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OILSEEDS focus

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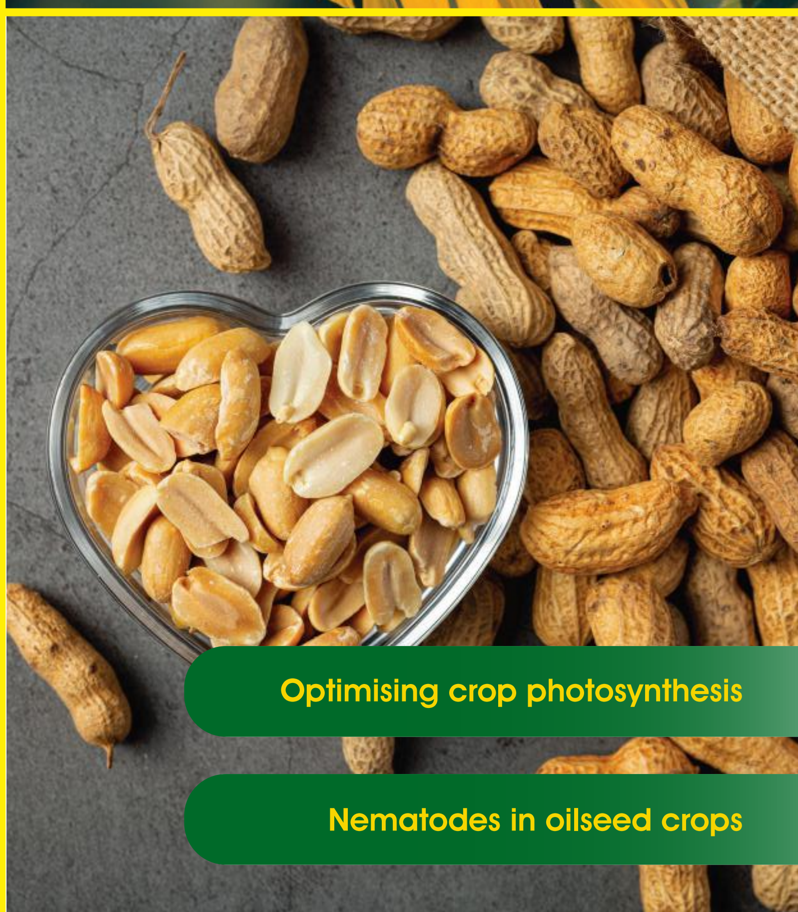

The role of refuge in *Bt* soya beans

Optimising crop photosynthesis

Groundnut cultivar performance

Nematodes in oilseed crops

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Oilseeds are transforming agronomic systems

By Prof Pieter Swanepoel, PRF trustee and chair of the Department of Agronomy, Stellenbosch University

Crop production systems are increasingly shaped by climate variability, disruptions to energy and fertiliser markets due to geopolitical tensions, rising production costs, pressure on soil resources, and concerns about long-term soil health. Despite these challenges, crop production systems are still expected to deliver stable yields while protecting soil, water, and natural resources.

In this context, agronomy is no longer simply about responding to seasonal constraints, but about reshaping production systems to remain viable over the long run. Few developments illustrate this change more clearly than the role oilseeds have played in transforming South African cropping systems and enabling the adoption of conservation or regenerative agricultural practices.

Rotation drives change

Conservation agriculture is well established as the dominant production system in the winter rainfall region of the Western Cape, where canola has played a major role in diversifying systems that were historically based largely on small grains.

In the summer rainfall regions, practices such as no-till and improved residue retention are being adopted in areas historically characterised by maize-based systems, although full conservation agriculture has not yet been widely implemented. The practical application of conservation agriculture principles in South Africa has been closely linked to the extent of crop rotation diversity achievable.

In these summer rainfall regions, soya bean and sunflower have enabled greater diversification of maize-dominant systems. These oilseed crops have played a crucial enabling role by increasing rotational diversity and supporting progress towards conservation agriculture practices. Although not all components of conservation agriculture are consistently applied across regions, the expansion of oilseed production has enabled many systems to move beyond continuous monocropping, representing a transition from principle to practice.

Nutrient use and soil function

Oilseeds have reshaped nutrient flows, most notably nitrogen (N). The expansion of soya bean introduced biological N fixation into previously maize-dominated summer rainfall systems. National fertiliser consumption trends show that, despite an expansion in cropped area over the past two decades, total N fertiliser use has remained relatively stable, while phosphorus and potassium use increased as oilseed ha expanded. This decoupling of production area growth from N fertiliser demand reflects the N contribution of soya bean.

Although further work is needed to optimise soya bean management to maximise N carry-over to maize, available evidence indicates that system-level N-use efficiency has improved. In contrast, although canola does not fix N, it improves N-use efficiency and disrupts pest and disease cycles in cropping systems previously dominated by small grains.

Research from the Western Cape shows that sustained conservation agriculture practices increase soil organic carbon and N mineralisation, allowing optimal wheat and canola yields to be achieved at lower N fertiliser rates than those historically recommended under conventional tillage.

The key implication is that oilseeds do not merely fit into conservation agriculture systems; they make them function. Soya beans stabilise N supply across the production system, while canola improves N efficiency and enhances crop rotation performance in healthy soils.

As oilseeds become more widely integrated into reduced-till and no-till systems, they also highlight areas where management must continue evolving, including disease pressure (particularly *Sclerotinia*) and weed dynamics. Much of this work is already underway, with research focussed on improved rotation design, integrated weed and disease management, and cultivar and agronomic adaptations that allow oilseed-based systems to realise their full potential while remaining productive and resilient.

Climate-smart benefits

From a policy and climate-smart agriculture perspective, oilseeds are important because they deliver both mitigation and adaptation benefits at the system level. Evidence from long-term conservation agriculture systems in the Western Cape shows that diversified rotations including canola increase soil organic carbon by around 0,24 to 0,30 tonnes of organic carbon/ha/year, while keeping direct greenhouse gas emissions low relative to yield. At the same time, soya bean- and canola-based rotations have reduced reliance on synthetic N fertiliser.

These traits align closely with climate-smart agriculture objectives: maintaining productivity and food security, improving resilience to climate variability, and lowering emissions per unit of production.

The next agronomic challenge is therefore not whether oilseed-based conservation systems can function, but rather how to manage system complexity. Agronomic advances will be supported by improved measurement, digital and data-driven decision-making tools, and remote sensing, which help producers manage inherent system variability rather than replace agronomic judgement.

A final thought

The performance of oilseeds, particularly soya bean and canola, reflects the interaction between agronomy, markets, and industry investment. The agronomic fit of oilseeds within conservation agriculture systems was essential, but impact occurred only when value chains, market access, processing infrastructure, cultivar improvement, and coordinated research efforts supported widespread adoption.

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Pressure abroad, strength at home

Global agricultural trade is heavily affected by the disruption of key shipping routes through the Strait of Hormuz. The result is an increase in transport and shipping costs, as well as higher fertiliser prices, while energy prices continue to surge. The Middle East is a key producer of fertiliser, especially urea, and shortages and price increases are unavoidable.

Rapidly escalating fuel prices as well as fertiliser availability could threaten global production. Interruptions in the supply chain for perishable goods are also likely to increase costs, especially in net-importing countries. The entire food supply chain is being affected by rising energy and transport costs. South Africa's citrus exports to the Middle East, which account for approximately 20% of the local market, may need to find alternative routes or markets.

Positive summer crop expectations

The third crop estimate for South Africa's 2026 maize season, at 16,84 million tonnes, is another excellent result and is expected to be the highest production level on record. Exports of more than two million tonnes are anticipated. Current soya bean crop estimates of 2,81 million tonnes also represent a remarkable achievement, with an average yield of 2,32t/ha, making it the largest soya bean crop ever produced in South Africa.

Sunflower production of 822 000 tonnes, together with the record winter canola harvest of 309 000 tonnes, places the balance between supply and demand in a very positive position and emphasises the importance of maintaining a robust export market.

Low grain and oilseed prices, driven by international market movements and exacerbated by higher fuel and fertiliser costs, will place pressure on profitability in the coming season. Greater emphasis across the value chain will therefore need to be placed on continued improvements in efficiency.

Dr Erhard Briedenhann

Send us your contributions and suggestions to make *Oilseeds Focus* an enjoyable and valuable publication for the oilseeds industry. Contact Dr Briedenhann at erhardb@netactive.co.za for more information.

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Sunflower lessons from Argentine producers

According to Ignato Nevaro, who leads the sunflower breeding programme at Syngenta's Camet facility, the area planted to sunflower in Argentina grew over the past ten years and currently the country is producing 2,7 million hectares of sunflower. "The market is basically divided into two segments: 88 to 90% linoleic, and 10 to 12% oleic."

Nevaro explains that sunflower production occurs in three production zones based on geography, climate, and rainfall. "In Argentina, sunflowers are sown from north to south, as soil temperatures increase. The northern part is used for winter production, and the southern and western parts for planting in spring. Planting starts towards the end of July in the northern region, and extends to mid-December or even later in the southern region. Harvesting is from mid to late October in the north, and mid to end of April in the south."

According to Nevaro, the sunflower industry focusses a great deal on oil yield. Producers receive a premium for oil percentages above a certain threshold. "Producers receive about a 2% bonus for each percentage point above 42% of oil concentration. The premium yield is calculated by multiplying the grain yield (kg/ha) with the crusher's bonus factor. Thus a 52% oil concentration will realise a 20% yield bonus." – *Farmer's Weekly*

Soya bean oil surges in US markets

Soya bean oil has emerged in the United States (US) as one of the hottest agricultural commodities of 2026. In late April, new-crop November soya bean futures closed in on US$11,80 per bushel, near a two-year high. In March, old-crop futures traded as high as US$12,50.

Soya oil's ascension was fuelled by a powerful combination: war-driven rallies in crude oil and diesel markets and an outlook for sharply higher US biofuels blending mandates. For producers, it's a good time to question just how much longer the ride can last. US soya bean processors are expected to crush a record amount for the fourth year in a row, based on a US Department of Agriculture (USDA) forecast, as the industry ramps up to keep pace with growing biofuel demand. The Trump administration's proposed biofuel mandates would increase biomass-based diesel blending requirements in 2027 by 60% from 2025 levels.

The shorter-term conundrum revolves around the question of whether this story, and by association the spring soya bean rally, is about played out. US soya bean acres are poised for a sharp increase, and spring planting started off ahead of schedule. Brazil just harvested another record crop, while China may possibly buy more US beans. Crude oil prices will eventually drop. – *Farm Progress*

Partnership brings seed treatments to SA

South African producers can look forward to new, exciting and innovative seed treatment solutions through a global partnership between Syngenta, headquartered in Switzerland, and Rizobacter, a subsidiary of Bioceres Crop Solutions in Argentina. Under their agreement, Syngenta Seedcare serves as the exclusive distributor for Rizobacter's biological seed treatment solutions and as of now, the partnership is set to introduce innovative, sustainable options to the South African market.

As a progressive leader in the industry, Rizobacter's global presence is a testament to its success, with 23% of the world's soya beans treated with its biological technologies. – *Syngenta press release*

California man jailed for canola theft

A Fresno man was sentenced to three years in prison and ordered to pay US$2 million in restitution for his role in a scheme in which US$4,8 million worth of canola intended for cattle feed was stolen. Richard Best and an accomplice, Shawn Sawa, carried out the scheme through Best's now-defunct train-to-truck transloading company, Richard Best Transfer Inc (RBT).

The victim food processors sent hundreds of thousands of tonnes of their canola to RBT for delivery to their customers. Sawa was the area manager for one of the victim food processors from whom he and Best stole canola. Sawa initially received kickback payments from Best to try to increase the supply of canola that RBT received from that food processor before they began their scheme. – *Feed Strategy*

Sunflower seeds recalled in the US

A voluntary recall has been issued in the United States (US) for 13 619lb of sunflower seeds due to the food possibly containing undeclared tree nut (cashew) allergens. The Food and Drug Administration (FDA) said in a recall letter that the products were distributed across 23 states and reached consumers through grocery store chains. The agency said there have been no reported illnesses, adding that anyone with an allergy or severe sensitivity to tree nuts are at risk of a serious or life-threatening allergic reaction if they eat the products. – *Live Now Fox*

Sunflower imports exceed pesticide limits

Sunflower imported from Argentina have been found to contain the presence of the active substances deltamethrin and malathion at levels four to five times higher than the allowed thresholds, according to the Bulgarian Food Safety Agency. The discovery was made during laboratory testing of a shipment that arrived with the tenth vessel carrying agricultural goods from Argentina. The agency stressed that such concentrations are not compliant with European Union food safety standards.

According to official data, Bulgaria has already received a total of 363 400 tonnes of sunflower seeds from Argentina through nine earlier shipments. Testing of this raw material has repeatedly shown pesticide residues above the maximum permitted levels, raising concerns over its suitability for food production within the European market. – *Novinite.com*

Soya beans that can talk

Brandon Hunnicutt, a producer from Giltner in Nebraska, is testing a new way of allowing soya bean plants themselves to monitor disease pressure and provide producers with an alert system that helps get ahead of disease problems before they express symptoms on the plants.

InnerPlant offers soya bean plants as biosensors for diseases. Through small, sentinel bioengineered crop plots, the company utilises phytosensor technology tied to the plant's immune response to detect soya bean diseases in a specified region, long before symptoms would normally show up.

"Fungicides aren't cheap, so you have to get your timing right," Hunnicutt said. "Knowing disease pressure ahead of time gives us a wider window to work with and to look at what the threshold level is and the severity index to see if it warrants a treatment." – *Farm Progress*

Battling nematodes in oilseed crops

By Dr Sonia Steenkamp, ARC-Grain Crops, Potchefstroom

Soya bean, sunflower, and groundnut producers face an ongoing challenge from plant-parasitic nematodes. Although several species are found in South Africa, only a few cause significant economic damage. Chief among these is the root-knot nematode (*Meloidogyne* spp.), known for its wide host range and devastating impact across multiple crops. Root-knot nematodes not only reduce yields but may also interact with fungi such as *Aspergillus flavus*, which produces aflatoxin in groundnuts and poses a serious food safety concern.

Close behind root-knot nematodes are lesion nematodes (*Pratylenchus* spp.), which likewise attack a broad spectrum of crops and disrupt water and nutrient uptake. For groundnut producers, the pod nematode (*Ditylenchus africanus*) is particularly problematic. Its rapid seven-day life cycle and high reproduction rate allow populations to quickly reach damaging levels.

Nematodes are here to stay. The goal is not eradication but keeping populations below damaging thresholds. Their wide host range and ability to survive and damage other crops included in soya bean, sunflower and groundnut rotation systems, complicate root-knot and lesion nematode management.

Pod nematode populations typically increase only after the withholding period of nematicides currently registered for groundnut. Their ability to survive in small numbers on all crops other than groundnut, combined with their rapid life cycle and high reproduction rate, make them almost impossible to control.

Chemical control and treatments

Synthetic nematicides remain the most widely used control method, providing rapid and effective suppression of lesion and root-knot nematodes. However, many registered products are class 1 nematicides, which are highly toxic and subject to restrictions due to environmental and food safety concerns. Newer, less toxic options such as fluopyram (registered for soya bean) are emerging, but availability (with respect to crop registration) is limited.

Seed treatments show promise, though none are yet registered for soya bean, sunflower, or groundnut in South Africa. Encouragingly, several multinational companies are developing biological and new-generation treatments.

Host plant resistance and cover crops

Genetic resistance offers a sustainable, environmentally friendly strategy with little to no extra cost to the producer. Resistant cultivars express genes that limit nematode feeding and reproduction, thereby reducing yield losses. Unfortunately, resistant options are scarce.

Soya bean: Breeding lines with resistance to *Meloidogyne incognita* have been developed locally, though resistance alone may not be enough in rotation systems; **sunflower and groundnut:** No resistant cultivars are currently available for root-knot or lesion nematodes; **groundnut (pod nematode):** A strong source of resistance has been identified, offering hope for future breeding programmes.

Collaboration between seed companies and nematologists will be essential to expand resistance options.

Selected cover crops can reduce nematode populations prior to planting follow-up crops. Mixed cover crop systems, tailored to the specific nematode species present, have shown success under controlled trials. However, effectiveness depends on accurate identification of the problematic nematode species and active growth in infestation hotspots. Results may still vary in heavily infested fields.

The bottom line

Managing nematodes in soya bean, sunflower, and groundnut is a balancing act. No single solution exists, but integrating chemical control, seed treatments, resistant cultivars, and cover crops can help keep nematode populations in check. Continued research and collaboration between researchers and agricultural companies will be key to ensuring sustainable production.

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Rethinking *Sclerotinia* management in oilseeds through risk reduction

By Dr Lisa Rothmann, senior lecturer in Plant Pathology, University of the Free State

Aiming for zero disease may sound ideal, but in most farming systems, it is neither realistic nor economically justified. In many cases, the cost of attempting to eliminate disease completely outweighs the benefits. A more practical goal is to keep disease levels below the threshold at which expected losses exceed the cost of control.

Oilseed diseases caused by *Sclerotinia sclerotiorum* require a risk-based management approach, as the most important decisions must be made before symptoms become visible. By the time water-soaked lesions, white cottony mycelial growth, or stem or head rot appear in the field, infection has already occurred, and management options are limited.

Successful disease management should focus on identifying points in the disease process where the epidemic can be slowed or disrupted before economic losses occur. Maintaining disease intensity below damaging levels involves focussing on key stages of the disease cycle. These include reducing the source of the initial inoculum that drives the first infections, understanding and managing the rate at which infections develop, and limiting the period during which the crop and pathogen interact under favourable environmental conditions.

This article unpacks these stages within the *Sclerotinia* disease cycle and highlights where management practices can realistically influence outcomes. By understanding the conditions under which management is effective and the factors that limit its success, readers can better judge how different approaches are likely to perform in their own production systems.

Canola stem rot, soya bean stem rot, and sunflower head rot are generally regarded as monocyclic diseases. This means the epidemic is mainly driven by initial inoculum, in this case, ascospores released from apothecia (*photograph 1*), rather than repeated cycles of secondary inoculum within the same season.

Although infected *Sclerotinia* tissue can develop mycelium and eventually form sclerotia, these lesions do not produce new airborne spores that repeatedly infect other plants during the season. This differs from polycyclic diseases such as wheat rust, where lesions produce new spores that spread and initiate repeated infection cycles.

This distinction is critical for management. In the case of *Sclerotinia*, control strategies must focus on reducing initial inoculum and limiting conditions that favour infection. This means disease risk is largely determined before and during the flowering period, rather than by repeated cycles later in the season.

Preventing inoculum build-up

Reducing disease intensity begins with limiting the number of sclerotia in the field, as this directly influences the number of apothecia that develop and, consequently, the amount of primary inoculum produced. However, managing the sclerotia population is challenging due to their high persistence in the soil, making them a long-term source of risk. Currently, there are few direct options to reduce their ability to successfully germinate and form apothecia.

It is useful to distinguish between two types of systems: fields with no history of the disease and fields where *Sclerotinia* is already established. In fields with no known history of *Sclerotinia* or where no susceptible crops have been grown for an

Ascospores being released from apothecia.

extended period (for example, six or more years, given sclerotia's survival), the primary objective is to prevent the introduction of sclerotia into the system.

In regions where large areas are planted to susceptible crops such as soya bean and sunflower, ascospores may enter fields from surrounding areas. However, because ascospores are short-lived and infection depends on timing, quantity and favourable conditions, apothecia within or near the field remain the most important source of inoculum for epidemic development.

A more important pathway for pathogen introduction is through retained contaminated seed, as sclerotia can be harvested along with seed and reintroduced during planting. For this reason, certified seed standards, such as those set by the South African National Seed Organization (Sansor), limit the allowable level of sclerotia contamination to very low thresholds (≤0,2%). Preventing introduction is therefore the most effective strategy for reducing long-term risk in these systems.

Managing established populations

In contrast, in fields where *Sclerotinia* is already established, the focus shifts towards reducing the existing sclerotia population. A key driver of this population is replenishment following disease seasons. The contribution of sclerotia to the soil inoculum pool can be substantial; for example, a single moderately infected canola stem may produce approximately 25 sclerotia (*photograph 2*), which are returned to the soil at the end of the season. Over time, this leads to a build-up of inoculum in fields with a history of disease, increasing the risk of future epidemics.

In fields with a history of *Sclerotinia*, options for reducing sclerotia are limited and mostly long-term. Tillage may redistribute rather than eliminate sclerotia, as buried structures can remain viable and stipes may still grow upwards, in some cases up to 9cm, to reach the soil surface.

Crop rotation is only effective when non-host crops are maintained for extended periods (for example, more than six years), which may be difficult in South African production systems, where rotations often include susceptible crops such as sunflower and soya bean alongside maize. These practices should therefore be regarded as gradual risk-reduction strategies rather than immediate control measures.

Biological control

The only biological control option that directly targets sclerotia is *Coniothyrium minitans*. This fungus colonises the surface of sclerotia, penetrates their internal tissues, and degrades them, reducing their ability to germinate. However, its effectiveness depends on contact with the sclerotia, survival in the soil, and sufficient time for colonisation, especially in fields where new sclerotia are replenished across seasons.

Other biological products, including those containing *Bacillus methylotrophicus*, *Bacillus amyloliquefaciens*, and *Trichoderma asperellum*, may reduce disease risk through indirect pathways, such as competition, promotion of plant health, and activation of systemic acquired resistance and induced systemic resistance.

It is important to remember that apothecia develop asynchronously in fields. This results in a prolonged period of ascospore release and dispersal, allowing infection of susceptible plant tissues. Although dispersal distances are not fully

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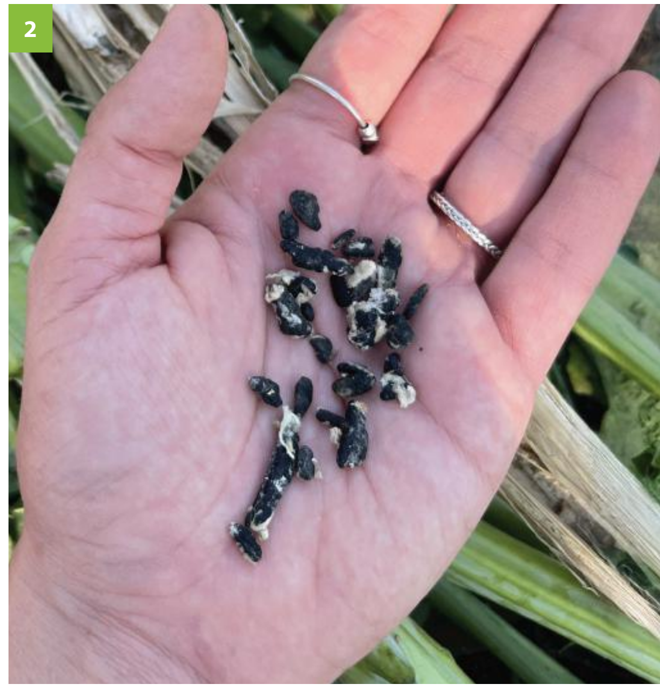

Sclerotia from one stem of canola infected with Sclerotinia sclerotiorum.

understood, reports of moderate movement of around 3,5km suggest that infection can occur even in fields where apothecia are absent.

Row width and canopy development are likely to play a role, with denser canopies potentially creating conditions that favour disease by increasing the frequency of spore release and colonising susceptible tissue. However, these relationships are not yet fully understood and require further investigation.

Timing management

This marks the shift from ascospore dispersal within and beyond the canopy to infection, where risk must be translated into timely management decisions. This is the fundamental challenge for growers. Decisions must be made before visible symptoms appear. Once symptoms are observed, the infection is already underway.

Management can also focus on reducing the overlap between crop susceptibility and pathogen availability; that is, limiting the period when flowering coincides with ascospore release and environmental conditions that favour infection. This risk can be influenced, although not eliminated, through planting date and cultivar selection.

Planting date determines not only when the crop reaches flowering but also how this timing aligns with periods of apothecial activity in the field. Similarly, cultivar choice influences not only when flowering occurs, but also its duration. For example, indeterminate soya bean cultivars flower over extended periods, increasing exposure to ascospores and, consequently, the risk of infection.

Fungicides and other interventions

When the initial inoculum cannot be sufficiently reduced, and the overlap between flowering, ascospore availability, and favourable weather cannot be avoided, management depends on disrupting infection. The aim is to prevent ascospores from establishing on susceptible tissue, thereby reducing disease development and limiting the number of sclerotia returned to the field. Chemical and biological control options may contribute at this stage, but their effectiveness depends heavily on correct timing and placement, particularly whether the product reaches the infection court.

In South Africa, canola has the widest range of registered active ingredients (five), while options for soya bean are more limited (two) and may overlap with products registered for soya bean rust. In sunflower, no products are currently registered specifically for *Sclerotinia*, although trials are underway with industry partners at the University of the Free State (UFS).

Ideally, fungicides must be applied preventively, before symptoms are visible, because once ascospores have germinated and colonised host tissue, infection is already established. During this stage, the pathogen produces cell wall-degrading enzymes and compounds such as oxalic acid, which promote host cell death and facilitate further colonisation. At this stage, opportunities for intervention are limited, as no curative fungicides are available for *Sclerotinia*. Effective control therefore relies not only on correct timing but also on whether the fungicide reached the infection court. This is particularly challenging in crops such as soya bean, where flowers develop within the canopy and sprays must penetrate to reach the target tissue.

A final approach, where *Sclerotinia* head rot is already established in sunflower, is early desiccation. This strategy has received increasing attention because it may help protect at-risk yield while limiting the number of sclerotia returned to the soil. In this way, it may reduce future risk by lowering the amount of primary inoculum available in subsequent seasons. Research is currently underway at the UFS to determine the appropriate timing of desiccation, balancing disease severity, potential yield losses, and economic returns.

Biological and economic risk

This brings us back to the central point: *Sclerotinia* management is not about achieving zero disease – it is about reducing risk within a specific production system. Disease management can be viewed through three lenses: the pathogen's biology, the farming system and surrounding landscape, and the financial implications of intervention. The question is therefore not only whether a control option is available, but whether it is likely to reduce risk sufficiently to justify the investment in a particular season.

This requires a clear understanding of the relationships between disease incidence (number of infected plants), severity (extent of infection), and yield loss. These relationships are dynamic, and no fixed thresholds apply across all systems. Once these relationships are better understood, the intervention and application costs can be weighed against expected yield, crop value, and market conditions, allowing *Sclerotinia* management decisions to be made on both biological and economic grounds.

Thank you to Thabiso Masisi for assisting in the revision of this article. For more information, contact Dr Lisa Rothmann at coetzeeLA@ufs.ac.za

Tour creates new appetite for sunflower production

Argentina is regarded as a global leader in sunflower production, with around 90% of the country's crop processed in oil extraction facilities and exported worldwide. "Argentinian sunflower material is well suited to South African conditions and offers the added benefits of high oil content and herbicide tolerance," says Hendrik van Staden, Syngenta Seeds business unit head for South Africa and field crops head for Africa and the Middle East.

In March this year, Syngenta took producers and industry stakeholders on a tour to Argentina to gain a better understanding of high oil content sunflower production.

Breeding for oil and resilience

According to Charles Basson, portfolio and technical marketing manager for field crops at Syngenta South Africa, the company focusses on several key attributes in their sunflower breeding programme: hybrids are selected early for high oil content; hybrids are planted across a range of environments and planting dates to evaluate plant height, head size, standability, head angle, as well as days to flowering and maturity; disease tolerance; herbicide resistance; grain yield; and seed production.

Syngenta draws from a vast genetic pool for selecting specific and desired traits in the breeding programme and uses marker-assisted technology for breeding. Understanding the breeding timeline is critical. Line development takes three years, followed by a further three years to evaluate selected hybrids. Pre-commercial trials to evaluate the material in commercial fields then continue for another two years. "Only after eight years will a new hybrid be commercially released," Basson says.

A key discussion point was gaining access to Syngenta's new herbicide-tolerant technology, which could enable more cost-effective weed control in sunflower. Producers were encouraged by progress in disease tolerance, particularly against *Sclerotinia sclerotiorum*, a major challenge in South Africa. Research undertaken in Argentina also offers renewed hope.

"Our pipeline is delivering high performing, high oil content hybrids with added flexibility," says Basson.

The Syngenta sunflower package consists of Sensako hybrids SNK 270 CL (64 to 68 days to 50% flowering), SNK 242 CL (62 to 64 days to 50% flowering), and SNK 441 CL (70 to 72 days to 50% flowering) offering planting flexibility.

"Our on-farm commercial trial data show these hybrids compare exceptionally well with competing products and should be considered by producers who are serious about sunflowers and return on investment. We strongly recommend planting a hybrid package to strategically manage disease and drought stress. Staggered planting dates further improve risk management," Basson notes.

The group also visited the Renova oil press at Quequén, where sunflower and soya beans are processed exclusively. According to Juan Manuel Zapata, production manager at Renova, sunflower is tested for moisture on delivery before being hulled and pressed to separate oil from the oilcake. "About 75% of the oil is extracted during this process. The oilcake then undergoes solvent extraction to recover the remaining crude oil, after which oil from both processes is blended," he explains.

Producer feedback

Petri van der Walt

"One aspect that stood out for me was the yield stability producers can achieve, even in the drier parts of the country and during drier seasons. The crops we visited did not show any significant deficiencies in nutritional elements, likely due to factors such as moisture conservation through no-till practices (prominent and visible mulch), soil fertility, high organic content of up to 4,5%, a focus on maintaining balanced soil chemistry relationships, and cultivar selection suited to the specific soil types.

Another interesting and encouraging aspect was the wide range of Syngenta's sunflower breeding lines used during the first year of selection, with 1 600 repeats. This enables them to make new and improved cultivars commercially available after five years.

Willem Venter

"Argentina is a beautiful country with impressive crop production figures for maize, soya bean, and sunflower. Although this may make us appear small in comparison, South Africa has the ability to produce enough to feed its own population. While we produce high-quality sunflower on a smaller scale, we continue to pursue top yields.

The new Syngenta sunflower hybrids are set to push the boundaries of local sunflower production, enabling producers to remain profitable. Syngenta also hinted at better technologies in the coming years, which is encouraging. After suffering great losses from *Sclerotinia* during the 2024/25 season, the prospect of more resistant hybrids offers welcome relief.

During our tour we spoke about how later planting dates, from mid-December to late January, increase *Sclerotinia* risk when high rainfall coincides with low night temperatures. I think the new cultivars give us reason for hope going forward.

Louis Scheepers

"The visit was very informative, particularly the no-till planting methods used in Argentina. It was interesting to see that they plant at a 0,52cm row spacing, compared to our 0,91cm. The narrower rows allow for better, more even ground cover and a more even plant population. The effort that goes into the sunflower breeding selection process to meet producers' needs also stood out for me. Lastly, the gathering of South African sunflower producers and the guidance from Syngenta representatives were top class.

Louis Heyns

"I really enjoyed visiting the sunflower press, as it allowed me to see things from the processor's perspective. For them, it is all about high oil content, which made me realise I should adjust my cultivar choices accordingly. In Argentina, producers are not only rewarded for oil but also penalised for low levels of oil in the seed, and I suspect the same will eventually happen in South Africa.

I also look forward to the availability of air technology in sunflower, which should enable more affordable and effective weed control, making it easier to produce sunflower profitably.

Tsaats Hattingh

"Syngenta's sunflower breeding programme focusses on high oil production, yield, and disease resistance. Experiencing this first-hand has given me, as a producer, greater confidence in making decisions on my farm.

We visited trials assessing plant density, disease resistance, herbicide tolerance, and hybrid performance to evaluate how the sunflower performs and reacts against variables. We also saw comparisons between existing cultivars and those in the pipeline. During the week, we visited a sunflower producer, an oil press, and Argentina's 'Nampo', truly experiencing the full Argentinian agricultural scene.

Top-performing cultivars in Argentina adapt well to our local conditions, and some of these high-performing lines may soon be available to us. In addition, we looked at management practices aimed at improving oil content, as Argentinian producers achieve slightly higher oil percentages from the same cultivars.

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Innovation with Integrity

Farming for the future: The role of refuge in *Bt* soya beans

By Isabel Neethling, Stewardship South Africa, Bayer

Soya beans have become an important crop in South Africa, with producers across various regions incorporating them into their cropping systems. Continued research in breeding, pest and disease management, and sustainable farming practices is crucial for enhancing productivity and resilience under often challenging conditions. A notable advancement in the oilseeds sector has been the introduction of genetically modified (GM) soya beans with insect-resistance traits.

Bt soya beans are engineered to express a protein from the bacterium *Bacillus thuringiensis* (*Bt*), which produces *Cry* proteins toxic to specific pests. The only *Bt* soya bean currently available to South African producers is Intacta RR2 Pro®, which expresses the *Cry1Ac* protein and provides highly effective control of the African bollworm (*Helicoverpa armigera*). When insects consume plant tissue containing these *Bt* proteins, the proteins activate in their gut, forming pores that cause paralysis and death. However, this targeted action is safe for humans, animals, and other beneficial insects.

The introduction of Intacta RR2 Pro® soya beans allows significant advancement in agricultural biotechnology, particularly in pest management. By reducing reliance on chemical insecticides, *Bt* soya beans lower production costs, help delay the build-up of pesticide resistance, and protect beneficial insects and natural predators. Ultimately, this excellent pest control contributes to improved crop yields.

To extend the benefits of this technology, proper stewardship of *Bt* soya beans is essential. Implementing a non-*Bt* refuge is critical for managing the *Bt* trait and ensuring ongoing value for producers.

The development of target pest resistance against *Bt* proteins poses the greatest threat to the sustainable use and value of this technology.

Resistance occurs when pests develop the ability to survive exposure to the *Bt* protein due to genetic variations or mutations. These variations arise naturally within pest populations, like eye colour variations occur in humans. When the number of individuals in the pest population with these natural genetic variations increases, resistance to *Bt* traits can be observed.

Functions of a refuge

To mitigate the risk of pest resistance to *Bt* proteins, producers must plant a refuge – an area within the field where a *Bt* crop is grown without any *Bt* proteins, thus without selection pressure on the target pest.

Refuge areas help maintain a population of susceptible pests (green moths originating from the refuge in *Figure 1*) that can interbreed with resistant individuals (red moths originating from the *Bt* soya bean in *Figure 1*). This dilution effect reduces the overall frequency of resistance genes in the pest population, making widespread resistance less likely (orange moths produced by red moths mating with green moths in *Figure 1*).

If a pest population is continuously exposed to *Bt* proteins without any susceptible individuals, the likelihood of resistant individuals surviving and reproducing increases (red moths mating with one another in *Figure 1*). By providing a habitat for susceptible pests, refuge areas ensure a continuous supply of pests that are vulnerable to *Bt* proteins. This is essential for preventing the selection pressure that can lead to the rapid development of resistance.

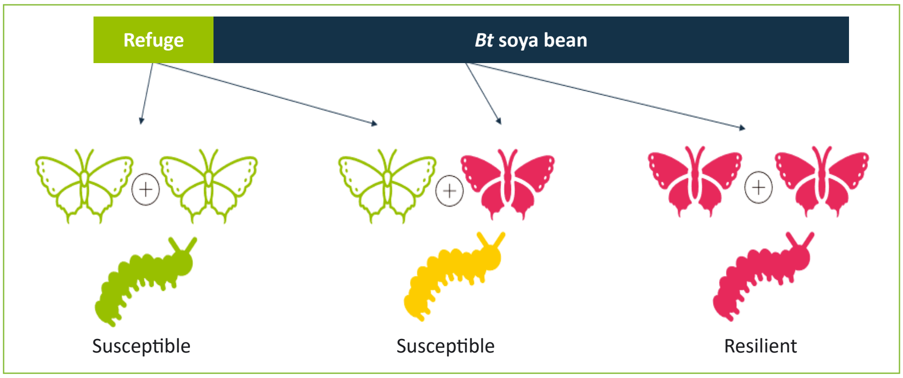
By planting a refuge, producers can maintain a population of susceptible pests that can mate with resistant individuals, further diluting the frequency of resistance genes in the overall pest population.

It is important to note that there is often little to no fitness cost associated with resistance genes. This means that if resistance develops in a pest population, it is unlikely that the population will revert to being susceptible to the specific genes expressed in the *Bt* crop. Essentially, resistance cannot be reversed. It is therefore crucial to prevent the buildup of resistance, as it cannot be treated, which underscores the necessity of always planting a refuge.

Bt soya bean refuge requirements

The requirements for planting a refuge are based on two key principles. First, resistant individuals emerging from the *Bt* soya bean area must have the opportunity to crossbreed with the predominantly susceptible individuals emerging from the refuge.

Figure 1: Role of refuge to prevent the build-up of resistant individuals in the population. Green icons are homozygous susceptible pests; red icons are homozygous resistant pests; orange icons are heterozygous susceptible pests.



To support this, the following refuge requirements must be observed:

- Producers planting soya bean seeds containing the *Bt* trait must also plant a non-*Bt* soya bean variety as a refuge area (20% of the total planted area). The non-*Bt* refuge may be treated with insecticides or bio-pesticides registered for use against target pests, but not with any products containing *Bt* proteins.
- No *Bt* plant should be more than 400m from the refuge area.
- Producers must ensure that the non-*Bt* variety is planted in a manner that allows the germinated plants to mature similarly to the *Bt* variety.
- Non-*Bt* seeds must be planted within seven days of planting the *Bt* seeds.
- The refuge must be located on the same field as the *Bt* variety, and producers are responsible for planting their own refuge area.
- The non-*Bt* variety should be cultivated under the same conditions as the *Bt* variety.
- The refuge should be planted along the outer borders of fields planted to the *Bt* variety.

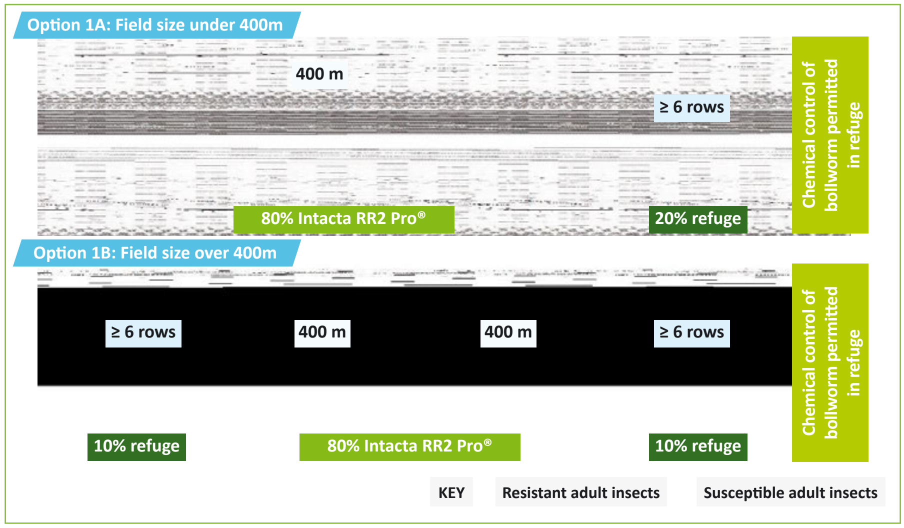
Second, to minimise the likelihood of larvae feeding on both *Bt* and non-*Bt* plants, the following recommendations are made: mixing *Bt* and non-*Bt* variety seeds is prohibited; crossing of *Bt* and non-*Bt* rows is not permitted; non-*Bt* varieties should be planted in strips at least six rows wide, except on smallholder farms where a six-row strip would exceed the required 20% refuge area.

To facilitate identification and monitoring of the fields, the refuge area should be clearly marked. In addition, producers are required to monitor and scout their fields at least once a week and must contact their seed representative immediately if they observe excessive damage. It is important to note that insecticide sprays should be applied over the entire field and not just the refuge. No insecticide sprays in the *Bt* crop should be necessary for the target pest, African bollworm.

It is recommended to spray for pests only when they reach an economic threshold, but before they reach economic injury levels. This approach helps preserve natural enemies and beneficial insects while reducing spraying costs. Always follow label recommendations.

If the field is larger than 400m, the refuge area should be split along the field's outer edges (*Figure 2*). For fields larger than 800m, additional sections can be placed within the field at 400m intervals (*Figure 3* depicts examples of possible layouts).

Figure 2: Intacta RR2 Pro® refuge planting requirements.



It is important to note that all these sections must be at least six rows wide, even if this increases the total refuge area to more than 20% of the field. Currently, unlike in maize and cotton, there is no 5% unsprayed refuge option for planting *Bt* soya beans.

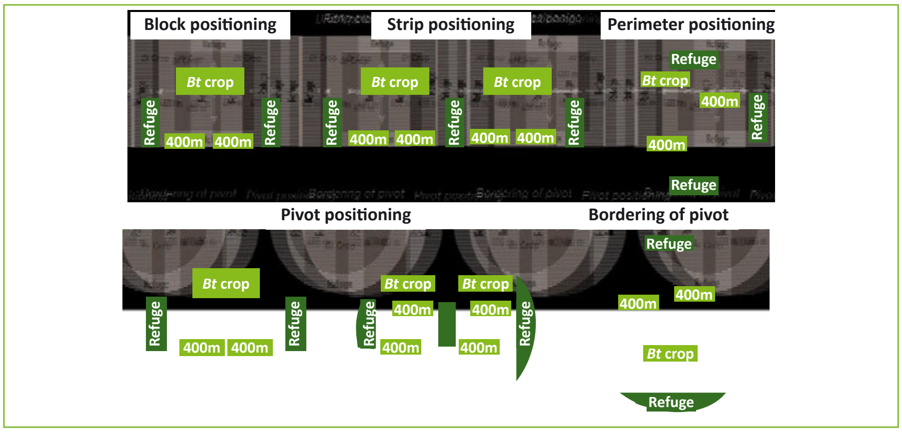
Compliance with the refuge requirements is mandatory, as stipulated by the technology holder and as set out in the permit conditions issued by the registrar under the *Genetically Modified Organisms Act, 1997 (Act 15 of 1997)*. The permit conditions specify that responsibility for compliance with refuge requirements rests with the technology user or the producer.

Conclusion

The adoption of *Bt* soya beans represents a significant advancement in South Africa's agricultural landscape, offering producers an effective tool for pest management and increased productivity. However, the sustainable use of this technology hinges on proper stewardship practices, particularly the implementation of refuge areas to mitigate the risk of pest resistance.

By adhering to established refuge requirements, producers can ensure the continued effectiveness of *Bt* technology. Ultimately, committing to best practices in refuge planting and pest management will benefit not only individual producers but also the long-term sustainability of soya bean production in the region.

Figure 3: Examples of refuge positioning on field.



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The future of canola production in a changing climate

By Andries le Roux, Stephanie Midgley, Johann Strauss, and Pieter Swanepoel

Canola (*Brassica napus* L.) has become a key component of dryland cropping systems in the Western Cape, offering both rotational and economic benefits. However, production is influenced by a changing climate characterised by rising temperatures, more variable rainfall patterns, and elevated atmospheric CO_2 levels.

While attention has mostly focussed on the risks associated with warming, less is understood about how canola will respond under future climate conditions where temperature and CO_2 increase simultaneously. This distinction is important, as these factors interact to influence crop development, water use, and ultimately yield and crop quality.

In this study, controlled-environment phytotron trials were used to simulate future climate scenarios and evaluate how canola cultivars, differing in herbicide tolerance and growing season length, respond. The aim was to translate these physiological responses into practical insights for canola production under future conditions.

Climate change and production

The production environment for canola in the Western Cape is becoming more complex, with rising temperatures, more frequent heat events, and elevated atmospheric CO_2 expected to influence future growing conditions. These changes do not occur in isolation, but interact to influence crop development, water-use efficiency, and the balance between vegetative growth and reproductive success.

Although climate change is often associated with risk, crop responses are not always straightforward. Much of the focus has been on heat stress, but less attention has been given to how rising CO_2 levels may influence crop performance. This is an important gap, as elevated CO_2 can partially offset some of the negative effects of warming by improving water-use efficiency and photosynthetic activity.

This raises a key question for producers and processors: How will canola respond when temperature and CO_2 increase simultaneously? Understanding this interaction is essential, as it directly affects not only yield, but also oil content and overall product quality.

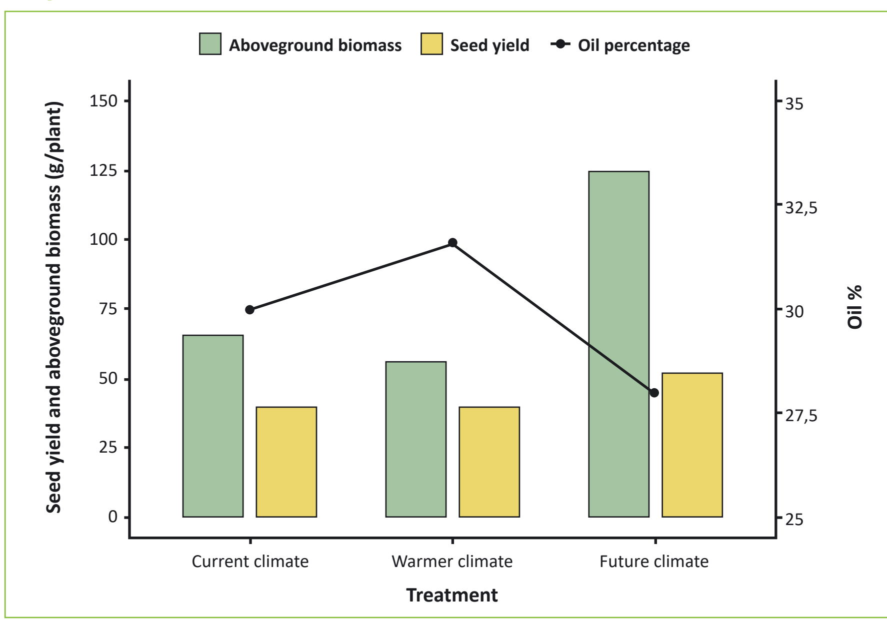
A controlled-environment phytotron study at Stellenbosch University was used to simulate future climate conditions. Three scenarios were tested: current temperature with lower CO_2; elevated temperature (+1 to 2°C) with lower CO_2; and elevated temperature combined with elevated CO_2, representing a realistic future climate scenario. The treatments were applied under optimal water and nutrient conditions, representing a best-case scenario. Six cultivars were included, representing conventional, Clearfield (Cl), and triazine-tolerant (TT) varieties with short and medium growing season lengths.

Although phytotron studies do not capture full-field variability, they provide valuable insights into how crops respond to specific environmental drivers, helping researchers interpret field responses and guide future management decisions.

Temperature alone is insufficient

Temperature alone did not improve canola performance. While it is often assumed that warming accelerates development and increases yield potential as conditions move closer to ideal, this was not observed.

Figure 1: Mean seed yield, aboveground biomass (both g/plant), and oil percentage (%) of canola under current climate, warmer climate, and future climate (elevated temperature + CO_2) conditions.



** When expressed on an area basis, this corresponds to an approximate increase in yield from about 3,6 to 4t/ha^{-1} under current and warmer conditions to about 4,7t/ha^{-1} under future climate conditions. In comparison, aboveground biomass increased from about 6,6 and 5,9t/ha^{-1} to about 11,2t/ha^{-1}. These values represent a direct transformation from phytotron measurements to a field-equivalent scale. They should be interpreted as indicative of potential production under optimal conditions, as controlled-environment studies do not account for field variability such as water stress, soil heterogeneity, pests, and plant competition.*

Under elevated temperature alone, biomass and yield did not increase. Although branching increased slightly, this was offset by higher rates of flower abortion, resulting in no net yield benefit.

These findings suggest that warming alone does not substantially affect production potential under optimal conditions. However, its effects under water-limited conditions were not explicitly evaluated in this study and are likely to be more pronounced.

Future climate effect on canola

A very different response was observed when elevated temperature was combined with elevated CO_2. Plants showed increased photosynthesis, improved water-use efficiency, and accelerated development. Elevated CO_2 enhances carbon assimilation, resulting in greater biomass production and higher yield potential. Reduced stomatal conductance also lowers water loss, thereby improving intrinsic water-use efficiency, an important advantage in dryland systems.

However, these benefits come with important trade-offs. Despite increased biomass and yield, oil percentage declined under future climate conditions. This suggests that while total production may increase, oil extraction efficiency may decrease, with implications for oil production and oilcake quality. Changes in oilcake composition may also affect its nutritional value for animal feed.

In addition, more branching and extended flowering periods led to higher flower abortion rates and a greater proportion of green seeds, which may further affect oil quality. Future climate conditions may therefore increase total production but not necessarily improve product value.

Cultivar choice

Cultivars differed in their response to elevated CO_2. TT cultivars showed a more conservative response and were less efficient at utilising more CO_2 than conventional and CI cultivars. This suggests that TT cultivars may not benefit to the same extent under future climate conditions, potentially widening the yield gap over time. This creates a trade-off: While TT systems are valuable for weed control, their yield potential under future climates may be lower.

These findings highlight opportunities to breed improved TT cultivars or for producers to balance yield potential with weed management needs.

Growing season length is also likely to shorten under future climate conditions, primarily due to faster growth at elevated CO_2 levels rather than temperature alone. As a result, current cultivars may effectively shift towards shorter-growing categories over time. In practical terms, this means that cultivars currently classified as medium may behave more like short-season cultivars in future.

This shift may increase the risk of misalignment between flowering and favourable conditions, particularly as heat stress and drought may occur earlier in the season. This reinforces the importance of aligning planting date and cultivar choice with expected seasonal conditions.

Implications for production

Climate change does not necessarily mean reduced production potential. Elevated CO_2 may improve growth, water-use efficiency, and yield under favourable conditions, but these gains may be offset by reductions in oil percentage and potential impacts on oil quality. The timing of flowering is critical. Management practices that influence phenology, such as planting date and cultivar selection, will be central to maintaining yield under changing conditions.

Cultivar selection will become more important. Conventional and CI cultivars appear better positioned to benefit from elevated CO_2, whereas TT cultivars may require further improvement or careful use under high weed pressure. Soil moisture conservation will also remain critical. Practices such as minimum tillage and residue retention will help ensure that crops can benefit from improved water-use efficiency.

Future climate conditions may not necessarily reduce canola potential, but they will increase the importance of making sound management decisions.

However, this study did not account for potential future changes in rainfall amount and timing, which could further influence production outcomes.

Key take-home message

- Changing climatic conditions will influence canola production through the interaction between temperature and CO_2, rather than temperature alone.
- Elevated CO_2 may increase biomass and yield potential but may reduce oil percentage and influence oil quality.
- Trade-offs between yield, oil percentage, and oilcake quality will become more important for the industry.
- Cultivar choice is also essential, with conventional and CI cultivars showing greater responsiveness to elevated CO_2 than TT cultivars.
- Growing season length is likely to shorten under future conditions, meaning that aligning flowering with favourable environmental windows is becoming more important.
- Soil moisture conservation, together with changing weed and disease pressures, will be critical to realise the potential benefits of future climate conditions.

Conclusion

Canola production in the Western Cape will continue to be shaped by a changing climate, but future conditions do not necessarily equate to reduced production potential. The interaction between elevated temperature and CO_2 plays a key role in determining crop response, with potential benefits for growth and water-use efficiency. However, these benefits will only be realised through effective management. The timing of flowering, cultivar selection, planting date, and moisture conservation will become more important as climate variability intensifies.

The challenge for the future will be not only to produce more canola but also to do so more efficiently and with consistent quality under variable conditions.

We thank the Protein Research Foundation (PRF) and Oil and Protein Seed Development Trust/Oilseed Advisory Committee (OPDT/OAC) for funding this research project. For more information and references, email Andries le Roux at andriesleroux@sun.ac.za

The use of fungicides to manage blackleg of canola

By Huibre Schreuder, Gert van Coller, and Diane Mostert

Canola has become an important crop in the Western Cape over the last two decades. The area planted to canola is increasing year to year, and projections indicate further increases in the coming years. Blackleg, which is caused by two closely related fungal species, *Leptosphaeria maculans* and *L. biglobosa*, is the most important disease of canola globally. Losses due to blackleg are estimated at between 10 and 20% in major canola-producing regions such as Australia, Canada and the United Kingdom, and severe epidemics can cause complete crop failure.

To limit the impact of this disease locally and to prevent severe epidemics in the future, it is important to study the disease and its pathogens under local conditions. A study funded by the Oil and Protein Seeds Development Trust (OPDT) was therefore launched in 2021 to lay the groundwork for developing an effective, integrated management strategy for blackleg tailored to local conditions.

The study consisted of three parts: a genetic study of *L. maculans* populations, the use of cultivar resistance, and the use of fungicides. The first two parts of this study were covered in the December 2025 issue of *Oilseeds Focus*. This article focusses on the effective utilisation of fungicides for blackleg management.

Fungicide use and resistance risk

Blackleg is managed through the integration of cultural practices, host resistance, and fungicide applications. Fungicides form an important part of this strategy and are routinely used for blackleg management in the Western Cape.

L. maculans infects the cotyledons and leaves of canola seedlings. The fungus then grows from the infection site through the leaf petiole into the stem and down to the hypocotyl. It survives in the hypocotyl, which later becomes the crown of the canola plant, without causing damage until later in the season, when it colonises the stem tissue and causes crown cankers.

These early seedling infections lead to crown cankers later in the season. Seed dressings are applied to protect the plant during the early seedling phase. A foliar fungicide is then applied at the four- to six-leaf stage to further protect the seedling against critical early infections. Producers also routinely apply up to two foliar fungicide sprays during flowering to manage *Sclerotinia* stem rot. This means that, in addition to a seed treatment, up to three fungicide sprays are applied to canola crops within a season.

Furthermore, conservation agricultural practices that conserve stubble are used in the Western Cape, resulting in infected stubble being exposed to fungicides applied to crops grown in rotation with canola. This potentially increases fungicide exposure and the subsequent selection pressure for the development of fungicide resistance. The use of fungicides should therefore be carefully managed, as *L. maculans* possesses several traits that make it prone to develop fungicide resistance. Resistance to demethylation inhibitor (DMI) fungicides in *L. maculans* has already been reported in Australia, while reduced sensitivity to DMIs has also been reported in Western European, Czech and Polish *L. maculans* populations.

Eight foliar fungicide products containing active ingredients from three fungicide classes – DMIs, quinone outside inhibitors (QoIs), and succinate dehydrogenase inhibitors (SDHIs) – are registered for blackleg management in South Africa (*Table 1*). There is a heavy reliance on DMI fungicides for blackleg management, with four of the eight registered fungicides containing only DMI actives. The same eight products are also registered for *Sclerotinia* stem rot, which further exposes *L. maculans* populations to these fungicides.

Screening for fungicide resistance

As DMI resistance was reported in Australian *L. maculans* populations, it is important to also investigate it in South Africa to pre-empt the development of fungicide resistance. Ninety *L. maculans*

Table 1: Foliar fungicide products registered for blackleg management of canola in South Africa.

Trade name	Active ingredient	Group	Frac code
Amistar®	Azoxystrobin	QoI[a]	11
Obstructo 250 SC	Azoxystrobin	QoI	11
Aviator® Xpro	Bixafen + Prothioconazole	SDH[b] + DMI[c]	7 + 3
Faculty Top 250 SC	Prothioconazole + Picoxystrobin	DMI + QoI	3 + 11
Santana 480 SC	Prothioconazole	DMI	3
Prosaro® 250 EC	Prothioconazole + Tebuconazole	DMI	3
Proteb 250 EC	Prothioconazole + Tebuconazole	DMI	3
TebuCure Prime 250 EC	Prothioconazole + Tebuconazole	DMI	3

[a]Quinone outside inhibitors; [b]succinate dehydrogenase inhibitor; [c]demethylation inhibitor.

isolates collected during the 2020 to 2022 growing seasons across the Swartland and Southern Cape canola production regions of the Western Cape (*Figure 1*) were used to determine the sensitivity of local *L. maculans* populations to two DMI active ingredients. Mycelial plate assays were used for the sensitivity screening.

In this type of analysis, the fungicide concentration that causes a 50% reduction in the growth of an isolate is determined; this value is known as the EC_{50}. This value is then used as a measure of the sensitivity of the fungus to the fungicide. The higher the EC_{50}, the less sensitive the isolate is to the fungicide. This quantitative measure allows for the comparison of sensitivity levels across different fungal isolates and monitoring of shifts in fungicide sensitivity within populations over time.

The two products tested in the assays were Santana 480 SC and Orius® 250 EW. Santana 480 SC was selected because its active ingredient, prothioconazole, is present in six of the eight foliar fungicides registered for blackleg management in South Africa. Orius® 250 EW was selected because tebuconazole, its active ingredient, is present in three of the eight registered fungicides, and is commonly used in rotation systems in the Western Cape.

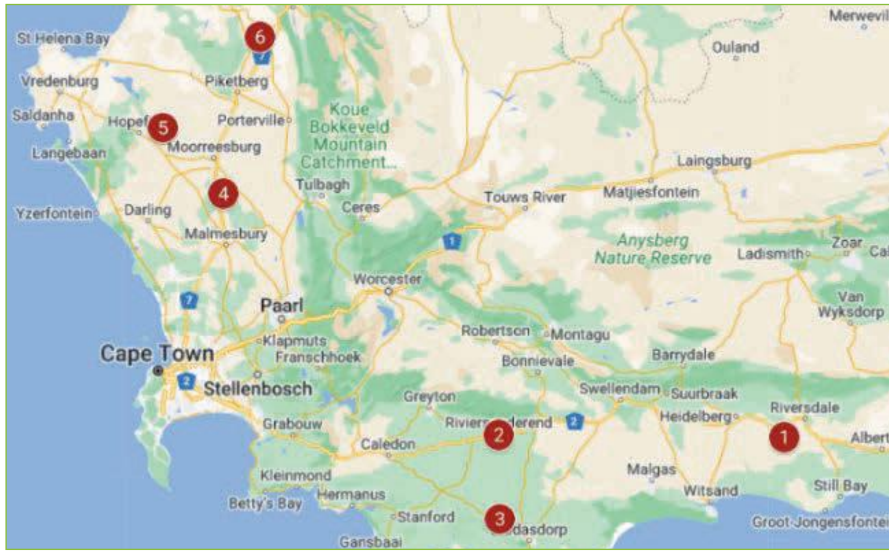
For isolates screened with prothioconazole (Santana 480 SC) there were no significant differences in sensitivity between isolates collected in different years. The EC_{50} values for isolates collected at Eendekuil were generally lower than isolates collected elsewhere, which is likely due to the agroecosystem in this area. Eendekuil receives the lowest rainfall, and production is less intensive compared to other locations in the Swartland. Consequently, fungicide spray programmes are also less intensive. It is therefore possible that the *L. maculans* population at Eendekuil had less exposure to prothioconazole.

For isolates screened with tebuconazole (Orius® 250 EW) there were no significant differences in sensitivity between locations, but there were differences between isolates collected in different years. The EC_{50} values gradually increased from 2020 to 2022, with the difference between 2020 and 2022 being statistically significant. This does not mean that the local *L. maculans* population is resistant to tebuconazole, but rather that its sensitivity is decreasing and that it is essential to continue monitoring the population. Comparing the range of EC_{50} values obtained in this study with those reported in other studies also indicates that the local *L. maculans* population is still sensitive.

International researchers have found that *L. maculans* isolates with reduced sensitivity to DMI fungicides have an insertion in the CYP51 gene promoter region. To determine the presence of DMI resistance in the population, whole-genome data from 264 *L. maculans* isolates, including the 90 isolates previously screened for DMI fungicide resistance, were analysed for these insertions. However, none of the CYP51 promoter insertions was detected in the sequences of the 264 isolates screened, which further supports the sensitivity of the local *L. maculans* populations to DMI fungicides.

The use of fungicides should be carefully managed to prevent fungicide resistance in local *L. maculans* populations. The active ingredients in seed treatments, as well as early and late foliar sprays, should be rotated to prevent repeated exposure to the same active ingredients, which can accelerate the development of fungicide resistance. Where possible, the active ingredients being alternated

Figure 1: Map showing the locations in the Western Cape where canola stubble samples were collected for the isolation of *L. maculans* used in this study (1 to 6) as well as locations where field trials were conducted (1, 2, 4, 5).



Locations in the Southern Cape production area: 1) Uitkyk farm near Riversdale, 2) Tygerhoek research farm near Riviersonderend, 3) Syngenta research farm near Napier. Locations in the Swartland production region: 4) Langgewens research farm near Moorreesburg, 5) Waterboerskraal farm near Hopefield, 6) Baviaanskloof farm near Eendekuil.

Table 2: Blackleg disease severity indices (DSIs) determined for canola cultivar 44Y94 following treatment with six fungicides in field trials conducted at four locations between 2022 and 2023.

Fungicide	Average DSI (%)[a]			
	Riversdale	Tygerhoek	Langgewens	Hopefield 2022[b]
Control	$7,04^{a}$	$12,27^{a}$	$23,67^{a}$	$18,67^{ab}$
Amistar®	7^{a}	$12,37^{a}$	16^{b}	11^{b}
Aviator® Xpro	$6,33^{a}$	$10,67^{a}$	$20,33^{ab}$	11^{b}
Bumper® 250 EC	$10,69^{a}$	$14,63^{a}$	$24,5^{a}$	21^{a}
Faculty Top 250 SC	7^{a}	$11,67^{a}$	$14,17^{b}$	$13,67^{ab}$
Prosaro® 250 EC	9^{a}	$13,17^{a}$	$20,88^{ab}$	$9,67^{b}$
Santana 480 SC	$7,67^{a}$	$13,5^{a}$	$15,83^{b}$	14^{ab}

[a]Values with the same letter do not differ significantly. [b]Data for Hopefield is only available for 2022. At all other locations, data from 2022 and 2023 were combined following statistical analysis.

should also belong to different fungicide groups. The fungicides sprayed to control *Sclerotinia* should also be considered in these rotations.

Fungicide efficacy screening

Although a range of fungicides is registered for the management of blackleg in South Africa, limited information is available regarding their efficacy. Therefore, fungicide field trials were established at four locations (*Figure 1*) in the Western Cape during the 2022 and 2023 seasons. Two cultivars were included in the trials based on their performance in cultivar trials conducted in 2021. Nuseed Diamond was selected as a cultivar more susceptible to blackleg, and Pioneer® 44Y94 CL as a more resistant cultivar.

Five registered fungicide products (Amistar®, Faculty Top 250 SC, Prosaro® 250 EC, Santana 480 SC, and Aviator® Xpro), one unregistered product (Bumper® 250 EC, containing the DMI active ingredient propiconazole), and an untreated control were evaluated in the field trials.

Fungicides were applied at the four- to six-leaf stage as prescribed on the product labels. Blackleg severity was evaluated roughly two weeks before the canola was ready for harvest. This was done by cutting individual plants horizontally through the crown and rating the percentage of blackened tissue in the cross-sections on a scale from zero to five. These rating values were then used to calculate the disease severity index, which represents the percentage of disease for each fungicide-cultivar combination. Data was statistically analysed to determine whether there were significant differences in the efficacy of the fungicides tested.

In the 44Y94 trials at Tygerhoek and Riversdale very little blackleg disease was observed. This was a combination of this cultivar's good resistance and lower disease pressure at those locations. However, because overall disease levels were low throughout the trial, there was insufficient disease pressure to assess how well the fungicides performed. As a result, there were no significant differences between the plants treated with fungicides and those left untreated.

However, higher disease severity was observed in the 44Y94 trials at Langgewens and Hopefield. In these trials, all fungicide treatments except Bumper® 250 SC reduced disease severity. Significant differences between the disease severity indices (DSI) of fungicide treatments and the untreated control were only detected at Langgewens for Faculty Top 250 SC, Santana 480 SC, and Amistar®. Results for the 44Y94 trials are contained in *Table 2*.

On the Diamond cultivar, sufficient disease was present in most trials, except for the 2022 Riversdale trial, where disease levels were too low to test the efficacy of fungicide applications. At all other locations and years, disease pressure was sufficient, and fungicide treatment resulted in lower disease severity indices than in untreated controls. In several cases, these reductions were significant.

Fungicides that yielded significantly lower DSIs than the untreated controls were Santana 480 SC (Riversdale 2023, Tygerhoek 2022, and Langgewens), Prosaro® 250 EC (Riversdale 2023, Tygerhoek 2023, and Langgewens), and Aviator® Xpro (Riversdale 2023, Tygerhoek 2022, and Langgewens). Faculty Top 250 EC significantly lowered DSIs at Tygerhoek in 2023, and Langgewens, Amistar® significantly lowered the DSI at Tygerhoek in 2022, and Bumper® 250 EC never lowered DSI significantly. Results for the Diamond trials are contained in *Table 3*.

Table 3: Blackleg disease severity indices (DSIs) determined on the canola cultivar Diamond following treatment with six fungicides in field trials conducted at four locations between 2022 and 2023.

Fungicide	Average DSI[a]					
	Riversdale		Tygerhoek		Langgewens	Hopefield
	2022	2023	2022	2023		2022
Control	13,67[a]	23,67[ab]	24,07[a]	23,24[a]	38,7[a]	29,7[a]
Amistar®	5,67[a]	21[bc]	15,06[bc]	15,67[ab]	28,7[ab]	21,7[a]
Aviator® Xpro	8,19[a]	17,33[cd]	10,67[c]	13[ab]	25,3[b]	20,7[a]
Bumper® 250 EC	9,16[a]	27,52[a]	21[ab]	15,33[ab]	32,8[ab]	27[a]
Faculty Top 250 SC	6,67[a]	18,67[b-d]	16,67[a-c]	11,67[b]	24,8[b]	18[a]
Prosaro® 250 EC	7,2[a]	14,33[d]	20,67[ab]	8[b]	26,2[b]	21[a]
Santana® 480 SC	6,44[a]	16[cd]	14,59[bc]	18,33[ab]	24[b]	16,1[a]

[a]*Values with the same letter do not differ significantly. Statistical analyses were performed for locations and years separately, except for Langgewens where a statistical analysis showed that the data for 2022 and 2023 could be combined.*

The registered fungicides evaluated in the field trials reduced blackleg severity, while the unregistered product, Bumper® 250 EC, was ineffective. Due to the relatively low price of Bumper® 250 EC compared with other commercial fungicides, producers often apply it to canola, even though it is not registered for that use.

The results from this study therefore discourage the use of the product for blackleg management. The benefit of a fungicide application increased with higher disease pressure and when applied to a less resistant cultivar. It is important that producers consider the resistance of the cultivar planted and the historical occurrence of blackleg in their region before deciding on a fungicide application.

Important study outcomes

This study provides a foundation for the effective and sustainable use of fungicides as part of an integrated blackleg management strategy in South Africa. Results suggest that local *L. maculans* populations remain sensitive to DMI fungicides registered for blackleg management. However, the increase in tebuconazole EC_{50} values between 2020 and 2022 is concerning, and the population should be continuously monitored to detect further shifts towards resistance.

Results from the field trials showed that the effectiveness of early fungicide applications depends on the disease pressure in the area and the genetic resistance of the cultivar. Producers should assess the benefit of a fungicide application within their context.

For more information, send an email to Huibre Schreuder at huibreschreuder@hotmail.com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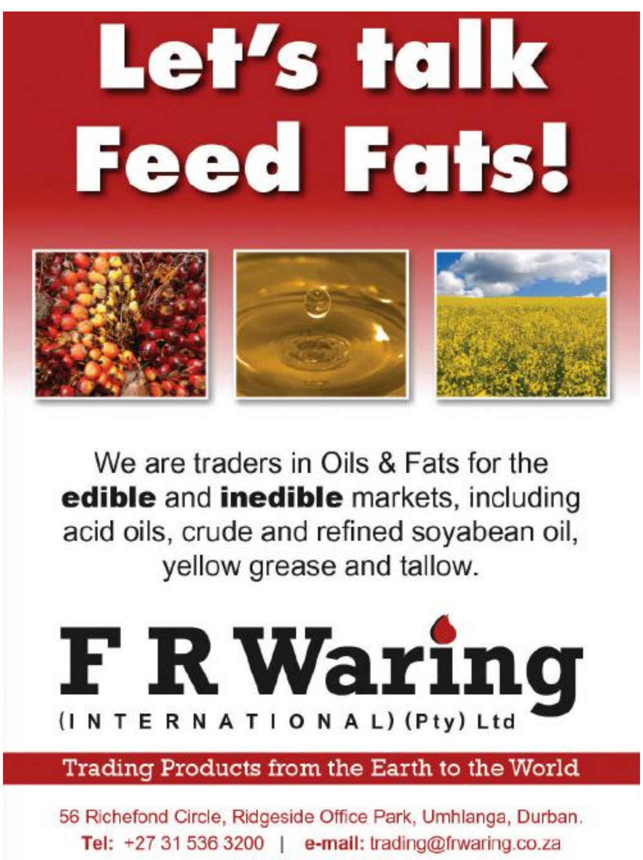
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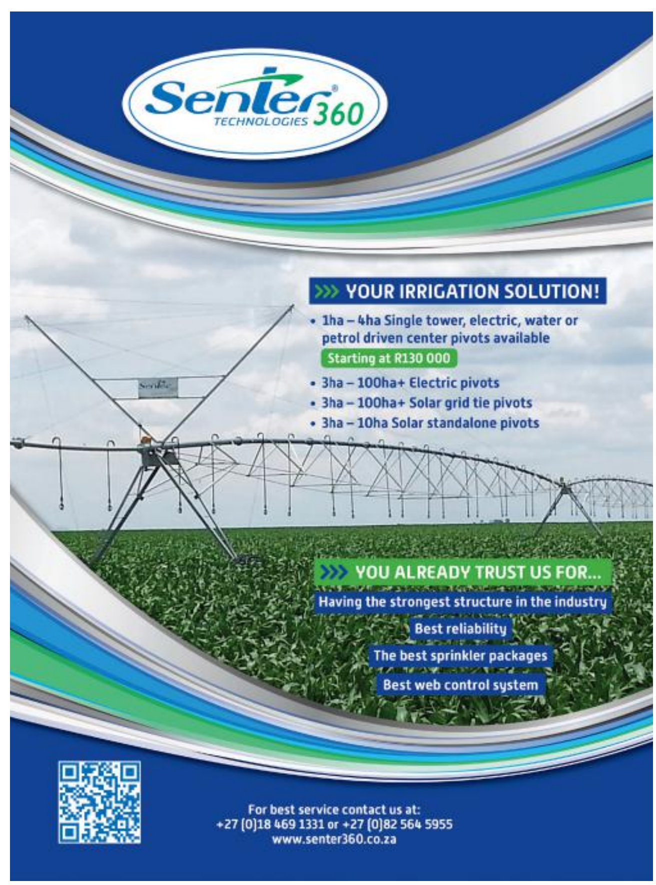
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A century of innovation shapes the future of farming

By Susan Marais, Plaas Media

Oilseed crops are steadily moving from the periphery to the mainstream of mixed farming systems. Once regarded primarily as rotational support crops, soya bean, sunflower, and canola are now central to profitability, soil health, and long-term resilience.

This shift – and what lies ahead – was a key discussion point during a Pioneer agronomy day held near Bethal at Te Water Farming, where global and local leaders from Corteva Agriscience, Pioneer's holding company, outlined how technology, genetics, and data are reshaping crop production. The day was particularly special as it formed part of Pioneer's centenary celebrations, with four agronomy days held across the country.

Oilseeds gain momentum

Oilseeds have traditionally played a supporting role in grain systems, helping to break disease cycles and improve soil structure. However, according to the panel, their role is evolving rapidly.

South African production trends reflect this change. Soya bean production has expanded in recent years due to strong demand for animal feed, while sunflower remains a reliable option under marginal conditions. Canola, meanwhile, is beginning to expand beyond its traditional Western Cape footprint. This diversification is particularly relevant for livestock producers, where oilseeds offer both a marketable crop and valuable on-farm feed source.

A central theme of the discussion was the growing importance of yield stability over maximum yield. "Yield potential is essential," said Casey Onstot, vice president of Corteva Agriscience's global maize business, "but the genetic potential already on farms today is significantly higher than what is being realised." He mentioned that the world record yield for a Pioneer maize cultivar was 39,15t/ha in 2023 in the US, which is far higher than the average South African yield.

Advances in plant genetics are also expected to play a central role in improving productivity and resilience. Gene editing is one of the most promising developments, noted Onstot, as it allows precise changes within a plant's existing genetic structure. Gene editing does not introduce foreign material; it enables targeted improvements such as stress tolerance, disease resistance, and efficiency in nutrient and water use. For oilseed producers, these advances could translate into more adaptable and reliable cultivars.

Building resilient crops

Globally, a substantial proportion of crop yield is lost to pests, weeds, and disease. The industry response is focussed on integrating resistance directly into plant genetics. One example discussed was the development of multi-disease resistance, where plants are bred to withstand several diseases simultaneously. Although the example focussed on maize, the principle is equally relevant to oilseed crops.

Climate variability remains one of the biggest risks. "Twenty years ago, we talked about what a normal season would look like," said Onstot. "Now the question is: What will the weather do next year?"

This uncertainty is spotlighting drought tolerance, heat resilience, and early vigour – the ability of a plant to sprout early and grow quickly, enabling it to better withstand challenges. For oilseed producers, particularly those in marginal areas, these traits are becoming more important to maintaining production consistency.

While global technology plays a major role, the panel emphasised that successful farming remains highly localised. Driaan Bresler, AME seed product development lead at Corteva Agriscience, highlighted the importance of local testing, noting that more than 100 yield trials are conducted annually to evaluate performance under different South African conditions. Data-driven tools and predictive analytics are used to refine these selections and support decision-making.

Opportunities and cost aspects

Beyond traditional markets, oilseeds are also gaining traction in emerging sectors. Onstot pointed to growing global interest in biofuels and sustainable aviation fuel, where crops such as canola could play a key role. These emerging markets could create new value chains for South African producers and reduce reliance on traditional commodity markets.

Input costs remain a major concern, especially in a volatile commodity environment. However, the panel stressed that seed should be viewed as a long-term investment rather than a short-term expense. "Our role is to bring the best possible products to producers," said Onstot. "To do that, we have to continue investing in research and development."

Jaco Snyman, business manager at Pioneer South Africa, emphasised the importance of proper management practices to maintain the effectiveness of current technologies. He stressed that technology must be used correctly, as it could compromise long-term productivity. This includes planting refuge areas, following recommended guidelines, and effectively using data and advisory services.

Integration remains key

Ultimately, the panel made it clear that the future of oilseed production lies in integration. For mixed farming systems, this means aligning crop selection, genetic potential, and management practices with livestock production and broader farm objectives. Oilseeds are therefore not standalone crops, but part of a wider system aimed at improving resilience, efficiency, and profitability.

For more information, send an email to info.rsa@pioneer.com or visit *www.pioneer.com/za*

Groundnut cultivars perform well despite a challenging 2024/25 season

By Dr Wikus Snijman, project manager: groundnut breeder seed, ARC-Grain Crops

The 2024/25 groundnut production season has drawn to a close, and producers are already shifting their focus to preparations for the upcoming season. To support this planning, the results of the 2024/25 cultivar evaluation trials were presented to groundnut industry stakeholders on 3 September last year, during the annual meeting in Potchefstroom.

These trials, conducted annually by the Agricultural Research Council (ARC) grain crops division across South Africa's groundnut production regions, provide valuable data to assist producers with planning.

Trial details

A total of 18 genotypes (cultivars and breeding lines) were evaluated. The registered cultivars Sellieplus, ARC K6 and Anel were included as controls against which the performance of the breeding lines was measured. Three coded breeding lines were developed by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the 12 breeding lines bearing the 'PC' prefix were developed and evaluated by the ARC.

Each trial featured the 18 genotypes (treatments) replicated three times. Each replicate consisted of four rows of 4m. Only the inner two rows were harvested for data collection to eliminate border-row effects. Trials under irrigation were cultivated at Jan Kempdorp (ARC experimental station), Wesselsbron (Onverwacht), and Groblersdal (ARC: Loskop experimental farm). The four rows within each replicate were spaced 45cm apart, with an intra-row spacing of 5cm.

Dryland trials were cultivated at Bothaville (Kwenaplex), Hoopstad (Qualita Seeds), Hoopstad (Kromdraai), and Groblersdal (ARC: Loskop experimental farm). Rows were spaced 90cm apart, with an intra-row spacing of 8cm. At harvest, pod weight was determined from the two inner 4m rows of each genotype within each replicate. Kernel weight was calculated using a 500g sample of dehulled pods; the dehulling percentage represented the total kernels recovered from that sample.

The data were subjected to statistical analysis (ANOVA) using the GenStat® program. Statistical differences were identified using Fisher's protected least significant difference test. In this article, only the top five performers across three key locations are highlighted in *Tables 1* to *3*.

Groundnuts under irrigation

In Wesselsbron (*Table 1*), PC 494-K7 ranked third and Anel fourth for pod weight, kernel weight, and hull percentage. PC 500-K13 produced the highest pod weight, though it slipped to second place for kernel weight and hull percentage. Genotypes 16608 and PC 500-K15 achieved first and fifth place, respectively, for kernel weight and hull percentage, despite failing to make the top five for pod weight.

PC 497-K7 consistently ranked second in Groblersdal (*Table 2*) for pod weight, kernel weight, and hull percentage. This steady performance made it the top overall performer at this location across all three categories. PC 494-K2, PC 494-K7, PC 482-K32, and 16528 ranked first, third, fourth and fifth, respectively, for kernel weight and hull percentage yields, but were not among the top five performers for pod weight.

The results from Jan Kempdorp revealed the same interesting trend observed at the other locations: some genotypes performed exceptionally in terms of kernel weight and hull percentage but not so well when it came to pod weight. Anel, PC 494-K2, 16608, PC 483-K32, and PC 500-K12 were the best performers for kernel weight and hull percentage. PC 489-K9, 16608, 16528, PC 500-K12, and PC 500-K13 had good pod weights but were not among the top performers for kernel weight and hull percentage. Genotype 16608 secured

Table 1: Pod weight, kernel weight and hull percentage at Onverwacht (Wesselsbron, irrigation).

Ranking	Pod weight (kg)	Kernel weight (g)	Hull (%)
1	PC 500-K13	16608	16608
2	PC 500-K12	PC 500-K13	PC 500-K13
3	PC 494-K7	PC 497-K7	PC 497-K7
4	Anel	Anel	Anel
5	PC 494-K2	PC 500-K15	PC 500-K15

Table 2: Pod weight, kernel weight and hull percentage at Groblersdal (irrigation).

Ranking	Pod weight (kg)	Kernel weight (g)	Hull (%)
1	15562	PC 494-K2	PC 494-K2
2	PC 497-K7	PC 497-K7	PC 497-K7
3	ARC K6	PC 494-K7	PC 494-K7
4	PC 489-K9	PC 482-K32	PC 482-K32
5	PC 489-K19	16528	16528

Table 3: Pod weight, kernel weight and hull percentage at Hoopstad (Qualita Seeds, dryland).

Ranking	Pod weight (kg)	Kernel weight (g)	Hull (%)
1	Sellieplus	PC 494-K2	PC 494-K2
2	PC 489-K19	16528	16528
3	PC 500-K13	16608	16608
4	PC 500-K15	15562	15562
5	15562	PC 500-K11	PC 500-K11

Table 4: Pod weight, kernel weight and hull percentage at Groblersdal (dryland).

Ranking	Pod weight (kg)	Kernel weight (g)	Hull (%)
1	15562	PC 497-K7	PC 497-K7
2	PC 494-K7	PC 494-K7	PC 494-K7
3	PC 489-K9	Anel	PC 489-K6
4	PC 494-K2	PC 489-K6	Anel
5	PC 489-K19	PC 482-K32	PC 482-K32

second place for pod weight and third for kernel weight and hull percentage.

Groundnuts on dryland

The data from Hoopstad (Qualita Seeds, *Table 3*) indicates similar trends among the top five genotypes. Although Sellieplus (the best performer), PC 489-K19, PC 500-K13, and PC 500-K15 yielded high pod weights, these genotypes were not listed under kernel weight and hull percentage. Except for 15562 – which delivered the fifth-highest pod weight and ranked fourth for kernel weight and hull percentage – PC 494-K2, 16528, 16608, and PC 550-K11 produced the best kernel weights and hull percentages. These genotypes do not appear elsewhere in *Table 3*.

Table 4, which presents the Groblersdal (dryland) results, shows that PC 497-K7 had the highest kernel weight and hull percentage; note, however, that it does not appear in the rest of the table. The only genotype that performed well across all three categories was PC 494-K7. PC 489-K19 had the fifth-highest pod weight yield but did not perform well in kernel weight and hull percentage. Similarly, PC 482-K32 produced the fifth-best kernel weight and hull percentage but fell short on pod weight.

Yield data from Kromdraai indicate that genotype 16608 performed best in terms of kernel weight and hull percentage, but did not rank among the top five for pod weight. Genotype 16528 was the only entry to appear in all three categories and therefore performed best overall among the top five. Sellieplus produced the highest pod weight yield. PC 500-K13 produced the third-highest pod weight but ranked fourth for kernel weight and hull percentage. Other genotypes that showed consistent performance in terms of kernel weight and hull percentage were PC 500-K13, PC 500-K15, and 15562.

In Bothaville (*Table 5*), Sellieplus once again produced the highest pod weight, but it does not appear under kernel weight and hull percentage. Sellieplus also performed well in the Kromdraai and Qualita Seeds trials. Anel achieved a high kernel weight and hull percentage but ranked fifth for pod weight.

Genotype 16608 produced the second-highest yields for kernel weight and hull percentage but did not perform well for pod weight. Anel, which showed good performance for kernel weight and hull percentage, produced the fifth-highest pod weight. The remaining four genotypes listed under kernel weight and hull percentage also maintained stable performance across the other trial locations.

Table 5: Pod weight, kernel weight and hull percentage at Kwenaplex (Bothaville, dryland).

Ranking	Pod weight (kg)	Kernel weight (g)	Hull (%)
1	Sellieplus	Anel	Anel
2	PC 500-K12	16608	16608
3	16528	PC 494-K2	PC 494-K2
4	PC 500-K13	PC 497-K7	PC 497-K7
5	Anel	15562	15562

Conclusion

The results presented in this article highlight the top five-performing genotypes for pod weight, kernel weight, and hull percentage. The variation in the performance of genotypes cultivated under irrigation was also evident in the genotypes cultivated under dryland conditions. The observation that genotypes with high pod weight yields do not necessarily produce high kernel weights or hull percentages may be attributed to the tetraploid nature of groundnut. However, genotype performance is determined not only by quantity (yield), but also by quality, as determined through grading. Both aspects are essential for identifying superior genotypes.

The results also indicate that certain genotypes are better adapted to specific climatic conditions and production areas. Some genotypes, such as Sellieplus and Anel, performed well across a range of climatic conditions. Despite the variation, the data provide reassuring evidence that the majority of top performers are represented across the trial sites.

Five breeding lines from ICRISAT will be included in the trials during the next production season. Traits such as shorter growing periods and resistance to insects and diseases will be evaluated. Should these breeding lines demonstrate potential, the intention is to incorporate them into future ARC breeding programmes to develop new cultivars for the industry.

The full set of results and tables can be obtained from the author at snijmanw@arc.agric.za

Importance of quality seed treatments

By Nadine Loubser, head microbiologist, MBFi

A crop's success is often determined long before it emerges from the soil. The first few days after planting are among the most vulnerable stages in a plant's life cycle, when seeds are exposed to soil-borne pathogens, pests, and environmental stressors. Without effective protection, poor establishment, uneven emergence, and reduced plant vigour can limit yield potential before the crop has an opportunity to develop fully.

This is where seed treatments play a vital role. In modern agriculture, they offer a highly effective and targeted approach to protecting and maximising crop performance from the start of the season. By delivering active ingredients directly onto the seed, growers can ensure protection and stimulation exactly where they are needed.

However, the success of a seed treatment programme is not determined by product choice alone – it also relies on how well the system is managed. What is applied, how it is applied, how products are mixed, and how seed is stored and for how long it remains viable all influence the outcome and determine whether the treatment performs in the field or falls short of expectations.

Defining treatment goals

Before selecting a seed treatment strategy, it is essential to define the primary objective. Fungicides, fertilisers, and stimulants (biological and chemical) are available, each serving a specific function within the production system. Aligning the treatment with the intended goal helps ensure the programme remains effective and economically viable.

Table 1: Seed was evaluated immediately after treatment (T0) and again after 21 days (T21). Counts are expressed as CFU per seed.

Treatment	T0	T21
Inoculant (no protector)	1 650 000	11 300
Inoculant (protector + powder)	2 010 000	110 000
Inoculant + powder	1 020 000	8 400

Early crop establishment underpins yield potential. In the first few weeks after planting, seedlings require protection and support to develop strong root systems and uniform stands. Effective seed treatments promote rapid germination, improve plant population consistency, and boost root development, enabling plants to access water and nutrients more efficiently. By reducing early-season stress, crops can reach key growth stages faster.

Application and compatibility

One of the greatest advantages of seed treatments is precision placement. Active ingredients are concentrated in the rhizosphere, where they are most effective, reducing losses and improving efficiency.

Application technique is equally important, as the order in which products are applied influences performance. Chemical treatments are generally applied first to create a stable base layer on the seed, followed by biological products, often together with a protective component that shields sensitive microorganisms from chemical stress and desiccation. Finally, powders are applied to improve flowability and handling.

This layered approach protects biological integrity and improves compatibility and performance. In contrast, poorly structured applications can lead to direct contact between incompatible components, thereby reducing microbial survival and efficacy.

Compatibility between treatment components must always be verified, as negative interactions can substantially reduce performance. Filter disk *in vitro* assays are commonly conducted in the laboratory. When no inhibition zone is observed, the active ingredients are considered compatible with biological components. Conversely, the presence of an inhibition zone generally indicates incompatibility and should be evaluated further at practical seed-treatment rates and application conditions.

A key but often underestimated factor is the survival of biological components after application. These products must be stored according to label recommendations, protected from excessive heat and ultraviolet light, and mixed thoroughly before use to ensure uniform distribution.

Protection and equipment

Powders such as talc and graphite are widely used in seed treatment to improve flowability during planting, but they are not without risk. While they improve handling and planting efficiency, they can also impose desiccation stress on beneficial microbes. Trials have shown that using powder alone reduces inoculant survival, whereas including a protective component improves results. In this example, survival increased by approximately 1 210% when a protector was included with the powder, compared with powder alone (*Table 1*).

Equipment calibration further influences success. Over-application or uneven distribution can negatively affect seed handling and microbial survival, while under-application may result in insufficient protection and reduced efficacy. In addition, uneven treatment or improper mixing can lead to inconsistent field performance.

A final thought

Seed treatment is among the most effective tools in crop production. When product selection, compatibility, application technique, and storage practices are all optimised, it can unlock crop potential from the very beginning of the growing season.

For more information, send an email to Nadine Loubser at nadine@mbfi or visit *www.mbfi.co.za*

Crop rotation for managing weed populations

By Louise Bestbier, Charné Viljoen, Johann Strauss, and Pieter Swanepoel

Managing weeds is a full-time job, as there are many factors to consider. For Western Cape producers, the majority follow the three principles of conservation agriculture (CA): minimum soil disturbance, >30% soil cover, and crop rotation – all of which influence how weeds are managed.

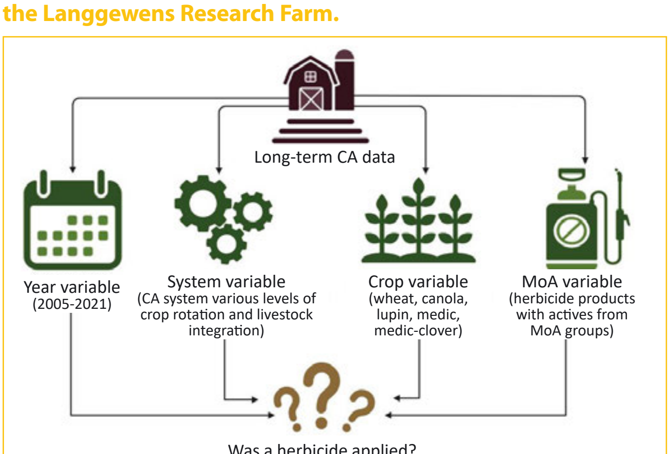
Weed-control reports vary depending on when CA is adopted. Some report improved control of specific weeds, whereas others report higher herbicide expenditure. Studies from France and Australia examining herbicide use in CA systems suggest that, after an initial phase of increased herbicide use, established CA systems (after four to ten years) often become less reliant on herbicides, particularly those requiring soil incorporation or direct weed contact.

Herbicide decision-making

What is the reality for producers in the Western Cape? Does adopting CA lead to the same reduction in herbicide use, or are concerns about ongoing reliance justified? To answer this question, long-term crop rotation trial data from Langgewens Research Farm was used to determine which factors influence whether to spray a herbicide or not.

The analysis revealed that the most important consideration when deciding to apply a herbicide was its mode of action (MoA) or chemical group. However, only a small number of MoAs were commonly used. These included herbicides belonging to MoA groups two (flumetsulam), three (trifluralin), six (bromoxynil) and nine (glyphosate). Surprisingly, the specific CA rotation system itself was not a major driver. The main decision-making factors were the year, which influenced cost and availability, and most importantly, the crop in the field.

Figure 1: An illustration of the machine-learning inputs from the Langgewens Research Farm.



In canola fields, the probability of applying a herbicide was only 22%, compared to 78% in wheat fields. This means that herbicides were used less in canola fields than in wheat fields. The low probability of herbicide application in canola fields may be explained by weed density measurements collected at Langgewens during 2024 and 2025.

Rotation suppresses ryegrass

The major weed ryegrass, measured by seed heads, was markedly suppressed when at least one additional crop was planted. For example, in a wheat monoculture, the average number of seed-producing ryegrass heads was 130/m², while in a wheat-canola rotation, it dropped to 50/m². Systems that incorporated livestock (sheep) grazing during the medic and medic-clover years had the lowest overall ryegrass head density, with only 20 spikes/m².

The data reveal a powerful lesson: Integrated weed management, such as incorporating crop rotation (especially with a break crop such as canola), is essential for weed suppression. Relying on the same successful herbicide year after year is a recipe for herbicide resistance. The Langgewens data suggest that the foundation of long-term weed control is strategic crop rotation, rather than simply rotating chemicals. When planning your season, consult your chemical representatives on how to protect key herbicides by using them less often and allowing the crop sequence to do the heavy lifting against ryegrass.

Herbicide-resistance testing

One variable missing from the machine-learning analysis was data on ryegrass herbicide resistance. In South Africa, information on weed management practices and the prevalence of herbicide-resistant ryegrass is limited, making it difficult for producers to take cost-effective spray decisions.

To address this gap, a study at Stellenbosch University is offering free herbicide-resistance testing for producers. By participating, you will receive a diagnosis of the resistance profile on your farm. This information is powerful, as it can directly indicate which herbicides are likely to remain effective on your land and which to avoid, helping prevent costly and ineffective applications.

Furthermore, your contribution will help researchers develop a provincial herbicide-resistance database. This initiative not only provides you with valuable information but also strengthens our collective understanding of resistance patterns in your region.

Scan the QR code to participate in the survey.

For more information, send an email to Charné Viljoen at charneviljoen@sun.ac.za

Reaping the sun's energy: Optimising crop photosynthesis

By Dr Charlie Reinhardt

From the 1600s to the 1700s, a small group of people in Europe worked independently on the mystery of how plants gained biomass from water and soil alone. In the 1770s, it was demonstrated that plants released oxygen at the expense of atmospheric carbon dioxide (CO_2). In the 1840s, it was discovered that sunlight energy was stored in plants as chemical energy, providing the first rational concept of photosynthesis.

It took another 100 years before British biochemist Robert Hill convincingly proved in 1940 that in the green tissue of plants, sunlight energy splits water (H_2O) molecules to yield oxygen (O_2). This process releases hydrogen (H) and energy-rich electrons whose energy is tapped when CO_2 is incorporated into carbohydrate compounds (CH_xO). Carbohydrates such as sugars and starches are the primary source of energy in living organisms, ranging from microbes to elephants.

Increasing crop yields

A positive approach to crop production is supported by factors that enhance the crop's photosynthetic capacity. This may seem obvious, yet there have been many disappointments with approaches aimed at increasing yield components, such as grain per spike or cob (wheat and maize), seed size and weight, and the number of spikes or cobs per hectare.

The main reason for disappointment is that as one yield component increases, another often declines. This result should be expected because those factors only describe yield, i.e. the final harvested biomass. Too little attention has been paid to what happens at the physiological level in plants, which is the foundation linking a crop's photosynthetic ability to its yield potential.

All yield components depend on available energy to produce food, and the pool of yield/food energy is fixed based on that. Therefore, to achieve effective and sustainable increases in yield, photosynthesis must be increased – the positive approach to crop production.

This requires that every input or practice in crop production be interrogated with respect to its effect on the crop's ability to photosynthesise.

The key to sustainable increases in photosynthetic ability is ensuring this essential life process performs optimally. However, the crop must still contend with the vagaries of its environment, including soil and climate (abiotic factors), as well as biological stressors such as pests (pathogens and insects) and weeds. Therefore, a good balance between yield potential and stability must be struck; consequently, crop management will vary from field to field, farm to farm, and region to region.

Productivity and profitability

It is clear that achieving greater crop productivity, rather than just higher total production or yield, is paramount. This requires harmonising the crop's inherent ability with available resources, including natural elements and human factors such as knowledge, time, and money.

These points demonstrate that best-practice recommendations cannot be cast in stone or offer 'one size fits all' solutions. Instead, they should be based on a sound knowledge of the principles of growing and managing the crop. This allows for the design and implementation of appropriate management decisions as specific situations arise.

As is generally acknowledged today, the overriding consideration for all crop production systems is profitability. In South Africa, as in most parts of the world, the historical monoculture system is largely a thing of the past because it became unprofitable. This brings us to the crux

Sunlight energy drives crop productivity through the photosynthesis process.

of increased profitability: Maximising the crop's yield potential (photosynthetic capacity) while providing an enabling environment (soil and climate) and keeping input costs under strict control. Of course, the one key factor over which we have the least control is the climate, and the variability of input costs presents its own challenges.

The three main role-players in optimising crop productivity, over which humans have varying degrees of control, are the crop, soil, and pests. Crop and cultivar choice, cultural practices, and nutrition and soil tillage needs and options are management decisions that ought to be based on existing data and sound knowledge.

Less predictable and measurable variables in terms of incidence and impact include diseases, insects, and weeds. Failure to maintain effective control over a single important pest can undermine crop productivity. None of these factors can be neglected; otherwise, the pillars of sustainable, profitable crop production will be weakened and, in the worst cases, removed.

Extraneous factors

Various stress factors can reduce the photosynthesis efficiency of crop plants at the physiological level. When the transport of energy-rich electrons is blocked or diverted by stress exerted on plants, their energy is not built into carbohydrates but creates a state in which 'free' or 'wayward' electrons react with free oxygen to form so-called superoxide radicals or radical oxygen species (ROS).

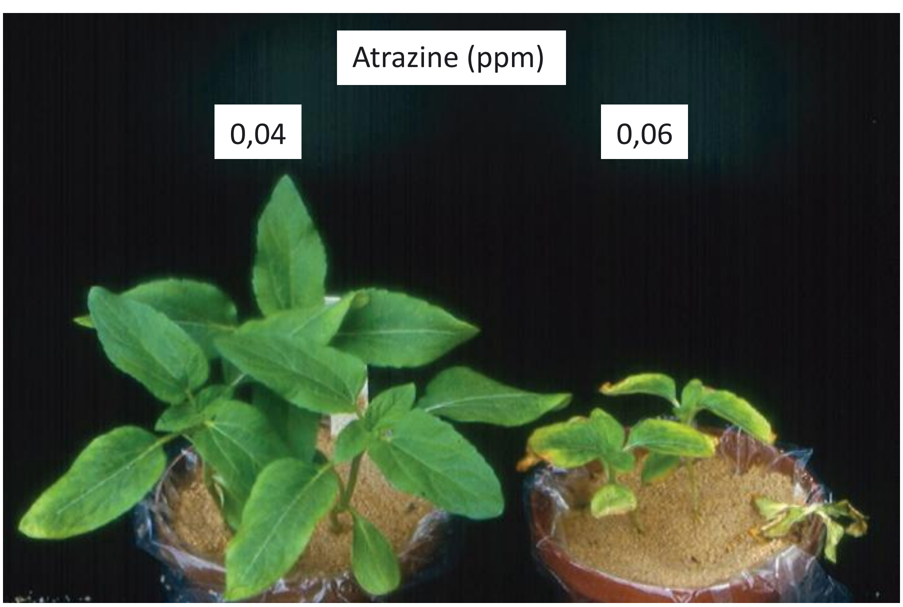
The ROS include the well-known oxidising agent H_2O_2 (hydrogen peroxide), which has a destructive effect on cell membranes. The first membranes to suffer damage are those in the chlorophyll-containing chloroplasts of leaves, where photosynthesis occurs, and energy-rich electrons and free oxygen are most abundant.

When chloroplast membranes disintegrate, the chlorophyll (green pigment) responsible for capturing sunlight is destroyed. The resulting symptom is chlorosis (yellowing) of formerly green leaf tissues. As stress and symptoms intensify, the chlorotic areas turn necrotic (brown and dead) as cell membrane destruction spreads through the leaf tissues.

Prominent stress factors that lead to the production of ROS include photosynthesis-inhibiting herbicides such as triazines (atrazine and terbuthylazine) and paraquat. Triazine herbicides can be used in certain crops without harm, only because there are enzyme systems in those crops, notably grasses, that rapidly deactivate or quench the herbicide's effect.

In contrast, paraquat is a non-selective herbicide that harms any green tissue it comes into contact with. Its action is so rapid, especially under high sunlight intensity, that plants cannot cope with its ROS effect. Environmental stress factors that promote the production of oxidative ROS in plants include extreme heat and cold, drought (water stress and heat), and waterlogging or flooding.

The herbicide atrazine damages sunflowers at low concentrations because the crop lacks the enzymes needed to protect against ROS formed when the herbicide inhibits photosynthesis.



Waterlogging causes chlorosis symptoms on all crop species due to the excessive production of toxic ROS under such conditions.

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The essentiality of fertiliser in South Africa

By Dr Pieter Haumann, chief executive officer, Fertasa

FERTASA
Fertilizer Association of Southern Africa

In South Africa's diverse agricultural landscape, fertiliser is not merely an optional input; it is a fundamental pillar of national food security and economic stability. As of 2026, the essentiality of these nutrients is underscored by the country's unique soil challenges, changing crop patterns, and heavy reliance on global trade.

Soil health and yield

South Africa's primary grain-producing regions, including the Free State, North West and Western Cape, are characterised by soils that are often inherently nutrient-limited or physically constrained. Fertilisers play a vital role in correcting these deficiencies, particularly those of nitrogen (N), phosphorus (P), and potassium (K):

- As the primary driver of yield, N consumption has stabilised at approximately 560 000 tonnes annually. It remains the most critical nutrient for field crops and intensive pastures.
- Phosphorus is essential for root development and seed formation, and highly immobile in South African soils. Its usage has grown by roughly 6,3% per annum over the last two decades as producers attempt to correct historical soil deficiencies.
- Essential for water-use efficiency and drought resistance, K consumption has risen by 4,4% annually, driven largely by the expansion of the high-value horticultural sector.

Without nutrient replenishment, agricultural productivity would plummet, making it impossible to sustain the output required for a population that has surpassed 60 million.

Economic impact and trade

Agriculture is an essential contributor in the South African economy, with the sector showing growth of 15,8% in early 2025. However, this success is tethered to a complex global supply chain. South Africa is a net importer of key fertiliser ingredients, particularly urea and ammonia.

In 2023 the value of fertiliser imports reached R14 billion, following a massive 2022 peak of more than R25 billion caused by global geopolitical tensions. Saudi Arabia, which supplies urea and monoammonium phosphate, as well as Russia, Qatar, and China are major supply partners. This dependency leaves South African producers vulnerable to exchange rate fluctuations and international price shocks, with fertiliser often accounting for up to 35% of total input costs for maize producers.

Crop dynamics and sustainability

The essentiality of fertiliser is also evolving as South Africa's crop profile changes. While the area dedicated to traditional cereals such as maize has contracted slightly, there has been a surge in soya bean and canola production.

Soya beans, as leguminous plants, fix some N but require high levels of P and K, altering traditional fertilisation strategies. At the same time, the rapid growth of the macadamia nut industry, in which South Africa is a global leader, together with citrus exports has increased demand for specialised nutrient blends.

To manage environmental risks and high costs, the South African fertiliser industry is pivoting towards precision agriculture. Approximately 10 to 15% of local producers now utilise advanced technologies such as variable-rate application and Internet of Things-enabled sensors to optimise nutrient placement. These tools ensure that fertiliser is applied only where needed, reducing waste and mitigating environmental risks such as groundwater leaching and soil degradation.

There is also a growing niche for organic and bio-fertilisers, with the first projected to grow by R1 billion as consumers demand more sustainable produce.

Conclusion

Fertiliser remains the lifeblood of South African farming. It bridges the gap between the country's natural soil limitations and the high yields required to feed a growing nation and compete in global export markets. As the industry moves towards 2030, the focus is shifting from simple 'blanket' applications to a sophisticated and data-driven approach that balances productivity with environmental stewardship.

For detailed guidelines on nutrient management, consult the Fertilizer Association of Southern Africa (Fertasa) or utilise the latest market reports from Grain SA to navigate pricing and supply trends. For more information, send an email to general@fertasa.co.za or visit *www.fertasa.co.za*

realIPM launches Sluxx® HP in South Africa

realIPM is proud to announce the official South African launch of **Sluxx® HP**, an advanced ferric phosphate-based molluscicide, which will be available nationwide from **June 2026**.

Developed for both commercial agriculture and home garden use, Sluxx® HP delivers highly effective control of slugs and snails while offering an outstanding environmental and safety profile. The product has already earned a strong international reputation for reliable performance under challenging field conditions and is approved for use in organic farming systems.

At a time when growers are more concerned than ever about soil health, water contamination, and the long-term environmental impact of agricultural inputs, Sluxx® HP offers a modern alternative to traditional molluscicides.

realIPM
biological crop protection

An organic approach

Unlike many conventional slug and snail baits that rely on harsher chemical active ingredients, Sluxx® HP contains **ferric phosphate**, a naturally occurring substance found in soil. Once broken down, it converts into iron and phosphate, both of which can be naturally utilised within the environment.

As a result, Sluxx® HP avoids many of the concerns associated with older-generation molluscicides, including contamination risks to water systems and broader environmental toxicity concerns. The product is also considered safe for beneficial organisms, such as earthworms and beetles, as well as birds, pets, wildlife, and fish.

Importantly, Sluxx® HP does not rely on dehydrating pests to achieve control. After consuming the bait, slugs and snails stop feeding almost immediately, retreat into the soil, and die naturally within a few days, significantly reducing visible slime and dead molluscs in the field.

The product's advanced wet-moulded pellet technology also ensures:

- Excellent rain and mildew resistance.
- High pellet durability and integrity.
- Very high bait density for improved pest encounter rates.
- Easy application with existing spreading equipment.
- No preharvest interval restrictions.

Effective, but soft on soil

"South African growers are looking for solutions that deliver strong efficacy without compromising environmental stewardship," said a spokesperson for realIPM. "Sluxx® HP provides growers with an effective solution for slug and snail control while supporting healthier soils, safer water systems, and more sustainable farming practices."

Sluxx® HP is registered for use in orchards and vegetables and has demonstrated effectiveness against key pest species, including the common brown snail (*Helix aspersa*) and white garden snail (*Theba pisana*).

The launch forms part of realIPM's continued commitment to bringing innovative, biologically aligned crop protection technologies to South African agriculture.

Sluxx® HP will be distributed nationally through realIPM and its partner network from June 2026. realIPM is a leading provider of biological crop protection and sustainable agricultural solutions across Africa and internationally, helping growers improve crop health through innovative, environmentally responsible technologies.

For more information, visit *www.realipm.co.za/project/sluxx/* or contact your nearest realIPM representative.

Sustainable biodiesel production:

Importance of feedstock resources and production methods

By Nutan Mhetras and Digambar Gokhale

Fossil energy consumption is increasing to keep pace with the rapid development of society. Hence, it is becoming a key factor in improving not only the national but also the global economy. The increase in fossil energy consumption not only reduces the fossil energy reserves, but also causes deterioration of natural ecosystems.

The transportation of goods and services mainly consumes non-renewable fossil fuels. It is estimated that petroleum resources contribute 80% of the total energy consumption, of which 55% is consumed in the transportation sector. As per the International Energy Agency (IEA), the demand for mobility will increase by 60% by 2050. The transport sector is one of the largest greenhouse gas emitters in the world. According to IEA regulations, greenhouse gas emissions are to be reduced by 30% by 2030. The vast consumption of non-renewable fossil fuels has compelled the scientific communities to search for alternative and renewable energy sources.

In this context, biofuels are unique and excellent energy sources that could potentially substitute fossil fuels. First-generation biofuels derived from food stocks were not considered attractive, since their use for biofuel production led to increases in food prices. Therefore, the United States government was advised by the World Bank to gradually stop the biofuel subsidies of 2011 for food-based biofuels. Hence, there has been more focus on second-generation biofuel production from non-food and renewable feedstocks such as lignocellulosic biomass.

In addition, scientists also thought of exploiting microalgae and cyanobacteria for production of third-generation biofuels. Microalgae use sunlight, CO_2, and water to generate oil-containing biomass from which biodiesel can be produced.

Plant oils, animal fats, and edible and non-edible oils are considered to be renewable sources for biodiesel production using the transesterification reaction. This reaction involves triacylglycerol (TAG), which is also known as triglyceride fats. TAG reacts with short-chain alcohols such as methyl or ethyl alcohol to form fatty acid alkyl esters and glycerol as by-products.

The transesterification reaction is carried out at high temperatures in the presence of catalysts. Thus, biodiesel consists of long-chain fatty acid methyl or ethyl esters. These esters are derived from either saturated or unsaturated fatty acids such as palmitic, stearic, oleic, and linolenic acid. Most of the water-soluble impurities remain after the transesterification reaction. These impurities need to be removed to increase the effectiveness of biodiesel as a fuel.

Edible and non-edible sources

Vegetable oils, animal fats, microbial oils, algal oils, and waste oils are used as renewable feedstocks for biodiesel production. Different feedstocks have advantages and challenges related to availability, cost, energy content, and sustainability. The major cost (80%) comes from the feedstock, and therefore feedstock selection is a crucial step in biodiesel production. Other factors contributing to feedstock selection are availability, composition, yield, and the purity of the produced biodiesel. The presence of impurities in the feedstock influences its quality, which can in turn affect biodiesel production. Impurities such as gums, waxes, and phospholipids can complicate downstream processing.

Almost 95% of the biodiesel is currently produced from edible oils. Edible oils are considered a first-generation feedstock, and approximately 70% of the biodiesel produced worldwide in 2020 came from soya bean. Canola oil was still a dominant feedstock (62%) for biodiesel production in Europe until 2012, but its use was decreased (38%) in 2019. Due to the global food crisis, several issues have emerged for using edible oils as biodiesel feedstock, which not only results in global imbalances in food supply, but also increases the prices of edible oils and biodiesel. In addition, large-scale biodiesel production from these food-based feedstocks needs increased cultivation of edible oil crops, leading to deforestation and ecosystem destruction.

To overcome these undesirable issues, inexpensive non-edible oils can be considered second-generation feedstock and important future sources for biodiesel production because they do not compete with the food chain. In addition, non-edible oil crops can grow in degraded forests, remote agricultural fields, irrigation channels, and along roadsides. Cultivation of non-edible oil crops reduces carbon dioxide levels in the environment. Examples of non-edible oil crops that can be used for biodiesel production are jatropha, jojoba, neem, mahua, and karanja. These feedstocks also produce useful by-products such as seed cakes that can be used as animal feed or for biogas production.

Other potential sources for biodiesel production are waste cooking oil (WCO), poultry and animal fats, fish, and algae, which can be considered third-generation oil feedstocks. Around 500 000 tonnes of WCO are discarded annually worldwide, creating environmental problems, while these wastes could become cost-effective feedstocks for biodiesel production. Animal and poultry fats such as lard, tallow, and chicken fat also appear to be suitable biodiesel feedstocks due to their low cost.

Microbial oil sources

Microbial lipids are similar to plant oils and can therefore be considered an alternative feedstock for biodiesel production. Microbes such as yeast, filamentous fungi, and bacteria with high lipid content can serve as biodiesel feedstocks. These microbes can accumulate high levels of lipids in their cellular compartments. Some can accumulate as much as 70 to 80% lipids based on dry cell weight under suitable conditions.

Oleaginous yeasts known for lipid production include *Candida*, *Yarrowia*, *Cryptococcus*, *Lipomyces*, *Rhodosporidium*, *Rhodotorula*, and *Trichosporon*. Some of these can accumulate 80% lipids on the basis of dry cell weight. To improve the economic feasibility of biodiesel production, these strains should be able to grow at high cell densities on non-food-based and cheaper carbon sources such as lignocellulose, with the ability to grow under robust process conditions.

Oleaginous fungi are attractive sources for biodiesel production because they produce γ-linolenic acid, which is not produced in high amounts by other microbes. Fungi are capable of growing on waste molasses, sewage sludge, glycerol, and agricultural residues, which are cheap. *Aspergillus* sp. EM2018 was reported to produce 53% lipids/dry biomass when grown on a medium containing potato extract and yeast extract (0,05%) at 30°C and pH 5.

Oleaginous bacteria could also be a potential source for biodiesel production due to their high growth rate, ease of cultivation, ability to grow on various substrates, potential for genetic and metabolic modification, and the fact that some can sequester carbon dioxide. However, limited information is available on their use as feedstock for biodiesel production compared to other microbes, such as microalgae and yeast.

A recent publication by Abiola *et al*. talked about the isolation of most lipid producing bacteria identified as *Providencia vermicola*, which accumulates 77,3% lipid of its biomass, representing a promising source for biodiesel production. Therefore, future challenges would be to look for bacterial strains that accumulate high lipids. Since bacteria are easily amenable to genetic and metabolic engineering, the adoption of new and advanced engineering strategies would develop strains capable of accumulating sufficient lipids to make the overall biodiesel production process cost-effective.

Mixed oil sources

Some oil feedstocks, such as rapeseed, sunflower and soya bean, show high amounts of unsaturated fatty acids. The unsaturated fatty acids react with atmospheric oxygen to form hydroperoxides, leading to oxidation instability. They also form sediment and gum, which affect engine performance. Some feedstocks contain high amounts of methyl esters of saturated fatty acids, which affect biodiesel quality because of their cold-flow properties.

Biodiesel produced from a single oil has a strong acid value, which causes tank corrosion. In addition, it has a high iodine value as well as higher kinetic density and viscosity, leading to carbon deposition in diesel engines and fuel injection systems. Therefore, the use of mixed oils, including waste oil, has been suggested for biodiesel production to overcome the constraints of using single-oil feedstocks. In addition, the use of mixed oils improve not only biodiesel quality, but also resolve issues related to feedstock availability.

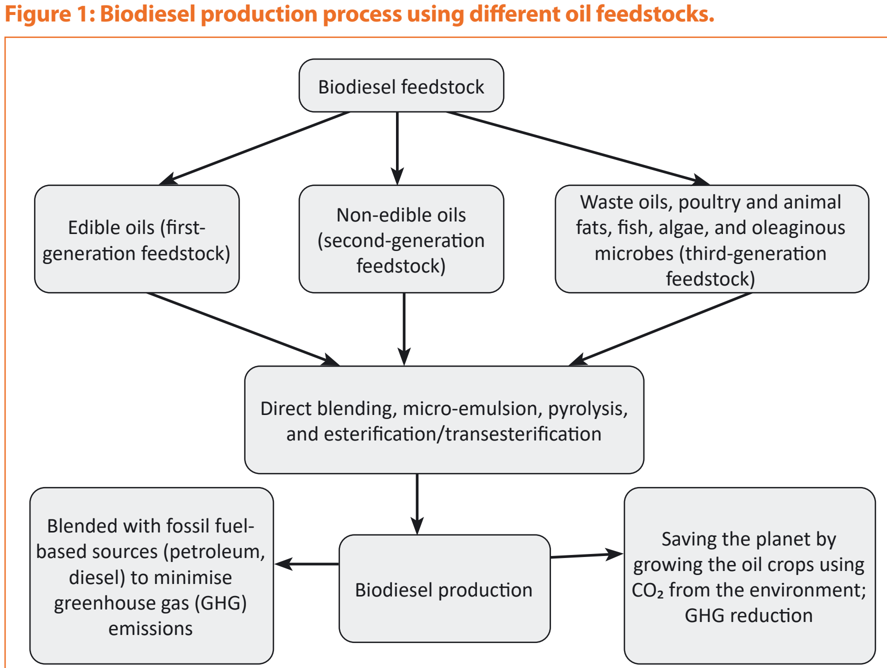
Biodiesel appears to be a compelling substitute for fossil-fuel based diesel, offering advantages such as a sustainable supply, environmental benefits, and economic potential. However, issues such as feedstock availability and biodiesel production costs still need to be addressed for its adoption as a sustainable fuel in future. Future research should focus on microalgal, microbial, and waste oils as feedstocks, since it is practically impossible to consider edible and non-edible oil plants as biodiesel feedstocks.

The world population continues to rise, with higher demand for cultivable land to meet the rising demand for food. Thus, not enough land is available, especially in Asian countries, to grow edible or non-edible plants for biodiesel.

Biodiesel production technologies

Several methods have been employed to synthesise biodiesel, but research into new methods is still ongoing to achieve higher yields and improve biodiesel properties, thereby minimising production costs. The technology for biodiesel production using edible oil feedstock is well established. However, using non-edible oils for biodiesel production

Figure 1: Biodiesel production process using different oil feedstocks.

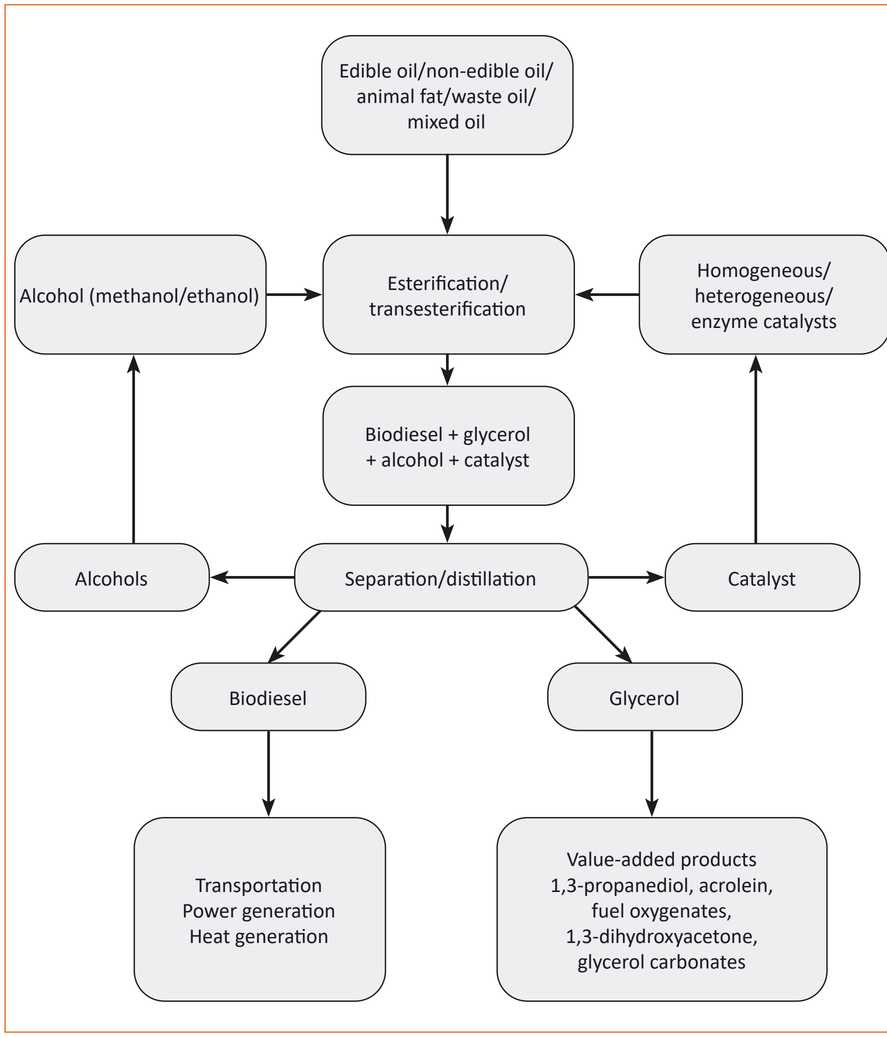


remains challenging due to the presence of free fatty acids (FFAs).

Earlier, blends of virgin vegetable oils and diesel were used in diesel engines in Europe during World War II. The Caterpillar company in Brazil successfully used diesel blended with 10% vegetable oil in a pre-combustion chamber without modifying the engine. Although the use of 100% vegetable oil commonly presents challenges related to high viscosity, this issue can be partially resolved by blending the oil with diesel.

Reduced viscosity improves fuel atomisation, which enhances combustion efficiency and reduces nozzle blockages. The direct use of oil alone, or blends of oils with diesel as fuel, still presents operational and performance problems due to high viscosity, poor volatility, high acidity, and the presence of FFAs. Later, due to advances in technology, key processes have been developed for biodiesel production from oil. *Figure 1* illustrates the overall biodiesel production process using different oil feedstocks.

Figure 2: Schematic representation of biodiesel production and potential processes for value-added products derived from glycerol.



Thermal cracking or pyrolysis

Thermal cracking, in the course of pyrolysis, is used for the synthesis of biodiesel from different edible and non-edible oil feedstocks, animal fats, or cellulosic biomass. The process involves preheating oil feedstocks at high temperatures (300 to 1 300°C) in the absence of air or oxygen with the help of Lewis acid catalysts such as zeolite, clay, montmorillonite, aluminium chloride, or aluminium bromide. The pyrolysis is classified into three types, based on the range of temperatures used: conventional pyrolysis (500 to 900°C), fast pyrolysis (850 to 1 250°C), and flash pyrolysis (1 050 to 1 300°C).

This technology can produce 67% pyrolytic oil or bio-oil from non-edible plant seeds, which can be used as an alternative biofuel. The process breaks down long-chain hydrocarbons into condensable short-chain hydrocarbons known as bio-oil, which has desirable fuel properties such as low viscosity, high cetane number, low sulphur content, acceptable copper corrosion rate, and limited water and sediment content. These properties make bio-oil a potential alternative biofuel source.

Bio-oil contains oxygenated compounds such as acids, aldehydes, ketones, aromatics, ethers, esters, phenols, and carbohydrates. It is rich in organic acids, furfurals, and levoglucosans, which are high-value compounds. Many separation and fractionation methodologies are available to obtain these value-added products, leading to bio-oil upgrading. However, these methodologies cannot be applied for bio-oil upgradation, since the concentrations of most of the compounds are below 1%, which hinders their separation.

Micro-emulsion

Micro-emulsion is a thermodynamically stable liquid prepared by dispersing one liquid into another, forming droplets smaller than 100nm in diameter. Isotropic fluids are used to form a colloidal dispersion of droplets ranging from 1 to 150nm. Oil is mixed with suitable emulsifying agents such as methanol, ethanol, or propanol to form thermodynamically stable micro-emulsions. Micro-emulsification produces biodiesel with low energy consumption and suitable properties. Micro-emulsification does not require pretreatment to produce biodiesel from non-edible oils.

The advantages of using micro-emulsified oil are lower smoke emissions than diesel, reduced toxic pollutant emissions during combustion, shorter ignition delay time, and improved combustion performance. The major obstacles associated with micro-emulsion oils are incomplete combustion and carbon deposition in engines.

Transesterification

Transesterification is a widely used method for producing high-quality biodiesel. It can be conducted with or without a catalyst and is therefore classified as catalytic or non-catalytic transesterification. The method involves the use of alcohols, preferably methanol or ethanol, for converting fats and oils into fatty acid alcohol esters and glycerol. There are three types of non-catalytic transesterification processes, namely the BIOX process, the supercritical alcohol process (preferably methanol), and plasma technology.

Non-catalytic transesterification process: The conversion of oil to biodiesel is a slow reaction because of the poor miscibility of methanol and oil. Co-solvents are soluble in both methanol and oil and are therefore used to enhance reaction rates. The BIOX process first converts 10% of the FFAs through acid esterification and then converts triglycerides through transesterification by adding a co-solvent (tetrahydrofuran, THF). The co-solvent is recycled and reused continuously in this two-step process.

The supercritical transesterification process utilises methanol at high temperatures (300 to 400°C) and pressures (>1 200 psi) for the conversion of oils to biodiesel. A high alcohol-to-oil ratio is required, and the reaction is completed in about five minutes. Unlike the conventional transesterification process, biodiesel production using supercritical methanol is not hindered by the presence of FFAs and water present in non-edible oils since no catalyst is used. As a result, sources such as unrefined oils, animal fats, and waste oils can be directly transesterified without pretreatment.

Plasma technology is one of the latest technologies for biodiesel production and can operate with or without catalysts. In this method, energetic electrons are generated by high voltage and collide with atoms and molecules, resulting in the formation of secondary electrons, photons, ions, and radicals. The advantages of this technology are that it requires a low reaction temperature, is not affected by impurities, no glycerine is formed, and separation occurs easily.

Catalyst-mediated transesterification process: Catalytic transesterification uses homogeneous, heterogeneous or biological catalysts. Homogeneous catalysts include alkali or acid catalysts and heterogeneous catalysts include solid acid, base, acid-base bi-functional, biomass-based catalysts, enzymes, and nano-catalysts. *Figure 2* shows a schematic representation of biodiesel production from oil feedstocks using transesterification, together with potential processes for value-added co-products.

Homogeneous catalysts include alkalis and acids used for biodiesel production. Alkaline catalysts are most suitable for oils containing low amounts of FFAs, because high FFA levels in oil can complicate glycerol separation due to saponification, leading to soap formation. Alkaline homogeneous catalysts include NaOH, sodium methoxide (CH_3NaO), KOH, and potassium methoxide (CH_3OK). These catalysts are most common because they are economical and easy to use, require less processing time, and operate under relatively low temperatures and pressure.

Most **heterogeneous catalysts** are solids that generate active sites when they react with liquid or gas reactants. These catalysts require higher oil-to-alcohol ratios and temperatures than homogeneous catalysts, which are their main disadvantages. However, their reusability, as well as the ease of separation and purification, are major advantages that help reduce material and processing costs. An additional advantage is that they can carry out the transesterification reaction even in the presence of high levels of FFAs and moisture in the oil.

Biological catalysts have been integrated into chemically catalysed synthetic processes to eliminate or minimise waste generation during the production and application of chemical products. Biocatalysis appears to be highly effective and may replace harsh chemocatalytic routes that generate copious amounts of waste. Biocatalysts such as whole cells or intracellular and extracellular lipase enzymes have received great attention for the production of bulk chemicals such as biodiesel, mainly through the use of commercially available enzymes.

Biocatalytic transesterification offers several advantages, including simple operation, low alcohol (methanol or ethanol) consumption, easy glycerol recovery, mild reaction conditions, low energy consumption, the use of low-quality raw materials with high FFA contents, and the absence of wastewater production. These advantages could contribute to sustainable and cost-effective biodiesel production processes.

Key take-home message

This article has highlighted the improvements and gaps in biodiesel research related to feedstock sources and production technologies. Biodiesel production is a complex process involving several stages, each with its own challenges, from sourcing the feedstock to ensuring final product quality. The main challenge is the sourcing of sustainable feedstocks for biodiesel production.

Though soya bean oil feedstock is considered the most suitable, other oils such as palm oil, canola oil, and used cooking oil can also serve as alternative sources for biodiesel synthesis. However, their sustainable supply is limited due to factors such as seasonality and demand, resulting in cost fluctuations. This leads to supply chain disruptions that hinder biodiesel production.

Non-edible oil feedstocks are considered promising because they do not interfere with the food chain, making them suitable sources for biodiesel production. Biodiesel production from lipid-containing algal biomass is technically feasible, but not yet economically viable due to the high costs associated with cultivation, harvesting, and oil extraction.

Oleaginous microbes could serve as an alternative source of biodiesel, although the high cost of growth media required for their cultivation is a major concern. This problem can be solved by using carbon sources derived from renewable waste streams to grow these microbes. The use of mixed oils promises not only a sustainable and cost-effective feedstock supply, but also enhances the possibility of biodiesel production at industrial scale.

Read the full article at *www.doi.org/10.1039/D5RA03084F*. For more information, send an email to digambar_52@yahoo.com

Precision soya crushing:
Quality over volume

Globally, soya bean meal accounts for roughly two-thirds of the protein meal used in animal feed, making it central to modern livestock production. From broiler houses to dairy farms, performance relies on the consistency and digestibility of this ingredient.

Record harvests in major producing regions have lifted meal volumes worldwide, with South Africa reflecting this trend. The 2024 and 2025 seasons have produced an exceptional soya bean crop, with forecasts of 3,1 million tonnes in 2026, supported by favourable La Niña rains. In these conditions, volume is no longer the differentiator. Quality is.

This shift comes as the local poultry industry reaches a new level of competitiveness. The BFAP 2025 *Competitiveness Benchmark Report* ranks the South African sector second globally, behind Brazil and ahead of the United States, on key production metrics and feed conversion. Feed accounts for roughly 70% of broiler input costs, with soya bean meal as the primary protein source. In a system operating at such high biological efficiency and fine margins, small differences in digestibility or heat treatment can affect growth rates and feed conversion.

Indepenent performance testing

It is against this backdrop that Pretoria Protein Company, which began operations in October 2024, subjected its soya bean meal to independent blind growth trials at the broiler research facility of Stellenbosch University. Birds were allocated to groups and fed identical diets containing soya bean meal sourced from eight major suppliers. The results, published in *Oilseeds Focus*, placed Pretoria Protein Company's meal at the upper end of observed feed conversion and growth performance outcomes among the evaluated samples.

In practical terms, this indicated efficient nutrient utilisation per kilogram of feed. The findings were notable not only for their performance metrics but also for the speed with which they were achieved. Optimisation in oilseed processing often takes several seasons of adjustment. Achieving competitive biological results within the first year of operation suggests a focus on process control from inception. That focus starts inside the plant.

Bean to product process control

Pretoria Protein Company structures quality assurance around three critical points: the condition of the incoming bean, the discipline of processing, and verification before final release. This framework replaces assumptions with measurements throughout the process.

Quality is assessed upon the arrival of raw materials and throughout crushing and extraction, with laboratory testing embedded in daily procedures. Hourly analyses measure protein, fibre, fat, moisture, and urease activity, while physical factors such as cracked-bean size and flake thickness are also monitored because they influence extraction efficiency and the quality of downstream meals.

Heat treatment forms the central balancing act. Just enough heat is required to deactivate urease and other anti-nutritional factors; too much can impair amino acids and reduce digestibility. Real-time data interpretation by trained laboratory personnel allows adjustments before small deviations affect larger volumes. The process concludes with final batch approval and the issuance of a Certificate of Conformance, providing clients with documented assurance that all specifications have been met. Regular independent external verification adds a further layer of accountability.

While Pretoria Protein Company focusses on manufacturing excellence, Pretoria Protein Trading oversees market engagement across South Africa, emphasising consistent quality as the foundation for purchasing decisions and building long-term supply partnerships. In a competitive poultry industry where biological performance is crucial, the dependability of soya bean meal is a primary consideration rather than an afterthought.

As global surpluses grow and domestic production strengthens, competition in animal nutrition will continue to move towards precision rather than volume. In that context, disciplined crushing, verified quality, and measurable feed results form a continuous loop. Pretoria Protein's early trial results indicate that, in a market flooded with supply, careful processing remains one of the few benefits that cannot be commoditised.

Disclaimer: The trials were conducted independently at Stellenbosch University's broiler research facility and published in *Oilseeds Focus* (Vol 11, No 4, December 2025). The publication does not endorse any supplier or product. The interpretation of the results presented here reflects Pretoria Protein Company's analysis.

Contact Pretoria Protein Trading at 012 004 3166 or info@pptd.co.za and Pretoria Protein Company at 012 004 1120.

The war in the Middle East and its impact on South African oilseed markets

By Gerhard Burger, junior agricultural economist, Grain SA

In 2021, the Ever Given, a Panama-flagged container ship, blocked one of the most important trading routes in modern maritime history, the Suez Canal. This 193km canal connects the Mediterranean Sea to the Red Sea and was obstructed for about a week, leading to a global logistical crisis. As global trade was delayed and European ports such as Rotterdam and Hamburg became congested, ships had to take a costly detour around the Cape of Good Hope, resulting in fluctuations in market-round freight rates.

Similarly, and more recently, disruptions in the Strait of Hormuz have had serious consequences for global energy flows, as a large portion of the world's crude oil exports passes through this vital passage. This leads to longer shipping routes, increased freight costs and delayed deliveries, all of which affect energy markets and drive prices higher.

The crucial question now is how these fluctuations in energy markets contribute to volatility in South African grain markets.

Exchange rate effect

Since March 2025, the price of local oilseeds, such as soya bean, have been trading at export parity. This is due to a very good harvest in the previous season, not only in South Africa but also in Brazil, which recorded a record soya bean yield. The increase in local supply led to a stock surplus in South Africa, which exerts downward pressure on prices. The Safex soya bean price fell by R600/t in April 2025 and continued to decline towards export parity as the year progressed. In April 2026, local Safex soya bean prices remained close to export parity.

However, according to the International Grains Council, international oilseed prices have seen some support since late February/early March 2026. Yet, with the local price still trading at export parity, this limited price support cannot be attributed to a change in the fundamental supply and demand figures. Rather, export parity prices are increasing due to the rand weakening against the dollar.

The rand-to-dollar exchange rate was on track to fall below the R15,72 mark by the end of January 2026, then began trading sideways until the end of February 2026. By that time, the conflict in the Middle East had escalated after the United States (US) launched Operation Epic Fury, and Iran restricted and even closed the Strait of Hormuz in response. About 20% of global oil tankers pass through this strait, and the situation marks the first time in modern history that it has been effectively closed or disrupted on such a scale.

The international fuel price consequently rose above US$100 per barrel, and investors pulled out of riskier markets, resulting in the rand losing support and the export parity price – the floor price at which local prices are currently trading – rising.

Crude oil effect

While an increase in local oilseed prices may provide much-needed support to local producers, especially given the tight profit margins they face, more pressing issues arise from the closure of the Strait of Hormuz.

South Africans have already felt the impact of significant fuel price increases, driven by a sharp under-recovery in the landing costs of diesel, petroleum, and paraffin. In April,

Figure 1: Prices of whole soya bean delivered to Randfontein. (Source: Grain SA)

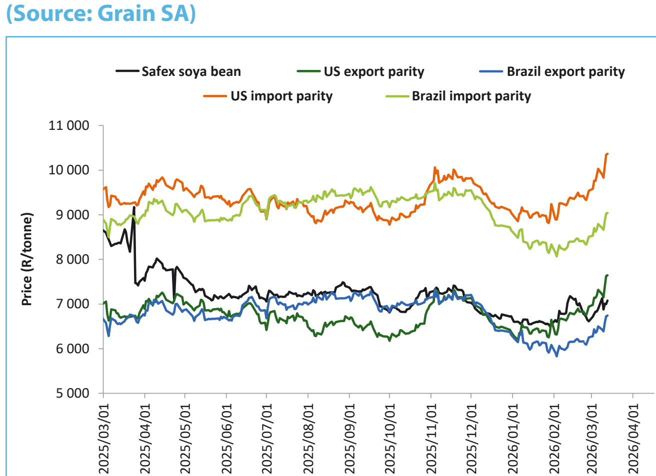


Figure 2: Rand to dollar exchange rate fluctuations since January 2026. (Source: Grain SA)

Figure 3: Over- and under-recovery of landed fuel costs for petrol and diesel. (Source: Grain SA)

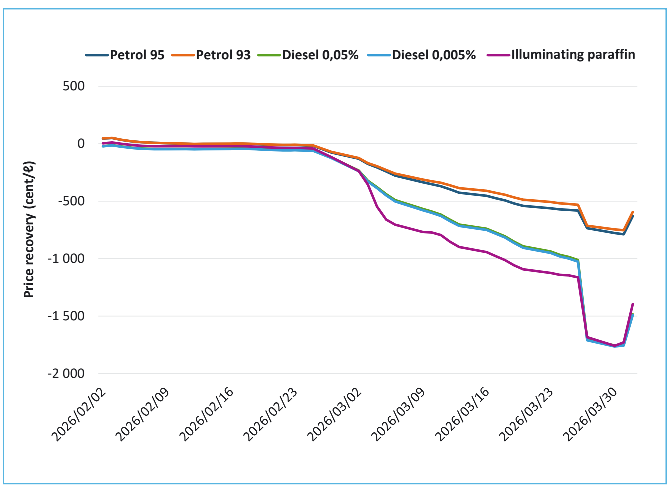
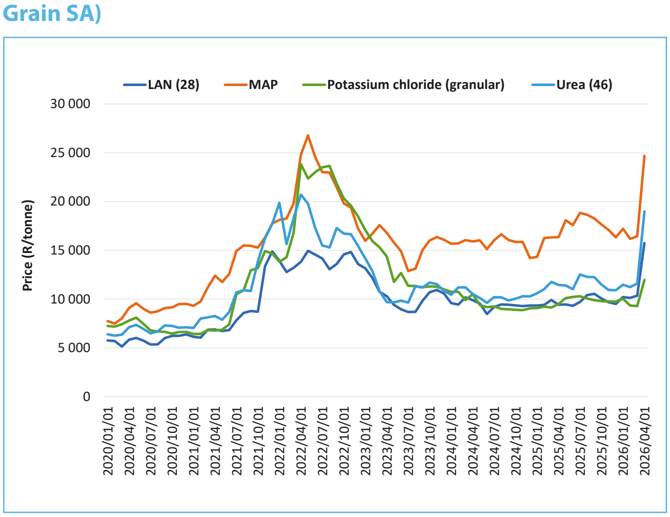


Figure 4: Imported fertiliser prices since 2020. (Source: Grain SA)



the fuel price increased by R7,51/ℓ for 0,005% diesel and R3,06/ℓ for 95-octane petrol, followed by another steep increase in May. These increases occurred despite the government's announcement of relief in the form of a reduction in the general fuel levy of R3/ℓ.

While we are assured that there will be sufficient diesel fuel supplies for producers entering the 2026 harvesting season, the runaway fuel price poses a significant threat to cash flow and profitability, which were already under pressure before the conflict and Strait of Hormuz restrictions.

Figure 3 illustrates fuel under- and over-recovery. Periods above the zero line indicate over-recovery, which generally points to potential price reductions. Likewise, periods below the zero line indicate an under-recovery and lead to price increases.

Fertiliser effect

While very few oilseed and oilseed product exports travel through the Strait of Hormuz, many agricultural inputs do. Like crude oil and other fuels, fertiliser movement is also being restricted by the closure of the strait. International urea prices have increased by more than 7% year-on-year; similarly, diammonium phosphate prices have increased by more than 11% and ammonia by more than 31%. These price increases can be directly attributed to restrictions on exports via the Strait of Hormuz.

Locally, fertiliser prices in April increased to almost the same level as during the Covid-19 pandemic in 2020. The average fertiliser price in April was approximately 48,7% higher than in March of this year.

With most of South Africa's fertilisers also imported, their prices are heavily dependent on the strength of the rand against the dollar. A weaker rand means more expensive fertiliser and other inputs. As fuel and fertiliser together account for approximately 43% of a producer's variable costs, the price support from an increasing export parity price, due to the weakening rand-dollar exchange rate, seems negligible.

Furthermore, these incremental, weak increases in export parity prices are not driven by changes in fundamental factors such as supply and demand, making the price support volatile and likely only temporary.

Navigating these waters

Due to the unstable and limited nature of the current export parity price support, producers are encouraged to secure only their immediate fertiliser and fuel needs to minimise possible short-term price and supply risks. It is also important to reassess fertiliser strategies by conducting soil analyses, setting realistic yield targets, and applying fertilisers efficiently. Additionally, improving fuel efficiency, updating financial plans, and re-evaluating break-even levels are crucial steps.

Producers should also consider using risk management tools such as hedging or crop diversification, and closely monitor developments in energy, fertiliser, and currency markets. While challenges remain, making informed and timely decisions can help safeguard farm profitability.

For more information, send an email to Gerhard Burger at GerhardB@grainsa.co.za

World oilseeds markets:
Oilseeds output and trade accelerate in 2026/27

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

Global oilseed production in 2026/27 is forecast at a record 718 million metric tonnes, up 3% compared to the 2025/26 marketing year, as strong demand for vegetable oil incentivises greater planting. Soya bean, sunflower seed, and rapeseed production are expected to reach new highs.

Area expansion in the world's largest soya bean-producing countries is the largest contributor to oilseed production growth. Global soya bean production is forecast to rise by 14 million tonnes to 442 million. United States (US) production, expected to reach nearly 121 million tonnes, accounts for five million of this increase. A 186-million-tonne Brazil crop adds six million, while a 50-million-tonne crop for Argentina adds an additional two million to global soya bean production over 2025/26.

Global sunflower seed production is forecast at an all-time high of 62 million tonnes, up seven million, on improved yields in the Black Sea region and area growth in all major producing countries. Russia (19 million tonnes) and Argentina (eight million tonnes) are expected to set new production highs, while production in Ukraine (14 million tonnes) is expected to recover by 23% after a decade's low crop in 2025/26.

Global rapeseed production is forecast to reach a record 97 million tonnes, up one million, due to increased area in many major producing countries. India (12 million tonnes) and Russia (six million tonnes) rapeseed production are expected to reach new records on continued area growth, while European Union (EU) production is anticipated to hit a ten-year high of 21 million tonnes. Canada's rapeseed production is forecast unchanged at 22 million, with area growth offset by a reduction from strong yields in 2025/26.

Global oilseed crushing is forecast to rise by 4% in 2026/27 to a record 607 million tonnes, as higher production enables greater crushing of soya bean, sunflower seed, and rapeseed. The biggest growth is in Brazil's soya bean (up four million tonnes to 65 million tonnes) and in the US (up three million tonnes to 75 million tonnes), as Brazil increases crushing capacity to utilise ever-larger crops, and the US crushes to meet growing domestic biofuel demand. China's soya bean crushing is forecast to increase by two million tonnes to 110 million to meet growing feed demand, while Ukraine's, the EU's, and Russia's sunflower seed crushing are each up two million tonnes due to production growth.

Oilseed trade

Global oilseed trade is forecast to grow by 1% to a record 217 million in 2026/27. Soya bean exports are up 1% to 189 million, driven by soya bean exports from the US and Brazil. Both are up three million tonnes from 2025/26 and are partly offset by a combined three-million-tonne decline for Argentina and Paraguay. Exports of sunflower seed are up 3% to four million tonnes, though most export growth is in meal and oil rather than seed. Rapeseed exports are up 2% to 19 million tonnes, driven by gains in Canada and Ukraine despite a reduction in Australia.

Meal trade and consumption

The global oilseed meal trade is forecast to increase by 6% to an all-time high of 119 million tonnes in 2026/27. The US (20 million tonnes) and Brazil (27 million tonnes) are both expected to reach historically high soya bean meal export levels due to increased crushing, pushing total soya bean meal exports up 5% to 88 million tonnes amid competitive prices and robust feed demand. Sunflower seed meal exports are expected to expand by 20% to ten million tonnes driven by rebounding supplies in Ukraine, Russia, and the EU.

Global oilseed meal consumption is forecast up 3% to a record 405 million tonnes in 2026/27, with growth expected in most countries to support feed demand. Global oilseed meal consumption on a soya bean meal equivalent (SME) basis

Figure 1: Soya bean exports and market share.

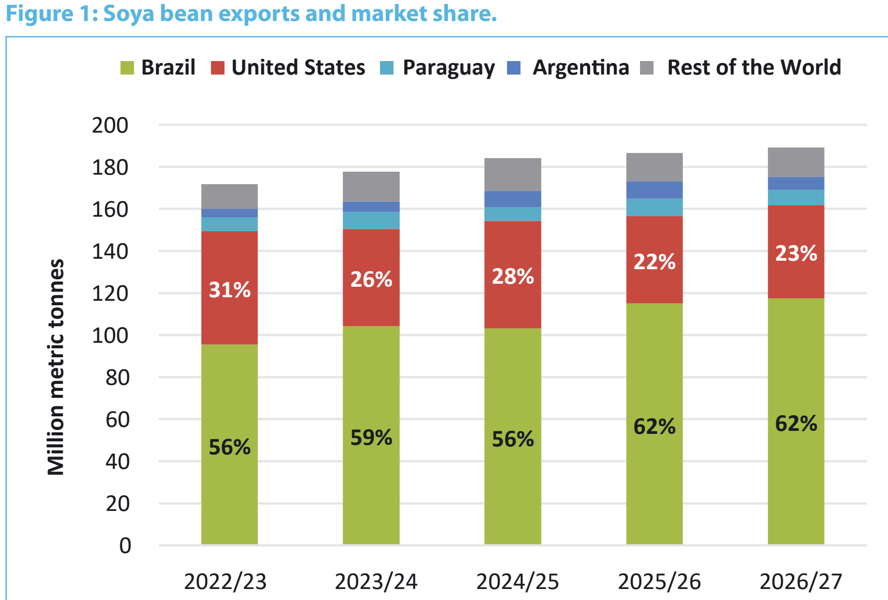
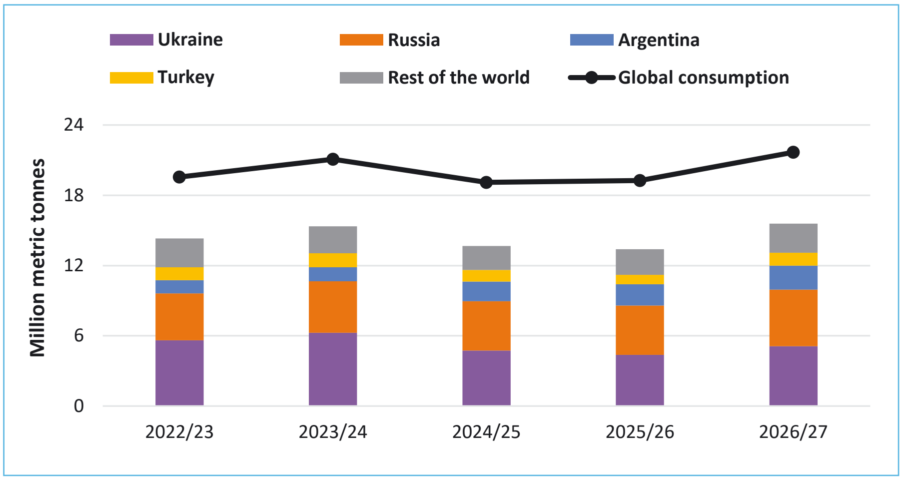


Figure 2: Sunflower seed oil exports and global consumption.



is also forecast up 3%. The proportions of global oilseed meal consumption on an SME basis are unchanged at 79% soya bean meal, 10% rapeseed meal, and 4% sunflower seed meal. The largest consumption volume growth is expected for China, up 3% on an SME basis, due to increased soya bean and sunflower seed meal consumption.

Commodity outlooks 2026/27

Soya bean: Global soya bean production in 2026/27 is forecast at a new record, with larger crops in the US, Brazil, and Argentina driven by area expansion and trend yields. US production is expected to reach the highest level since 2021/22, while Brazil production sets its third consecutive record. Paraguay is the only major producer with declining production, down from last year's yield-driven all-time-high crop.

Global soya bean exports are also forecast at record levels due to growth in the US and Brazil, more than offsetting reduced Argentina exports due to the resumption of export taxes after last year's temporary reductions.

Imports are up for China, Turkey, Pakistan, Vietnam, and Egypt, largely due to growing feed demand and expanded capacity at domestic crushing facilities. Argentina's soya bean imports are expected to decline due to increased availability of domestic soya bean for crushing and lower exports from Paraguay. EU imports are also expected to fall as crushing shifts towards rapeseed, and sunflower and soya bean meal imports rise. Global soya bean ending stocks are forecast to remain unchanged, as rising crush capacity and robust global feed and oil demand are expected to fully utilise rising production.

Global soya bean crushing is forecast to surge, especially in major soya bean-producing countries. US crush is expected to reach unprecedented levels, driven by domestic demand for soya bean oil as feedstock for biofuel production. Brazil crush is expected to reach a new high as growing capacity is utilised to process the record 2026/27 crop. Argentina's crush is also expected to rebound. Soya bean meal exports are forecast to jump due to expanding crushing in these three countries.

Soya bean meal imports are expected to grow in most markets due to the increased exportable supplies from major producers, led by the EU, Indonesia, Mexico, and Vietnam, on strong feed demand. Soya bean oil exports are up slightly. Growing Brazil and Argentina exports more than offset a decline for the US as more US soya bean oil is consumed domestically.

Global soya bean meal consumption is forecast higher, reflecting robust feed demand expected to require larger volumes of all major oilseed meals in 2026/27. China, Brazil, Vietnam, Egypt, and the US have the highest growth expectations for soya bean meal. Global soya bean meal stocks are forecast to expand proportionately with rising global soya bean meal consumption.

Global soya bean oil consumption is expected to rise, with nearly all growth attributable to increased industrial consumption, as food use remains flat. Higher US and Brazilian soya bean oil consumption is the main driver, driven by higher industrial consumption, while China has the largest surge in food use. Soya bean oil ending stocks are forecast to rise.

Sunflower seed: Global sunflower seed production is expected to reach new heights in 2026/27 on improved Black Sea yields and area growth in all major producing countries. Ukraine production is recovering from a decade's low in 2025/26, while Russia and Argentina continue to increase area and reach new production records. Sunflower seed production is also expected to rebound in the EU following two years of below-average yields driven by dry weather.

Global sunflower seed crushing is forecast to expand in line with growing production, enabling unprecedented exports of both sunflower seed oil and meal. Export growth for both products is driven by Ukraine and Russia, owing to strong crushing and export-oriented industries, whereas EU exports are more limited due to higher domestic demand for oil and meal. India, China, and Turkey's sunflower seed oil imports are anticipated to see the largest increases. China leads growth for sunflower seed meal imports, with higher global supplies enabling a return to previous import levels. Ending stocks of sunflower seed and products are expected to rise in 2026/27 due to the rebound in global supplies.

Export prices

Soya bean prices continued to rise in April this year. Weather delays for the Argentine harvest and a sliding US dollar bolstered US prices. EU rejections of Brazilian and Argentine soya bean meal due to the inclusion of an unapproved genetic event caused a temporary spike in US soya bean meal in late April, with South American meal temporarily dropping. Following this occurrence, soya bean meal prices for all origins declined in line with expectations of ample crush across all exporters.

Brazil and Argentina soya oil prices fell in April, while US soya oil prices rose. Increased crushing in South America bolstered exportable supplies, putting pressure on prices. US soya bean oil prices have approached record highs since 2022 amid expectations of higher demand from the biofuel industry.

For more information and the full May 2026 report, visit *www.fas.usda.gov*

CANSA fact sheet on canola oil

By Prof Michael Herbst, CANSA

Canola was developed using traditional plant breeding techniques to significantly reduce the levels of erucic acid and glucosinolates found in the parent rapeseed plant. The name 'canola' is apparently a contraction of 'Canadian' and 'ola', meaning oil.

There is a strict internationally regulated definition of canola that differentiates it from rapeseed, based upon it having less than 2% erucic acid and less than 30 micromoles of glucosinolates. Oilseed products that do not meet this standard cannot use the term canola. High-erucic acid rapeseed, although still grown, is now confined to contract production for specific industrial uses, including environmentally friendly lubricants.

Canola oil has generated a lot of research interest in its potential health benefits because of its low level of saturated fat, high monounsaturated fat content, and good balance of omega-3 and -6 fats. The canola plant belongs to the same genus in the crucifer family, *Brassica*, a large family of plants that also includes turnip, mustard, Brussels sprouts, cabbage, kale, cauliflower, and broccoli.

On 6 October 2006, the United States Food and Drug Administration (FDA) ruled that canola oil is eligible to bear a qualified health claim on its ability to reduce the risk of coronary heart disease due to its unsaturated fat content, namely: "19g (about 1½ tablespoons) per day may reduce the risk of coronary heart disease due to its unsaturated fat content, according to supportive but not conclusive research. Canola oil should replace a similar amount of saturated fat in the diet without increasing calories". Health concerns about canola oil are, therefore, unfounded.

Canola oil facts

Canola oil is one of the healthiest culinary oils in the world, with zero trans fat and the lowest amount of saturated fat of all common cooking oils. It has been rigorously tested and approved by authoritative scientific bodies for human consumption. In fact, canola oil is recognised as a heart-smart cooking oil by many health organisations. The facts about canola are set straight here, showcasing the oil's heart-smart properties and versatility, as well as the crop's usefulness in animal and industrial applications.

Scientists agree that canola oil is healthy: Clinical studies have been conducted for decades, involving thousands of human volunteers, to examine canola oil and

A brief history of canola oil

- **1950:** The agricultural area seeded to rapeseed dropped to 162ha (400 acres) from a high of 32 300ha (80 000 acres) in 1948. The post-war availability of other edible oils eliminated the need for rapeseed, but some processors continued to pursue industrial oil export markets. In the early 1950s, both the National Research Council and private oil processors in Canada were experimenting with edible uses for rapeseed, partly because rapeseed looked promising from an agronomic standpoint, and Prairie farmers needed an alternative cash crop.
- **1956:** The Food and Drug Directorate of the Department of National Health and Welfare (now Health Canada) ruled that rapeseed was not an approved edible oil in Canada. The department was persuaded to withdraw its objection pending a submission showing that the oil was safe.
- **1958:** After some 18 months of feeding trials on experimental animals, in which no harmful effects from feeding rapeseed oil were observed, the directorate removed its objection. During the same year, Drs Baldur Stefansson and Keith Downey began breeding work to reduce erucic acid content in rapeseed.
- **1974:** Tower, the first canola, was released. This new *Brassica napus* variety meant that Canada could now produce oil and meal that were nutritionally superior to that produced from rapeseed in other parts of the world.
- **1978:** The term canola was trademarked by the Western Canadian Oilseed Crushers' Association (now the Canadian Oilseed Processors Association) to differentiate the superior low-erucic acid and low-glucosinolate varieties and their products from older rapeseed varieties.

its effects on the body. Canola oil is not only safe for humans, per approvals from the United States, Canada, and other governments, but studies have also shown it may offer health benefits.

Canola oil is free of trans fat and cholesterol, and has the lowest amount of saturated fat among common cooking oils. Trials have shown that it may favourably affect the body when used in place of other fat sources. In October 2006, canola oil received a qualified health claim from the FDA for its potential to reduce the risk of heart disease when used in place of saturated fat in the diet.

Canola is its own plant species and differs from rapeseed: Although they look similar, canola and rapeseed plants are very different. Scientists used traditional plant breeding to eliminate the undesirable components of rapeseed, namely erucic acid and glucosinolates. Before canola oil received 'generally recognised as safe' status from the FDA and recognition as a vegetable oil by Health Canada, it had to go through rigorous testing to ensure it was safe for human consumption.

Canola was developed through traditional plant breeding: Unwanted traits in rapeseed were removed through traditional crossbreeding to produce canola in the late 1950s and 1960s. In fact, modern crop biotechnology had not yet been invented at that time. Today, different varieties of canola help produce crops that are resistant to drought, pests, diseases, and other challenges producers face. Plant breeders are continually making breakthroughs to help growers get the most out of their crops.

Canola belongs to the same family as cabbage and cauliflower: Canola, along with cabbage, broccoli and cauliflower, is part of the *Brassica* genus, which belongs to the mustard family of plants. Although members of this family are occasionally mistaken for ingredients used in mustard gas, they have nothing to do with it. Mustard gas was named because of its mustard-like odour.

Canola meal is a highly valuable feed for livestock: Canola meal's high protein content makes it a useful and nutritious feed for cattle, fish, chickens, and other animals. In dairy cattle, canola meal has been shown in several studies to boost milk production compared to other animal feeds. In 18 studies conducted over 24 years, results showed that using canola meal instead of soya bean or cottonseed meal increased milk production by an average of 1ℓ/cow/day.

Canola oil is non-allergenic: Food allergens are proteins that can trigger an immune response in susceptible individuals. Allergic responses are abnormal reactions to a specific food. Since traditional refined canola oil does not contain proteins, it will rarely, if ever, cause an allergic reaction.

Canola oil has a long shelf life: It can be stored at room temperature for about one year. This is about the same shelf life as most other vegetable oils. Store canola oil in a cool cupboard for optimal shelf life.

Canola oil is free of cholesterol and trans fat and low in saturated fat: It does not raise cholesterol levels in the body and is considered a heart-smart cooking choice. In fact, canola oil is high in monounsaturated fat, which studies show may help lower 'bad' LDL cholesterol levels in the blood and control blood glucose. Canola oil also contains an omega-3 fatty acid that may help protect the heart and is a good source of vitamin E.

Canola oil is used in biodiesel, lubricants, soap, and other products: Any oil derived from plants can be used in making these products. Oils from canola, olives, maize, soya bean, and flax can all be used to produce a wide range of non-food items, including cosmetics, paints, and plastics. Vegetable oils can even help fuel one's car with biodiesel. Canola oil is a particularly good feedstock for biodiesel due to its low saturated fat content.

Medical disclaimer

This fact sheet is intended to provide general information only and should not be considered a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action based on information contained in this fact sheet. To the fullest extent permitted by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants, estate or heirs) relating to the use of any information contained in this fact sheet.

Studies included in this fact sheet may indicate possible health benefits, but these are not necessarily sufficient to support labelling, advertising or marketing of food products. Please consult a food-labelling consultant and/or the latest regulations to ensure that such claims are feasible and allowed.

For more information, send an email to info@cansa.org.za or visit *www.cansa.org.za*

CHEM NUTRI ANALYTICAL

From accreditation to application: Defining the standard in soya analysis

By George Schmulling, SHEQ manager, Chem Nutri Analytical

In our industry, everything starts with trust in the data. Whether evaluating raw materials, making formulation decisions, or maintaining quality control, results only matter if they are consistent and comparable.

Soya remains one of the most widely used and nutritionally significant raw materials in poultry feed. Even small variations in composition can directly affect feed cost and formulation efficiency and, ultimately, influence animal health and performance. Accurate and reliable analysis is therefore essential.

This is where accreditation plays a defining role. In South Africa, accreditation by the South African National Accreditation System (SANAS) represents the highest level of independent verification of laboratory competence. It is not merely a certification, but an ongoing evaluation of a laboratory's ability to produce technically valid and defensible results. At Chem Nutri Analytical, this principle is central to how we operate, and is clearly reflected in the scope of our accreditation.

Complete scope for soya analysis

Chem Nutri Analytical is the only SANAS-accredited laboratory on the continent, and possibly internationally, with a full scope of accreditation covering soya analysis. This scope includes protein, moisture, fat, ash, fibre, mineral analysis, and oil quality parameters, as well as protein quality indicators such as potassium hydroxide (KOH) solubility and the protein dispersibility index (PDI). It also covers anti-nutritional factors, such as urease activity and trypsin inhibitor activity (TIA).

Individually, these parameters are vital; collectively, they provide a complete picture of soya quality. What sets this apart is not only the range of analyses but also the fact that all parameters fall within the accredited scope. This means they are measured using validated methods, under controlled conditions, with demonstrated accuracy and precision.

Across the industry, laboratories may offer a wide range of analyses, but often only a portion of these are accredited. The remainder are conducted using non-accredited or internally developed methods, limiting comparability and confidence in the results.

At Chem Nutri Analytical, the full soya profile falls within the scope of accreditation, ensuring dependable results that can be trusted across applications. With thousands of soya samples analysed annually, this scope is not theoretical; it is applied daily, generating a large and expanding dataset of high-quality, accredited analytical results.

Participation in proficiency testing further reinforces this. Maintaining an average Z-score well within internationally recognised limits demonstrates alignment with both local and international peer laboratories, confirming the reliability of the methods in practice.

Accredited data in action

A dataset built on accredited methods, covering multiple parameters across thousands of samples, provides a level of confidence that is difficult to replicate. It also enables advanced analytical applications, such as near-infrared spectroscopy (NIR).

NIR offers rapid, non-destructive analysis and is widely used for screening purposes, but its role must be clearly understood:

- Wet chemistry remains the gold standard.
- NIR does not replace it; it complements it.
- NIR is a predictive tool. Its accuracy depends on the quality of the calibration models used, and those calibrations are only as good as the reference data used to build them.

This is where most systems fall short and why SoyaGuard was developed. Rather than relying on generic or externally sourced calibration models, SoyaGuard is build using data generated within Chem Nutri Analytical's laboratory, using SANAS-accredited methods. As a result, the calibration models are based on data that is validated, traceable, and produced consistently under controlled conditions.

The dataset used is also locally derived, incorporating samples from across South Africa and neighbouring regions. Many NIR models available in the market are developed using datasets from other regions, such as Europe or North America. While technically sound, these models do not always reflect the variability seen in African raw materials.

SoyaGuard addresses this directly by using an African dataset that reflects real-world conditions. This improves the robustness and relevance of the predictions. The model itself covers the full proximate profile, as well as key functional and anti-nutritional parameters, including protein, moisture, fat, ash, fibre, TIA, KOH solubility, PDI, and urease activity.

Calibration performance

The strength of any NIR model lies in its calibration performance. For SoyaGuard, this is reflected in *Table 1*.

The values reflect calibration models developed from a large, diverse dataset encompassing a wide range of sample types and regional variability. The standard error of calibration (SEC) represents the expected deviation between laboratory reference values and corresponding NIR predictions and can be interpreted as the typical range within which NIR results will fall (approximately laboratory result ± SEC).

It is important to note that certain parameters, such as PDI, are inherently more variable due to the nature of the

Table 1: SoyaGuard calibration performance.

Constituent	Unit	SEC	Type
Protein (Dumas)	(g/100g)	0,453	PLS
Protein (Kjeldahl)	(g/100g)	0,571	PLS
Moisture	(g/100g)	0,752	PLS
Fat	(g/100g)	0,235	PLS
Ash	(g/100g)	0,363	PLS
Fibre (crude)	(g/100g)	0,311	PLS
PDI	%	4,440	PLS
KOH	%	2,810	PLS
TIA	(mg/g)	0,374	PLS
Urease activity	(ΔpH)	0,066	PLS

reference method. The AOCS Official Method recognises both intra- and inter-laboratory variability, with internal repeatability differences of up to 4,375 units and inter-laboratory differences of up to 9,664 units. In this context, the observed SEC of 4,440 for PDI falls well within the expected variability of the reference method. This confirms that the observed variation is driven by the analytical method itself, rather than the performance of the calibration model.

Balancing speed and accuracy

While wet chemistry methods remain the reference standard, SoyaGuard provides a valuable extension of that capability. It enables rapid screening of samples, offering immediate insight into key quality parameters. This is particularly useful in high-throughput environments where timely decisions are essential.

This means faster assessment of incoming raw materials; early identification of out-of-specification samples; additional confirmation alongside laboratory results; and improved decision-making at intake and formulation stages. Importantly, this speed does not come at the expense of reliability. Because the model is built on accredited data, the predictions remain anchored to validated analytical results.

Wet chemistry provides accuracy, validation, and a reference framework, while NIR provides speed, efficiency, and real-time insight. When combined correctly, they create a system that is both robust and practical. At Chem Nutri Analytical, this integration is deliberate.

Final thoughts

Accreditation is a fundamental part of operating a laboratory that can be trusted. It is what makes reliable application and innovation possible. At Chem Nutri Analytical, everything we do is built on this foundation. From our accredited soya analysis scope to the development of SoyaGuard, the focus remains the same: Produce data that can be trusted, implemented, and defended.

SoyaGuard is a direct extension of this approach, taking accredited science and applying it in a way that adds speed and efficiency, without compromising accuracy. And ultimately, that is what matters.

For more information, contact Chem Nutri Analytical at info@chemnutri.co.za or 011 316 8800.

Accredited science at the heart of agriculture

By Theresa de Beer, specialist analyst, SAGL

The Southern African Grain Laboratory NPC (SAGL) was founded in 1997, following the deregulation of South Africa's agricultural marketing boards, with a clear vision: to be recognised as the market leader in grain and associated analyses in Southern Africa.

By 1999, its Crop Quality Division (CQD) had achieved South African National Accreditation System (Sanas) accreditation in line with ISO/IEC 17025 standards, cementing its reputation for quality and reliability. The laboratory's accreditation status is maintained through regular surveillance audits by Sanas, a signatory to the International Laboratory Accreditation Cooperation (ILAC), ensuring that SAGL's services are recognised internationally.

Providing industry support

Initially focussed on wheat and maize, SAGL has since expanded its scope to include oilseeds and oilseed products, offering trusted, independent data across the entire grain and oilseed value chain. One of its key roles is participation in commodity forums and technical committees, where SAGL provides data and interpretation to guide industry-level decision-making. The laboratory also works closely with wheat, maize and sorghum breeding companies and field trialists, as well as the Agricultural Research Council (ARC) for oilseeds, analysing trial samples to support cultivar selection for commercial production.

Each year, SAGL conducts national crop quality surveys that provide vital insights for the agricultural industry. These surveys track the quality of commercial crops across regions, highlight differences in production, and supply key data for exports. They also help identify trends linked to environmental change and food safety, guide regulatory decisions, and support seed breeders in developing cultivars suited to South African conditions.

The surveys ensure that producers, researchers and policymakers have reliable information to improve efficiency and maintain the high standards of the country's grain and oilseed value chain. Imported crops are tested using the same methods, allowing direct comparison with local production. In addition, annual mycotoxin surveys monitor post-harvest/pre-storage and post-storage/pre-processing samples. SAGL assists the industry by evaluating mycotoxin screening kits for use in non-laboratory environments and advising on regulatory changes to safeguard food safety.

Research and testing

SAGL contributes to research and capacity building by collaborating with universities and hosting student internships. The processing industry also benefits from projects that address quality challenges and optimise efficiency, for example, developing methods to measure enzyme activity in malted sorghum.

Another project investigates changes in the texture of maize pap and their relationship to milling quality. In collaboration with the ARC, SAGL developed this quality evaluation parameter based on the analysis of whole maize using near infrared transmittance, which provides a non-destructive, inline tool that can be used to predict maize milling performance.

SAGL plays a vital role in monitoring fortification compliance in South Africa and in bridging communication between industry stakeholders and government departments to mitigate the impact of regulatory changes on the industry.

To ensure accuracy and reliability across the sector, SAGL offers proficiency testing schemes for maize, wheat, soya bean, sunflower and related products. These schemes verify laboratory performance, highlight training needs, and confirm instrument accuracy, all of which are critical for grain trading and regulatory compliance, including grading regulations. SAGL also provides tailored training programmes for analysts, equipment suppliers and product developers, while analysing calibration samples for instrument manufacturers.

In 2016, SAGL expanded further with the creation of the Crop Protection Division (CPD), achieving Sanas accreditation and Organisation for Economic Co-operation and Development (OECD) good laboratory practice (GLP) compliance the following year. The CPD delivers independent testing of crop protection products, such as pesticides, focussing on storage stability under OECD GLP principles, shelf-life extension studies, and seed treatment quality control, with testing for active ingredients and impurities according to international standards.

SAGL's staff comprises a dedicated, well-trained team with a thorough understanding of the agricultural sector and the ability to adapt to evolving testing and regulatory requirements. Its technical specialists bring extensive expertise in analytical methods, project design, and technical knowledge in their field of study, while the management team strengthens operations with decades of experience in research, laboratory management, and project management.

In short

Since its establishment nearly three decades ago, SAGL has grown beyond its role as a testing facility to become a cornerstone of the grain and oilseed value chain. By combining precision in analysis, trust in independent data, and a commitment to growth through collaboration, SAGL continues to empower and support industry stakeholders while reinforcing its reputation as both a guardian of quality and a driver of progress.

Send an email to Theresa.deBeer@sagl.co.za or visit *www.sagl.co.za* for more information.

Litigation: The value of class action

By Hans-Jurie Moolman, Moolman & Pienaar Incorporated

Events, decisions, and actions by individuals and/or the state often affect the rights of others. In many instances, more than one person, institution, or interest group may be impacted.

Our legislative and decision-making processes are designed to include public participation or consultation with individuals. This ensures that decisions are made with due recognition of competing interests and potential impacts on rights. Unfortunately, these processes are not always followed.

Unlawful decision-making

In some cases, even when processes are formally observed, underhanded tactics, such as fabricating evidence, can create the illusion that public and stakeholder rights have been considered. Often, affected parties only become aware of the consequences when the decision is already at an advanced stage of implementation.

Some of the key issues frequently involved in such cases are:

- Decisions by provincial governments regarding activities that require environmental approval.
- Applications for prospecting, mining, or exploration.
- Decisions by local authorities regarding land rezoning, township establishment, changes in land use, and water licence applications.
- Measures to control the outbreak and spread of animal diseases.
- Activities by individuals that, when exercised unreasonably, constitute a legally contestable nuisance to others.
- Land claims.

Contesting the case

When public participation fails to produce the desired impact and the relevant decision-makers do not recognise the rights of affected individuals or institutions, litigation or contesting the case in court becomes the final recourse.

> By joining forces, the costs of litigation are shared among many, rather than borne by a single person or institution, making the process more accessible.

However, litigation presents significant challenges. Court cases are often too expensive for most individuals. Even after a favourable ruling, there is the possibility of an appeal to a higher court which will typically suspend the original judgment until the appeal is resolved. This situation leaves people in an untenable position: their rights are infringed while they may lack the resources to defend themselves.

Class actions are increasingly emerging as a possible solution. They allow individuals whose rights have been violated to come together and collectively pursue legal action to defend their shared interests. By joining forces, the costs of litigation are shared among many, rather than borne by a single person or institution, making the process more accessible.

Working together in this way spreads the financial burden that would otherwise fall on a single party or institution, reducing each participant's individual cost. As a result, achieving a favourable court outcome and protecting one's rights becomes financially accessible to everyone who contributes.

Enforcement of rights

Section 38 of the *Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)* explicitly recognises the right to group action where fundamental rights in Chapter 2 of the *Constitution* are affected. It provides as follows:

"Anyone listed in this section has the right to approach a competent court, alleging that a right in the *Bill of Rights* has been infringed or threatened, and the court may grant appropriate relief, including a declaration of rights. The persons who may approach a court are:

(a) Anyone acting in their own interest.
(b) Anyone acting on behalf of another person who cannot act in their own name.
(c) Anyone acting as a member of, or in the interest of, a group or class of persons.
(d) Anyone acting in the public interest.
(e) An association acting in the interest of its members."

Addressing the complex challenges of our time requires more innovative approaches. As litigation becomes essential for protecting and enforcing rights, it is crucial that individuals and institutions join forces. Collaborative action strengthens the likelihood of success and ensures that cases can be pursued to their conclusion, securing final judgments where necessary.

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Deductions from employees' compensation

By Tiaan Botes, legal advisor, LWO Employers Organisation

Good intentions can easily lead to costly disputes when deductions are incorrectly made from employees' compensation. This is one of the most common violations identified by inspectors from the Department of Employment and Labour during farm visits. Such mistakes can cost employers in terms of money, time, and working relationships.

Sectoral Determination 13, as gazetted under the *Basic Conditions of Employment Act, 1997 (Act 75 of 1997)*, provides clear rules governing deductions.

What does the law say?

Deductions required by law, such as income tax (PAYE) and contributions to the Unemployment Insurance Fund (UIF), must be made by the employer. These deductions are mandatory and non-negotiable. The same applies to deductions made in terms of a court order or arbitration award against the employer.

Under certain conditions, an employer may deduct up to 10% of an employee's regular wages for food and up to 10% for housing. However, the following conditions apply:

- Food or accommodation must be provided consistently and regularly as part of employment.
- No additional deductions for food or housing may be made from the employee's remuneration.
- The deduction may not exceed the actual cost to the employer of providing the food or housing.
- Regarding housing, no additional deductions may be made for electricity, water, or other services.
- Before a housing deduction can be made, the dwelling must comply with certain minimum standards: The roof must be durable and watertight; the dwelling must have glass windows that can be opened; electricity must be available inside the house if electricity infrastructure exists on the farm; safe water must be available in or near the house (within 100m); the dwelling must be at least $30m^2$ in size; proper toilet facilities must be available, such as a flush toilet or a pit latrine inside or near the dwelling.
- In the case of communal housing (where more than two employees live together), the maximum deduction allowed is 25% of the employee's minimum wage, and the employer must divide the deduction equally among the employees.
- No deductions for housing may be made for children under the age of 18.

An employer may also deduct repayments for loans or advances made to an employee, provided that the deduction does not exceed 10% of the employee's wages on the relevant payday.

Deductions for payments to third parties may only be made at the written request of the employee. Examples include medical aid contributions, pension fund payments, or trade union subscriptions.

Employers may recover the cost of damage to or loss of property only if the damage occurred during the course of employment and the employee was found responsible. The employer must follow a fair process and give the employee an opportunity to explain why the deduction should not be made. The employee must agree to the deduction in writing, and the total monthly deduction may not exceed 25% of the employee's monthly remuneration.

The law strictly prohibits deductions from an employee's wages for tools, work clothing, training costs, grazing for the employee's livestock, or fines for misconduct or breach of the disciplinary code. Deductions made without written consent, without a legal basis, or outside the limits prescribed by legislation are also prohibited.

Practical advice to employers

Ensure that every deduction is clearly reflected on the employee's payslip, including the name, amount, and reason for it. Employers should also keep accurate records of all deductions in the employee's personnel file. Where written consent is required, it must always be obtained. Verbal agreements are often not sufficient evidence in court.

Legislation governing wage deductions is strict. Employers are therefore advised to seek specialist advice to ensure full compliance with the applicable legal requirements.

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 Commission for Conciliation, Mediation and Arbitration (CCMA). Take note that this article is not legal advice – consult one of our legal advisors about any specific legal problem or matter. For more information, send an email to info@lwo.co.za or visit *www.lwo.co.za*

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