financial management principles and re-investing for future generations

By Rachichi Marokane, national transformation co-ordinator, Potatoes SA

The momentum in preparations for the 2023 potato production season is building in Limpopo, where the popular planting window from March to July has arrived. Producers are rushing to prepare amid inconsistent climatic conditions. Added to that, the current energy crisis is not only disruptive in respect of irrigation for first ripping, but has also increased scepticism among producers regarding optimal hectares that must be planted.

"There is still hope that the last rains during late March and early April will allow sufficient moisture so that we can commence with field preparations," said Robert Chauke, a Potato SA enterprise development farmer who attended a financial management training session presented in Vivo, Limpopo in March this year.

Over 70% of potato operations costs are usually spent during the first three months of the operational period. In Limpopo, where operational costs amount to over R150 000, and to a farmer with a poor cashflow, the current challenges spell another difficult year.

Re-investing for a wealthier generation

As part of its transformation objectives, Potatoes SA identified the need to offer financial management training – hence the session held in Vivo, Limpopo for developing farmers partaking in its development programmes.

The two-day session exposed producers to numerous factors that affect potato cropping as well as financial management principles relating to farming. Gert Bester, who is also the chairperson of the Potatoes SA board, shared his path to becoming a successful commercial potato farmer producing under dryland conditions. With re-investment highlighted as the main 'take-home' message for the day, a number of principles relating to financial management were explained to the attendees.

Gert explained that producers need to understand what makes potatoes grow the way they do, in order to understand why they also react in a certain way. Over history, the potato has evolved itself as a crop with genetic potential that can yield up to 170 t/ha. Yield variations across different countries are mainly due to factors such as climate, soil potential, pests, and the like.

Managing non-allocated costs

In respect of financial management principles, producers were advised that planting fewer hectares and maximising yields through dedicated efforts relating to seed quality, optimal fertilisation and chemical application can result in a profitable and manageable enterprise. With various expenses related to farming, these items can be categorised into allocated and non-allocated costs.

Gert defined the latter as the most difficult to manage as it does not vary in accordance to the level of outputs. He reiterated that farmers must make sure that they take care of the non-allocated costs as part of their break-even goal.

Non-allocated costs discussed included:

- Overheads.
- Capital.
- Replacement costs.
- Personal costs.

Managing a farming business holistically is vital for determining cashflow status. However, one would ideally have to distribute non-allocated costs across enterprises. Not only does this measure the productivity of an individual enterprise; it also assists the farmer when deciding whether to increase his/her production scale to generate sufficient operating profit that will at least offset the non-allocated costs.

When developing a consolidated cashflow plan, it is important to develop cost centres that allow the producer to develop parameters that will apportion non-allocated costs per enterprise.

Running a solvent and liquid enterprise

With most formal lending institutions requiring land as security, farmers

Attendees at the financial management training session held in Vivo, Limpopo during March 2023.

Table 1: Apportioning non-allocated costs: Fictional scenario of a diversified farm.

Expense	Total
Administrative	R 5 456
Repairs	R 25 467
Salaries (3 staff members)	R 180 000
Insurance	R 13 546
Electricity	R 24 567
Fuel bakkie	R 15 469
Personal salary	R 145 321
Instalment	R 36 678
Total	**R 446 504**

Weight determining factor

Branch	Income	% of income	Branch responsibility
Potatoes	R 3 532 235	75%	R 334 878
Cattle	R 321 789	7%	R 31 255
Beans	R 756 006	16%	R 71 440
Cabbage	R 120 987	2%	R 8 930
Total	**R 4 731 017**	**100%**	**R 446 504**

are urged to aim at investing in such a fixed asset which, in most cases, appreciates in value. Current assets such as a positive bank balance, proper production facilities and disposable livestock are crucial in maintaining the liquidity of the farm. Repayment of liabilities and increased retained earnings should also be prioritised by producers to bolster the solvency of their enterprises.

Financial management remains pivotal in the sustainability of any farming enterprise. Developing farmers need to understand that they are in the business of making money. Re-investing as much as possible and asking the right people for help, can realise the dream. Although a liquid and solvent state is not a panacea in farming, individual farmers must know how to manage their entities by planning ahead and adhering to sound financial principles.

For more information, contact Rachichi Marokane at email rachichi@potatoes.co.za.

The frying experience:

Exploring the evolution from conventional to air frying technology

By Jorge Luis Alonso G, information consultant specialising in potatoes

In restaurants, at home and in the food industry, frying is one of the most common methods of food preparation. It is a technique used all over the world, based on the dehydration of food immersed in hot oil. The speed and ease of preparation, the low price and the aggregation of desirable food properties contribute to its use. These include colour, texture and flavour. All of these positive attributes are the result of the physical and chemical changes that occur during the frying process.

Fried food and human health

Few studies have focused on the biological consequences of consuming oil-fried foods in humans. However, polar compounds found in fried foods have been linked to endothelial dysfunction and high blood pressure, which can lead to chronic diseases, especially cardiovascular disease. People who eat fried foods are also more likely to develop obesity and intestinal disorders.

Despite the restrictions, fried products are trendy, consumed in and out of the home, and found as fast food in many restaurants. But because of the risks of a high-fat diet, modern day consumers are increasingly looking for more nutritious and safer food alternatives. Reducing the oil content in fried foods has become a necessity.

Several alternatives are available to replace the traditional frying process with systems that provide similar characteristics of fried foods, but with higher nutritional quality and ease of use.

Based on this idea, air fryer technology has appeared on the market. These devices use hot air combined with high-speed air circulation to heat food from all sides at the same time, without adding oil. The proposal is to obtain fried foods with low amounts of fat. Its acceptance depends on the sensory characteristics of the final product, which should be close to those of the conventional frying process.

In 2019, a team of researchers based in Sao Paulo, Brazil published a review on the changes that occur in foods that are subjected to conventional and air frying, comparing the pros and cons of these processes. Their paper 'Frying Process: From Conventional to Air Frying Technology' was published in the journal *Food Reviews International* and can be accessed here: *www.tandfonline.com/doi/abs/10.1080/87559129.2019.1600541*.

Significance of the frying process

Frying is an efficient method due to its speed, unique sensory properties, and preservative effect. The moisture content after frying determines the shelf life of fried foods: the more dehydrated by frying, the longer the shelf life. For example, potato chips or corn chips have a shelf life of up to 12 months at room temperature.

There are two main techniques of commercial frying that differ in the method of heat transfer: surface frying and deep frying:

- **Surface frying:** A thin layer of oil transfers heat from the hot surface of the pan to the food. The product has a different brown colour and prevents product standardisation.
- **Deep frying:** Heat transfer is a combination of convection in the hot oil and conduction into the food. All surfaces receive similar heat treatment, resulting in uniform colour and appearance.

Similarly, the frying process can be continuous or discontinuous. The continuous process is used by the industrial market for frying extruded snacks, fried pasta, and pre-cooked and fried potatoes. The discontinuous one is used by the institutional market, including fast food chains, restaurants and pastry shops.

What happens at high temperatures?

Placing food in hot oil raises the surface temperature and evaporates water; the surface then begins to dry. The evaporation layer moves into

the food, forming a porous surface crust. Its rapid formation is beneficial because it retains moisture in the food and limits the rate of heat transfer to the interior. Economic considerations and product requirements determine the temperature used for frying. For instance, high temperatures (180 to 200°C) reduce processing times and increase production rates.

Fears about the health effects of consuming trans fats have led industries to substitute raw materials such as frying oils. But the benefits of replacing saturated fats with unsaturated fats come with many drawbacks. For example, the high unsaturated fatty acid content leads to instability at high temperatures and increased susceptibility to oxidation, rancidity and off-flavours. Also, the sensory characteristics of some of these oils can affect the taste of the food or result in reduced crispness, palatability and flavour.

During the heating of the oil, some reactions produce many degradation compounds. With the continuity of the reactions, the functional, sensorial and nutritional change leads to a low-quality product. For these reasons frequent oil changes are necessary, thus increasing costs. Equally important is contamination from degraded oil and acrolein, an oil degradation product characterised by the formation of a bluish mist.

Reactions and changes in food

Certain chemical reactions cause a reduction in quality or deterioration during the frying procedure. Frying exposes oil and fat to three factors that can degrade quality and alter composition:

- Moisture from the food (which causes hydrolytic changes).
- Oxygen in the air (which enters the oil through the surface of the cooking vessel, causing oxidative changes).
- High temperature.

Colour is an important quality attribute that influences consumer food choices. and air frying requires more time to achieve the characteristic colour of food fried in oil.

There are many changes in the properties of oils and foods, such as sensory (flavour, aroma, texture and colour), nutritional, functional and toxicity qualities. The most observed physical changes in oils are viscosity increase, colour change, and foaming.

For foods subjected to such a process, the possible results can be both desirable and undesirable. For example, the colour presented by the potato after frying implies its acceptability. This visual characteristic is influenced by oil type, oil age and thermal history, oil/product interfacial tension, temperature, cooking time, and sample size.

Sugar content also affects the colour of fried potatoes because the hydrolysis of sucrose by the enzyme invertase is the primary source of glucose and fructose-reducing sugars, which are precursors to the Maillard reaction. This reaction is a non-enzymatic reaction between free amino acids and reducing sugars at high temperatures. It produces dark pigments and toxic products such as acrylamide.

High levels of reduced sugars in tubers result in poor-quality potato chips.

The production of the texture in fried foods is a result of changes in proteins, fats, and polymeric carbohydrates. Specifically, changes in protein quality occur through the Maillard reaction with the amino acids in the crust.

Different methods of frying

The effect of frying on the nutritional value of food varies depending on the type of process used. High temperatures of the oils result in a rapid formation of the crust, which seals the surface of the food, causing a reduction in changes within the interior and significant retention of nutrients.

Researchers have attributed changes in fried food quality to starch gelatinisation reactions, protein denaturation, caramelisation, enzyme inactivation, and fat absorption.

The oxidation of fat-soluble vitamins in the oil contributes to a loss of nutritional value, as retinol, carotenoids, and tocopherols are destroyed, which alters the taste and colour of the oil. However, tocopherols undergo preferential oxidation, resulting in an antioxidant effect on the oil.

This effect is particularly important since most frying oils have a vegetable origin and contain a large proportion of unsaturated fats that tend to oxidise.

As the frying process alters the chemical nature of the heated oil, generating toxic compounds, there is a concern for the safety of the consumer and the possible consequences for the human organism.

Air frying technology

The air frying process is an alternative to conventional frying that addresses its drawbacks. It uses hot air to cook a variety of fried foods instead of dipping them in hot oil. In this process, a fine mist of oil droplets in the hot air comes into direct contact with the food, resulting in even and efficient heat transfer that minimises quality variations. The food is dehydrated during the process and gradually develops a crust-like deep frying.

Air frying technology was first introduced in European markets, where it was well received, and later introduced worldwide. This patented technology cooks food while maintaining a pleasant taste and reducing the fat content by up to 80% compared to deep frying.

But it is important to consider other potential benefits and drawbacks of this technology, including changes in food characteristics and comparisons with traditional frying methods.

Air frying versus deep frying

When air frying was compared with deep frying by some authors, it was

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found that the samples of French fries absorbed about ten times more oil in the hot oil frying process during the same frying time. In frozen potatoes, the oil content was changed from the original content in deep frying, while the oil concentration was reduced to half of the original content in air frying.

However, this reduction in oil content resulted in the formation of a less uniform crust that was less resistant to water loss and affected the sensory characteristics of the final product.

The air frying process showed a similar moisture concentration compared to deep frying, but water and volume losses were higher. The formation of a crust in the frying process limited the water loss.

Changes in oil content were observed in both processes when samples of French fries were blanched or frozen. A study found that air frying could achieve the characteristic colour of deep frying. Deep frying results in products with lower fat content and similar moisture and colour compared to air frying.

One of the relative disadvantages of air frying is that it requires a longer cooking time than frying, which may not be ideal for people who have busy lifestyles and need to prepare meals.

Nevertheless, the air frying process can be used to produce low-fat products, although the products may have different sensory characteristics such as taste, colour, odour, appearance, hardness, crispiness, crunchiness and oiliness.

The crispness factor

On the other hand, the air frying technology did not show significant differences in sensory attributes such as taste, appearance, odour, and acceptability when compared to oil frying. In fact, air frying was preferred for crispness, firmness, oiliness, and colour.

In addition, potato strips prepared by the air frying process showed superiority in attributes such as hardness, crispiness, and oiliness when compared to traditional fried potatoes, which may be attributed to the lower oil uptake compared to deep frying.

Studies using scanning electron microscopy (SEM) and differential scanning calorimetry (DSC) have shown that the main difference between products subjected to air frying and immersion frying is the greater extent of starch gelatinisation that occurs in traditional frying, resulting in a dry and thick crust.

The thin, homogeneous and smooth crust obtained by air frying is due to the slow evaporation of water from the surface of the product, which prevents intense local evaporation of water and hinders starch gelatinisation.

Colour, speed and water content

However, the central region of air-fried products is harder compared to those from immersion frying due to the lower degree of starch gelatinisation at lower temperatures. Some authors studied oil absorption during immersion frying and found that it occurs mostly toward the end of the process, resulting from the condensation of water vapor in the product caused by a drop in temperature below the boiling point.

In air frying, higher water losses during the process were not compensated by significant oil absorption, resulting in higher mass losses.

Colour is an important quality attribute that influences consumer food choices, and air frying requires more time to achieve the characteristic colour of food fried in oil.

Although the boiling point of water is reached almost linearly with time in both air frying and oil frying, it is reached faster in deep frying than in air frying. Beyond this point, air frying maintains a constant temperature while deep frying shows a significant temperature increase above 100°C.

The researchers agree that air frying has several advantages over conventional fryings, such as being a practical alternative for obtaining healthier fried foods due to reduced fat content, lipid degradation and oxidation.

It also has environmental benefits such as reduced oil consumption and wastewater emissions. According to one study, air fryers offer more significant energy savings than others, which translates into a 70% savings.

A final word

The current shift in society's eating habits deserves attention and requires constant monitoring, particularly from the food industry. Although there is no evidence to suggest the discontinuation of frying in meal preparation, air frying technology is recommended due to its ability to reduce the oil content in foods. It has been proposed that the use of air frying equipment may become a trend in the coming years for snack factories, fast food chains, restaurants, and homes.

This alternative offers several advantages, including decreased costs of vegetable oils, reduced environmental pollution, and energy conservation, while also appealing to consumers who seek healthier dietary options, which can ultimately benefit businesses.

Despite its benefits, more attention should be given to studying air frying technology and its mechanisms of action on food components and properties, as well as its effects on human health.

The author, Jorge Luis Alonso G, is an information consultant specialising in the potato crop. He writes marketing materials for Ag-Tech companies. This article was placed courtesy of *Potato News Today*. Read the original article at *www.potatonewstoday.com/2023/03/15/the-frying-experience-exploring-the-evolution-from-conventional-to-air-frying-technology/*.

From humble spud to a feast fit for a king

By Phillip Crafford, Plaas Media

The potato is a versatile stalwart in the vegetable rack. Most of us believe that a potato's uses end the moment it sprouts an eye or develops a bad spot. However, this is not the case as potatoes fall under the no-waste category of vegetables.

To celebrate the humble spud and showcase its versatility, Potatoes SA hosted a potato festival at the University of Pretoria's Eat@UP facilities on 8 March this year. The event was hosted in conjunction with the University's Faculty of Culinary Sciences.

Lerika Potgieter (right), a Master's student in consumer science, discussing the evening's menu. She designed the menu along with her supervisor, Dr Hennie Fisher (left), using five different potato cultivars and according to no-waste principles.

The star of the show

Gert Bester, chairperson of Potatoes SA, welcomed everyone to the event. Bester said that the organisation has long-established ties with the university when it comes to potato research.

The evening's menu was compiled by Lerika Potgieter and Dr Hennie Fisher. Potgieter is a consumer science student who is doing her Master's study on the concept of no-waste in potatoes under the supervision of Dr Fisher. They explained how they designed the evening's menu based on no-waste principles using various potato cultivars. Potgieter explained that her research focusses on using all the parts of a potato in cooking, such as using potato skins to make a non-dairy milk alternative or using it as a canape.

The evening's menu was a feast for the senses. Clockwise, the starter was a lightly curried potato soup with a savoury potato cracker. The second course was a potato spaghetti Caesar salad, followed by a potato Wellington. The meal ended on a high note with potato doughnuts served with vanilla potato ice-cream and iced coffee with potato milk.

Dr Carmen Muller, a researcher at the University who was involved in a number of potato research projects, added that the public is unaware of the exact shelf-life of potatoes and how to use it economically. The perception is that a potato is spoiled when it is bruised and should be thrown away while in fact the spot can simply be cut out.

Potato research is never complete

Prof Lise Korsten, a professor in plant pathology at UP, shared the history of the University's potato research

From the left: Some of the speakers and attendees were Prof Martin Steyn and Prof Lise Korsten, both from the University of Pretoria (UP), Dirk Uys, research manager at Potatoes SA, Prof Hettie Schönfeldt and Prof Barend Erasmus of UP, Sanette Thiart of the Potato Certification Service, Prof Jacquie van der Waals of Citrus Research International, and Dr Carmen Muller, also of UP.

which dates back to 1905. She also described the history of potato consumption which can be traced back to 6 000 BC when spuds were foraged in the Peruvian Andes. The role of potato research in the modern age is to find plausible solutions to potato diseases and food security. Korsten suggested the introduction of spud stations at universities or street vendors as an alternative to conventional take-aways.

Prof Martin Steyn, also of UP, said that between 15 and 25% of yields are spoiled due to diseases and/or harvesting. He also referred to the debate on whether to wash potatoes prior to market introduction. With fresh water becoming scarcer by the day, Steyn said that the potato industry must continue to cultivate more water-efficient potato cultivars. This will assist with food security and ensure the industry's sustainability in future.

For more information, email Dr Carmen Muller at vanniekerk.carmen@gmail.com.

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Business entities: Options for farmers

By Gideon Robbertse (BComm LLB LLM H Dip Tax Law)

The most commonly used business entity is a producer who holds the farm in his/her personal capacity, which means the farm is registered in his or her name at the deeds office, and business is conducted in the producer's own name. This is often the case where the farm was inherited from a family member.

The problem with this is that there is no separation between the property, farm and the farm's business activities. If the farming enterprise goes bankrupt, the farm will also be used to pay creditors. Upon the producer's death, his/her deceased estate will pay estate duty and capital gains tax on the value of the farm and the farming business, often resulting in the forced sale of the farm due to a lack of liquidity in the estate to pay debts and taxes.

Many producers in South Africa find themselves in this predicament. Producers are sometimes advised to operate the farm in his or her own name in a bid to exploit the lower tax rates afforded to small enterprises. What the producer wins is, however, lost when wealth taxes such as estate duty and capital gains tax are charged upon his/her death.

Trusts and close corporations

Another trend is producers who transfer their farms to a family trust and continue to conduct the farm's business in his or her personal name. There are even cases where the farming business was conducted in a trust.

The advantage of this structure is that the capital growth of the farm's market value is shifted to the trust, and outside the producer's personal estate, thereby saving on future estate duties and capital gains tax on the growth. However, moving the farm was probably done on a loan account basis, which means the trust still owes the purchase price of the farm to the producer. This amount remains an asset in the producer's estate upon which he or she will pay estate duties and in some cases capital gains tax.

Section 7C of the *Income Tax Act, 1962 (Act 58 of 1962)* taxes such loans if the loans are interest free. Another benefit is that ownership of the property and farming business has been separated. This allows the producer to rent the farm from the trust, and deduct the rent as an expense from his or her farming profits. However, it loses sight of the fact that the trust will pay the highest possible income tax rate (45% from rand one).

In the past, the use of a close corporation (CC) was popular, mainly due to the cheaper accounting and set-up costs. Since the new *Companies Act, 2008 (Act 71 of 2008)* came into effect, no new CCs can be formed and a private company now offers the same advantages as a CC.

Options for today's circumstances

The company structure combined with a family trust is the best entities that fit the producer's objectives. If the farm is held by a company, and the farming business in another company, renting the farm can create a tax deduction in the trading company, while the farm holding company will be taxed on the rental income after capital allowances.

If the shares in the companies are held by a family trust, the farm and farming business are effectively outside the personal estate of the producer, resulting in an estate duty and capital gains tax savings. It further safeguards the farm when the farming business is in financial trouble, although financing through financial institutions might water this advantage down due to, for example, mortgage security over the farm.

Separating the farm and farming business also provides a form of protection if a farm is expropriated without compensation, or for less than market value. The company owning the farm and the trading company enter into a long-term notarial lease (e.g. 50 years) that is registered against the title deed of the farm. If expropriated, the rights of third parties, such as a lessee or the farm trading company, must be honoured, resulting in the producer continuing with his or her farming activities on the farm for the remainder of the lease period.

This business entity structure means the producer can externalise ownership of the farm and farming business offshore (Mauritius, Seychelles or other jurisdictions), thereby becoming a foreign investor. This affords the producer the opportunity to get a reward granted for compensation of his or her farm when expropriated, in international tribunals, and which could be enforced against the state in South Africa.

For enquiries, contact Gideon Robbertse on 072 788 3596 or gideon@grattorney.co.za.

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Insubordination: Types and steps to follow

By Tiaan Botes, legal advisor, LWO Employers Organisation

Insubordination refers to the defiance of, or resistance to authority and the refusal or failure to obey clear, reasonable and lawful instructions. Many employers have had to deal with insubordination in the workplace and it is important to know how to deal with it correctly and in line with labour legislation.

Types of subordination

Insubordination is generally a serious offence, although it is important to differentiate between offences due to negligence and offences with intent, as it has a definite impact on the seriousness of the offence. The seriousness of the offence is also influenced by the employee's type of work and responsibilities, the (possible) consequences of the offence and the impact of the offence on the employee-employer trust relationship.

Insubordination can be related to a wide variety of offences and is mainly linked to disrespectful behaviour. Common offences include:

- Non-compliance with established rules and procedures.
- Playing games – this offence is more serious when such action endangers the safety or health of others, or the good spirit in the workplace and smooth running of work.
- Insolence – any disrespectful attitude towards the supervisor, a more senior person or a client.
- Refusing to obey a reasonable and legal instruction.
- Abusive language – this offence is more serious when it is aimed at race, gender, religion or any other arbitrary ground.
- Distributing unauthorised propaganda – information, especially of a biased or misleading nature, used to promote or publicise a particular political cause or point of view.

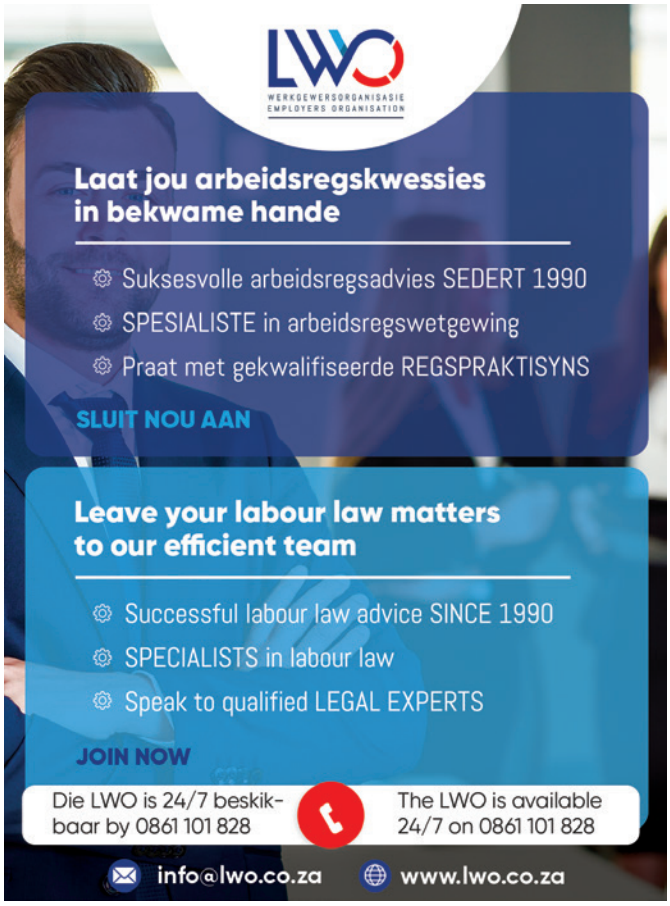
Each case must be assessed according to its own merits and the sanction should be in line with the seriousness of the offence.

Steps to follow

Employers are advised to follow these steps to identify misconduct referring to insubordination:

- **Investigate:** During the investigation the employer must establish whether the employee acted in an insubordinate manner. The employer should also gather evidence in this regard and determine the seriousness of the offence, including (possible) consequences.
- **Consult with the employee:** When consulting with the employee, the employer should determine if the offence was due to the employee's negligence or with intent. It is important to give the employee the opportunity to present more information and explain the situation from his/her point of view.
- **Determine the sanction:** The sanction is determined by the seriousness of the offence. To establish if the sanction is fair, the employer must consider the facts of the case as every case has its own merits. It is important to note that the employer must prove on a balance of probability that the employee is guilty before imposing any sanction.
- **Take disciplinary action:** A disciplinary code is vital to ensure that there are clear rules in the workplace, with appropriate sanctions, for employees to follow. When these rules are broken, the employer can apply progressive discipline (warnings), or in cases of severe misconduct proceed directly to a disciplinary hearing. The employer must take note to keep detailed records of employees' misconduct and sanctions applied.

Every employee must have a detailed job description to clarify duties and the employer's expectations.



During February and March 2023, a total of 13 potato producing regions as well as non-producing suppliers delivered potatoes nationally to fresh produce markets.

Average percentage downgraded: **8.58%.**

Total number of bags delivered from 13 regions and non-producing suppliers and inspected on the fresh produce markets: **12 225 565.**

Figure 1: Classes inspected at all fresh produce markets during February/March 2023.

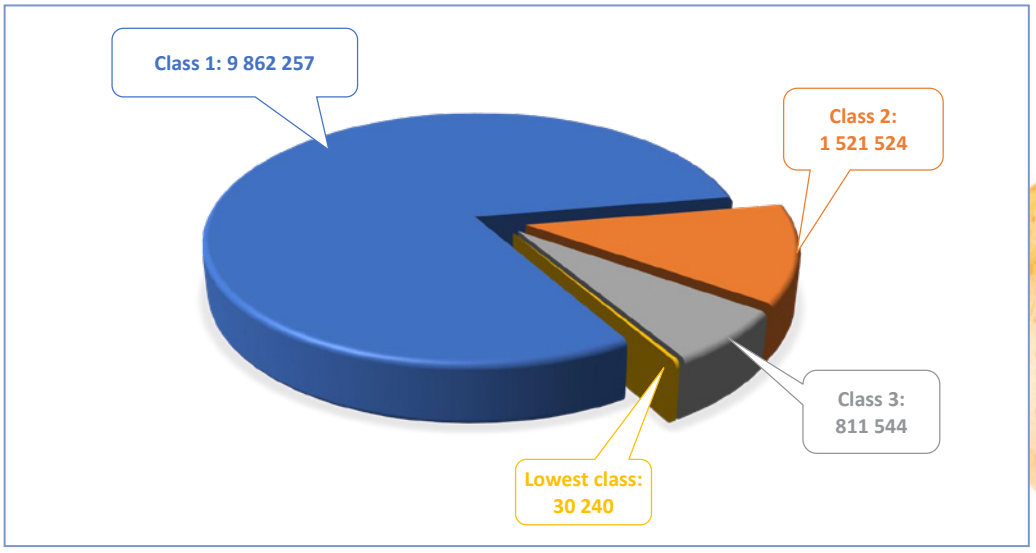


Figure 2: Potatoes of potato bags downgraded (total 1 048 646) at all fresh produce markets during February/March 2023.

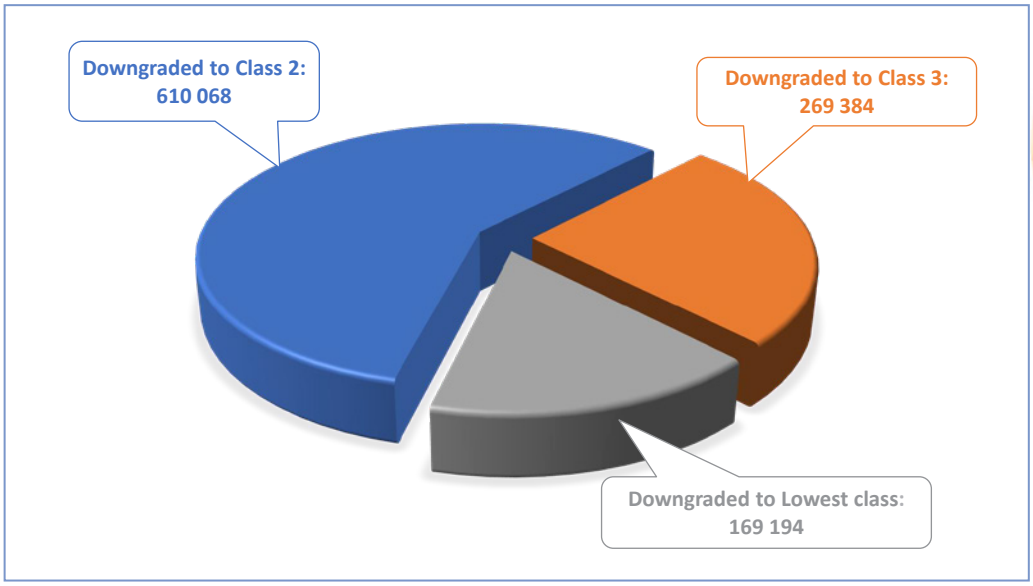


Figure 3: Potatoes downgraded (%) per region at all fresh produce markets during February/March 2023.

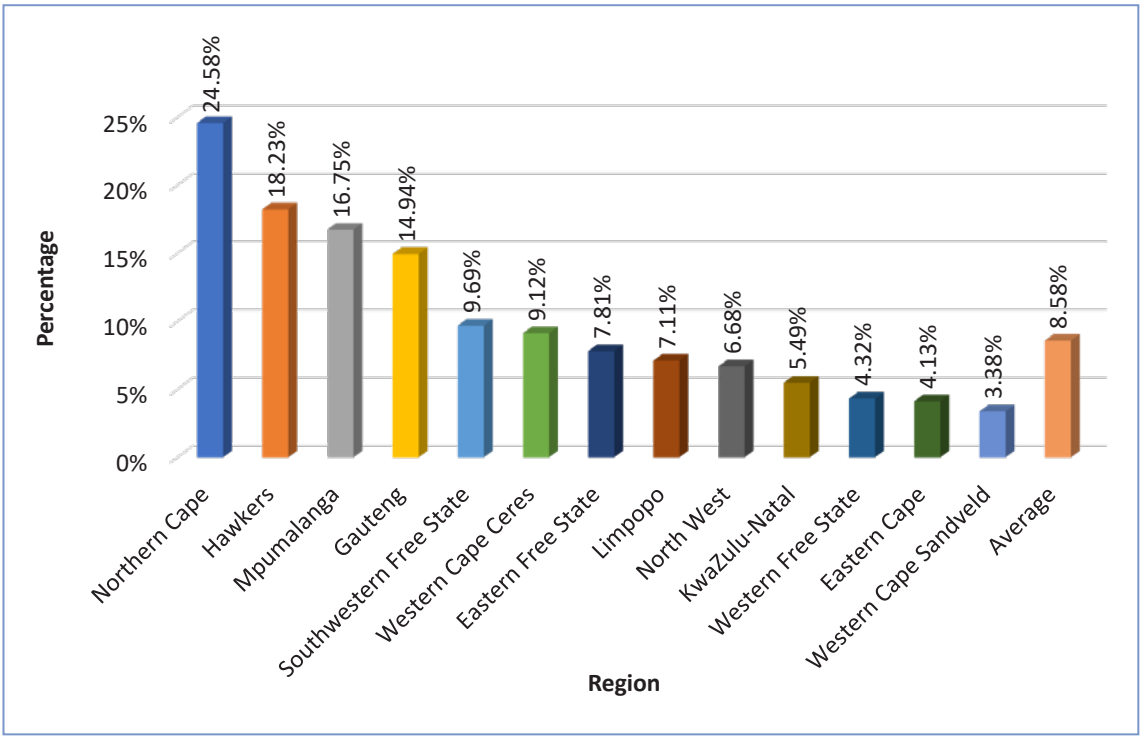
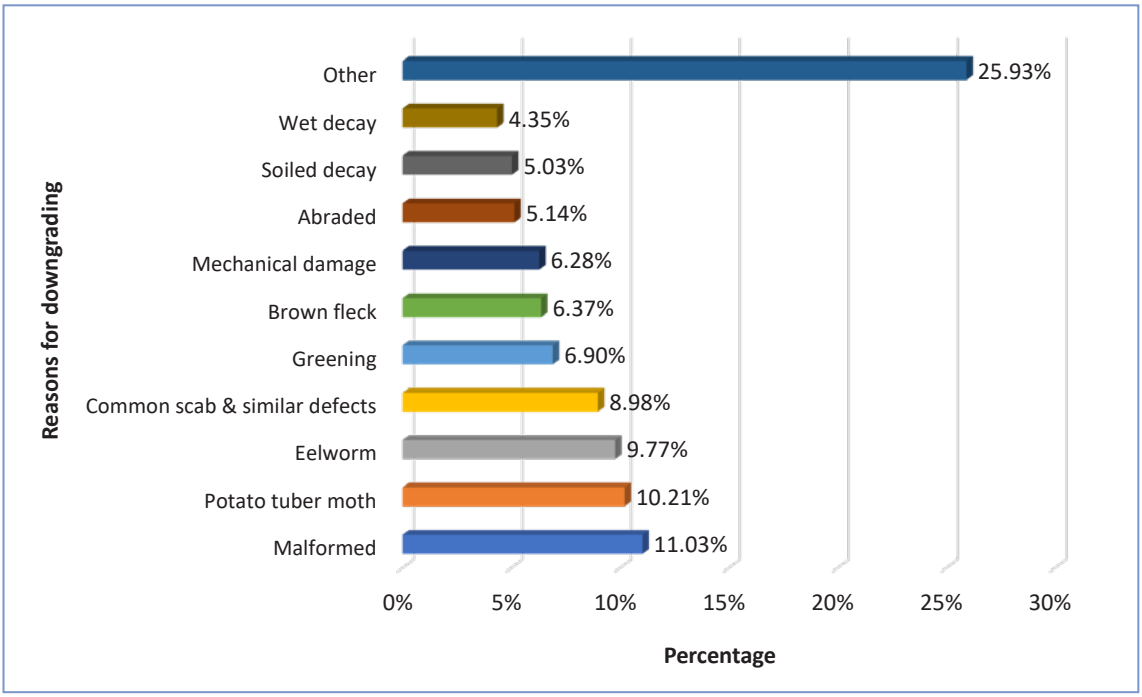
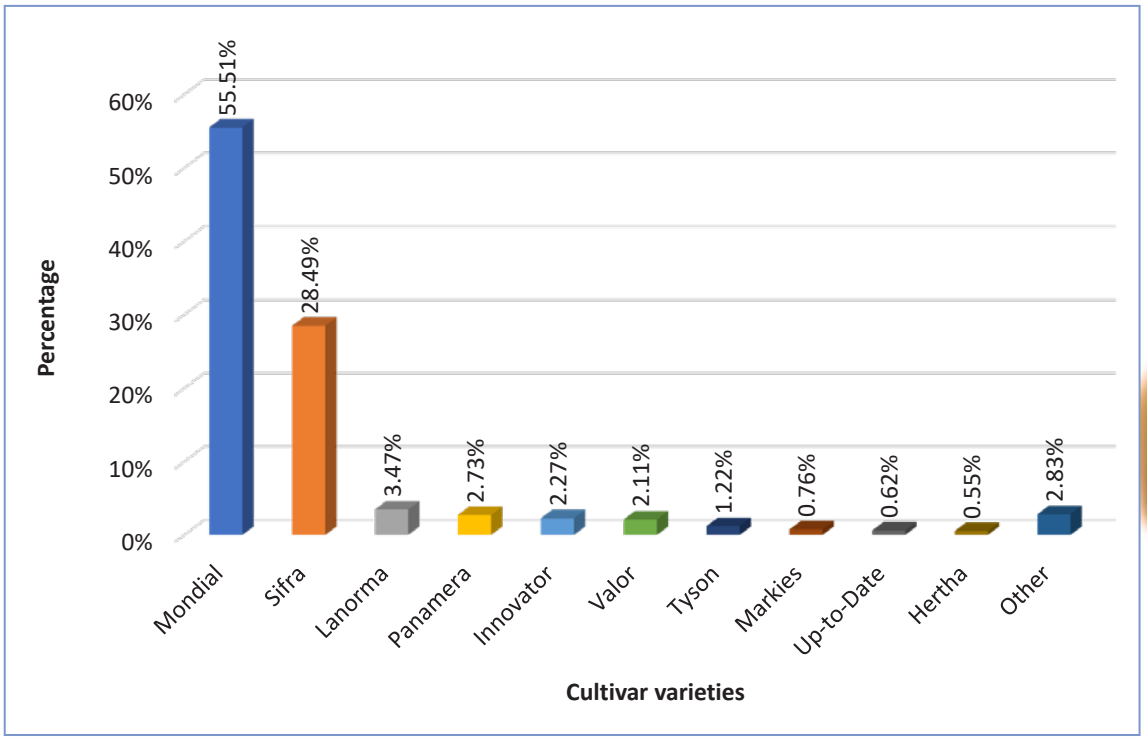


Figure 4: Main reasons for downgrading at all fresh produce markets during February/March 2023.



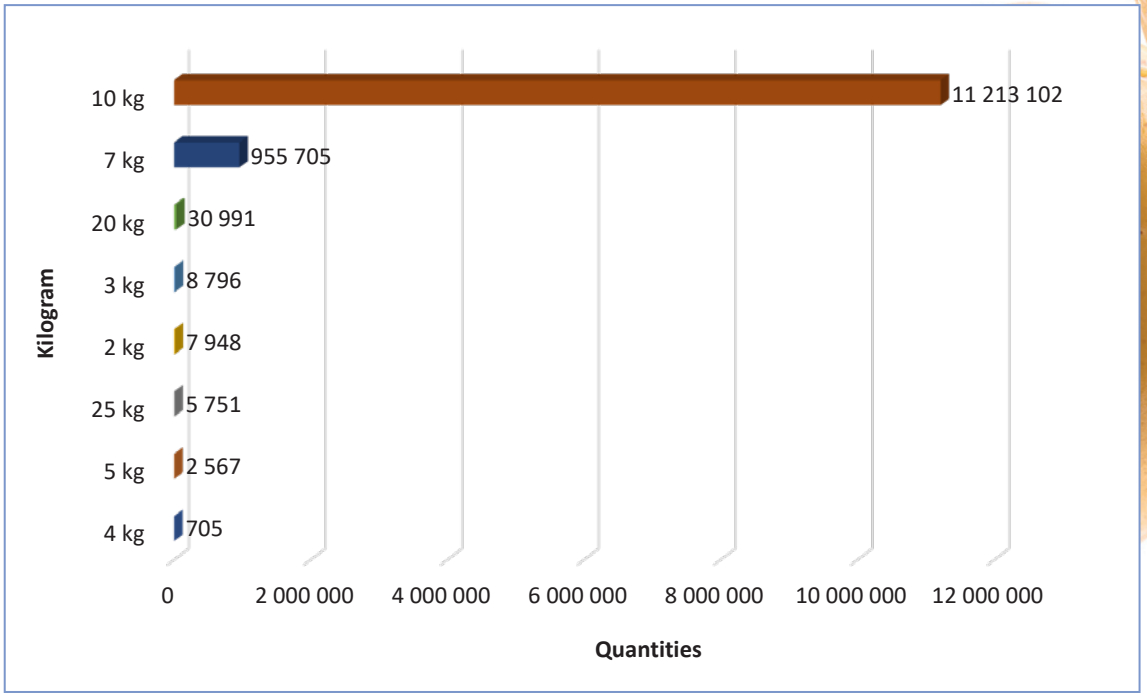
Other include: *Wet decay, browning, wet by decayed tubers, soiled, insect damage, growth cracks, wilt, watergrass damage (ext), vascular browning, directive issued for marking requirements, hollow heart, broken and cut tubers, tomato spotted wilt virus, skin eelworm, heat damage, too small, combination of defects found between samples, sprouts, soiled by decayed tubers, rhizoctonia.*

Figure 5: Cultivar varieties inspected at all fresh produce markets during February/March 2023.



Other include: *Mondeo, Taisiya, Avalanche, El Mundo, Sababa, Taurus, Nicola, FL 2108, Savanna, Apache (POWW), Fianna, BP1, Labadia.*

Figure 6: Volumes of different potato bags inspected on all fresh produce markets during February/March 2023.



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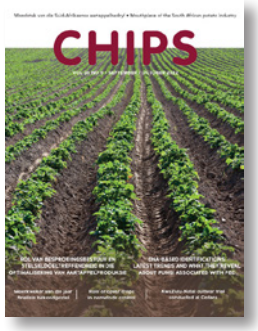

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