

OILSEEDS

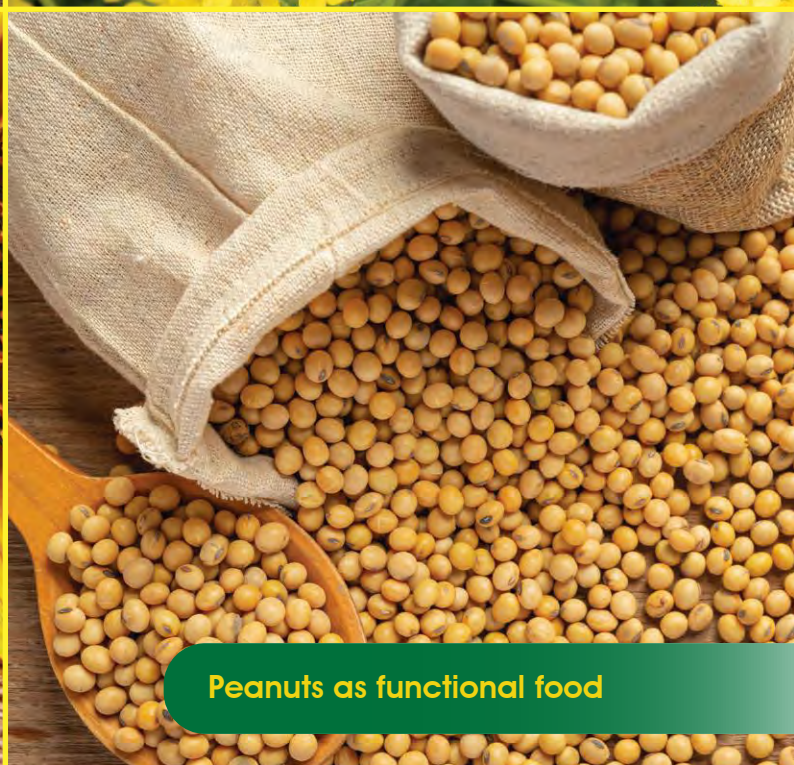
focus

Protein Research Foundation • Oil & Protein Seeds Development Trust • Oilseeds Advisory Committee



Soya bean meal import duties

Understanding disease intensity



Peanuts as functional food

Crop pests colluding with weeds



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PROTEIN AND UREASE ANALYSIS

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Agriculture in South Africa: Resilience is key

By Johann Kotzé, CEO, Agri SA

Agriculture is one of the cornerstones of society, contributing to fundamental necessities of life such as food and clothing. It is widely acknowledged that our sector has a profound influence on the lives of individuals. When reflecting on the importance of agriculture, one is inspired by its potential to improve lives and bolster communities. This should motivate the sector to invest in its future, recognising that by doing so, it not only fulfils essential needs but also contributes to the overall prosperity of our nation.

In 2024, the world is expected to encounter increasingly frequent and impactful short-term crises. Tackling these challenges is no longer solely the responsibility of governments; instead, it demands collective action from every entity – government, business, and individuals – to mitigate their effects. Concurrently, the challenges faced in South Africa present an opportunity for the agricultural sector to redefine its value and contribute to society.

Challenges and opportunities

Looking ahead, we anticipate a landscape marked by both triumphs and challenges. Many of the familiar hurdles of conducting business in South Africa unfortunately persist. Despite ongoing uncertainty regarding load shedding, numerous farm businesses have taken proactive steps by generating their own power. However, fundamental infrastructure issues remain, with roads teetering on the edge of collapse and rail and port systems ranking among the least efficient globally.

But amid uncertainties, agriculture continues to serve as a beacon of hope, fostering partnerships between the public and private sectors. By joining forces we

can surmount obstacles and fortify the industry against future disruptions.

The export environment is anticipated to remain challenging in the coming year due to various factors. Concerns persist over mounting regulations in the European Union. Ongoing geopolitical tensions, such as the Russia-Ukraine and Israel-Palestine conflicts, are expected to persist, underscoring the need for urgent attention to logistics efficiency, market promotion, and maintaining strong relationships with existing and potential export markets.

The pressure on household food security is expected to remain a concern this year. Balancing the need for a healthy and sustainable food sector amid rising production costs and biosecurity concerns, while ensuring food access and affordability for all, is a delicate task. It is clear that resolving these issues requires more than just efforts from the agriculture sector; it demands a robust economy offering increased employment opportunities and growth.

Passion and dedication

Despite the adversities encountered, the resilience of the agricultural community remains unwavering. Producers' passion and dedication to the sector enable them to overcome obstacles and make meaningful contributions to society. Their commitment to excellence positions them as global competitors, showcasing the prowess of South African agriculture on an international stage.

As we navigate challenges such as climate change, infrastructural limitations, and policy uncertainties, visionary leadership becomes indispensable. It is not confined to the upper echelons of management; rather, it permeates every level of the agricultural community. Each producer contributes to this



Johann Kotzé.

collective endeavour by leveraging new technologies and implementing sustainable agricultural practices.

South African producers possess a deep understanding of the pivotal role agriculture plays in our society. They stand at the forefront, equipped with the knowledge and experience to lead the industry into the future. By embracing innovation and adopting forward-thinking practices, they pave the way for progress. We are confident that through collaborative efforts and shared expertise, we can tap into the vast growth opportunities that lie within the agricultural landscape of Africa.

Agri SA firmly believes in challenging the status quo to propel growth and foster innovation. Our role is to inspire and empower producers to envision a future brimming with possibility. Together, we can realise our aspirations and shape a brighter tomorrow for agriculture in South Africa and beyond. 🌱

Email Johann Kotzé at
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Good prospects for 2024

The Department of Agriculture, Forestry and Fisheries' Crop Estimates Committee report of 30 January 2023 revealed a preliminary area of 2 637 750ha planted to maize versus the previous season's 2 586 100ha. It is postulated that a season that was not expected to be dryer than last year, may have favoured maize marginally over soya beans in some areas.

The area planted to soya beans reduced marginally to 1 036 600ha compared to 1 148 300ha in the previous season. Sunflower and maize plantings increased at the expense of soya beans. This is mainly weather-related.

The area planted to sunflower increased to 613 200ha from 555 700ha the previous season. The overall preliminary estimated hectares planted to summer crops increased to 4 407 750ha from last season's actual 4 392 050ha, which is a positive move.

The final canola crop planted in 2023 increased to 131 200ha and production yielded 237 450t. The previous year's planting amounted to 122 510ha that produced 210 000t. The total winter crop production increased from 2 665 300 to 2 759 120t.

Good rainfall

Rainfall, although uneven in certain regions, was excellent in terms of the previous season's winter crop and has been very favourable for the current summer crop. Given the favourable soil moisture, poor crops are impossible at this stage. Providing that the next two months remain favourable, we are likely to see excellent crop yields this year.

The previous season's crops allowed for a surplus after domestic consumption. According to the South African Grain Information Service (Sagis), South Africa could be exporting 2,94 million tonnes of maize until the end of December. The Supply and Demand Estimates Committee projects 3,6 million tonnes for the season. Soya bean exports hit a record of 596 155t (Sagis) at the end of December last year, with an estimated 600 000t for the season.

Commodity prices

Due to global supply, this year's price for grains has been significantly lower. This is a burden to producers but a relief to consumers.

At the end of January last year, yellow maize prices were approximately R4 600/t and this year it is at R3 600/t. Soya bean prices, in turn, are approximately R10 700/t compared to last year's R7 700/t. Sunflower prices are currently at R11 300/t compared to last year's R8 150/t.

We are excited about the prospects of an excellent crop in 2024 and look forward to its positive impact on the industry. Enjoy this issue of *Oilseeds Focus* and may you find the pages informative and empowering.

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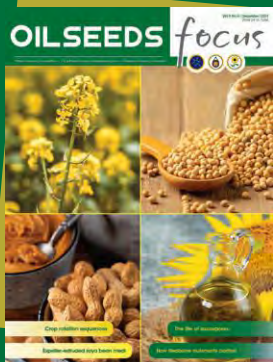
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Oilseeds Focus is a magazine aimed at addressing issues that are relevant to the canola, soya bean, sunflower and groundnut industries. To subscribe, please contact Beauty Mthombeni at 064 890 6941 or email beauty@plaasmedia.co.za. Subscriptions are free.



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NEWS

Europe negotiates genomic proposal

The European Parliament issued a statement highlighting that they have adopted a “position for negotiations with member states on the commission proposal on new genomic techniques (NGTs), which alter the genetic material of an organism, with 307 votes to 263 and 41 abstentions.”

The European Parliament further stated that “the objective is to make the food system more sustainable and resilient by developing improved plant varieties that are climate resilient, pest resistant, and give higher yields or that require fewer fertilisers and pesticides.”

Currently, in the European Union (EU), “all plants obtained by NGTs are subject to the same rules as genetically modified organisms (GMOs). Members of the European Parliament (MEPs) agree with the proposal to have two different categories and two sets of rules for NGT plants. NGT plants considered equivalent to conventional ones (NGT 1 plants) would be exempted from the requirements of the GMO legislation, whereas other NGT plants (NGT 2 plants) would still have to follow stricter requirements. MEPs want to keep mandatory labelling of products from both NGT 1 and NGT 2 plants.”

We draw from this statement that South Africa should also review its regulations on gene-editing matters to be at the forefront, as the country has been within acceptable health regulation parameters in the past two decades.

The goal should be to support a growing and competitive agricultural sector. From its roots, trade and scientific embrace have been at the centre of South Africa’s agricultural progress, and this should be the running theme even today. Importantly, with the EU now seeing the light, South Africa and New Zealand are the only major agricultural producers worldwide that regulate NGTs and new breeding techniques under GMO legislation. This needs to change. – *Wandile Sihlobo, Agbiz*

North America’s ammonia plans

North America is set to lead the global ammonia industry capacity additions with a share of 44% by 2028, by gaining capacities from new-build and expansion projects between 2024 and 2028, according to GlobalData, a leading data and analytics company.

GlobalData’s latest report, *Ammonia Industry Capacity and Capital Expenditure Forecasts with Details of Active and Planned Plants to 2028*, reveals that the total ammonia capacity of new-build and expansion projects in North America is expected to be 31,19 million tonnes per annum by 2028.

Ammonia is a widely used chemical in various end-use industries. The demand for ammonia in North America is driven by the growing usage of nitrogen-based fertilisers in the agricultural industry in the region. The other factors contributing to the growth of ammonia are the low-cost feedstock and the emergence of end-users with decarbonisation goals. – *GlobalData Media Centre*

Peanut butter brands recalled

The National Consumer Commission alerted the public that certain peanut butter brands were recalled. These include Dischem’s Lifestyle 400g and 800g Smooth and Crunchy, Wazoogles Superfoods (all sizes), Pick n Pay’s No Name 1kg smooth and Eden All Natural. The commission advised the public to immediately stop consuming these products and return them to the store they bought them from for a full refund, with or without proof of purchase.

“Following in-house standard testing, these products were found to have higher than regulated levels of aflatoxin, which may constitute a health risk. Aflatoxin is a naturally occurring mycotoxin, but the levels we detected were higher than the regulatory threshold,” a retailer said.

Aflatoxin presents a real health risk, but poisoning depends on the dose. Food and allergy specialist, Dr Harris Steinman, told *Daily Maverick* that aflatoxin is a high-risk toxin but needs long exposure. The disease also only occurs after approximately 20 years of significant consumption. – *Daily Maverick*

InteliGro changes leadership

WinField United South Africa (WUSA) and InteliGro jointly announced that Gideon Hefer, managing director of InteliGro, has decided to step down from his position effective 1 April 2024.

Hefer, a qualified chartered accountant from the University of Johannesburg, joined the then Terason in 2001 and was part of the team that established InteliChem in 2012. He played a key role in the merger of Terason and TechniChem, forming the well-known industry leader, InteliGro, in 2016. Being appointed as chief executive officer (CEO) of InteliChem in 2017, he joined the WUSA executive management team as managing director of retail in 2021.

Jan Vermaak, CEO of WUSA, confirmed that Gideon will remain within the group, taking on a different role to support strategic initiatives. In the immediate future, Gideon will prioritise his family life and contribute to organisations focussed on upliftment and feeding programmes, causes that are close to his heart. – *Winfield United*



Sunflower production increases

Oil World, a global market analyst in Hamburg, Germany, is forecasting global sunflower seed production for 2023/24 at 56,7 million metric tonnes (MMT), up 3% from 2022/23. Higher production in Ukraine and Russia is the leading contributor to the increase.

Ukrainian and Russian sunflower production estimates remain murky due to the ongoing war, but production is anticipated to be around 8% higher than in 2022. The EU, Argentina, Turkey and the United States (US) are expected to have decreased production versus last year.

The 2023/24 global sunflower crush is estimated to reach 52,5MMT, relatively equal to the last marketing year. Higher crush volumes are expected in Ukraine, Russia and the US. Global sunflower oil production is expected to remain equal to the last market year at 22,1MMT.

Oil exports to China, India and many other countries are expected to rebound from reduced levels experienced in the 2022/23 marketing year to more normal quantities. US sunflower oil export supplies have tightened recently and will improve as new-crop supplies move to the crush plants in the coming months. Ending global sunflower oil stocks are projected to be relatively low at 4,23MMT by the end of September. – *Farm Progress*

New nematode species discovered

The University of California Riverside's (UCR) scientists have discovered a tiny worm species that infects and kills insects. These worms, called nematodes, could control crop pests in warm, humid places where other beneficial nematodes are currently unable to thrive.

The new species is a member of a family of nematodes called *Steinernema* that have long been used in agriculture to control insect parasites without pesticides. *Steinernema* are not harmful to humans or other mammals and were first discovered in the 1920s.

"We spray trillions of them on crops every year, and they are easy to buy," said UCR nematology professor, Adler Dillman, whose laboratory made the discovery. "Though there are more than 100 species of *Steinernema*, we are always on the lookout for new ones because each has unique features. Some might be better in certain climates or with certain insects."

They have named the new species *Steinernema adamsi* in recognition of the American biologist, Byron Adams, who is the chair of the Biology Department at Brigham Young University. – *Phys.org*

European Union scraps pesticide proposal

The head of the European Commission, Ursula von der Leyen, has announced plans to scrap a proposal halving pesticide use across the EU by 2030. The move is an apparent concession to producers who have been protesting in many EU countries against regulations, including the planned reduction in pesticide use.

Von der Leyen said the proposal had become a "symbol of polarisation". The reversal still needs to be formally approved. Pesticide reduction is among several grievances that producers in countries including France, Belgium and the Netherlands have been demonstrating against recently.

They argue that reducing the amount of pesticide they are allowed to use will negatively impact their crops and therefore put food production in the EU at risk.

"Our producers deserve to be listened to," Von der Leyen told the European Parliament recently. "I know that they are worried about the future of agriculture and their future as producers."

Von der Leyen also said the issue of pesticide use had not gone away and that further conversations would be needed before a new proposal to reduce them could be put forward. The EU had aimed to halve the use of the chemicals by 2030 as part of its Green Deal, which is aimed at tackling climate change. Its proposal also included a ban on the use of pesticides in areas including public parks and gardens, schools and sports fields. The plan had already run into issues and was rejected by the European Parliament in November. – *BBC*

Save the date: WSRC12

The 2023 World Soybean Research Conference (WSRC11) was attended by more than 700 participants from 51 countries and was held from 18 to 23 June 2023 in Vienna. It was the first worldwide conference focussing on soya bean research in Europe.

The next instalment of this conference, WSRC12, will be held in Rosario in Argentina in 2027. Follow this link to submit a query for more information from the organisers: www.wsrc2027.com.ar. 🟡

Understanding disease intensity

By Dr Lisa Rothmann, lecturer, Plant Sciences, Plant Pathology Division, University of the Free State

“Without quantification of disease, no studies in epidemiology, no assessment of crop losses, and no plant disease surveys and their applications would be possible.” (Kranz, 1988)

Disease intensity is a term used to describe the amount of disease in a population, and is divided into two concepts: disease incidence and disease severity. The former is defined as the number of plant units, including plants, leaves, roots, etc. showing disease relative to the total number of units.

In contrast, disease severity measures the plant tissue affected by disease compared to the total plant tissue.

Disease assessment strategies

An additional concept is prevalence, an extension of disease incidence, a measure of disease presence in the proportion or percentage of fields observed within a region.

Two strategies can be followed to conduct disease assessments:

- Disease estimation, which follows a visual subjective approach and may be descriptive of the proportion of diseased versus healthy tissue.
- Disease measurement, which uses equipment and instruments with greater objectivity and precision to quantify disease. It is critical to note the contrast of measuring the pathogen, which focusses on quantifying the disease-causing organism and/or parts thereof.

In a cabbage field, where water-soaked lesions are present on cabbage heads, a count of symptomatic plants will give an indication of disease incidence (Figure 1A). Sunflower head rot incidence can be easily evaluated for the presence of symptoms, water-soaked lesions and mycelial development, where a proportion or percentage of symptomatic plants can be determined in contrast to the population of plants.

However, measuring the head rot severity by assessing the lesion size of sunflower head rot is more complex, as

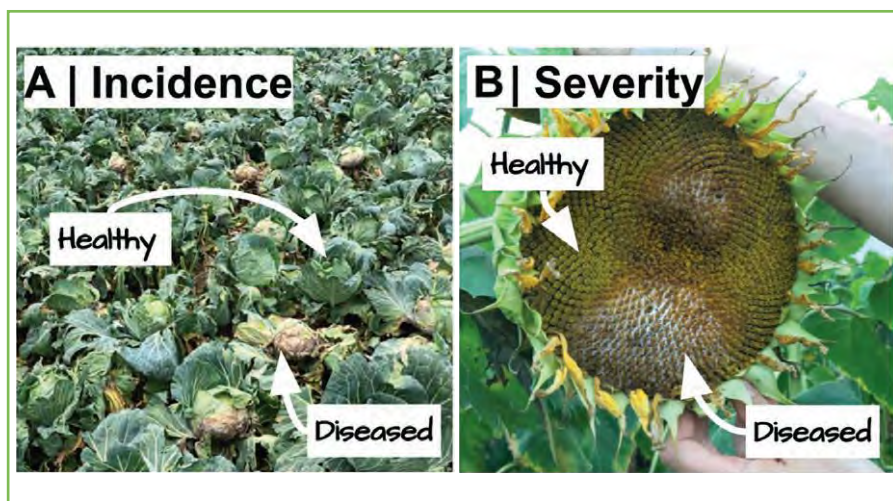
evaluations of lesion size are subjective between evaluators (Figure 1B).

Precision could be increased by manually measuring lesions with a ruler, although this would not be practical at a meaningful scale. However, pictorial guides, known as standard area diagrams, have been developed to aid raters in making disease severity more objective (Figure 2A).

Improving accuracy and precision

Kwanele Sabela, an MSc Agriculture researcher at the Plant Pathology

Figure 1A and B: Disease incidence (A) and severity (B) indicated on cabbage and sunflower fields.

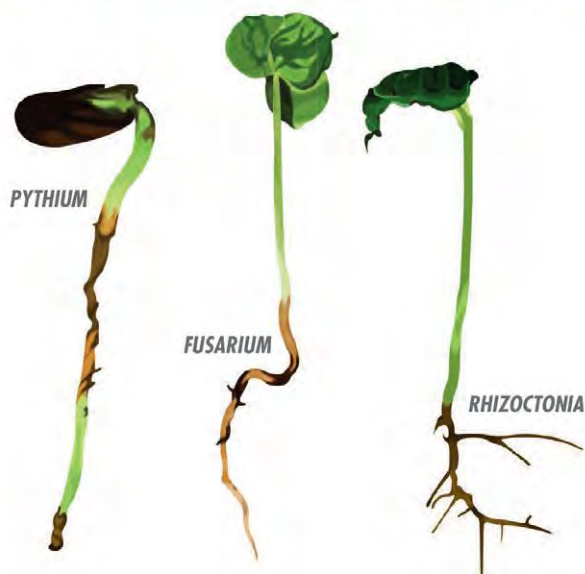




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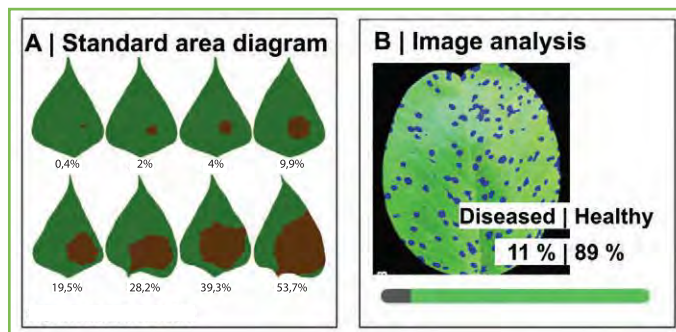


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Figure 2A and B: An example of a standard area diagram (A) and an image analysis (B). (Source: Fagundes-Nacarath *et al.*, 2018)



Division of the University of the Free State, is designing a tool for evaluating head rot severity with a range of lesion sizes to improve accuracy and precision between raters. Accuracy is how close a measurement is to reality, i.e. 'trueness'. Precision is how often one can measure disease accurately or the nearness of measurements to one another.

To avoid accuracy and precision being compromised, one can consider training and instructions for distinct symptom types and patterns, assess disease when one is 'fresh' and the environment is conducive for discerning between colours/patterns, select a scale which circumvents value preferences, and ensure a sample size that is representative of a population.

Image analysis is another technique where photos of a range of disease severity are assessed and measured using colorimetric analyses to compare the area of healthy versus diseased tissue through distinguishing variations in colours associated with tissues (Figure 2B).

A cellphone application called Leaf Doctor (www.quantitative-plant.org/software/leaf-doctor), which measures the percentage of tissue area diseased from photographs of symptomatic plant organs, has been developed by a group of plant pathologists in the United States and is freely available to the public.

Utilise reliable assessments

The degree of yield loss depends on the number of plants infected (incidence/prevalence), the degree and extent of tissue damage (severity), the host crop growth stage and the type of infection. In oilseed crops, quality characteristics, including pod shattering, reduced seed size and oil content, are indirect losses observed with *Sclerotinia* diseases. As British mathematician Lord Kelvin succinctly stated: "To measure is to know".

Applying these tools will enable more reliable assessments of disease severity when determining cultivar tolerance, fungicide efficiency, and isolate aggressiveness, for example. Management strategies can be evaluated and advanced by understanding the extent and scale of disease events requiring plant disease measurement. 🌱

For more information and references, contact Dr Lisa Rothmann on 051 401 3666 or lisa.ann.rothmann@gmail.com.

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Canola research in the spotlight:

Key takeaways from the Combined Congress 2024

By Prof Pieter Swanepoel, Department of Agronomy, Stellenbosch University

The recent conclusion of the annual Combined Congress marked a focal moment for agricultural research. Held in George, the Combined Congress united societies such as the Soil Science Society of South Africa, the Southern African Society for Horticultural Sciences, and the South African Society of Crop Production.

The congress featured diverse contributions to canola research, and served as a platform for scientists to share cutting-edge canola research, providing insights into innovative farming practices, climate adaptation, and soil health.

Congress highlights

The effect of gypsum source and form on soil chemical properties and early canola (*Brassica napus*) growth in an acidic sandy soil by Marina du Plessis, Pieter Swanepoel and Ailsa Hardie: This study investigates the impact of various gypsum sources on acidic, sandy soil in South Africa, addressing common calcium (Ca) and sulphur (S) deficiencies.

Six gypsum products were applied in a greenhouse pot trial, with the aim of raising soil Ca levels. Results showed that all gypsums increased soil pH and reduced acid saturation in the top 50mm, but only granulated phosphogypsum and mined recrystallised gypsum effectively alleviated acidity below 50mm, leading to larger root biomasses.

Granulated phosphogypsum stood out due to its superior acid-neutralising capacity, attributed to the presence of

microfine gypsum. While differences in canola shoot Ca and S contents were negligible among gypsum treatments, all gypsum sources improved dry shoot and root biomass, except for phosphogypsum, which had a weaker effect on soil acidity. In the short term, granulated phosphogypsum and mined recrystallised gypsum were identified as superior in correcting acidity and enhancing canola root growth.

Predicting the N₂O emissions in different tillage and crop rotation systems in the Swartland region, Western Cape by Kent Buchanan, Pieter Swanepoel, Stephanie Midgley and Johann Strauss: This study focusses on managing nitrous oxide (N₂O) emissions, a potent greenhouse gas in cropland agriculture. N₂O emissions are currently estimated based on nitrogen availability, but this method has high uncertainty.

The study aims to enhance accuracy by considering multiple factors influencing N₂O emissions, such as carbon availability, soil moisture, temperature, pH, fertilisation practices, and tillage methods.

The research involves predicting N₂O emissions in three crop rotation systems (wheat monoculture, wheat-medic alternating, and wheat-canola-wheat-lupin rotation) under conventional and zero tillage. Preliminary results suggest that conventional tillage reduces N₂O emissions due to lower soil moisture and organic carbon content. However, more work is needed before rigorous conclusions can be drawn.

The study aims to develop a simple and efficient framework to predict N₂O emissions, providing insights for producers and informing government policies in the Swartland region of the Western Cape.

Climate change impacts on canola growth and yield characteristics: challenges and opportunities by Andries le Roux, Stephanie Midgley, Pieter Swanepoel and Johann Strauss:

The study investigates the impact of changing climatic factors on canola growth and yield due to increased atmospheric greenhouse gases. A literature review of 22 papers identified several effects: elevated CO₂ benefited canola growth, optimal temperatures enhanced biomass, and moderate soil moisture stress reduced leaf area. In the reproductive stage, elevated CO₂ improved seed yield by 38%, while high temperatures (>28°C) and soil moisture stress reduced yields by 87 and 43%, respectively.

Rising CO₂ had a fertilising effect, increased heat stress during reproduction had a significant impact, and drought stress during reproduction was detrimental to canola production. Elevated CO₂ may partially offset yield-reducing effects.

Extent of soil acidity in no-tillage systems in the Western Cape province of South Africa by Adriaan Liebenberg, Ruan van der Nest, Ailsa Hardie, Johan Labuschagne and Pieter Swanepoel: In the Western Cape, over 80% of producers have adopted no-tillage systems for crop production efficiency. However, this



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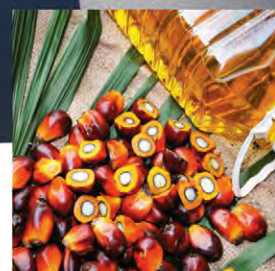
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practice hinders the mixing of soil amendments such as limestone, leading to nutrient and pH stratification between soil layers.

A survey across crop production regions focussed on fields under no-tillage for at least eight years, with no recent liming, and involving barley, canola, or wheat in crop rotations. Results showed suitable mean pH and exchangeable acidity for crop production, but the Swartland region exhibited higher acidity and lower pH compared to the Southern Cape. Stratification of calcium, magnesium, and acidity was observed, particularly in the Swartland, with 20% of samples showing sub-optimal pH levels for canola production.

The study concludes that addressing soil acidity stratification is crucial, suggesting strategic one-off tillage as a potential solution.

The risk involved with planting farm-retained canola seed (*Brassica napus*) by Piet Lombard, Lisa Smorenburg and Johann Strauss:

This study assesses the feasibility of planting farm-retained F2 hybrid canola seed compared to F1 hybrid canola. A field trial with six F1 and corresponding F2 cultivars was conducted, treating F1 seeds with fungicides.

Despite the same seeding density, F1 treatments had, on average, 9,6 more plants per m⁻¹. F2 cultivars showed increased blackleg infection (22,2%) compared to F1 (11%), with varying severity among cultivars. F2 seed had, on average, 0,8% less oil content, and the yield declined between 5,5 and 24,1%, averaging a 13,9% reduction.

The study concludes that while using farm-retained seed may offer cost savings, the risk of disease pressure and reduced crop yields make F1 seed more advantageous.

Effects of tillage rotations with a ripper on canola productivity in the Swartland by Velicia Mabitsela, Flackson Tshuma, Johan Labuschagne and Pieter Swanepoel: The study investigates the impact of tillage rotations involving a ripper on canola productivity in the Western Cape. Tillage rotations with a ripper, a novel

approach in the region, are considered potential alternatives to continuous tillage or no-tillage, which could adversely affect crop productivity. Various tillage treatments, including continuous and rotation options, were implemented at Langgewens Research Farm.

Plant population did not differ significantly among tillage treatments. Biomass production at 60 and 90 days after emergence was influenced by tillage practices, with all tilled treatments showing higher canola biomass compared to no-tillage and zero-tillage treatments. The ripping treatment in the rotation increased biomass production significantly compared to no-tillage and zero-tillage.

Preliminary conclusions suggest that while tillage rotations did not significantly enhance biomass production compared to continuous tillage, they outperformed no-tillage and zero-tillage treatments. More research is needed to understand the effects of tillage rotations on canola production.

Regenerative agriculture vs conservation agriculture: effects on soil quality and crop productivity by Guy Musto, Pieter Swanepoel and Johann Strauss:

The study evaluates the potential of regenerative agriculture (RA) practices in addressing sustainability challenges in small-grain farming systems in Mediterranean climates. Conservation agriculture (CA) has been effective but faces issues such as herbicide resistance and rising input costs.

The experiment at Tygerhoek Research Farm compares RA and CA systems with four crop types (canola, wheat, barley, and cover crop). RA, relying on biological inputs, shows no significant effect on soil chemical properties but increases available phosphate. Microbial activity and diversity trend higher under RA, especially for cover crops and wheat.

Crop productivity improves under RA in the second year, suggesting benefits from preceding cover crops. Despite lower productivity in some cases, RA practices show promise for enhancing soil health and sustaining crop productivity with fewer synthetic inputs. Long-term testing is recommended for further assessment.

Canola weed suppression at various levels of planting densities by Robin Riet, Charne Viljoen and Johann Strauss:

Canola production in South Africa relies heavily on herbicides for weed control, raising concerns regarding herbicide resistance. This study explores alternative weed management practices, specifically the weed suppression ability of different canola cultivars at various planting densities, with and without herbicides. The trial involved two cultivars (triazine tolerant and imidazolinone tolerant) and four planting densities.

Without herbicides, the Clearfield cultivar generally showed lower weed biomass compared to triazine tolerant, and higher planting densities did not guarantee better weed suppression. With herbicides, Clearfield exhibited poorer weed suppression than triazine tolerant, likely due to more effective herbicide use. The study suggests that while higher planting densities may not ensure better weed suppression, selecting competitive cultivars can be effective, especially with proper herbicide application.

Economic system stability of short rotations in the Overberg by Lisa Smorenburg, Johann Strauss and Marde Booyse:

This paper evaluates the economic stability of short rotation systems in the Overberg production area, emphasising the importance of crop diversity and sequence in CA systems. Data from 13 rotation systems, including pasture/crop and crop-only systems, were analysed over a 19-year period.

The analysis revealed significant differences in the stability of these systems. Crop/pasture systems demonstrated more stability in profitability over time compared to pure cropping systems. While a six-year crop-only system yielded higher returns, it was less stable than most pasture/crop systems. The choice of cash crops in pasture/crop systems proved crucial, and limitations in current legume options affected the performance of crop-only systems. Overall, crop/pasture systems showed more consistent profitability over the years. 🌱



Climate change and agriculture: Global collaboration efforts in the spotlight

By Prof Stephanie Midgley, scientist at the Western Cape Department of Agriculture and associate professor at the Department of Horticultural Science, Stellenbosch University

More frequent and intense weather events across the globe, including South Africa, are causing havoc, with severe impacts on agriculture. Climate change must be dealt with urgently through mitigation and adaptation, to protect food supply, farming livelihoods, and agricultural economies.

The good news is that knowledge, technologies and solutions are available, and by working together at all levels, from the farming industry to global partnerships, we can progress faster to assist the sector and value chain to become more climate resilient.

Increasing climate risks

Last year was an extraordinary year in the history of global climate, as countries across the world grappled with record-breaking extreme weather, including floods, droughts, heatwaves, storms and wildfires. Global temperatures set records every month from June to December 2023. It was the warmest year since record-keeping commenced in the mid-1800s, and the warmest year on record in 77 countries (*Carbon Brief*, 2023).

Many other records pertaining to ocean warming, the rise in sea levels, shrinking glaciers and ice sheets, and sea-ice extent were set in 2023. In South Africa, devastating floods in KwaZulu-Natal and the Western Cape (two one-in-100-year floods in June and September) caused immeasurable damage to urban and agricultural infrastructure, annual and

perennial crops, and riverbanks, with a concurrent loss of agricultural soils and sedimentation.

Climate change is no longer something our children and grandchildren will have to deal with in future. It is happening now, and at a pace that astounded many climate scientists. This leads one to describe the events of 2023 as absolutely gobsmackingly bananas. There is widespread agreement among many scientists, politicians and businesspeople that climate change adaptation efforts and resources fall short of the type, scale and intensity of climate-related events already taking place (World Economic Forum, 2024).

Moreover, the Intergovernmental Panel on Climate Change (IPCC) in 2021 determined that “it is indisputable that human activities are causing climate change, making extreme climate events, including heat waves, heavy rainfall, and droughts, more frequent and severe”. This requires much stronger global and national efforts to reduce greenhouse gas emissions from all sources, including agriculture.

Food and agriculture at COP28

The United Nations (UN) Framework Convention on Climate Change meets annually at the Conference of the Parties (COP), also commonly termed the UN Climate Change Conference. Here, the implementation of the convention is reviewed, and decisions are adopted to promote effective implementation. The 28th COP was held in Dubai from 30 November to 12 December 2023. After many years

of engagement, the food and agriculture sectors finally took centre stage.

The outcome was the *COP28 United Arab Emirates Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action* (the Declaration), signed by 134 countries. They represent over 5,7 billion people, 70% of the food we consume, nearly 500 million producers, and 76% of total emissions from the global food system.

There is growing recognition that the global food supply is facing severe threats and disruption from climate extremes, and is a major contributor (around one third of global emissions) to climate change. This tension creates challenges for the sector that must increase food production to nourish growing populations, while reducing greenhouse gas emissions and avoiding the loss of ecosystems such as forests. These are critical for future resilience and carbon uptake from the atmosphere. The declaration also emphasises that the lives and livelihoods of producers living on the frontline of climate change must be protected.

Fortunately, producers, scientists, value chain actors and innovators are coming up with alternatives and solutions that can help. These include the scaling of regenerative agriculture technologies, the use of accurate and affordable climate services like weather forecasts, tools and early warnings, digital agriculture, more efficient irrigation technologies, innovative insurance and other social protections. “Food systems transformation” is required

(Vermeulen *et al.*, 2018), and we have no time to lose in doing this sustainably for the benefit of the planet, producers, and all value chain role-players.

Climate change and agriculture

With so much activity on the international stage, what does it all mean for South Africa and our agricultural sector?

Dr Peter Johnston and his colleagues at the University of Cape Town (Johnston *et al.*, 2024) compiled a scientific synthesis to inform policymakers, media, the private sector, civil society, academics and anyone looking for country-level information on climate change.

The report explains how climate impacts in South Africa have cascading effects on people's lives (Figure 1). Climate change impacts on agriculture tend to interact in complex ways with other chronic social, economic and environmental challenges, with linkages to poverty, food and nutritional insecurity, health systems, vulnerable livelihoods, water and energy insecurity, biodiversity loss, and deteriorating infrastructure.

The report also mentions that a "global temperature rise of 3°C is projected to reduce labour capacity in agriculture by 30 to 50% in sub-Saharan Africa, relative to 1986 to 2005." This impact on producers, workers and their communities, as well as the health and resilience of the production environment, are of great concern.

A new era for partnerships

South Africa does not have the financial and human resources to tackle climate change mitigation and adaptation adequately in the timeframes required. Despite an extraordinary effort and commitment from many individuals, we need much more support and collaboration for implementation on the ground that leads to upscaled outcomes.

This is where partnerships between producers and their organisations, the public sector, the private sector, research and academia, and civil society are essential, from local farming regions to international contributors. Recent developments include the Western Cape, where the deeper and broader

implementation of the SmartAgri Plan (Midgley *et al.*, 2016) is gaining momentum.

Climate disaster solutions

The Western Cape Department of Agriculture (WCDa) hosted a multi-stakeholder dialogue on climate disaster solutions on 24 and 25 April 2023. The dialogue was a follow-up to the drought dialogue for the agricultural sector held in June 2016, which concluded with 32 jointly identified challenges, prioritised to five actionable points that were subsequently implemented.

The April 2023 dialogue went beyond drought to cover all climate-related extremes and disasters across the Western Cape, aiming to "move from relief to resilience and risk reduction". Specific objectives were to learn from the lessons of the past (post-2016), to revisit existing relief tools and resources, and to agree on forward planning for greater resilience.

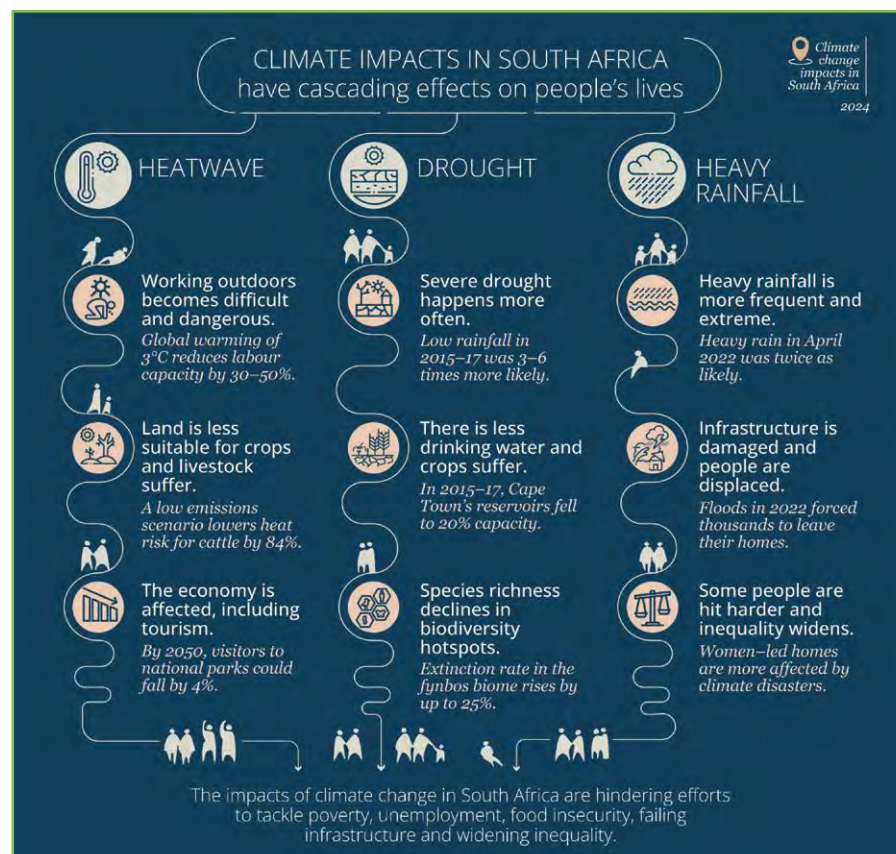
The two-day event brought together 81 government decision-makers at the district and provincial levels, with national level officials, smallholder and commercial producers and representatives of organised agriculture and industry commodity organisations, conservation bodies, representatives of the banking sector, related agri-businesses and selected subject experts.

The outcome of working group discussions was seven prioritised themes, with details on actions needed. They cover the negative lessons, including challenges and barriers, learnt since 2016 that must be turned into positive actions, and the positive lessons and successes that should be further developed and scaled up. A task team is taking the work forward.

Agreement to enable research

On 6 November 2023, the WCDa and the Western Cape Department of Environmental Affairs and Development Planning signed a memorandum of agreement (MOA) with Stellenbosch University's School for Climate Studies. The School for Climate Studies was launched in 2021 to create a transdisciplinary capacity on climate-related knowledge, the public sector's climate policies and initiatives, the private sector's innovation capacities and the social impact mission of the university.

Figure 1: Climate impacts in South Africa have cascading effects on people's lives.
(Source: Johnston *et al.*, 2024; credit: InfoDesignLab)





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The MOA will provide a platform to pursue local and international research and capacity-building opportunities to build the climate change knowledge base in the Western Cape. With current shared interests such as nature-based solutions, invasive pests, hydrological changes, carbon removals in landscapes, job creation, skills training and economic development, and strong links to the Stellenbosch University AgriSciences Faculty, the agricultural sector will be sure to benefit.

According to ministers Ivan Meyer and Anton Bredell, co-leaders of climate change governance in the Western Cape, the signing of this agreement is testimony to the Western Cape government's drive towards climate change resilience.

Meyer said: "Droughts, floods and heat waves will become more regular, and these trends highlight the need for a co-ordinated response from government, tertiary institutions, private sector and the whole of society to mitigate the impact of climate change."

International agreement

A bilateral MOA between the WCDoA and the California Department of Food and Agriculture was signed on 11 March 2022. This initiative rests on the fact that California and the Western Cape are two of the five regions in the world with similar (Mediterranean-type) climates, experiencing similar climate disasters such as floods, droughts and fires, and expecting similar climate change futures of warming and drying.

The sharing of knowledge and experience is thus beneficial to both parties. Several joint webinars have been



Ivan Meyer, Western Cape minister of agriculture, and secretary Karen Ross, California Department of Food and Agriculture.



Delegates present at the signing of the memorandum of agreement on 6 November 2023: At the back are Anton Bredell, Western Cape minister of local government, environmental affairs and development planning, Prof Sibusiso Moyo, deputy vice-chancellor of research, innovation and postgraduate studies at Stellenbosch University, and Ivan Meyer, Western Cape minister of agriculture. In front are Gerhard Gerber, head of the Department of Environmental Management and Development Planning, Prof Louise Warnich, dean of the Faculty of Science at Stellenbosch University, and Dr Mogale Sebopetsa, head of the Western Cape Department of Agriculture.

conducted, and in 2022, a delegation led by the WCDoA's Ivan Meyer undertook a visit to California. Several outcomes were identified that need to be further explored.

This was followed up by a study tour led by Dr Ilse Trautmann, deputy director general of agricultural research and regulatory services from 19 to 23 June 2023. In addition to bilateral opportunities that include training and skills development, one of the key outcomes was support for the establishment of the proposed Mediterranean Climate Action Partnership (MCAP).

Global collaboration

MCAP was launched at COP28 in Dubai with a signing event that included the 14 founding sub-national governments from five continents on 2 December 2023. The partnership sets the stage for global collaboration that will assist sub-national regions to accelerate action on drought, wildfire and extreme heat impacts.

On behalf of the WCDoA, Dr Trautmann signed the following commitment:

- Expand public awareness of climate impacts and solutions in our regions and around the world, with innovative communications amplified through a common voice.
- Learn from each other and build capacity around what does and does not work to confront shared climate threats through member convenings, study tours and expert exchanges.

- Exchange approaches on policies, programmes and governance, investment and economic development strategies and foster research collaboration that advances shared knowledge on trends and impacts.
- Accelerate concrete actions in Mediterranean regions to protect our communities from climate change impacts, while reducing greenhouse gas pollution, conserving ecosystems, halting biodiversity loss, implementing nature-based climate solutions, increasing nature restoration, and accelerating the clean energy transition.
- Track and report progress to the global community in appropriate settings.

The scale of the challenge is enormous. What we achieve in the next five to ten years will be critical. However, with strong partnerships that foster sharing, learning and joint action, the agricultural sector can meet the challenge. The WCDoA is excited to put into action the various partnerships with producers, organised agriculture, landscape managers, research and academic institutions, governments at various levels and project partners.

The next steps include a strong drive to raise funds and to identify and action priority opportunities that will support the agricultural sector. 🌱

For more information and resources, contact the author at Stephanie.Midgley@westerncape.gov.za or 083 652 9062.



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Trials exhibit canola's adaptability

By Hugo Lochner, Plaas Media

Cultivar trials planted annually by the Western Cape Department of Agriculture show that canola can be cultivated with confidence in the province. According to Piet Lombard, senior scientific technician at the department's Directorate of Plant Sciences, canola adapts well to local climate conditions given the results of the last two years, which include a dry 2022 and a wet 2023.

Trials were planted at five localities during 2023 in both the Swartland and Southern Cape. In the 2023 cultivar evaluation programme, 18 canola cultivars (17 in 2022) were tested, four of which were conventional cultivars, four CI cultivars (Clearfield, imazamox tolerant), eight from the TT group (triazine tolerant) and two combination type cultivars with both the CI and TT tolerance (Enforcer CT and PY520 TC).

Effects of a wet year

The 2023 season in the Swartland was characterised by a very wet period from 25 May until the beginning of July. Rainfall in July and August was below average, but in September it was much more than the long-term average. October in turn was very dry. Total rainfall during the 2023 growing season was 37mm more than the long-term average.

According to Lombard, the good rain received in September prevented plants from being exposed to moisture stress. Favourable lower temperatures, especially in August and September, which is an important flowering and seed-filling period for canola, favoured 2023 yields in the Swartland.

In the Southern Cape, the Tygerhoek Experimental Farm near Riviersonderend received more than double the long-term average rainfall (624mm) during the 2023 growing season. This is the wettest recorded growing season in history after 2021. During 2021, 396mm of rain fell during a single event in May, whereas in 2023 it rained more than the long-term average throughout the season, except for August.

The temperature at Tygerhoek was not as favourable as in the Swartland. August was characterised by above-average warm maximum temperatures, while the minimum temperatures were below average from July to September.

The Swartland's best performers

The Swartland's harvest season was late due to the wet and cold weather in September. Although the trials in the region were exposed to very wet conditions, little to no *Sclerotinia* occurred in the cultivar trials. However, *Sclerotinia* was widely observed in the Swartland.

The Swartland's average yield per trial ranged from 3 323kg/ha (Langgewens, second planting) to 2 266kg/ha at Philadelphia.

Just like in 2022, the conventional cultivar CC90014 (3 168kg/ha) produced the highest average yield, followed by Quartz (2 942kg/ha) and Diamond (2 822kg/ha). The yields of the latter two cultivars were significantly lower than that of CC90014.

Of the four CI cultivars planted in 2023, PY421C CI (3 143kg/ha) and the long grower, 45Y95 (3 086kg/ha) performed best, followed by the cultivars Solstice CI and 44Y94. The yield of the four CI cultivars did not differ significantly from one another.

Within the TT cultivar group that includes CT/TC cultivars, HyTTec Trophy, PY520 CT and HyTTec Trifecta produced the highest yields of 2 666kg/ha, 2 663kg/ha and 2 646 kg/ha respectively, followed by CT210001, Blazer TT and Alpha TT. The yields of the cultivars in the TT group did not differ significantly from each other. The average yield of the TT cultivars was 13 and 18% lower than the conventional and CI cultivars, respectively.

Southern Cape results

Due to the long season and high rainfall in the Southern Cape, many fields were inaccessible during the optimal weed



The Western Cape Department of Agriculture hosted its sixth farmers' day in September 2023 on the farm Waterboerskraal near Hopefield. The farm is one of five localities in the Swartland where the department conducts trials. Visitors could, among others, view cultivar trials of various small grains, canola, lupins and pasture crops, and learn about canola's susceptibility to black stem and the success of chemical sprays against this disease.

Activate soil life

By Henri Viviers, technical manager, Eco-Green Plant Health



Nutri-Soil is a natural, liquid, protein-containing soil activator that is essential for improving and stimulating soil life. Nutri-Soil contains free amino acids, beneficial soil enzymes, natural carbon and plant hormone extracts, as well as macro- and micro-elements. This unique formulation therefore contains the complete range of free amino acids, acting as a chelating agent that improves the absorption of macro- and micro-elements through the plant's root system.

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root development, leading to the formation of a dense network of capillary roots – this increases the surface area and volume of the roots.

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the advantage they need. Nutri-Soil is ideal for in-furrow application during sowing and planting. Other application options include irrigation systems (e.g. orchards), pivot points (e.g. potatoes) or spraying on the root zone (e.g. maize).



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The canola trials looked promising in September last year but, much like other crops, the trial plantings suffered as a result of a very wet period from 25 May to early July 2023.

control and fertilisation stage. Lombard says that the yields were nevertheless very good.

The trial at Roodebloem near Caledon in the Southern Cape had the best average yield (3 359kg/ha). The other localities' average yields were all above 3 104 kg/ha. The Southern Cape's average trial yield was 3 204kg/ha compared to 2022 and 2021's average yields of 2 124kg/ha and 3 271kg/ha, respectively.

In the conventional cultivar group, Quartz (3 628kg/ha) produced the highest yield, like it did in 2021 and 2020. The cultivar CC90014 was second (3 469kg/ha), followed by Diamond. There was no significant difference between Quartz and CC90014.

In the CI group, 45Y95 (3 980kg/ha) had the highest yield. This cultivar has good potential because its yield in several trials was more than 4 000kg/ha. The CI cultivar 44Y94 had the second highest yield (3 738kg/ha), followed by PY421C CI and Solstice CI. The yield of 45Y95 was significantly higher than all the other cultivars in the Southern Cape.

In the TT group, the TT cultivar HyTTec Trifecta (3 250kg/ha) and the combination cultivar PY520 CT (3 232kg/ha) had the highest yields. They were followed by the new combination cultivar CT210001 and HyTTec Trophy. HyTTec Trifecta's yield was significantly higher than that of CT210001 and HyTTec Trophy.

According to Lombard, the average yield of the TT group was 8 and 17% lower than conventional and CI cultivars, respectively. In 2022, the difference was

6 and 12%, respectively. The CI group has more cultivars with longer growing seasons than the conventional group. Therefore, the long seed-filling period in 2023 benefitted the CI cultivars' average yield.

Choose the right cultivar

Lombard says the trial results from the past season highlighted the positive impact climate can have on production. This stands in stark contrast to the 2019 season and to a lesser extent 2022. Both seasons had a dry and very hot spring.

It is impossible to provide for all climate extremes. Still, it must be borne in mind that well-adapted cultivars are essential for success. Producers should note the following when choosing cultivars:

- The availability of seed.
- The yield potential of the cultivars.
- Weed management in the canola year. Weed resistance results in growers considering TT, TC and CT cultivars to better manage weeds. The yield potential of the combination type cultivars that have both CT and TT tolerance should be compared to that of the TT cultivars. The TT gene in canola plants negatively influences yield and consequently TT cultivars' yield is usually lower than that of conventional and CI cultivars.
- The physiological rate of development of the cultivars. There are several cultivars with different growing season lengths available within the three groups. The growing season length is very important in the Western Cape

with its typical short growing seasons. Yield stability over growing seasons and across areas is essential when selecting a cultivar.

- Black-stem resistance is common, and it is vital to alternate cultivars. Canola should be sprayed with a fungicide during the five-leaf stage.
- *Sclerotinia* infestation, a risk during wet growing seasons, can drastically lower yields. With last year's wet growing season, *Sclerotinia* was widely noticed in the Swartland. This year there is an increased risk of *Sclerotinia*, especially in the Swartland.

Availability of seed

The availability of sufficient seed from suitable canola cultivars has been a major problem for the local canola industry in recent years. None of the aforementioned factors can be properly managed if not enough seed is available.

The seed shortages have resulted in growers withholding seed, but the risks associated with withheld seed are very high. Lombard says a reduction in yield was one of the risks. In 2022 and 2023, at Langgewens experimental farm, it was found that an average of 10 to 13% of the yield will be lost when withheld seed is planted instead of commercial seed. 🌱

For more information on the Hopefield trials, contact Piet Lombard at email Piet.Lombard@westerncape.gov.za or on 021 808 5415.

Swathing or direct combining of canola

By Piet Lombard and Dr Johann Strauss, Western Cape Department of Agriculture

According to the Canola Council of Canada, canola plants and pods that are well-knit together have a lower risk of wind-induced harvest losses. Plants that have been severely damaged by insects or hail are more prone to experience seed and pod losses.

Weeds and the off-type canola plants from farm-retained canola seed remain green for longer which can complicate direct harvesting. The occurrence of diseases such as *Sclerotinia* and blackleg causes some plants to mature early, which increases the risk of harvest losses.

Canola that fell over should be swathed close to the soil; the problem is that there is no stubble to anchor the row against wind. The latest cultivars have an improved pod-shatter resistance and are less prone to harvest losses due to pod shatter.

Swathing

Swathed canola can be ready to harvest earlier than standing canola but according to the Canola Council of Canada, too early swathing (<60% seed colour change) does not necessarily mean early combining. Canola that is swathed

when it is too green will take much longer to become harvest-ready than canola which was swathed at 60% seed colour change. Swathed canola is ready to harvest under normal conditions about five to 14 days after cutting, when the moisture content has dropped to around 10 to 12%.

Swathing too early can result in the crop not reaching its full yield and quality potential; seed with too much chlorophyll can be a problem which can have a negative impact on the grading of the seed. When green seed is present, allow a few more days in the windrow for further colour change. Green seed may change colour in the windrow but does not change significantly once combined and stored.

Avoid swathing during hot (>29°C or more) and dry weather, as rapid desiccation resulting from these

conditions may cause processes in the plant to stop prematurely, and seed with too much chlorophyll may be present.

Optimum time of swathing

According to the Canadians, at least 60% of the seed on the main stem should have changed colour once swathing commences. In Canada however, they are working with much higher seeding density than we work with locally. In South Africa, it is recommended that the seed colour change of the entire plant be considered in canola with low plant densities (20 to 30 plants/m²). Swathing must start at 60% seed colour change.

Seed that has not fully developed at this stage of swathing will not develop any further (no increase in oil and protein content). The youngest seed on the plant should already be firm to the touch when rolled between the fingers.

Steps to determine colour change

- Select one pod from the middle third section of the main stem (Figure 1).
- Select three pods from the middle third section of the side branch (Figure 1).
- Repeat five times in an area (20 pods).
- Move to four other areas in the field and repeat the above procedure until 100 pods have been collected.
- Split the pods open and collect the seeds in a bowl.
- Compare the colour with the scale in Figure 2.



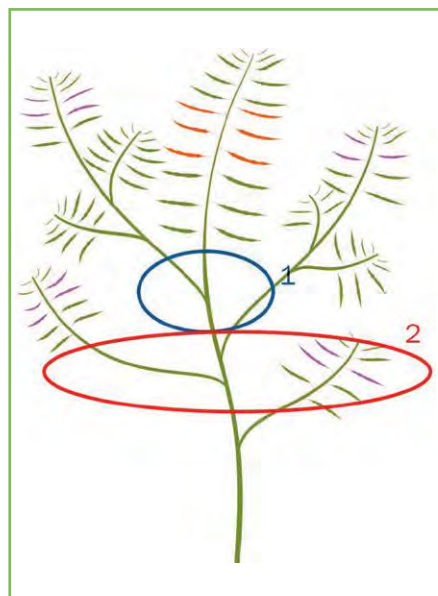
Canola seed not ready for swathing yet. (Source: Canolafokus)



On the left is a mature plant with *Sclerotinia* and on the right is the off-type canola that flowers later and consequently matures later. (Source: Canolafokus)



Figure 1: Determining seed colour change percentage. (Source: Canolafokus)



The side branches carry up to 75% of the harvest yield. The side branches change colour later than the main stem. Major losses can be incurred if one uses only the main stem to determine the swathing stage.

Direct combining

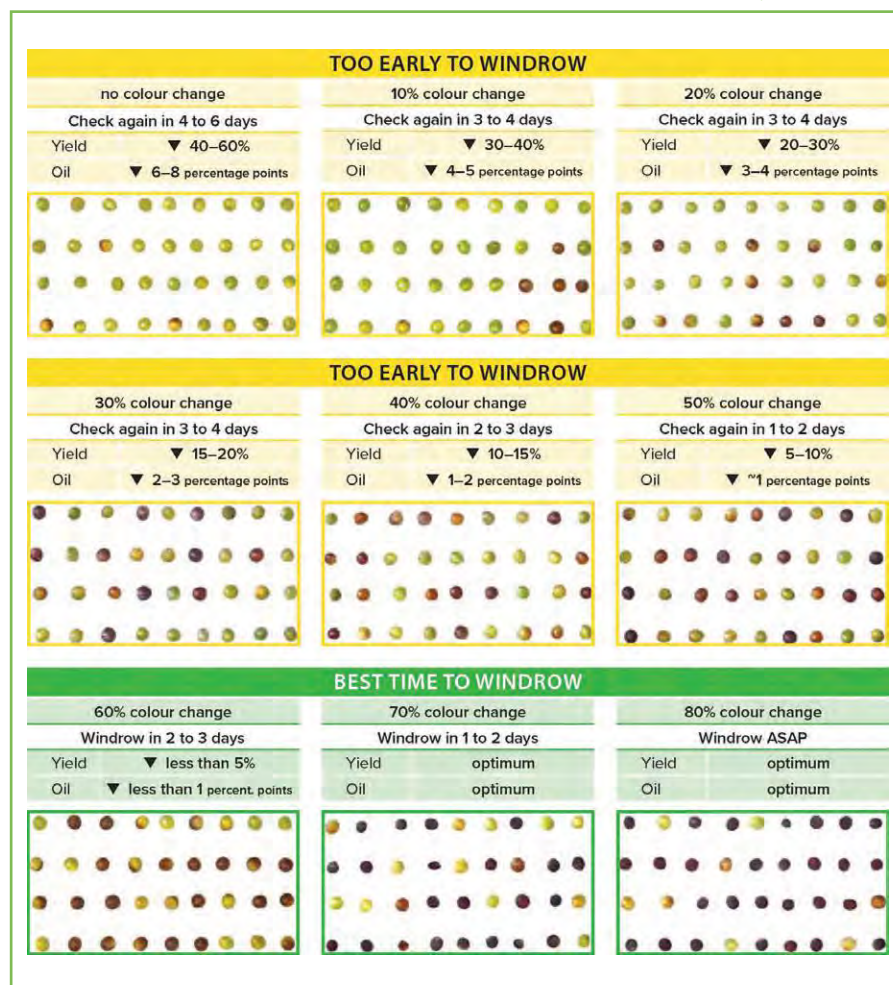
When directly combining, every plant can reach its full potential depending on the prevalent climate. Crops that mature unevenly run the risk of pre-harvest seed loss due to wind damage. One should wait for the moisture content of all plants to drop sufficiently before harvesting.

Pre-harvest chemical desiccation

The concept of chemical desiccation with Diquat should be redefined. It acts mainly as a desiccant by rupturing the cell membranes and disrupting photosynthesis on exposed green parts of plants. Diquat is known as a desiccant because it rapidly dries out the leaves and the rest of the plant. Canola plants that are sprayed with a desiccant (Diquat) do not mature faster, but the seed dries out quicker which enables an earlier harvest.

Desiccants such as Diquat will prevent (it rapidly desiccates the green material) the plant from reaching maturity.

Figure 2: The different seed colouration percentages. (Source: Grain Research and Development Corporation, Canola Windrow on time, reap the awards, July 2020)



Therefore, canola must be desiccated at the correct stage to avoid locking in green seed, optimising yield and seed quality. That is why the percentage of brown seed should be accurately measured before chemical desiccant is applied. The time to apply Reglone is when the crop is at 90% or more brown seed.

Pod drop and seed-shatter

Producers must know two important things:

- Not all canola cultivars have the same level of shattering resistance, even though this characteristic has improved immensely in the last few years.
- Shattering resistance does not prevent pods from breaking off (pod drop). Pod drop is still a risk when canola is combined directly.

The conclusion is that shatter resistance reduces the risk of harvest loss when it comes to direct combining, but it does not completely eliminate the risk of pod drop and consequent seed losses.

Canadian research and observations report that these characteristics are controlled by different genes. The University of Manitoba conducted a study on seed loss and found that genotype is the primary characteristic related to shattering resistance, while environment and genetics are the main reasons for pod drop.

Canola breeding programmes indirectly selected for shattering resistance in the past. Australian canola cultivar breeders do not swathe the canola but harvest it directly. 🌱

Germination and seedling development responses of sunflower seeds to temperature and different levels of water availability

By Asma Haj Sghaier, Hussein Khaeim, Ákos Tarnawa, Gergő Péter Kovács, Csaba Gyuricza and Zoltán Kende

The establishment of a crop consists of three sub-phases: sowing through seed germination, seed germination through seedling emergence, and seedling emergence through first competition among young plants. Seed germination is a three-step process.

During the imbibition stage, dormant seeds absorb water and undergo hydrolysis. Variations in the amounts of proteins, carbohydrates, and lipids can influence the imbibition process, which is formed by the interaction of these three substances. Protein and oil bodies are the principal reserves in oilseed crops that provide energy, carbon, and nitrogen to the seedlings during germination.

The second step of germination regulation involves activating adenosine triphosphate production in glycolysis, the Krebs cycle, the respiratory chain, and the translation of stored messenger ribonucleic acid. Germination is complete when the radicle emerges from the seed coat and produces a root. The plumules construct a shoot system capable of absorbing inorganic substances, water and light energy for healthy growth.

The germination process impacts seedling survival rates and crop establishment, which climate influences. Inadequate seed germination can result in inadequate stand establishment, negatively impacting crop yield and quality. Furthermore, efficient seed germination affects seedling density per unit area.

Germination and temperature

Temperature and moisture are particularly key germination regulators. Temperature

plays a crucial role in germination processes, as it regulates membrane permeability and enzyme activity, germination and the metabolic reaction of the seed. The optimal temperature for maximising germination and emergence varies depending on the crop.

Understanding crop seeds' germination and emergence response to temperature is crucial because it identifies their tolerance to low and high temperatures, and the climatic conditions under which partial crops can germinate and establish successfully.

The high temperature may inhibit seed germination by decreasing the availability of energy and hydrolysates, thereby delaying or inhibiting the synthesis and activity of hydrolytic enzymes, including fatty acid oxidation, the breakdown of storage oil, and gluconeogenesis. Similarly, lower temperatures contribute to disruptions and delays in reserve mobilisation, leading to seed viability loss and poor seedling development.

Impact of soil moisture

Water is essential for the germination of seeds. It is a medium for enzymatic processes, the solubilisation and transport of metabolites, and a reagent in the hydrolysis of proteins, lipids, and carbohydrates in the storage tissues of

germinating seeds. A sufficient amount of soil moisture, or imbibition of the seed, is required for germination.

The soil moisture deficit at this stage inhibits the seed's ability to absorb the required water and delays germination by inhibiting the enzymes responsible for hydrolysing endosperm starch into metabolizable sugars and providing energy for plant growth. As a result, it might significantly reduce actual germination, resulting in poor, irregular, and non-uniform germination and crop stand. In addition, drought stress can induce oxidative stress and increase the production of reactive oxygen species in seeds.

It causes a reduction in cell volume, which causes the cellular content to become more viscous, ultimately leading to the denaturation and aggregation of proteins and abnormal functioning of photosynthesis-related enzymes.

Sunflower cultivation

Sunflower is an annual oilseed crop belonging to the *Asteracea* family.

It is cultivated on 27,87 million ha and produces 50,22 million metric tonnes, giving it an 8% share of the global oilseed market. After soya bean, oil palm, and canola crops, oilseed rape is the world's fourth most profitable and cost-effective crop.



Photo showing seed germination at 25°C in a Petri dish. At this temperature, both germination and seedling development were observed to be at a high level.

Sunflower is a temperate zone crop that thrives in various soil and climate conditions because it is a rustic crop. It can withstand early autumn frost, which generally kills maize and soya beans. In general, sunflowers are grown primarily for their seeds, which contain 40 to 50% oil and 17 to 20% protein, and thus can alleviate the gap between the production and consumption of edible oil and animal feed around the world.

During germination, seeds are subject to various biotic and abiotic stresses that, individually or in concert, inhibit germination and seedling development. Depending on the severity of the stress and the genetic background, germination is either delayed or inhibited.

Limited data

To our knowledge, information on the effect of water and temperature on sunflower seed germination appears to be limited, mainly regarding the detection of water availability in the seed using the

thousand-kernel weight (TKW) method. In this regard, the work highlights distinct technological approaches that may be beneficial in the future for germination research and by producers in critical circumstances to anticipate the sowing date for sunflower crop establishment and successful seed germination.

It contains the following primary objectives: (i) to evaluate the effects of temperature on the germination and development of sunflower seedlings at various temperatures and determine the optimal level; (ii) to determine the minimum, optimal, and maximum water requirements for germination based on the volume of water in 1mL increments and the weight of 1 000 kernels, as determined by prior studies; (iii) to determine the optimal seed number and seedling density as well as the impact of pre-sowing seed technology on seedling development, to control fungal growth.

Effect of temperature levels

The right temperature is required for plants to transition from one phase of their life cycle to the next. In this study, seeds were exposed to eight constant temperature levels ranging from 5 to 40°C to determine the optimal temperature for sunflower germination.

At approximately 25 to 30°C, germination (radicle reaching 1cm) began. Below these temperatures, the beginning of germination gradually slowed. In the present research, sunflower seeds germinated at temperatures between 5 and 30°C, and 25°C was the ideal temperature for germination, with a range of 15 to 35°C.

Low temperatures of 5°C or below delayed the germination process and meant this took longer. Higher temperatures accelerated the germination process. Low and critical high temperatures slowed the metabolic rate to the point where essential pathways for germination initiation ceased to function. This can lead to a loss of seed viability and poor seedling development. Furthermore, elevated temperatures cause plants to have a faster metabolism, which depletes the seed energy required for growth. Temperature promotes metabolic and enzyme activity in addition to the seed's ability to absorb water, hence enhancing germination.

At extremely high temperatures, the available energy for growth is lost rapidly, preventing germination. In addition, when the temperature rises, the growth of the radicle and the shoot increases linearly until the optimal level is reached, after which it decreases linearly. The optimal temperature range for radicles was determined to be 15 to 35°C, with temperatures of 15 and 25°C overlapping in the early stages.

Each development stage's temperature requirements contribute to the radicle's temperature sensitivity. Previous research has demonstrated that each growth phase of the radicle requires a specific cumulative temperature.

Not only does germination need a certain temperature, but so do root development and shoot growth at each stage. For example, the plumule grew similarly between 15 and 35°C. However, it required a higher temperature than the radicle, which had a higher length value at 25°C. A shoot in the late stages showed an overlapping growth pattern between 15 and 20°C. The same finding was observed in the seedling development during the very late stages, between the temperatures of 15 and 25°C.

As each part of the stem and root responds differently to temperature, evaluating the complete seedling development is a more reliable method for predicting the effects of temperature on plants. The optimal temperature range for sunflower germination and seedling development was determined to be 25°C, with a range of 15 to 35°C. The temperature of 40°C harmed them; most enzymes became inactive, and seeds died, indicating that the high temperature accelerated the seeds' ageing.

Effect of water levels

This study examined the effect of one of the most influential environmental factors on germination, water, which influences sunflower establishment from sowing to seed filling. Water absorption is a prerequisite for germination. The amount of water substantially affected the seed germination potential.

According to both methods, with the 1mL intervals technique and TKW water levels, due to their deep and long root, sunflower seeds could germinate at low and higher water availability, beginning

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at 0,6mL or 125%. This quantity may be equal to or close to the required moisture content for germination. In the literature, this proportion was estimated to be 30% for maize, 40% for wheat and 50% for soya beans.

Species diversity may be responsible for these differences. Once the critical seed moisture content is reached, sufficient moisture is present to initiate germination. Previous research has documented the minimum water potential required to induce seed imbibition during the plateau phase of seed imbibition, a crucial phase in regulating seed germination.

It was observed that the duration of this phase is highly dependent on water potential and species. It can be extended to water potentials around 0,03 Megapascals (MPa) in some species and 1MPa in others.

Water quantity

Generally, an optimal quantity of germination water has a substantial impact on plant growth. Water availability is advantageous to the shoot, radicle and seedling. Although the radicle grows more slowly than the shoot, their optimal water conditions for growth and development are similar.

As a result, the optimal water range for total seedling length is 8,2 to 11,4mL, corresponding to 1 625 to 2 250% of the TKW. Radicle growth is the most critical factor in early seedling survival because it enables the seedling to exploit soil water through rapid root extension.

Under varying water conditions, dry weight accumulation in the radicle, shoot and seedling revealed a significant difference. The optimal water range for radicle development was determined to be 8,2 to 11,4mL, representing 1 625 to 2 250% of the TKW. This value was higher than their dry matter accumulation: approximately 1,9 and 4,4mL, representing 375 to 875% of the TKW. This finding demonstrated that the sunflower's prominent radicle structure allows it to exploit available water. However, water

application that exceeded the optimal range had a detrimental effect on the dry matter accumulation of plants.

Given that rapid radicle development under optimal hydric conditions contributed significantly to shoot dry matter accumulation, the plant will respond to increased water availability by increasing its flow and assimilating plumule to increase its dry matter accumulation. As a result, the accumulated dry matter for the plumule was determined to be between 4,4 and 8,2mm, representing 875 to 1 625% of the TKW. Furthermore, the radicle structure required less water to produce dry matter: 1,9 to 4,4mL.

Therefore, the optimal range for the entire seedling is 4,4 to 8,4mL, as determined by the TKW method, which falls within the optimal range determined by the 1mL method (4 to 12mL), confirming the TKW method's accuracy in determining the minimum optimal water requirement for germination, as supported by previous research.

Effect of seed number density

In this experiment, the effects of 6, 8, 10 and 12 sets of seeds per Petri dish (PD) on germination and growth parameters were compared to determine the optimal number of seeds that results in the highest germination efficiency.

The results revealed a significant difference in the growth and dry weight of the radicle and shoot among the seed numbers set. The seedling growth and dry weight increased as the number of seeds per PD increased. High seedling length and dry seedling matter were observed using a set of 10 to 12 seeds per PD.

Although 6 to 8 seed densities enhanced germination, seedling development was slower. This finding may be attributable to the shortage of a vital resource, such as water, at a low seed number as a result of competition. In addition, dense seedlings could be more susceptible to lodging, which increases disease incidence and, as a result, the seedling emergence percentage.

The optimal seed density for growing sunflowers in vitro under controlled conditions is 10 to 12 seeds per PD. Therefore, optimising seed density per PD and other environmental factors are crucial during germination tests.

Final thoughts

It is crucial to consider the length of the vegetative season and the plant's ability to germinate when planning the cultivation of sunflowers. This would allow producers to schedule the planting date, assuring the crop's successful establishment and growth. In this study, the optimal temperature range for sunflower germination and seedling development was determined to be 25°C, with a range of 15 and 35°C.

This finding revealed that optimal seed germination could occur as spring temperatures rise before the hot temperatures of summer. Below or above optimum ranges, the germination potential was diminished. Water has a significant effect on sunflower germination and growth.

The hybrid utilised in this experiment had the potential to germinate in a wide range of water concentrations, beginning at 0,6mL, or 125% of the TKW. Optimising the water availability for seeds based on millilitres of the TKW appeared to be the most successful strategy since it takes into consideration the seed's weight and size when estimating the appropriate amount of water for optimal seed development.

The optimal amount of water for seed germination, seedling development, and dry matter buildup ranged from 4,42 to 8,2mL, or 875 to 1 625% of the TKW.

In addition, regulating seedling density is essential to prevent water factor limitation and competition among seedlings, as well as to limit disease issues. Therefore, 10 to 12 seeds per PD was found to be the optimal seed density for cultivating sunflowers in vitro.

Future studies, breeding initiatives, and the prediction of sowing dates may benefit from these findings, particularly when seed supplies are limited. 🌱



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Oil as the new gold

Although sunflowers are planted in South Africa for oil production and bird feed purposes, the future of this crop lies in oil production. SY 3970 CL and SNK 270 CL are two of Syngenta's sunflower hybrids in the Sensako brand that can be planted specifically to deliver high oil content.

"The future of sunflower lies in oil," Basson points out. "In the past, the focus used to be on grain yield only, leaving processors with the short end of the stick. The new focus is on hybrids with a high oil content, that can contribute to increased profitability for growers and processors alike."

The current oil-content standard for sunflower grain is between 36 and 38%, but with SY 3970 CL growers have been achieving 42 to 50% oil in the past few years. "There are several new hybrids in the Syngenta pipeline and growers can look forward to products that will not only yield high oil content, but will also perform well in terms of grain yield."

With the right support and planning, which includes crop protection, growers can realise excellent returns on an investment in sunflower. 🌻

For more information on our product range, visit www.syngenta.co.za or www.sensako.co.za.

Syngenta's Sensako sunflower hybrids are well-known for their proven adaptability to local growing conditions.

Sunflower's ability to adapt to different climate conditions and planting dates makes it the ideal crop for South African conditions. The crop has the capacity to deal with drought conditions and tolerates high and low temperatures well. This can be a great advantage in the coming planting season with expected below-average rainfall if El Niño-predictions are realised.

Globally, Syngenta is regarded as the leader in sunflower genetics. The amalgamation of Syngenta and Sensako gives producers direct access to excellent Sensako sunflower genetics, and producers can now benefit from planting hybrids with high oil content and herbicide tolerance.

Consider excellence

"Not only should South African producers consider Syngenta's Sensako sunflower hybrids for their proven adaptability to

local growing conditions, but also because of Syngenta's global dominance in the sunflower market," says Charles Basson, sunflower breeder and product placement lead at Syngenta.

"The fact that Syngenta is a global leader in the sunflower market is a testament to their expertise and commitment to agricultural innovation. Syngenta's hybrids are the result of extensive research and development, ensuring high oil content and excellent yield potential that cater to the demands of both local and international markets. Producers seeking to enhance their crop's profitability should strongly consider Syngenta's sunflower hybrids, which stand out due to their superior oil content – a critical factor in market value and demand."

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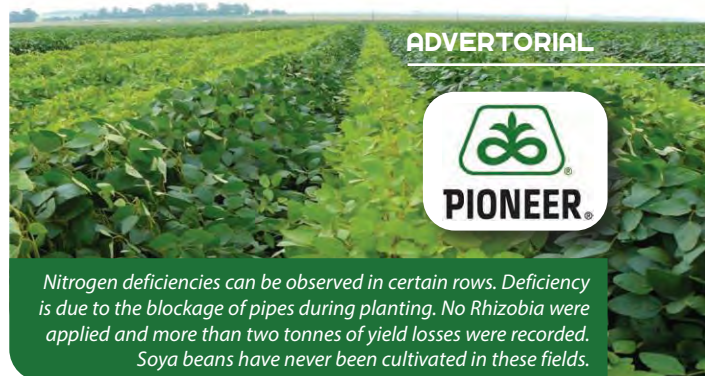
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Five steps to cultivating high-yield soya beans

By PR Janse van Rensburg, agronomist, Pioneer



While maize typically gets a lot of credit for its use as a crop, soya beans also have the potential to deliver high yields when managed correctly. Granted, a lot depends on the weather. A dry February can divest the extra input and strategy benefits, but it is worth investing some money if favourable weather conditions are foreseen.

Soya bean planting depth

Soya beans should be planted at a depth of 4cm to ensure uniform emergence, good stands and higher yields (Lawson *et al.*, 2009). The seedbed must be firm, even and of equal depth to ensure all seed are planted at the same level. Same-day sprouting is essential. Also, avoid rocky soil as the combine header must be able to harvest close to the ground.

Soya beans planted close to the soil surface have poor emergence and inoculation potential because of high soil temperatures and soil drying out prematurely. Table 1 summarises the trial results of a 2018/19 season planting at Delmas conducted by Roelof le Roux, a Pioneer agriculturalist.

Soya beans must be planted in moist soil. The seed must absorb 50% of its weight in water for the germination process to begin. Two-year-old seed should not be planted as germination can decrease by up to 80% when old carry-over seed is used.

Cultivar selection

Plant health is crucial when selecting a cultivar, especially in respect of nematode, sudden death syndrome and white mould resistance. Consider full-season products suited to the region. Plants that flower late into the season produce more pods and potentially higher yields.

For optimal yield, select cultivars with new genetics. Soya bean varieties are divided into maturity groups. Consult a South African soya bean production chart. The Agricultural Research Council (ARC) plants annual maturity group trials in three production regions (cold, temperate and hot). The data generated provides recommendations as to which growth lengths work where and how the genetics have improved yields.

Inoculation

Use a live nitrogen-fixing root-nodule bacteria such as *Bradyrhizobium japonica* to

treat seed. In-row or on-seed application is effective during planting as it improves the chances of inoculum survival. It is important to treat seed annually even though the soil might contain carry-over rhizobia.

Plant date – early planting

Soya beans are planted from the end of October until mid-November to benefit from the extended flowering potential of full-season varieties. Soya beans are a light-sensitive crop and will continue flowering as long as the season permits.

Weed management

All weeds must be eradicated pre-planting. Prof Christy Sprague of Michigan State University in the United States found that 200kg/ha is lost in yield terms if weeds are allowed to grow to 1cm. The application of pre-emergence herbicides is key and offers the best solution to manage resistant weeds. It keeps weeds at bay until the application of a post-emergence herbicide.

Seedbed weeds should also be eradicated as it is important to control weeds before the flowering stage. Some weed seeds are viable nine days after flowering. Pre-harvest weed removal prevents seed from becoming problematic in future.

Challenges

There are disadvantages to intensive soya bean management. Practices applied to increase yields, such as the use of plant hormones, increases vegetative growth, leading to poor lodging. Large numbers of pods increase the weight that side branches must bear, making it difficult for the plant to remain upright after heavy rain or during dry-off. Shorter type soya bean cultivars that have closely placed internodes are less likely to fall over. Early planting can be beneficial and requires no extra input.

Table 1: Harvest losses due to planting depth (2019 South African Futures Exchange [Safex] price was used).

Depth	Tonnes/ha	Potassium (K) difference in kg	Tonnes/ha	% K difference	Safex	R/ha difference
1cm	3,918	488	0,488	-11%	R4 500	-R2 195,86
3cm	4,406	K	K	K	-	K
5cm	4,271	136	0,136	-3%	-	-R609,96
7cm	4,023	384	0,384	-9%	-	-R1 726,40
9cm	3,88	527	0,527	-12%	-	-R2 370,11

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Competition alert!

Crop pests colluding with weeds

By Prof Charlie Reinhardt, North-West University

Since the introduction in the 1940s of the first synthetic herbicides, 2,4-D (2,4-dichlorophenoxyacetic acid) and MCPA (2-methyl-4-chlorophenoxyacetic acid), with selective action on broadleaf weeds in grass crops, great strides have been made towards efficient weed control and understanding the mechanisms involved in weed-crop interactions. Weed management is about the manipulation of weeds and their environment to reduce and, better still, eliminate them and their interference with the crop.

Achieving effective weed control, which is both timeous and economical, requires knowledge about weeds, control methods and the 'how and when' of weed interference with crop plants. The environment in which weed-crop

interactions occur has a modifying influence on their levels of intensity and outcomes. Soil and climate greatly influence our weed control efforts and therefore environmental factors must also be considered. The abiotic environment is represented by soil and climate, and the biotic environment encompasses all living organisms, i.e. 'the good, the bad, and the ugly'.

Weeds play host to insects

In their battle with crop plants, weeds collude with pathogens and insects, often serving as hosts that provide shelter and food. The hosting of crop pests by weeds has obvious disadvantages for crops, but there is one advantage that is seldom recognised, which is that weeds occurring outside crop fields can act as catch plants by diluting pest pressure on the crop. Such refuges for pests mirror the practice of having refuge areas on fields with insect-resistant *Bacillus thuringiensis* (Bt) crops.

The purpose of refuge areas in Bt crops is to enable wild-type (non-resistant) insects to mate with those that are insecticide-resistant to produce non-resistant offspring. Current weed management best practice is to control weeds even outside crop fields to avoid seed sources. No doubt the burgeoning problem of herbicide-resistant weeds will change future perspectives and weed control practices.

Weed factor

Fleabane weed types, *Conyza* species, arguably are South Africa's worst herbaceous, annual weeds in terms of distribution and aesthetic and economic impact. The three fleabane types that are recognised as harmful or noxious, locally and internationally, are *Conyza bonariensis* (hairy or flax-leaf fleabane; *kleinskraalhan*), *C. sumatrensis*

(*C. albida* or tall fleabane; *vaalskraalhan*), and *C. canadensis* (horseweed fleabane; *Kanadese skraalhan*).

Of these three, hairy fleabane is generally the most prevalent in both annual and perennial cropping systems and often dominates weed communities of crop fields, orchards, vineyards, roadsides and gardens.

Zero- and reduced-tillage systems are especially prone to infestation by hairy fleabane, mainly for the following reasons:

- Seeds only germinate on or near the soil surface (<10mm depth).
- Tillage operations that bury weed seeds are either absent or of low intensity.
- Certain populations, in both the summer and winter rainfall regions, have proven resistance to glyphosate herbicide (read more about this topic at www.up.ac.za/sahri) which is often the sole weed control method in zero-till systems with glyphosate-tolerant crops.
- One plant produces 200 000 seeds on average, and the parachute seeds can travel many kilometres with even a moderate breeze. Given this scenario, it should not be surprising that especially hairy fleabane is proliferating at an alarming rate, and with it, glyphosate resistance.

Insect factor: Green stink bug

Several serious insect pests threaten soya bean production in South Africa (Elrine Strydom, *SA Grain*, Oct 2021, pp 51 to 53). The green stink bug (*Nezara viridula*) is also a serious soya bean pest in Argentina and Brazil where Dalazen *et al.* (2016, *Planta Daninha*, vol 34, pp 51 to 53)



Hairy fleabane – the veritable bane of crop producers. (Photograph: Prof Charlie Reinhardt)



All too common a sight on crop fields during winter and early spring – dense infestations of fleabane weeds should not be tolerated due to seed production and the harbouring of crop pests. (Photograph: Prof Charlie Reinhardt)

investigated the migration of the green stink bug between hairy fleabane and soya bean.

They found that the direction of stink bug migration along a 'green bridge' represented by hairy fleabane is dependent on the plant's (hairy fleabane and soya bean) growth stages, and that the weed plants provide food and shelter for the first generations of green stink bugs during the fallow or pre-crop period, as well as for later generations when the crop matures.

Hairy fleabane essentially has two periods of emergence during the year: the first in autumn and the second in spring, when temperatures reach around 20°C. They conclude that those are the times when hairy fleabane must be controlled, i.e. when the plants are still young and most likely to be herbicide susceptible.

If herbicide resistance exists, special measures would be required that include alternative weed control methods such as tillage, cover crops, organic mulching and the like.

Insect factor: False chinch bug

Nysius natalensis damages sunflower at both the seedling and seed-filling stages, causing serious reduction in grain yield, oil content and seed germination. During a roadside survey, Du Plessis *et al.* (2007) identified 26 plant species on which false chinch bugs feed and lay eggs (*African Journal of Entomology*, vol 15, pp 310 to 318). Among the hosts, there are serious weeds such as *Amaranthus* and *Conyza* species.

False chinch bug and hairy fleabane are both ubiquitous pests in South Africa; in their research on glyphosate resistance

of hairy fleabane, Reinhardt *et al.* (www.up.ac.za/sahri) observed false chinch bug in all the seed samples they collected during a single survey of the weed along main roads stretching from Pretoria to Buffels Bay in the Southern Cape.

Insect factor: Common cutworm

Based on a survey of crop fields conducted in 1988, Drinkwater and Van Rensburg (1992) reported the mutually beneficial association of common cutworm (*Agrostis segetum*) with winter and spring weeds on maize fields, inter alia, hairy fleabane (*Phytolactica*, vol 24, pp 25 to 28). Interestingly, even in 1988 fleabane species (*Conyza* spp), starvation senecio (*Senecio consanguineus*), and Mexican poppy (*Argemone subfusiformis*) were serious weeds, and they still are.

They concluded that weed species with dense spread and high biomass were the preferred refuges and food for cutworm larvae. This is exactly, and even to a greater extent, what high infestations of fleabane these days offer the insect pest. An obvious exacerbating factor is the lack of effective weed control which could be linked to herbicide resistance. In 1988, and even in the early 1990s, nobody could be bothered by the then-emerging threat of herbicide resistance – just one example of the penalty for lack of knowledge and diligence.

The collaboration between weed and insect pests in harming crops makes it even more imperative that weeds on crop fields are controlled effectively, to the extent that neither seeds, the carriers of herbicide resistance, nor live vegetative matter (food for insect pests) remain on fields close to the time of planting the new crop.

In promoting this weed management strategy, the proponents of reduced soil disturbance and fewer synthetic pesticides could have their hackles raised, but what 'soft' alternatives remain if producers must contend with burgeoning weed numbers and herbicide resistance? The answer lies in finding the acceptable middle-of-the-road solution. But then again, this will take some doing. 🌱

Prof Charlie Reinhardt is a professor in agronomy at North-West University, and a research leader in the South African Herbicide Resistance Initiative (SAHRI) at the University of Pretoria (www.up.ac.za/sahri). He can be contacted on 083 442 3427 or at dr.charlie.reinhardt@gmail.com.



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Gypsum and calcium: Solutions to sodic soils

By Marina du Plessis and Ailsa Hardie, Department of Soil Science, and Pieter Swanepoel, Department of Agronomy, Stellenbosch University

Soil sodicity (*swartbrakgrond*) refers to a condition in which soil contains excessive levels of sodium. This condition can adversely affect soil health and crop production. The accumulation of sodium in soil, stemming from factors such as weathering of sodium-rich parent materials and human-induced salinisation, adversely affects soil structure and nutrient balance. Sodic soils are associated with poor water infiltration, aeration, surface crusting and erosion, leading to plant nutrient deficiencies, stunting and low yields.

Gypsum (calcium sulphate) is a cost-effective and widely available solution for remediating sodic soils. Studies highlight the benefits of gypsum application, including reducing exchangeable sodium percentage (ESP) and soil pH, and enhancing the ease of water movement through the soil. In South Africa, both mined geological gypsum and by-product gypsum, such as phosphogypsum from phosphoric acid production and gypsum from acid mine water treatment, offer readily available sources for agricultural use.

An alternative source is flue-gas desulphurisation (FGD) gypsum which is produced in coal-burning plants and

is a relatively pure by-product gypsum. Currently, FGD gypsum is produced in South Africa but is not yet available commercially. More recently, gypsum products such as liquid gypsum, a gypsum suspension, and granulated gypsum (*gipskorrels*) have emerged on the market.

Comparing gypsum solubility

While gypsum remains a common product in the agricultural industry, the solubility of South African gypsum sources has not been assessed. This study aimed at comparing the solubility of local gypsum sources, along with newer products such as liquid gypsum

and granulated gypsum, against mined class A gypsum. Additionally, the study evaluated the effectiveness of these gypsums in comparison to granulated micro-fine calcitic lime (*verpilde kalk* or *kalkkorrels*) and calcium (Ca) nitrate for soil sodicity remediation and water movement improvement.

A soil column experiment was carried out to test the gypsum, micro-fine lime and Ca nitrate products. A sodic, sandy loam topsoil sample was collected for evaluation. Twelve gypsum products, two micro-fine calcitic lime products, and one commercial Ca nitrate fertiliser were tested against a control (no product added). Each treatment involved packing soil in cylindrical containers, applying the respective source on the surface, and simulating six weeks of heavy rainfall.

At the end of week six, soil saturated hydraulic conductivity (how easily water moves through soil) was determined, along with soil pH, electrical conductivity, basic cations, soil acidity, ESP, and soil water dispersible clay percentage.

Findings

The findings revealed that finely textured gypsum, especially by-products such as liquid and FGD gypsum, have faster reaction rates and outperform coarser, mined class A gypsums in mitigating soil sodicity quickly. However, all gypsum sources contributed to



Examples of soil sodicity and surface crusting in the field.



The different gypsum sources used in the study.

its higher cost and the need for specialised application methods due to its suspended nature should be noted.

Unfortunately, FGD gypsum is showing promise, but is not yet commercially available in South Africa, and standalone Ca nitrate use is costly. Producers in South Africa currently rely on phosphogypsum, mined water treatment gypsum and mined gypsum as the primary sources. Given that the cost of gypsum in South Africa is primarily driven by transportation costs rather than mining costs, producers should choose the nearest gypsum source and calibrate the application rate based on its Ca purity. 🌱

The authors would like to thank SA Lime and Gypsum, Yara Africa Fertilizer and Stellenbosch University for funding this research. Our thanks to the Protein Research Foundation for offering the first author a bursary.

lowering soil ESP and soil pH compared to the control. Micro-fine lime had no effect on soil ESP or soil pH due to low solubility.

Only liquid gypsum, phosphogypsum, FGD gypsum, and Ca nitrate managed to enhance soil hydraulic conductivity. While liquid gypsum proved effective,

Read the full article in the *South African Journal of Plant and Soil*, vol 40 (issue 4 to 5), visit www.doi.org/10.1080/02571862.2023.2288192 or email aghardie@sun.ac.za.



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Tank mix adjuvant applications explained

By Dr Chantal Scholtz, research and development scientist, MBFi

Tank mix adjuvants are additives that are incorporated as part of a spray mixture to enhance the performance and efficacy of active components such as insecticides, fungicides and herbicides.

Different adjuvants perform different functions including protecting the active components against degradation to improve wetting, spreading and penetration. It also reduces spray application problems such as drift. No single adjuvant can perform all these functions simultaneously, meaning that adjuvants need to be carefully selected and combined to achieve the desired results. MBFi has developed a range of adjuvants to perform various functions or applications.

Max 357 and its application

Water hardness and pH affect water quality – both also influence the efficacy of insecticides, fungicides and herbicides. Hard water contains higher amounts of the bivalent cations calcium (Ca^{2+}) and magnesium (Mg^{2+}), which can bind to glyphosate and sulfosate-based herbicides, rendering them inactive.

Most pesticides are stable in a pH range of 5 to 6, meaning alkaline water (pH 8+) can result in the irreversible hydrolysis or degradation of many

pesticide-active ingredients such as the organophosphates, carbamates and synthetic pyrethroids, changing them to completely inactive chemicals.

Max 357 is a water-soluble buffering and cation sequestration agent with low volume application rates of between 5 to 100mL/100L water (hardness dependent). It contains 38% DTPMPA and 12% ATMPA as active ingredients, giving Max 357 the capacity to strongly sequester bivalent cations such as Ca^{2+} and Mg^{2+} . By sequestering these cations, Max 357 removes them from the solution. This leaves the glyphosate and sulfosate herbicides free to perform their function.

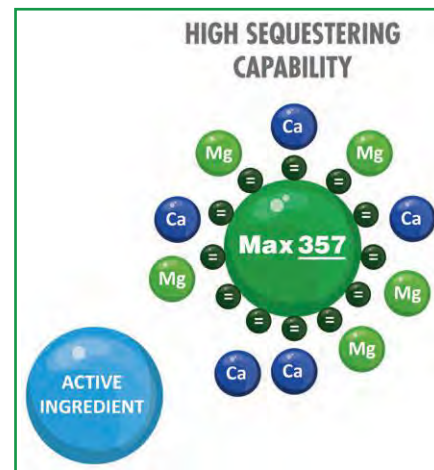
Max 357 is also able to efficiently buffer the pH of the tank mixture to the desired pH range of around 6, protecting sensitive pesticides against degradation by alkaline hydrolysis and helping to increase active life.

Twister and its application

For pesticides and fertilisers to function they need sufficient time to absorb into the leaf surface. On the day of application environmental conditions such as temperature, wind and humidity can have a major impact on the active ingredients' ability to perform this function optimally.

Twister is a versatile, multi-functional, emulsifiable concentrated adjuvant

Figure 1: Max 357 sequesters the Ca^{2+} and Mg^{2+} cations, leaving the active ingredient free to act.



wetter-spreader, penetrant and anti-evaporate that can improve the activity of pesticides and fertilisers. It is based on soya bean oil and the corresponding methylated soya bean oil esters (700g/L). Due to the non-ionic surfactant nature of Twister, adding it to the spray tank helps to reduce the surface tension between the droplet and the leaf surface. This in turn increases the ability of the droplet to stay in contact with the leaf surface for longer, increasing the amount of pesticide absorbed.

The anti-evaporate properties are a result of the incorporation of methylated soya bean oil esters which gradually allow the product to form an oily film over the water drop as the drop gets smaller. It eventually covers the remaining water, slowing the rate of evaporation down. This further increases the contact time between the pesticide or fertiliser and the leaf surface for optimal absorption.

Registration holder: N Laboratories (PTY) Ltd. Marketed and distributed by MBFi (PTY) Ltd. Max 357 reg no: L 9664 Act 36 of 1947 – Ai AMTPA 12,5% and DMPTA 38%; Twister reg no: L 9666 Act 36 of 1947 – Ai 700g methylated vegetable oil.

Figure 2: T.0 – Illustration of the evaporation process over ten minutes for a clean water droplet compared to an emulsion-containing droplet.



T.1min – Water mass reduces due to evaporation. The volume reduces and forces oil droplets closer together.
 T.6min – Emulsion droplets start to coalesce and form larger oil droplets.
 T.10min – Very little water is left and the emulsion is no longer present. Due to the density difference between water and oil, the oil layer covers the remaining water, preventing water loss and increasing contact time.

For more information,
 visit www.mbf.co.za.

Zero waste technology of soya bean processing

By Joanna Szulc, Błażej Błaszak, Anna Wenda-Piesik, Grażyna Gozdecka, Ewa Żary-Sikorska, Małgorzata Bąk and Justyna Bauza-Kaszewska

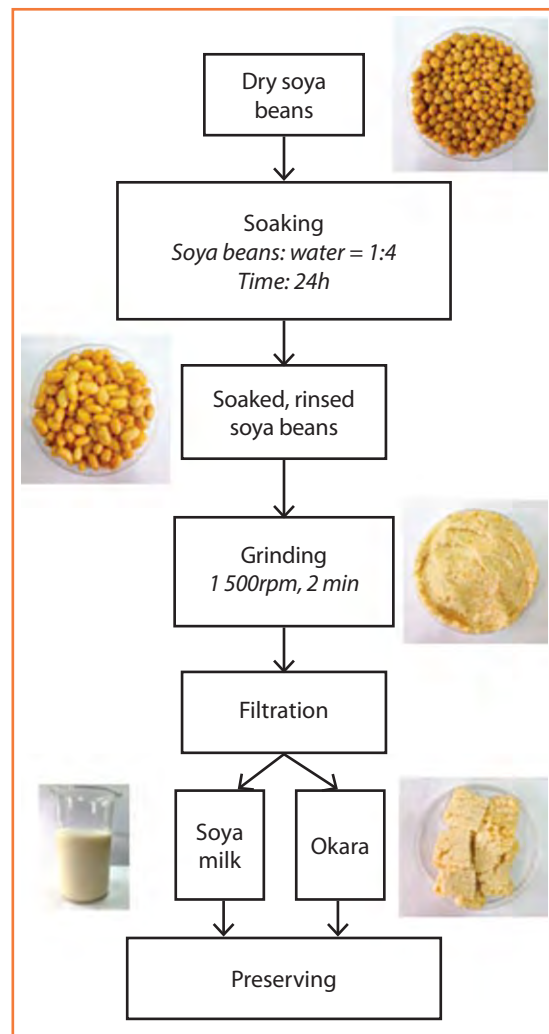
Soya bean can be easily digested and are a valuable substitute for animal protein in various applications. That is why soya products are a very important component of a vegan and vegetarian diet. During soya milk processing, large quantities of by-products are generated. Few know that every kilogram of dried soya beans processed into soya milk or tofu gives approximately 1,2kg of soya bean curd residue, namely okara, often regarded as a waste.

Acting in the spirit of zero waste, a soya bean processing technology has been developed that does not generate waste. The developed technology consists of obtaining soya milk followed by filtration to remove the insoluble residues, preparing okara and fermenting to obtain vegan soft cheese. Samples were analysed for physical, chemical and organoleptic properties. Also, the microbial quality of the obtained products was tested.

Soya products produced with the proposed zero waste technology were assessed by the sensory panel and received very good marks. Fermented soya products are characterised by high levels of *Lactobacillus* spp (10^5 to 10^8 CFU/mL), thus consuming them can offer health benefits. Cheese made from okara can be an alternative to cheeses currently obtained from soya milk.



Figure 1: Schematic of soya bean processing.



Okara regarded as waste

In recent years, several studies have been conducted to recover bioactive compounds or nutrients from agricultural wastes. A lot of research is done regarding processing by-products to obtain innovative or improved food products. A very promising by-product with many uses and applications in food, feed and agricultural industries is okara, a by-product generated during the manufacturing process of soya bean-based products.

Every 1kg of dry soya beans processed into soya milk or tofu leaves approximately 1,2kg of soya bean curd residue, okara, often regarded as waste. In 2022/23, the United States Department of Agriculture

estimated that the world soya bean production will be 391,17 million metric tonnes around the globe. Roughly 7% of soya is used directly for human food products such as tofu, soya milk, edamame beans, and tempeh.

According to this data, in the season of 2022/23, approximately 27 million metric tonnes of soya beans would be processed into soya products, which would generate over 32 million metric tonnes of wet okara. Because of the high moisture content, most of the okara is discarded in landfills.

Okara's potential

The chemical composition of okara differs depending on the soya bean cultivar, the method of soya milk processing, and the number of water-soluble components extracted from the ground soya beans. Okara contains many beneficial components such as phytochemicals, e.g., isoflavones, crude protein with all essential amino acids or dietary fibre, which is mainly insoluble fibre.

That is why dumping okara in landfills should be limited and transformation into novel food products should be considered. Although okara has many nutrients, the

Table 1: General composition of okara.

Nutrient	Amount, g/100g dry matter
Carbohydrate	3,8 – 5,3
Protein	15,2 – 39,1
Fat	4,9 – 21,5
Dietary fibre	12,2 – 61,3
Ash	3 – 5,3

biggest problem in okara processing is its high moisture content of approximately 70 to 80%.

The major component of dry okara is dietary fibre, up to 60%. Okara is also a source of crude protein and even up to 40% of protein can be found in dry matter (DM). This makes okara a potential source of low-cost plant protein for human nutrition. The general composition of okara as a scope of values found in literature is presented in *Table 1*.

Okara also contains anti-nutrient compounds, such as phytic acid, and saponins, which can be reduced by fermentation. The amount of carbohydrates is low at approximately 4,5%. Together with a lack of fermentable carbohydrates, it makes the fermentation of okara inefficient and to improve microbial growth sugar addition must be considered.

Putting waste to good use

Attempts are being made to introduce okara as an additive to enrich food products since soya-based products are known for their health-beneficial properties. Wickramaratna and Arampath investigated the possibility of utilising okara in bread-making to improve the nutritional quality of bread. Okara can be found in many food recipes to improve fibre and protein profiles. Studies showed that okara can be a substitute for gluten-free flour, an additive to growing medium for *Lactobacillus* and *Bifidobacterium* fermentation, an ingredient for fermented beverages.

In the literature, studies on preparing soya-based cheeses describe technologies with soya milk as a main ingredient. Okara as a by-product is also a great source of

Table 2: Sensory properties of vegan soft cheeses rated on a five-point scale.

Attribute	Weighting factor	Sample	
		Vegan soft cheese without rennet	Vegan soft cheese with rennet
Colour	0,2	4,44	4,83
Aroma	0,2	4	3,56
Flavour	0,35	3	2,67
Texture	0,25	3,33	3,72
Overall quality	-	3,57	3,54

nutrients, but okara's processing into cheese is currently not happening.

This work aims to develop soya bean processing that does not generate waste. The first step is obtaining soya milk with a known method. The second is the utilisation of okara by transforming it into a soft cheese analogue.

The developed technology is zero-waste technology as it allows using whole soya beans for soya milk and okara. The first trials were not accepted by the sensory panel due to the texture of the soya cheese (data not included). This caused a modification of the technology and introduced the second grinding. This step made okara more homogenous and smoother, which is proven by the distribution of particle sizes of samples.

The developed technology is suitable for okara with $80 \pm 1\%$ content of water. The moisture of by-products of soya processing depends on conditions during soya bean preparation, which is why it is required for moisture adjustment in okara when the content of water in raw material for vegan soft cheese differs from assumptions.

Enhancing nutritive value

The presented zero waste technology with okara processing fits in current trends and can provide a valuable nutritional product, which is soya soft cheese. Numerous studies reported that fermentation of okara using specific micro-organisms can enhance its nutritive values.

Soya vegan soft cheese obtained from fermented okara was characterised by high protein content (28 to 28,3% DM), and by fermentation, it can be expected that the product was also characterised by free amino acids and peptides content.

The fat content of soya soft cheese ranged from 6,71 to 7,97% DM and it was not high. Microbiological analysis proved that the obtained soya soft cheeses have probiotic potential with the presence of 107 to 108 CFU/mL lactic acid bacteria.

The overall quality of soya cheeses obtained from okara was above 3,5. This note describes the good quality of the product. The texture was rated with higher notes in the case of cheese made with rennet. The presence of rennet increased protein aggregating, and it results in good texture features. Sensory tests proved that the developed product might be accepted by consumers. The obtained soya soft cheese can be used as a substitute for soft cheese made from cow's milk.

The technology of okara processing into vegan soft cheese may be considered to be economically viable. The economic analysis was made by the method of valuation of discounted cash flow: neutral variant, which calculates the present value of future revenues. The analysis showed that the rate of return on investment in the proposed technology is higher than the weighted average cost of capital.

The obtained soya soft cheese analogue has the potential to be used as an ingredient in further food processing raw material for cheesecake, dumpling stuffing, cottage cheese analogue, smoked cheese analogue, ripening cheese analogue and others. However, it may require some modifications in the recipe or used technology and therefore extended research.

The future development of the technology concerns not only the expansion of the product range obtained from okara processing but also the use of other by-products from the food industry, e.g., protein-rich spent grain or oilseed cake. 🌱

Soya bean and sunflower markets: Local and international updates

By Johan Teessen, Grain SA

The soya bean season has commenced in Brazil, the largest producer of soya beans, while Paraguay was set to begin harvesting at the time of writing this article. The rest of the world is currently in the midst of the growing season, with harvesting anticipated to commence at the end of March. In the sunflower market, Argentina has initiated harvesting, and South Africa is scheduled

to begin in April. In terms of soya beans and the approaching harvest, concerns regarding production are becoming more prominent.

Figure 1 illustrates the yield per hectare for Brazil, the United States (US), Argentina and South Africa. The primary focus within this group is on Argentina, where the projected yield per hectare has increased from 1,7 to 3 tonnes, almost doubling. This higher production is expected to lead to

increased stock in the international market, potentially exerting a negative impact on the international price and influencing local market prices when competing as an exporter.

International yields

It is noteworthy that, excluding the 2022/23 season which was marked by severe drought, Argentina has exhibited a relatively stable trend. Nine out of the 11 seasons produced yields of 2,8 tonnes/ha and above. Shifting attention to total production, Argentina is projected to increase from 25 to 48,5 million tonnes. In contrast, US production is anticipated to decrease from 116 to 112 million tonnes, and Brazil is also expected to record a decrease from 155 to 153 million tonnes.

The combined total production of the top three producers is projected to increase from 296 to 314 million tonnes, while Chinese consumption does not align with the same level of increase. This underscores concerns that international prices may be at risk, should these production estimates materialise.

Local market

Figure 2 illustrates the price movements of the local South African Futures Exchange (Safex) price (purple line), Brazilian export parity (light-blue line), Argentine export parity (dark-blue line), and the European Union (EU) export parity price (orange line).

In early January 2024, the Brazilian price showed a decrease as the country began harvesting and exporting, with pressure from the harvesting activity influencing the overall price. Towards the end of January, the Safex price started declining due to the impact of the decrease in sunflower prices and the spill-over effect from the Brazilian pricing, affecting the local market.

As February commenced, South Africa entered a weather-centric market, with concerns that the hot and dry weather conditions might lead to lower yields, further influencing market dynamics.

Figure 1: Yield per hectare for Brazil, the US, Argentina and South Africa. (Source: United States Department of Agriculture)

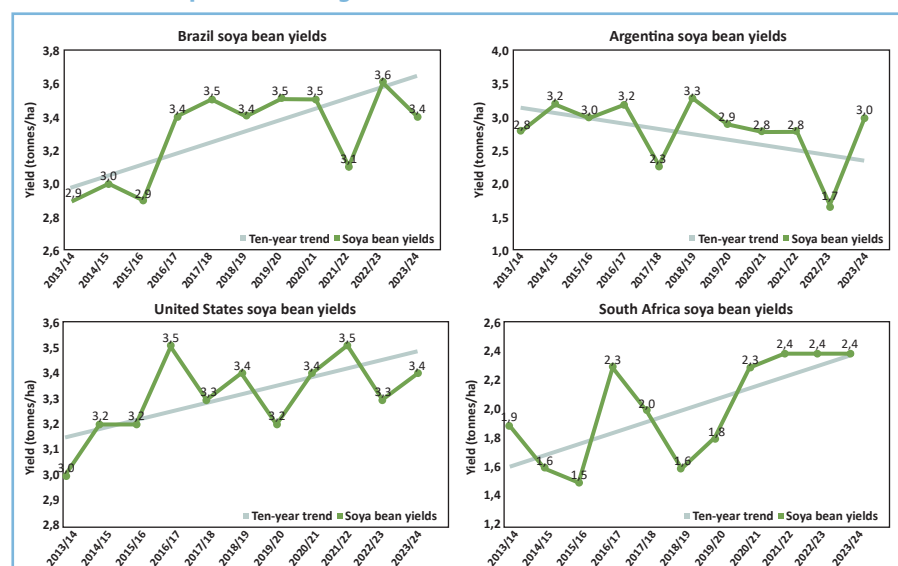


Figure 2: Soya bean price movement. (Source: SA Grain)

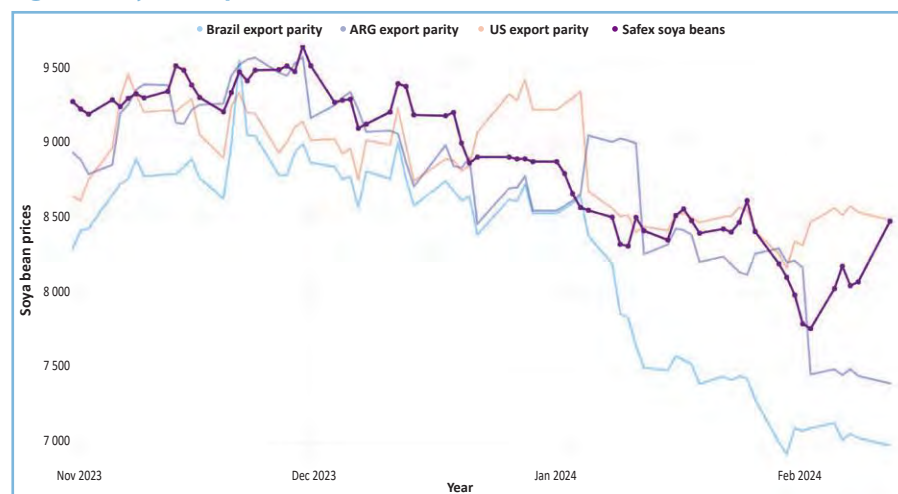
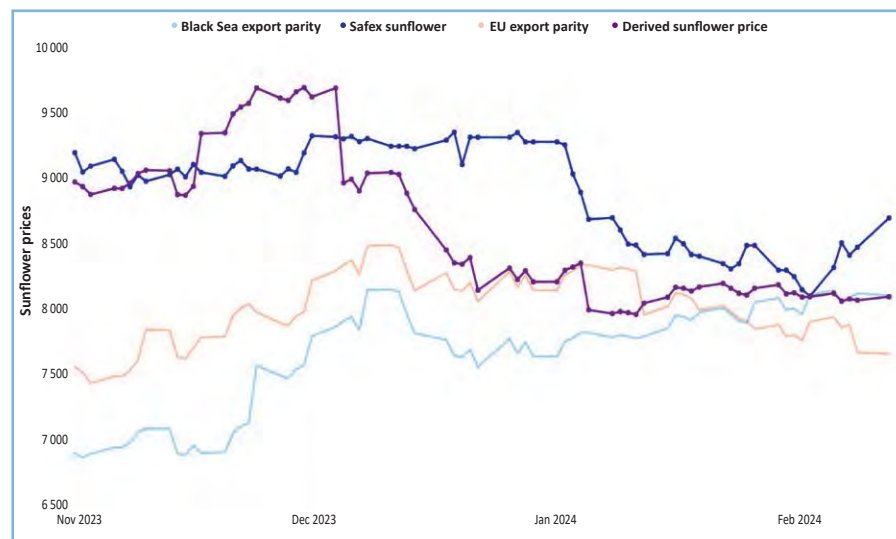


Figure 3: Sunflower price movement. (Source: Grain SA)

Sunflower price movements

Figure 3 illustrates the sunflower price movements, including the local Safex sunflower price (dark-blue line), a derived sunflower price (purple line), the Black Sea export parity price (light-blue line), and the EU export parity price (orange line). The derived sunflower price integrates factors such as the local crushing margin, local sunflower price, and imports of

sunflower oil and oilcake, indicating what a competitive local market price against these imports should look like.

In early December, a significant decrease was observed in the derived sunflower price, even as the local market traded relatively unchanged. The beginning of January saw a second decline in the derived sunflower price, coinciding with a corresponding downward trend in the

local market price. From mid-January, the derived price moved laterally while the local market price gradually converged to it, eventually aligning at the start of February.

Subsequently, South Africa transitioned into a weather-driven market, influenced by hot and dry conditions that supported prices. Concurrently, the Crop Estimates Committee advised a downward revision of preliminary hectares planted, adding another bullish layer to the market dynamics.

Conclusion

The sunflower and soya bean markets are influenced by several factors, each capable of impacting market prices positively or negatively. The market is yet to see how these factors play out. For producers, it is important to note that in such an unpredictable market, there may be both upward and downward movements in market prices. In the event of rallies, brief marketing opportunities could emerge for producers to take advantage of. 🌱

For more information, contact the author at johan@grainsa.co.za.

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Soya bean meal import duties:

An integrated value chain approach

By Ferdi Meyer, managing director, BFAP

The success of the South African soya bean value chain over the past decade has been well documented. In essence, a favourable investment environment coupled with clear policy mandates by the Department of Trade, Industry and Competition (DTIC) triggered the private sector to invest in excess of two million tonnes of crushing capacity during the early 2010s. These investments, combined with extensive cultivar trials and the introduction of the technology levy paid by producers to incentivise seed companies to provide South African producers access to the latest seed technology, ignited the rapid expansion in production.

Growth in the industry

The South African soya bean industry has been one of the fastest growing agricultural subsectors over the past two decades. The industry expanded

production from merely 264 000 tonnes on 165 000ha in 2008 to more than 2,7 million tonnes on 1,1 million ha in 2023. Consequently, the crushing levels of soya beans also increased and in 2023 South Africa, for the first time in history, produced sufficient soya bean meal to meet local demand and replace all imports of soya meal.

Furthermore, South Africa exported 277 000 tonnes of soya beans in 2022/23 and for the 2023/24 marketing season, total exports are projected to reach almost 600 000 tonnes.

Over the past two years, the local industry has transitioned from being dependent on imports to self-sufficiency and local prices have shifted to export parity levels (*Figure 1*), which implies that local soya beans are trading approximately 30% below the value of imported beans. This has boosted crushing margins and volumes significantly, and put crushers in a position to offer significant discounts

compared to import parity prices of soya meal. In fact, for the current marketing season it is expected that approximately 1,8 million tonnes of soya beans will be crushed.

Discounts on soya meal are exceeding R2 000/t in the inland market, and meal is being transported to coastal areas, where approximately 25% of domestic feed is being consumed. Local soya meal prices are trading well below import parity prices, and therefore benefitting the local intensive livestock industries' overall profitability and relative competitiveness. Also, the production of soya vegetable oil increased rapidly on the back of higher crushing volumes, thereby replacing vegetable oil imports.

All in all, one could argue the industry has found a new equilibrium, or what the Bureau for Food and Agricultural Policy (BFAP) referred to in its *Baseline* projections several years ago as the "second phase of growth" in the soya

value chain, where the local industry will have to compete and be economically sustainable at export parity levels.

The new equilibrium

Figure 1 presents a typical Baseline outlook where the local soya value chain expands at a much slower pace over the outlook period, basically capped by the sluggish growth of meal demand in the animal feed industry. Total production is projected to reach just over three million tonnes by 2032, with national average yields at 2,6t/ha and exports increasing steadily to just over 700 000 tonnes.

It is important to realise that this is only one plausible outcome in respect of the future of the soya value chain under a specific set of assumptions, which could change in future. The recent drive by the Animal Feed Manufacturers' Association (AFMA) to apply for the reduction of import duties on soya meal, serves as a good example of external factors that could change and have decisive impacts on the future of the industry.

Taking into consideration the current state of the soya value chain, as summarised here, one can imagine members of AFMA would feel that the import duties can be reduced since South Africa is not importing soya meal and the level of the duty has little bearing on prices. Yet soya bean production levels could be adversely affected by the weather.

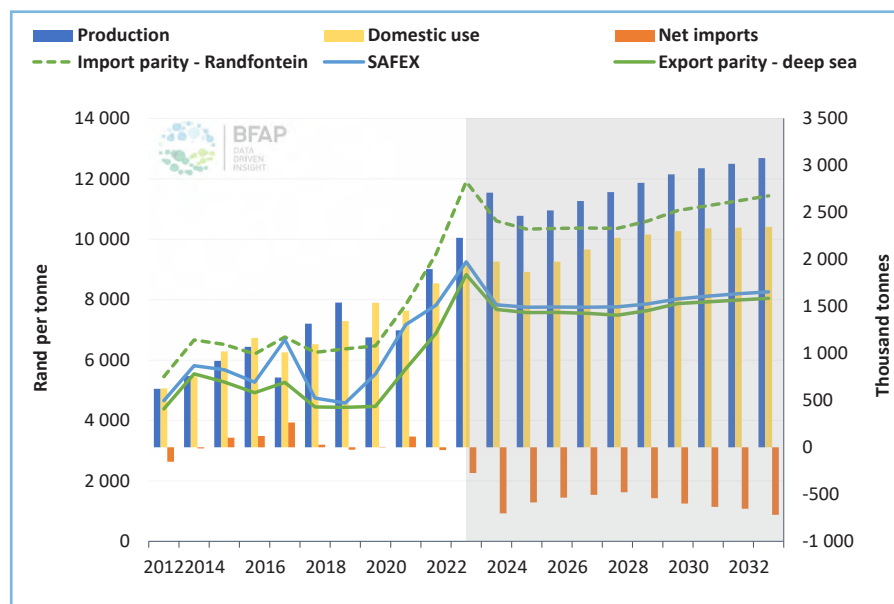
For example, in the current 2023/24 production season the total area under soya beans has declined by approximately 80 000ha. Although this area would under favourable weather conditions be sufficient to produce a surplus crop, many regions have reported crop damage due to drought conditions, and the national average yield will most likely be lower than over the past two years.

Effect of transport costs

Feed mills in the coastal regions argue that they are carrying the costs of the import duty during periods when the discounts on meal are not big enough to offset its high transportation costs to the coastal regions. By reducing the import duty, the import parity prices for these mills would be lower and thereby push down local meal prices to compete with imported meal.

Transport costs from the northern production regions to the coastal areas are

Figure 1: South African soya bean production, consumption, trade and prices.
(Source: BFAP Baseline 2023)



extremely high, mainly due to the collapse of the rail network and all products must be transported by road. Currently, it costs approximately R900/t to transport meal from the north to the coastal production region, yet it costs only R600/t to transport meal from Argentina (the top exporter of soya meal in the world) to Cape Town per ship.

The competitiveness of the local industry not only comes down to the relative prices, but also hinges on the quality of the meal produced. Although some South African crushers found it challenging to match the quality of imported meal from Argentina in the initial years, the quality of soya bean meal produced in South Africa has improved to such an extent that it is widely considered superior to that of Argentina. Recent studies from Europe have found that South African soya bean meal is superior to Argentine soya bean meal.

Quality and competition

Although the coastal mills are making a valid argument regarding the costs of import duties, it does not hold for the regions where the bulk production and processing of soya beans of the country takes place. Currently, the complete value chain is reaping the benefits of investments and policy support over more than a decade. Soya bean prices are trading approximately 30% below import parity levels (at or slightly below export parity levels), competition among the

crushers is tough, and high-quality meal is offered at a discount of approximately R2 000/t for the inland markets.

With the local soya bean meal demand estimated at approximately 1,3 million tonnes, of which approximately one million tonnes is consumed inland, the total value of the discount for the feed and livestock industry for the current marketing season amounts to around R2 billion, which is multiple times larger than the total value of the import duty (approximately R120 million per annum) that would have to be paid by coastal feed mills if all soya bean meal consumed in the coastal areas is imported.

Furthermore, the contribution by producers in the form of technology levies to incentivise seed companies to provide South African producers access to the latest seed technology, amounts to approximately R180 million, also overshadows the relative value of the import duty that feed millers would pay. The availability and adoption of the latest seed technology and genetics remains a key driver for producers to stay profitable and produce sustainable surpluses at export parity price levels in future.

The relative competitiveness of soya bean crushers and the quality of meal they produce is not only determined by the cost and quality of soya beans, but also the ability of the facility to run at optimal utilisation of installed capacity to reduce capital expenditure (CapEx) and operating

expenditure (OpEx) per tonne of meal produced.

A fine balance

With an installed capacity of just over two million tons of dedicated soya bean crushing facilities in South Africa, it implies that the utilisation rate in the current season is projected to exceed 80% with a projected crushing volume of 1,8 million tonnes, which supports the overall cost competitiveness of the facilities. Under a scenario of duty-free soya bean meal imports, it is likely that much of the meal demand in coastal areas (approximately 300 000 tonnes) could be imported again as in the past, which implies that approximately 380 000 tonnes (20%) less soya beans will be crushed.

The fine balance of import duties within the complete oilseed complex (seed, meal and oil) and livestock industry has been a key factor in supporting the growth of the local industry. Many firms are also vertically integrated and benefit, for example, from the protection offered by the import duty

on chicken meat. Hence, picking one or two duties in a stack of duties throughout the value chain makes it even harder to disentangle, and could lead to unintended consequences for other value chains in the oilseed complex.

All protein meals (sunflower, soya bean and canola) are trading in a fine balance and none of the import duties on soya bean meal will have a direct effect on the value of sunflower meal, putting an already strained industry under more pressure. Furthermore, if duties are only taken off from meal and not soya beans, crushers will be unable to compete in a year where South Africa has a shortfall of soya beans.

In conclusion

In a perfect textbook world, free trade with no duties and non-tariff trade barriers would render the optimal market. However, market trends and geopolitical dynamics are shaping a far more complex reality that is constantly evolving. Robust partnerships and dialogue among all stakeholders in the private and public sector are key for South

African value chains to prosper, create jobs and drive inclusive growth in these complex global dynamics.

The collapse of our road and rail network, port facilities, and electrical grid has put our value chains on the backfoot. These inefficiencies are becoming the biggest drivers of food price inflation. When it comes to grains, oilseed, and livestock production, South Africa is a very small player in the global market. The spillover effects from a wide range of indirect support measures and subsidies in major exporting countries is significant.

In the case of soya bean meal, prices are at a two-year low and additional downward pressure can be expected in the next three to six months, due to the prospective oil demand-driven sharp increase in soya bean crushings. Vegetable oil demand is driven by major support and mandates in the biofuel industries. Although this is good news for intensive livestock operations, it implies that our local integrated soya bean and chicken value chains will be facing significantly more competition in future. 🌱

For more information, email ferdi@bfap.co.za or visit www.bfap.co.za.



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JSE trials multiple reference point model for soya

By Vuyo Mpumza, manager: Commodities, Johannesburg Stock Exchange

As the largest stock exchange in Africa, our strategic goals at the Johannesburg Stock Exchange (JSE) revolve around creating a dynamic and robust stock exchange that meets the diverse needs of our clients. We dedicate ourselves to constantly enhancing our offerings by utilising advanced technologies to refine our operations and provide groundbreaking solutions that cater to the ever-evolving needs of the market.

Over a year ago, in alignment with this strategy, the JSE announced that it would be trialling a new methodology for its deliverable soya contract, departing from a single reference point model in favour of a multiple-points-of-demand model.

Following extensive deliberation within the JSE market participant committees, the decision was made to adopt this new methodology proposed by Dr Johan Strauss. Dr Strauss, a highly knowledgeable retired lecturer in the field of agricultural economics, played a crucial part in shaping this model as it formed the bedrock of extensive research during his doctoral studies. The JSE agreed to trial the concept for two years to assess whether the multiple reference point

model would result in the same price discovery and price convergence as is currently achieved.

Success factors

The importance of price convergence between the spot and derivatives market is critical to the success of any derivatives contract. This is achieved through facilitating physical delivery as and when required. Although the key role of a derivatives contract is focussed on price risk management, the ability to make or take physical delivery in an efficient and robust manner does contribute to a successful derivatives contract.

Since the inception of the agricultural derivatives market in 1995, the JSE has been operating derivatives contracts on a single reference point model, namely Randfontein, while delivery would be recognised at various delivery points across the country. Going forward or with the new model, all JSE registered delivery points will be allocated a location differential to align deliveries to Randfontein. This means that the reference to Randfontein as a single reference point will no longer apply to the soya bean derivatives contract, but will consider points of demand (consumption).

The multiple reference point model considers demand at each point of consumption relative to supply and models on a linear basis. In the initial year of the trial, the JSE maintained the reference points of consumption to ten points as indicated in *Table 1*.



Vuyo Mpumza.

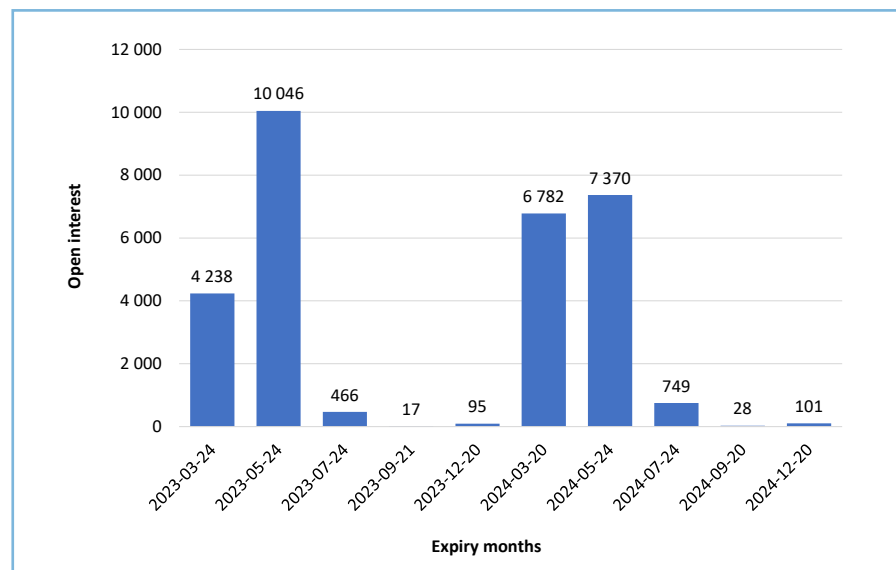
Based on the linear modelling, a location differential is determined for each JSE registered delivery point, with some points having a zero differential and others increasing as they are further from the consumption areas. For the final list of differentials for the upcoming marketing season, refer to the JSE website and navigate to www.jse.co.za/trade/derivative-market/commodity-derivatives-market/physical-delivery.

As of 1 March 2024, we will enter the first delivery month of the new marketing season with the multiple reference model in operation. The JSE has been monitoring trading activity on soya contracts, comparing trading volumes and open interest activity during hedging months to the old model. So far there is no apparent indication of a drop in

Table 1: Reference points of consumption, trial year one.

Crushing plant	Area
RSP	Bronkhorstspuit
COFCO	Standerton
Wilmar SA	Randfontein
Majesty	Krugersdorp
FSO	Villiers
Drakensberg Milling	Winterton
Nedan	Mokopane
CEOCO	Delmas
Willowton Oil & Cake Mills	Isando
Gauteng Oil & Mills	Nasrec

Figure 1: Open interest in soya future, 2023 and 2024.



market involvement, but there is also no notable increase in activity.

Figure 1 illustrates the different hedging months' open interest as of 8 February 2024 and compares it to the previous year.

The real test will begin in March, when market participants will be able to determine whether the multiple reference point model corresponds with

an effective hedge, particularly for those taking physical delivery. The JSE will continue to monitor physical delivery throughout the year and seek feedback from active market players.

As we embark on this exciting journey, the JSE eagerly anticipates the opportunity to collaborate with all market participants to evaluate the effectiveness

of the model. Our ultimate goal remains unchanged – to offer a distinguished platform for price discovery and price risk management. We are fully committed to working hand in hand with the market to explore innovative solutions that will drive the growth of the market. With great enthusiasm, we eagerly anticipate the fruitful path that lies ahead.

Give your input

Work is already underway for the 2025 marketing season. The JSE has requested the input of market participants regarding additional reference points, especially considering the possibility of an export point in the scenario. For the results of this specific scenario, visit www.clientportal.jse.co.za to view market notices *Soya Bean Indicative Differentials* and *Indicative Differentials with Scenarios*.

As the JSE, we constantly aim to improve our products and services. As such, we welcome feedback from market participants regarding their experience using the soya contract where multiple reference points are considered. Please send your feedback to commodities@jse.co.za.

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Global oilseeds markets and trade: Raised soya bean production boosts exports

Issued by the United States Department of Agriculture's Foreign Agricultural Service

Argentina's 2023/24 soya bean production was raised by two million tonnes to 50 million in January of this year. As a result, the soya bean crush volume is lifted by one million tonnes. Returning to normal production following last year's historic drought, Argentina's crush is forecast higher with exports of soya bean meal and oil also projected to rise.

Meanwhile, Brazil's soya bean production has been cut by four million tonnes to 157 million as hot and dry weather in recent months strained the crop in key growing regions. With production prospects declining, Brazil's soya bean crush and meal and oil output was revised down significantly in January 2024. All of the above changes were made on both the local crop year (February to January for Brazil, April to March for Argentina) and the marketing year (October to September).

With Argentina's recovery and large Brazil carry-in from the previous harvest, shrinking crop prospects in Brazil are unlikely to have significant implications on global meal and oil trade in 2023/24. After ramping up crush for the last two years and backfilling for Argentina, Brazil is projected to return to more normal crush volumes and export patterns. With growing domestic industrial soya bean oil consumption, reduced crush will send oil exports lower. On the meal side, exports are expected down, while domestic consumption remains strong and meal stocks are projected to rebound.

Overview for 2023/24

The global oilseeds production forecast was lowered in January this year to 660 million tonnes on large reductions in Brazil's soya bean crop and sunflower seed for Argentina, the European Union (EU) and Russia, more than offsetting higher Argentina and United States (US) soya bean crops. Global oilseed trade is up slightly on higher Russia and Paraguay



Figure 1: Soya bean export prices.

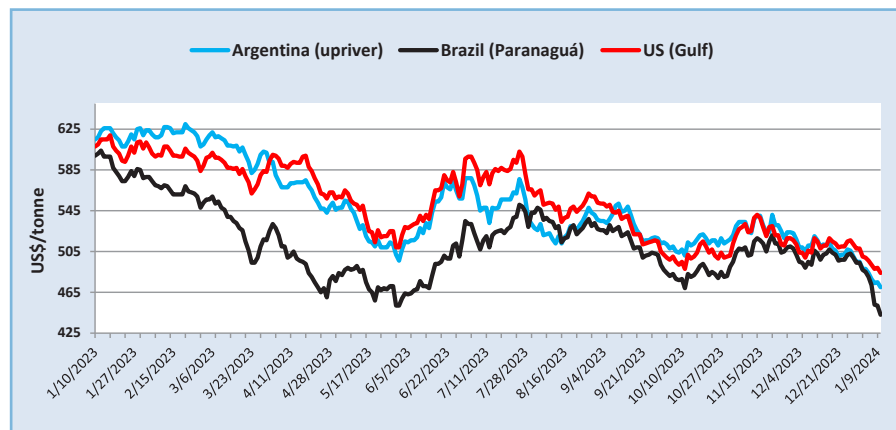
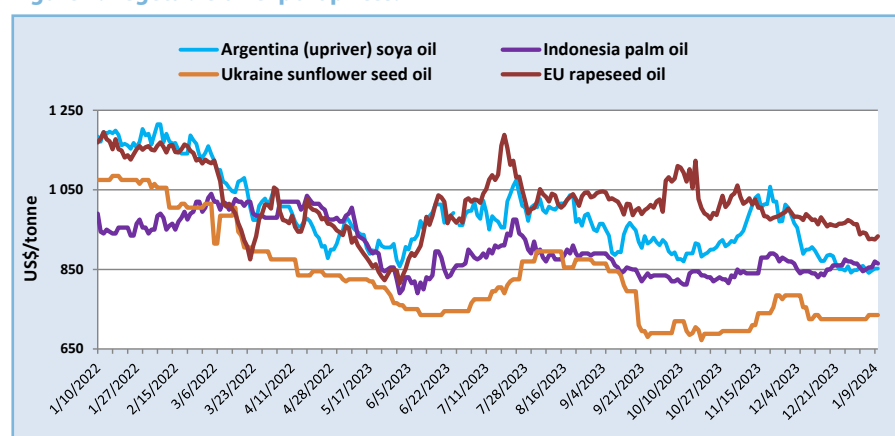


Table 1: Outlook changes for 2023/24. (All figures are in thousand metric tonnes)

Country	Commodity	Attribute	Previous	Current	Change	Reason
Argentina	Meal, soya bean	Exports	23 400	24 400	1 000	Raised crop and crush prospects
	Oil, soya bean	Exports	4 400	4 750	350	
	Oilseed, soya bean	Imports	5 700	6 100	400	Higher shipments from Paraguay
Brazil	Meal, soya bean	Exports	22 000	20 500	-1 500	Reduced crush on lower production prospects
	Oil, soya bean	Exports	2 250	1 850	-400	
India	Meal, soya bean	Exports	600	1 000	400	Strong exports supported by price competitiveness
Paraguay	Oilseed, soya bean	Exports	6 000	6 300	300	Raised crop prospects and larger exportable supplies
Peru	Meal, fish	Exports	1 100	800	-300	Reduced production outlook
Russia	Oilseed, soya bean	Exports	900	1 250	350	Larger exportable supplies

Figure 2: Vegetable oil export prices.



bean meal and Peru fish meal exports. Vegetable oil trade is slightly up with higher Argentina soya bean oil and Canada rapeseed oil more than offsetting lower Brazil soya bean oil exports. The projected US season-average farm price for soya beans is down 15 cents to US\$12.75/bushel.

Export prices

Soya bean prices were down since the last *World Agricultural Supply and Demand Estimates Report* on better prospects for Argentina and Paraguay soya bean production as well as rainfall in Brazil in the last week of December. Soya bean meal prices moved in tandem with soya bean prices. Although soya bean crush was strong in the US, Argentina's processing continues to be very low.

Vegetable oil prices diverged somewhat in January. Palm oil prices were up slightly on strong India purchases and a seasonal drawdown in Malaysia crude palm oil stocks. Soya bean oil dropped significantly as crude oil remains near annual lows and biofuel producers switched to lower-cost alternative feedstocks. Ample Black Sea sunflower seed oil supplies further pressured vegetable oil prices, with Ukraine sunflower seed oil maintaining a significant discount compared to alternative origins. 🌱

Table 2: Soya bean export prices. (US dollar/metric tonne) (Source: International Grains Council)

	US	Argentina	Brazil
8 December	US\$504	US\$511	US\$492
10 January	US\$484	US\$470	US\$443
Change	-US\$20	-US\$41	-US\$49

All prices are free-on-board: US Gulf, Argentina upriver, and Brazil Paranaguá.

soya bean exports, more than offsetting lower Russian sunflower seed exports.

Global oilseed ending stocks are down slightly on large reductions in Brazil and India soya bean and Russian sunflower seed, not offset by higher Argentina and US soya bean carryout. Oilseed crush is down

slightly on lower Brazilian soya bean and EU sunflower seed crush despite higher Argentina and India soya bean crush.

Global meal production is lowered, but meal exports are unchanged with higher Argentina and India soya bean meal exports offset by lower Brazil soya



Peanuts as functional food: A review

By Shalini S Arya, Akshata R Salve and S Chauhan, Food Engineering and Technology Department, Institute of Chemical Technology, India

Peanut is an important crop grown worldwide. Commercially it is used mainly for oil production but apart from oil, the byproducts of peanut contains many other functional compounds like proteins, fibres, polyphenols, antioxidants, vitamins and minerals which can be added as functional ingredients in many processed foods. Recently it has also been revealed that peanuts are an excellent source of compounds such as resveratrol, phenolic acids, flavonoids and phytosterols that block the absorption of cholesterol from diet.

It is also a good source of co-enzyme Q10 and contains all 20 amino acids with the highest amount of arginine. These bioactive compounds have been recognised for having disease-preventive properties and are thought to promote longevity. Processing methods such as roasting and boiling have shown an increase in the concentration of these bioactive compounds.

Peanuts or groundnuts as they are known in some parts of the world are the edible seeds of a legume. A peanut (*Arachis hypogaea*) is technically considered a pea and belongs to the family (*Fabaceae*) of

beans or legumes. Although a legume, it is generally included among the oilseeds due to its high oil content.

Peanut nutrition profile

Protein, fats, and fibre are the major components that make up peanuts. All these components are present in their most beneficial forms. The protein is plant-based: the fat is unsaturated, and the fibre is a complex carbohydrate which are all proven to be the best for human nutrition.

According to the American Peanut Council, the peanut fat profile contains approximately 50% monounsaturated fatty acids, 33% paraformaldehyde and 14% saturated fatty acids which is a heart-friendly combination of fatty acids (Feldman 1999). The amount of trans fat in peanut butter with 2% stabiliser is 156 times less than what is needed to reach the 0g trans-fat cut-off on food labels (Sanders 2001).

Peanut products (raw, butter and oil) are more beneficial to heart health when compared to low-fat diets. The high monounsaturated fat peanut diets lowered total body cholesterol by 11% and bad low-density lipoprotein cholesterol by 14%, while good

high-density lipoprotein cholesterol was maintained with a reduction in triglycerides (Pelkman 2004).

The benefits of the peanut diet on cholesterol were comparable to the olive oil diet. There is strong evidence supporting an association between monounsaturated fat as well as overall nut intake and a reduction in the risk of coronary heart disease (Matilsky *et al.* 2009).

Emerging data clearly shows that type of fat can impact health in various ways at different stages of life. The fat in peanuts and peanut butter provides healthy calories to malnourished infants and children in their time of need.

Proteins

Peanuts are a legume and have more protein than any other nut with levels comparable to or better than a serving of beans. After the peanut oil is extracted, the protein content in the cake can reach 50% (Zhao *et al.* 2011). Peanuts contain all 20 amino acids in variable proportions and are the biggest source of the protein called Barginine (United States Department of Agriculture, 2014).

According to the protein digestibility corrected amino acid score (PDCAAS),

peanut proteins and other legume proteins such as soya proteins are nutritionally equivalent to meat and eggs for human growth and health (Food and Agriculture Organization, 2002). The amino acid profile of the peanut meals shows that it can be an ingredient for protein fortification (Yu *et al.* 2006).

Since the proteins in peanuts are plant-based, they carry with them additional components that have positive health benefits like fibre and unique bioactive components, unlike animal protein. The peanut proteins have been found to have good emulsifying activity, emulsifying stability, foaming capacity, excellent water retention and high solubility, and can also provide a new high protein food ingredient product formulation and protein formulation in the food industry (Wu *et al.* 2009).

Based on these observations, recently peanut protein has been incorporated into noodles (Wu *et al.* 2007) and infant formula, (Nimsate *et al.* 2010). There is a renewed interest in the studies related to the flavours in the peanut kernel and skin.

Peanut digestibility

The components in peanuts are highly digestible. The true protein digestibility of peanuts is comparable with that of animal protein (Singh and Singh 1991). The limiting amino acid in peanuts varies based on the study, i.e. lysine, methionine or threonine (Venkatachalam and Sathe 2006). Protein quality is defined based on the amino acid pattern and percent of digestibility of proteins.

The PDCAAS for peanuts has been estimated to be approximately 0,70 out of one whereas for whole wheat PDCASS is 0,46. Fat digestibility varies based on the structure of different fatty acids. Peanuts contain over 50% monounsaturated fats, which are easily digested due to a single unsaturated hydrogen bond which is easily broken (Feldman 1999).

Since peanuts are legumes, they contain phytic acid which is associated with decreasing the bioavailability of other nutrients due to their binding properties, but the amount in peanuts is lower than compared to other legumes such as soya bean (Schlemmer 2009).

The fibre in peanuts is mainly insoluble, with lower amounts of soluble fibre (Higgs 2003). It contributes to daily intake but has not been shown to bind nutrients and restrict their absorption. The small amount of soluble fermentable fibre may improve the adsorption of some minerals (Greger 1999).

Fibre

Peanuts are also a good source of fibre, according to the Food and Drug Administration. Sucrose and starch constitute the major proportion while reducing sugars form a minor proportion of the peanut carbohydrates (Tharanathan *et al.* 1975). This may contribute to the fact that peanuts have a low glycaemic index (GI) and glycaemic load (GL) (Foster and Powell 2002).

On a 100-point scale, the GI of peanuts is 14, and the GL of peanuts is one. Additional

research has shown that when peanuts or peanut butter are added to a high glycaemic load meal, such as with a bagel and a glass of juice, they keep the blood sugar stabilised so that it does not rise too high too quickly (Johnston *et al.* 2007).

Peanuts contain carbohydrates, and all foods that contain carbohydrates elevate blood-glucose levels. Some carbohydrates, such as simple sugars, have a swift, dramatic effect on your blood sugar.

Carbohydrates that contain fibre or starch, these two types of carbohydrates have a slower, less pronounced effect on blood sugar. The American Diabetes Association ranks peanuts and other nuts as diabetes superfoods.

To make the list, foods must supply important nutrients such as fibre, calcium, potassium, magnesium and vitamins A, and E. Foods on the list must also rank low on the glycaemic index. Peanuts make the list because they contain magnesium, fibre and heart-healthy oils and do not overly affect your blood glucose.

Vitamins

The consumption of 100g of peanuts is capable of providing a recommended daily allowance (RDA) of up to 75% of niacin, 60% folate, 53% thiamin, 10% riboflavin, 35% pantothenic acid, 27% pyridoxine and 55,5% vitamin E.

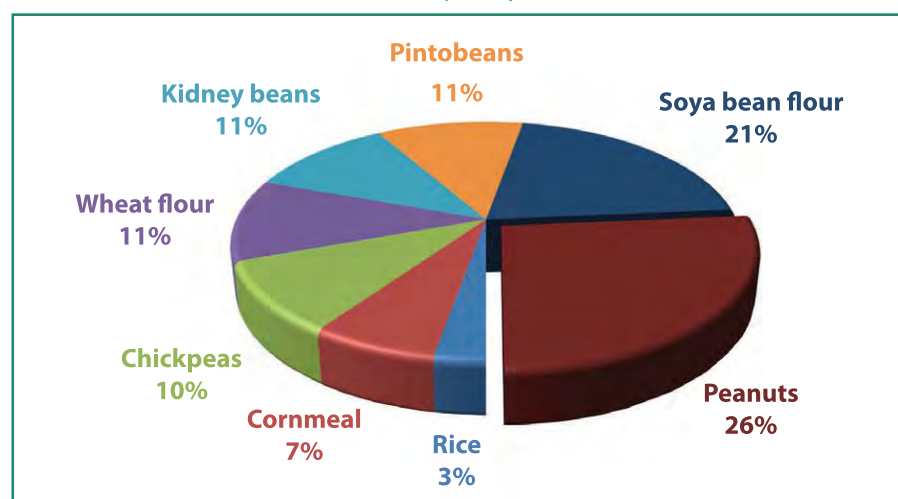
It has been recognised as a great source of niacin, which is important for the functioning of the digestive system, skin, and nerves, helps in the conversion of food to energy and is supposed to protect against Alzheimer's disease and cognitive decline (Morris 2004). Peanut is an excellent source of vitamin E and is considered a hard-to-get nutrient as it was shown that over 90% of men and women were not meeting the recommendations for intake (Gao *et al.* 2006).

Vitamin E consumption in low quantities can lead to benefits against coronary heart disease (Bramley *et al.* 2000). Peanut also contain good amounts of folate which is especially important in infancy and pregnancy, in the production and maintenance of cells.

Minerals

Small amounts of peanut consumption can meet the most RDA's of many minerals which are crucial for health and proper functioning of the body. It is clear that

Figure 1: Total protein in various grains and legumes per half cup. (Source: Modified from American Journal of Clinical Nutrition, 1999)



100g of peanut can provide RDA levels of 127% copper, 84% manganese, 57% iron, 54% phosphorus, and 42% magnesium intake is associated with reduced inflammation (King 2005; Song *et al.* 2005) and a decreased risk of metabolic syndrome (Song *et al.* 2005) and type II diabetes (Larsson and Wolk 2007).

Compact source of energy

Peanuts provide high energy levels for lesser consumption levels (Kirkmeyer and Mattes 2000; Burton-Freeman 2000). They are also referred to as energy dense (Alper and Mattes 2002). Peanuts contain approximately 50% fat, which at nine calories per gram, contributes more calories than traditional foods used in humanitarian relief such as milk, maize, soya bean, wheat and other grains.

The majority of fat in peanuts is heart-healthy monounsaturated fat, with balanced levels of polyunsaturated and saturated fats (Feldman 1999).

Nutrient-dense

Peanuts are rich in multiple natural micronutrients including vitamins, minerals, and bioactive compounds such as resveratrol that are beneficial to health, making them a viable option for improving the nutrition status of those who are malnourished, developing, growing, or in need of critical nutrients in peanuts are integral to growth, development, metabolism and immunity (Geulein 2010).

It is likely that the individual nutrients in peanuts work by multiple mechanisms and that they have synergistic effects towards improving health status. In more than 15 000 people who consumed peanuts and peanut products, it was found that levels of vitamin A, vitamin E, folate, magnesium, zinc, iron, calcium and dietary fibre were higher than those who did not consume peanuts (Griel *et al.* 2004).

The recent focus is on the proper utilisation of the by-products from peanut processing. It has been found that peanut hulls, peanut skin, peanut leaves, and stems are all nutrient-rich parts of the crop with their functional component. It has been reported that for 1 000kg of peanut,

the cold procedure can generate 700kg of peanut meals, while the hot crushing procedure can produce 500kg.

Usually, only a little peanut skin is utilised to extract polyphenolic compounds or make cattle feed, most of the skins are used as the wastes of the peanut processing industry and discarded (Sobolev and Cole 2003).

Research has identified numerous compounds in peanuts and in their skins that may have added health benefits beyond basic nutrition.

Peanut skins can provide an inexpensive source of polyphenols for use as functional ingredients in food or dietary supplements and make a positive contribution to the nation's health (Yu *et al.* 2006). An estimated 35 to 45g of peanut skin is generated per kg of shelled peanut kernel. Over 0.74 million metric tonnes of peanut skins are produced annually worldwide as a by-product of the peanut processing industry (Sobolev and Cole 2003).

The production of peanut hulls has been estimated to be 230 to 300g of peanut hull per kg of peanut. The production of peanut vines from harvested peanuts has been estimated to be 60 to 65% of the peanut production. Peanut vines are rich in dietary fibres and flavonoid components (Du and Fu 2008). The peanut vines include roots, stems, leaves and flowers.

Peanuts as a functional food

Research has identified numerous compounds in peanuts and in their skins that may have added health benefits beyond basic nutrition. Peanuts have been touted as a functional food with numerous functional components like Coenzyme Q10

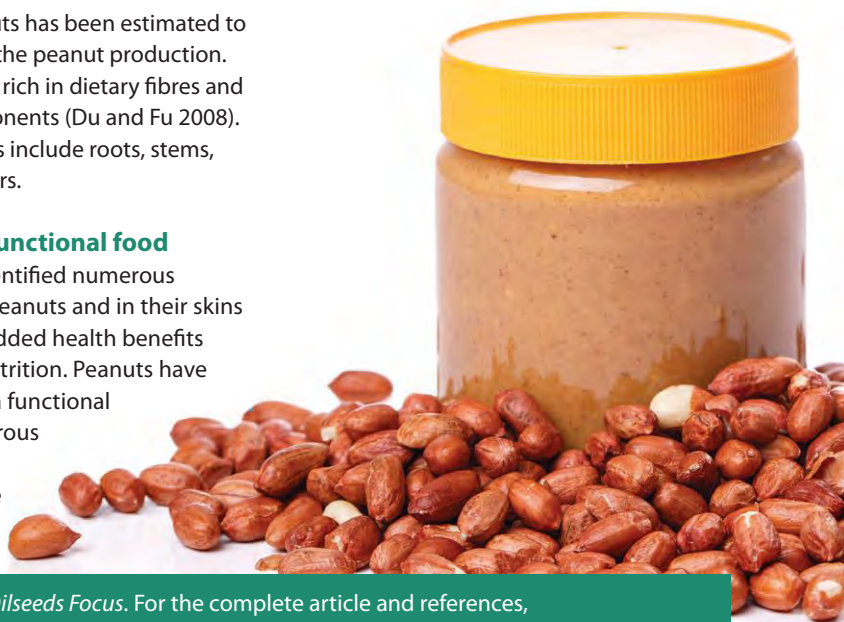
which protects the heart during periods of lack of oxygen – for example high altitudes and clogged arteries.

Peanuts are also a good source of dietary fibre and provide a wide range of essential nutrients, including several B group vitamins, vitamin E, minerals such as iron, zinc, potassium and magnesium, antioxidant minerals (selenium, manganese and copper), plus other antioxidant compounds (such as flavonoids and resveratrol) (Geulein 2010).

These bioactive components have been recognised for having disease-preventative properties and some are antioxidants while others are to promote longevity. The antioxidant capacity of peanut is due to the total biological matters in peanut seed such as vitamin E in oil or chlorogenic acid, caffeic acid, coumaric acid, ferulic acid, flavonoids and stilbene (resveratrol) (Yu *et al.* 2006). Fermented peanut meal (Zhang *et al.* 2011) has been used to study the antioxidant activity and free radical scavenging activity.

Final thoughts

There is a huge scope for the commercialisation of peanut products and the market trends look extremely positive owing to all the aforementioned factors. Also, there is a greater need to spread awareness that peanuts can prevent undesired supplementations through non-dietary sources on regular consumption in Indians, particularly. 🌱



This article has been shortened for use in *Oilseeds Focus*. For the complete article and references, visit www.ncbi.nlm.nih.gov/pmc/articles/PMC4711439.

Rural crime: Determining the extent of SAPS duties

By Hans-Jurie Moolman, Moolman & Pienaar Incorporated

Crime is not only crime against a person, but also against the country and the legal order that was established to organise society. Although legislation is often perceived as restrictive under certain circumstances, its proper enforcement generally creates boundaries around imaginary spaces within which citizens can be free.

This is perhaps the sole reason why crime and lawlessness have such a negative impact on South Africans. A murder figure of almost 200 000 recorded over the last ten years is evidence enough.

Duties of the SAPS

The *Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)* (the *Constitution*) places a heavy duty on the South African Police Service (SAPS) to act, with expanded powers, on crime on behalf of the South African community. The *Constitution* divides this duty into three parts based on action:

- **Prevention:** Pro-active before a crime or crimes are committed.
- **Combat:** Active while a crime or crimes are being committed.
- **Investigation:** Reactive and after a crime has been committed.

No distinction is made as to the priority these actions should enjoy. These three actions will immediately come into play during any action or threatened action, as well as incidents that would amount to common law offenses or any other crime defined in legislation (statutory offences).

The following can contribute to the prevention of crime:

- Image of the police and officers' public actions.
- Visibility of police officers.
- Functional crime intelligence networks.
- Community involvement in the fight against crime.
- Safety awareness among the public.
- Regular focussed crime-fighting operations.

- Specialised use of human resources to prevent specific crimes.
- Quick response to crime when it occurs, and its deterrent value.

Factors that can contribute to the active fight against crime include proper training of SAPS members as well as appropriate equipment such as vehicles, weapons, and other means to expand the SAPS's power. Likewise, a thoroughly set out policy is needed to promote law enforcement. Community participation and organisations, as well as quick responses to crime will also contribute to active crime fighting.

The following can contribute to the SAPS' crime-fighting endeavours:

- Improved and efficient handling of victims' complaints.
- Improved knowledge of statutory offenses and their prosecution.
- More support for victims of crime.
- Continual communication with victims during an investigation.
- Properly trained and competent detectives.
- Specialised units for priority crimes.
- Forensic capabilities (scientific and accounting).
- Direct and active involvement of the Prosecuting Authority in investigations.
- Training focussed on taking of statements and compiling of dossiers for court proceedings.
- Better control over dossiers and evidence.
- Action against underperforming or incompetent officials.
- Managing conflicts of interest among officials who must investigate rural crime.

- Managing the rate at which investigations are completed.

Upon detailed analysis of the SAPS' responses to crime in terms of the *Constitution*, a set of criteria can be developed to determine the extent to which the SAPS is able to respond to an unchanged and growing threat of crime.

Filling in the gaps

Communities have a duty to insist on the SAPS fulfilling the important task that has been assigned to it. It is equally important for communities to be realistic as to the regions of our country in which the SAPS falls short in this regard. In such areas, the inability of the SAPS must be supplemented with legal and professional intervention from the community and private security industry.

It requires a deliberate, planned effort to identify local threats, determine local capabilities and resources (people and equipment) to combat crime, get all interest groups working together, co-ordinate their responses and actions, and fight crime in partnership with the SAPS.

The goal is the establishment of safer communities and preservation of life. It is time for certainty and decisive action to replace assumptions about safety. Crime affects everyone and is best fought where criminals feel ill at ease. This does not require violence, but involved communities working alongside the SAPS to help carry out their constitutional mandate. 🌱

For more information, phone Hans-Jurie Moolman on 018 297 8799 or email hj@mmlaw.co.za.

Illegal foreigners in your employment

By Christiaan Swart, senior legal advisor, LWO Employers Organisation

Employers in the agricultural sector are regularly faced with situations where an employed foreign national is no longer in possession of valid work documentation.

Employers are subsequently required to take the appropriate actions to terminate such a person's contract of employment. But how does an employer proceed to do this legally?

Employment requirements

Employers are prohibited from employing any illegal foreign nationals in terms of the *Immigration Act, 2002 (Act 13 of 2002)*. Where an employer is found guilty of contravening this Act, the employer will face imprisonment of no longer than one year, for a first offence, or can be fined.

Take note that South African labour legislation protects foreign nationals, even if they are not in possession of a valid work permit/visa.

Employers should ensure that potential employees are in possession of a valid work permit/visa. Be sure to conclude a fixed-term contract with such a person, clearly stating that the contract is valid for the duration of the valid work documentation.

In the instance where the foreign national is employed on a permanent contract, or without any contract, the employer must follow a fair procedure before employment can be terminated. Take note that South African labour legislation protects foreign nationals,

even if they are not in possession of a valid work permit/visa. This means that foreign nationals can also approach the Commission for Conciliation, Mediation and Arbitration (CCMA) and lodge a claim for unfair dismissal if the employer does not follow a fair procedure with a valid reason for termination of employment.

Steps to take

The employer must act as soon as he/she becomes aware of the fact that the employee's work documentation has expired:

- Inform the employee that legislation prohibits the employment of illegal foreign nationals and that it is therefore a requirement to continue employment.
- Warn the employee that, should he/she fail to produce a valid work permit/visa within a reasonable time, it could lead to the termination of employment.

The employer must provide the employee with the opportunity to obtain the required valid work permit/visa. This could entail providing the employee with time off in order to obtain the documentation, and even assistance with the application. If the employee fails to produce the required valid work permit/visa, the employer must follow the proper incapacity procedure to terminate employment and dismiss the employee.

The incapacity procedure

- Issue a notice of an incapacity consultation. This notice must set out that:
 - The issue regarding the employee's valid work permit/visa will be discussed.

- Due to the fact that he/she is not in possession of the required valid documentation, he/she is operationally unable to perform his/her contractual obligation.
- Should he/she fail to provide the required valid documentation, it could possibly lead to termination of employment.

- Consult with the employee and discuss the notice in full. Provide the employee with the opportunity to respond to the allegations of not being in possession of the required valid documentation. Discuss any possible assistance that can be offered to the employee. Warn the employee that, if the valid documentation is not provided, it could lead to termination of employment.
- Should the employee fail to provide the required valid documentation, issue the employee with a notice to attend an incapacity hearing. During the hearing, provide all the relevant facts/documents/evidence to the chairperson. The employee will also be given the opportunity to state his/her case before the chairperson. The chairperson may make a recommendation of dismissal.

UIF registration

Employers must also ensure that foreign employees are registered with the Unemployment Insurance Fund (UIF). The only exception in respect of foreign employees where the employer does not have to register the employee for UIF, is when the employee is appointed on a fixed-term employment contract and the employee will return to his/her country of origin after the contract expires. 🌍

The LWO Employers Organisation assists employers to comply with labour law, and to use it to their advantage to protect their business. As a registered employers' organisation with the Department of Employment and Labour, the LWO has the right to represent members at the CCMA. For more information, contact Christiaan Swart on 071 485 3565 or christiaan@lwo.co.za or info@lwo.co.za, or visit www.lwo.co.za.



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