

# OILSEEDS

# focus

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Weed control and crop rotation



Animal feed demand

Soya bean exports here to stay

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# Cutting costs to retain long-term competitiveness

*By Theo Boshoff, chief executive officer, Agbiz*

**This year has reminded us of the extent to which South African agriculture – particularly the grains and oilseeds industry – is affected by international events beyond our control.**

La Niña has resulted in two consecutive years of above-average rainfall. While this is generally positive for field crops, the exceptional rainfall has resulted in damage to crops and a delay in harvesting. The ongoing conflict in the Black Sea region has also harmed the subsector.

On the one hand, it resulted in higher input costs as energy prices soared and fertiliser costs increased due to reduced global supply coupled with higher shipping costs. On the other, drought and supply-side constraints from the Black Sea region pushed up the price of oilseeds and cereals. This will not be news to anyone operating in the subsector.

## **Maintaining SA's profitability**

While 2022 may be an outlier, the Bureau for Food and Agricultural Policy predicts global prices for the field crop sector to be largely flat. With this in mind, the South African subsector needs two elements to remain profitable, namely scale and a reduction in costs. As part of Agbiz's efforts to create an enabling environment for agribusiness in the country, our focus is squarely on systemic elements that reduce unnecessary costs to the system.

Discussions are under way with Transnet to determine the prerequisites for companies to consider moving grain transport back to rail. South Africa used to transport up to 80% of this commodity on rail, but this percentage flipped once government decided to focus its infrastructure spend on roads.

Globally, long-distance transport by rail is significantly cheaper than by road, but significant changes would be required for the industry to move back to rail.

In certain instances, sidings have been neglected and significant investment may be required to operationalise these silos after 25 years of inaction. It would be unfair to expect agribusinesses to carry this burden, thus financial solutions in partnership with government and development agencies are needed to revitalise these lines. Likewise, not all lines will be financially feasible.

## **Facing challenges, together**

Agbiz is in the process of signing an interface agreement with Transnet whereby industry and transport can jointly map out the agro-logistic network and identify areas where partnerships are needed. Reliability is another key constraint, but the industry and Transnet are already working closely to improve service and clamp down on cable theft, which causes disruptions.

Regulatory costs related to product inspections also need to be viewed within the broader prism of competitiveness. The grading and inspection of grain is a necessary component to facilitate trade, but the various options available to do so must be analysed. There is a legitimate purpose to these inspections, but the options need to be carefully considered to ensure that preference is given to a system that reduces costs and avoids duplication while still meeting the objective of the *Agricultural Products Standards Act, 1990 (Act 119 of 1990)*.

## **A culture of innovation**

Agbiz is facilitating a process that brings together stakeholders within the broader value chain, as well as the Department



*Theo Boshoff.*

of Agriculture, Land Reform and Rural Development. We hope that through continued dialogue, the parties will arrive at a conclusion that maintains standards with due regard to the costs imposed as this affects the competitiveness of the sector.

Finally, South Africa needs to embrace a culture of innovation if we are to remain competitive in the face of climate change. The industry has embraced biotechnology, but work is needed to foster a regulatory environment that encourages the adoption of technology. 🌱

For enquiries, send an email to the author at [theo@agbiz.co.za](mailto:theo@agbiz.co.za).

# Grain, oilseeds and oil markets turn bearish

**G**lobal market prices for vegetable oils declined due to pressure from the supply of Indonesian palm oil. This, even though palm oil exports increased rapidly, with palm oil stocks in Indonesia that continue to increase.

In terms of soya bean, South American exports declined by 20% year-on-year. Slow demand for soya bean and soya bean meal has recently been a bearish factor. Purchases of soya beans by China have decreased, with a clear attempt to switch to soya beans from South American origin in a bid to reduce dependence on the United States.

## Ukraine: Things are looking up

The production of canola in Canada is expected to recover significantly this year due to favourable weather conditions, while Ukraine's canola production could be larger than expected at three million tons, despite an adverse environment, limited storage capacity and concerns about logistics. The rapid increase in the production of biofuels is also affecting the oils and fats market.

After having been stranded in the port since February, the first shipment of grain (26 000 tons of maize) left the Port of Odesa in the Ukraine at the beginning of August under a deal brokered by the United Nations, in an effort to help ease the global food crisis.

## Oilseed crops in South Africa

A record soya bean crop of 2,15 million tons and an exceptional sunflower crop of 922 750 tons bode well for the oilseeds industry in South Africa, bringing us ever closer to self-sufficiency in terms of oilseeds meal for animal feed production and oil for human consumption; a target that the supply chain has been working hard towards for many years.

The prospects for an even bigger area planted to oilseeds in the coming season

are high due to price ratios, input cost differences and profitability.

The quality of sunflower seed (mainly the protein level) is of concern for oilseed crushers. The levels of sunflower oilcake protein this year are postulated to be mainly the result of weather, lower heat units and possible higher-than-normal levels of *Sclerotinia*.

Large oilseed crop yields should result in prices remaining at export parity. The export of soya beans this season, mainly through Maputo, illustrates that we can be exporters of soya beans in the long term. To remain globally competitive, yields must continue to increase.

## The latest in soya production

The new technology being introduced to commercial soya bean production, as well as improved germplasm is predicted to soon bring a welcome boost in yields. This process has been assisted by the South African Cultivar and Technology Agency's levy that is aimed at the introduction of improved technology.

Enjoy this issue of *Oilseeds Focus*.

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](mailto:erhardb@netactive.co.za) for more information.

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### To subscribe

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



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# NEWS

## New varieties for Tanzanian groundnut growers

Groundnut growers in the Mpwapwa District in Tanzania are elated about the Mangaka 2009 improved seed variety developed by the Tanzania Agricultural Research Institute (TARI) Naliendeale.

According to local producers, the variety has high yield potential, drought and disease resilience, as well as early maturity, compared to the old varieties they rely on. Mangaka 2009 seed variety is among the 11 new and improved groundnuts developed by TARI Naliendeale. The new varieties are high-yielding, drought- and rosette-tolerant with market preferred traits.

A research scientist and national co-ordinator of the Groundnut Research Programme, Dr Happy Daudi, said the 11 new and improved varieties are essential for sustained increase in crop yield against climate change uncertainties.

Dr Daudi said the new varieties included Naliendeale 2009, Mangaka 2009, Nachi 2015, Narinut 2015, Mtwaranut 2016, Tanzanut 2016, Mnanje 2009, Nachingwea 2009, Masasi 2009, Kuchele 2015 and Naliendeale 2016. She said the Mangaka 2009 variety takes 90 to 100 days with an average yield ranging between one and two tons per hectare. – *AllAfrica*

## Food ministry wants further cut in oil prices

The food ministry in India recently called a meeting of edible oil manufacturers and trade bodies to discuss the possibility of a further reduction in the retail prices of cooking oil, amid a fall in global prices of these commodities.

This will be the third such meeting since May. Global edible oil prices have witnessed a decline, especially after Indonesia, the biggest exporter of palm oil, removed the ban on shipment and eased the supply of sunflower and soya oils.

India meets 56% of its annual edible oil consumption via imports. According to trade data, landed prices of palm oil, which has a share of more than 56% in India's import basket, fell by more than 14% to \$1 170/ton on 29 July from the level a month ago.

Similarly, soya bean and sunflower oil prices have declined by 4 and 14% to \$1 460/ton and \$1 550/ton, respectively, in the last month. These two have a combined share of 43% of India's edible oil import bill.

– *Financial Express*

## Syngenta Seed announces leadership transition

Hendrik van Staden has been appointed Syngenta's Seeds business unit head of Sub-Saharan Africa. "In his new role, Van Staden will guide the organisation in its mission to foster the current momentum and to drive further growth of the seeds business in Africa, and advance our commitment to regenerative agriculture," Kobus Lindeque, former seeds business unit head of sub-Saharan Africa, said.

Lindeque was instrumental in the integration process between Sensako and Syngenta in South Africa and the development of a summer crop growth strategy to support the extremely successful Sensako wheat seed business. This growth strategy of Syngenta's Seeds business in Africa will be the foundation for future growth. As an expert business mentor, Lindeque will remain available in the capacity of a business consultant and will work closely with Van Staden in the onboarding process.

Most recently, Van Staden was part of the Bayer customer marketing team as the campaign activation and branding lead for Africa. He focussed on the implementation of tactical marketing campaign plans linked to go-to-market strategies.

Over the past couple of years, Syngenta announced a renewed focus on the seed business in sub-Saharan Africa. Syngenta is globally recognised as a reputable company providing producers with vigorous, strong and innovative hybrids, varieties and biotech traits, as well as crop protection options to suit all growing conditions.

– *Press release, Syngenta*



*Hendrik van Staden.*

## Erratum: Key decisions in weed management

In the June 2022 issue of *Oilseeds Focus*, the article "Key decisions and actions in weed management prior to establishing the next crop" erroneously referred to 'picloram' instead of 'paraquat'. All references to 'picloram' must be replaced by 'paraquat'. A rectified version of the article was placed in all e-versions of the June 2022 issue of *Oilseeds Focus*. Anyone who wishes to receive a copy of the rectified article is welcome to send an email to lynette@plaasmedia.co.za.



### Sunflower could expand edible oil industry

Despite Tanzania being the second biggest sunflower producer in Africa and accounting for about a third of the continent's total production, the country still imports nearly half of the edible oil it consumes annually.

This is largely due to low production of sunflower and other sources of edible oil such as groundnuts, sesame, cotton and palm. However, the cultivation of sunflower – which grows well in semi-arid and semi-humid areas – has been steadily increasing in recent years.

This demonstrates the potential that sunflower farming holds, and it behoves farmers and other stakeholders to take full advantage of the associated opportunities. However, there are three major challenges that need to be addressed by government and other stakeholders so that the sunflower sub-sector can play an important role in the edible oil industry in Tanzania.

These are availability of proper sunflower seeds and assured access to finance and reliable markets. Stakeholders such as the Agricultural Markets Development Trust have shown the way through their bundled services, which help farmers to obtain proper seeds and access some financial services.

Research into different seed varieties should be encouraged to help farmers who are currently struggling with low-yield seeds. Availability of financial services in rural Tanzania also remains a major challenge.

Another point of concern is the markets for sunflower oil that require support. Today, the Tanzanian market is awash with imported palm oil, discouraging farmers and other investors within the sector. – *The Citizen*

### Unexpected rise in US soya ratings

Condition ratings for the United States (US) soya bean crop unexpectedly rose in places such as Illinois, North Dakota, South Dakota and Minnesota, the US Department of Agriculture (USDA) said.

The USDA pegged the soya bean crop as 60% good to excellent as of July 31, up by 1% from a week earlier and in line with ratings from a year earlier.

A better-than-expected soya crop from the US, the world's top exporter after Brazil, could help replenish supplies of the oilseed at a time of tight global stocks. Analysts had been expecting the report to show good to excellent ratings of 58%, according to a Reuters poll. – *Hellenic Shipping News*



### Record canola plantings as oil prices soar

Skyrocketing prices have led to a record amount of canola being planted in Australia this year. The Australian Oilseeds Federation (AOF) estimated that more than 3,4 million hectares of canola had gone in across the country, including 880 000ha in New South Wales (NSW).

This represented a new record for NSW and 25% up on the area harvested last year. Despite the increase in hectares sown, production forecasts are below last season, with the 2021 yields seen as hard to beat.

AOF executive officer, Nick Goddard, said price was the driving factor in the swing to canola this year. "Prices have gone through the roof during the last 12 months and that's made canola a very attractive option," Goddard said. Canola futures were above \$1 200/ton during the sowing period but have since dropped back to around \$800/ton.

The record peak in prices was partly driven by concerns over Ukraine's sunflower production, with canola oil as a substitute for sunflower oil. – *abc.net* 🌱

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# RHIZOBIA SYMPOSIUM & SCLEROTINIA DISCUSSION

DATE: 7 September 2022

TIME: 08:00

VENUE: CSIR Convention Centre  
BROUGHT TO YOU BY: OPDT/OAC

## PROGRAMME

### RHIZOBIA SESSION 1

|             |                                          |                                                                   |
|-------------|------------------------------------------|-------------------------------------------------------------------|
| 08:00-08:30 | Registration                             |                                                                   |
| 08:30-08:45 | Opening and welcome                      | Dr E Briedenhann                                                  |
| 08:45-09:15 | International experience: Rhizobia       | AR Maglia,<br>Rizobacter                                          |
| 09:15-09:45 | Registration of Rhizobia in South Africa | T Nepfumbada,<br>Retrose Scientific                               |
| 09:45-10:15 | Application of Rhizobia                  | JR Etherington,<br>Microbial Biological Fertilizers International |

### 10:15-10:30 TEA BREAK

|             |                                                                                             |                             |
|-------------|---------------------------------------------------------------------------------------------|-----------------------------|
| 10:30-11:00 | Seed coating and treatment with Rhizobia                                                    | TBA                         |
| 11:00-11:30 | Rhizobia research in South Africa                                                           | Dr A Hassen,<br>ARC-PPRI    |
| 11:30-12:00 | Importance and efficiency of various strains                                                | TBA                         |
| 12:00-12:30 | Rhizobia in various soil types, soya bean cultivars, testing of samples and standardisation | Dr R Hendriks,<br>Mikrobika |
| 12:30-13:00 | Question and answer session                                                                 |                             |

### 13:00-14:00 LUNCH

### SCLEROTINIA SESSION

|             |                                                               |                                                   |
|-------------|---------------------------------------------------------------|---------------------------------------------------|
| 14:00-14:30 | Sclerotinia Research Network and research                     | Dr Lisa Rothmann,<br>University of the Free State |
| 14:30-15:30 | Panel discussion: Progress with <i>Sclerotinia</i> management | J du Plessis,<br>Facilitator                      |
| 15:30-15:45 | Conclusion                                                    | G Keun                                            |

### COCKTAILS AND NETWORKING



# ISO 17025 ACCREDITED

## PROTEIN AND UREASE ANALYSIS

With the adoption of AOCS methodology, and participation in AOCS oilseed industry proficiency schemes, Central Analytical Laboratories (CAL) is the leading laboratory in the region for the crushing industry.

# Soya bean *Bradyrhizobium* persistence or an inoculation paradox?

## The case of Mooigelegen Farm, east of Ermelo

By Dr Ahmed Hassen, Khumbudzo Ndhlovu, Prudence Mtsweni, Ansa van Vuuren, Elna van der Linde and Francina Bopape, Agricultural Research Council Plant Health and Protection (ARC-PHP), Abe Shegro Gerrano, Agricultural Research Council Vegetables, Industrial and Medicinal Plants (ARC-VIMP), Pretoria, and Food Security and Safety Focus Area: Faculty of Natural and Agricultural Sciences, North-West University, and Olubukola Oluranti Babalola, Food Security and Safety Focus Area: Faculty of Natural and Agricultural Sciences, North-West University

About 88% of the over 19 321 known species of the plant family *Fabaceae* (legumes) form a symbiotic association with a group of soil microbes known as rhizobia (Chaulagain and Frugoli, 2021). The association leads to the formation of specialised structures, namely nodules on the roots of legumes.

Inside the nodules, the rhizobia convert atmospheric nitrogen ( $N_2$ ), usually unavailable to plants, into a usable form of nitrogen (N), namely ammonia ( $NH_3$ ). The  $NH_3$  is then converted to amino acids and amides within the nodules, after which it is transported in the xylem sap to other parts of the legume plant. This important interaction between the legumes and the rhizobia that results in converting N gas into a usable form of plant-available N is termed biological N fixation (BNF).

Using this process, it is estimated that 50 to 60 million tons of N are fixed annually by the symbiotic interaction between rhizobia, 250 million hectares of pulse and oilseed crops, and 220 million hectares of pasture legumes globally (Farquharson *et al.*, 2022).

### Exploring rhizobia inoculation

According to an early study by Van Rensburg *et al.* (1976) the indigenous soil rhizobia, which specifically nodulate and fix N in soya bean, are absent in many African soils, including South Africa. It is therefore essential to inoculate soya bean plants with the appropriate type of rhizobia, *Bradyrhizobium japonicum* (*B. japonicum*), in the form of liquid or powdered inoculants.

Inoculation with rhizobia is also required when a legume is grown in a particular soil



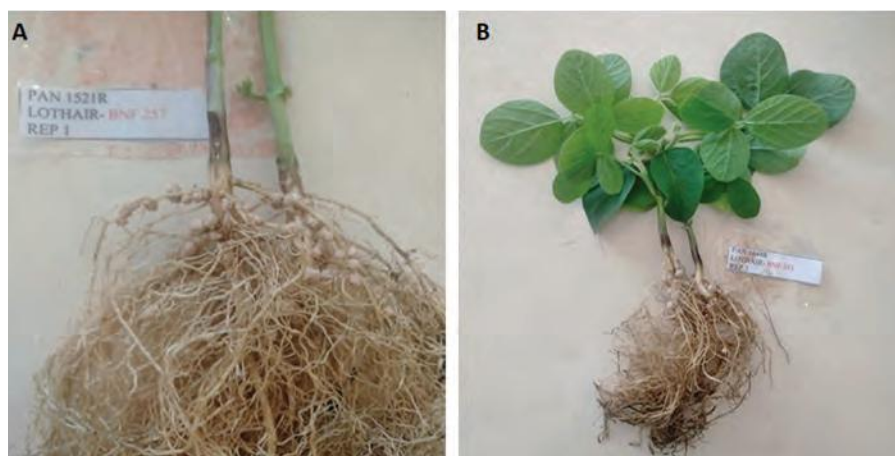
Photo 1A) Soya bean roots uprooted from Mooigelegen Farm showing several prominent nodules formed mainly on the root crown regions (photo: Jantjie Randell). B) The same plants on the field on which the nodules in Photo 1A are shown (photo: Jantjie Randell). C) Dr Ahmed Hassen and Prudence Mtsweni of the ARC-BNF unit are pictured with Jantjie Randell at one of the fields planted to maize. D) Dr Abe Shegro Gerrano of ARC-VIMP (left) and Dr Ahmed Hassen collect soil samples from the maize rhizosphere.

for the first time or after a break of several years. This is because compatible, effective rhizobia will not be present in such circumstances and therefore inoculation with a high concentration of rhizobia is required (Farquharson *et al.*, 2022).

In December 2021, a team of research scientists from the Agricultural Research Council Plant Health and Protection (ARC-PHP), as well as the ARC-Vegetables, Industrial and Medicinal Plants (ARC-VIMP) visited Jantjie Randell, a soya bean producer at Mooigelegen Farm in Lothair,

east of Ermelo, for a survey and soil sampling as part of an existing soya bean inoculants research project funded by the National Research Foundation (NRF).

Randell has been growing soya bean and other crops such as maize for several years. He used to treat his soya bean plants with *Bradyrhizobium* inoculants every second year, using mainly seed treatment and sometimes liquid application of different commercially available products of *B. japonicum* strains in furrows. However, he stopped inoculating his soya bean



Soya bean roots showing several big nodules on the crown region formed in a glasshouse soil trapping experiment after soya bean cultivar PAN 1521R (photo 2A) and PAN 1644R (photo 2B) were planted in soils collected from the rhizosphere soils on Mooigelegen Farm. The nodules were formed by the native soil rhizobia which were trapped by the roots (photo: Khumbudzo Ndhlovu).

seeds with *Bradyrhizobium* products as he claimed that his untreated seeds could do better in his soils.

The last time he inoculated his soya bean with rhizobium inoculants was in 2014. Nevertheless, the producer employs other management practices such as correcting soil with nitrogen, phosphorus and potassium (NPK) fertilisers in the ratio of 1:2:4 and later 1:2:6, and planting soya bean by rotating with maize every other season.

Randell plants mainly two types of cultivars at a time. In the past he used soya bean cultivars such as LS 6161R, PAN

1664R, PAN 1532R, PAN 1623R and P 64T39.

### Root nodule formation

By the time this survey was done, the soya beans had just been planted and there was not yet an opportunity to collect and observe the nature and abundance of the root nodule formation. Randell was asked if he had any record or information on the amount of N fixed per hectare by his soya bean plants without having to treat the soya beans with any *Bradyrhizobium* inoculant products.

Except for the lack of information available on the amount of biologically fixed N, he indicated that on the best soya bean fields it was possible to obtain a yield of as much as three tons per hectare per year.

Photo 1A to 1D shows soya bean root nodules and the plants in the field on Randell's farm in 2021. As can be seen in Photo 1A, several large nodules were formed on the crown region of the root, which Randell confirmed were active nodules owing to the pink colour inside and, of course, the yield that was achieved.

This observation made by Randell appeared paradoxical on the surface regarding the necessity of inoculation with rhizobia, especially under South African conditions in which the soils are devoid of the specific

rhizobia that nodulate soya bean and fix atmospheric nitrogen.

### Testing rhizosphere soil samples

To validate this and as part of our research objective, we collected rhizosphere soil samples from three different sites on the Mooigelegen Farm which were planted to soya bean and maize in the 2021/22 growing season. The soil samples were taken to the laboratories and were subjected to a glasshouse trapping experiment to verify the presence of native rhizobia isolates in the collected samples, or possibly persistent rhizobia isolates from past inoculations that might potentially colonise the roots and form root nodules by planting different soya bean cultivars.

The results obtained were very interesting in that most of the soya bean cultivars, including PAN 1532R used by producers in the past, were able to form intact green shoots with seemingly effective nodules, i.e. large pink nodules mainly on the crown root region when grown in the native soils collected from the rhizosphere (Photo 2A and 2B).

The next task was to investigate if the trapped nodules harbour rhizobia (particularly *B. japonicum* and other *Bradyrhizobia* species) commonly involved in the nodulation and N fixation of soya bean. Thus, we conducted a molecular identification method for each bacterial isolate retrieved from the root nodules of each soya bean cultivar.

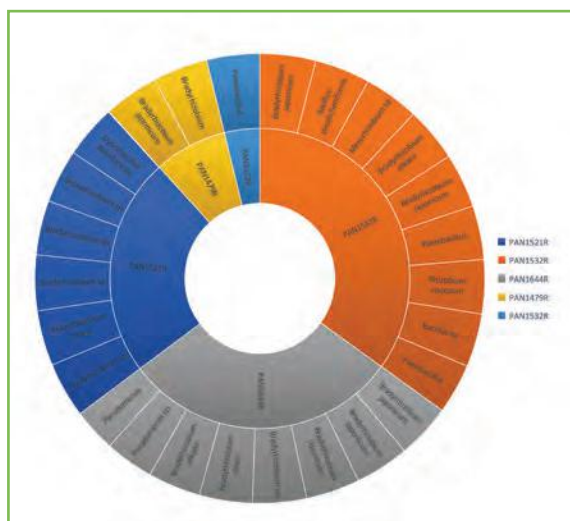
This identification shows that *B. japonicum*, *B. elkanii* and other *Bradyrhizobium* spp. survive in the native soils and were trapped by more than one soya bean cultivar used in the glasshouse trapping experiment (Figure 1).

Some other bacteria also retrieved from the nodules such as *Pseudomonas*, *Paenibacillus* and *Bacillus* are not root nodulating and N fixing symbionts, but could be living in the nodule tissues as endophytic bacteria. Generally, in our observation, the relative abundance of non-*Bradyrhizobium* spp. such as *Mesorhizobium*, *Rhizobium* and other non-*Rhizobium* endophytes was very low.

### Concluding remarks

Soya bean (*Glycine max* L.) is not a crop native to South Africa and was first introduced and cultivated as an economic crop in 1903. When an exotic legume such

**Figure 1: Identification of species and genus level of rhizobia strains isolated from the root nodules of soya bean after being trapped from the rhizosphere soil in a glasshouse experiment. (Source: Khumbudzo Ndhlovu, Biological N<sub>2</sub> Fixation unit, ARC-PHP)**



as this is introduced into new soil, its growth and yield will only be improved by inoculating it with rhizobia, hence the necessity of inoculation.

Inoculation is also essential when the soil contains a higher population of rhizobia that are only competing for nodulation, but are not effective in N fixation. Therefore, it is always recommended to conduct a 'need to inoculate experimental trials' in order to decide whether or not inoculation is required in a given soil before growing legumes, as reported by Howieson and Dillworth (2016).

Despite the fact that soils at Mooiegelegen Farm have not been planted to soya beans inoculated with rhizobia for the past eight years, quite a large population of rhizobia could be detected from the native rhizosphere soil. Most of the rhizobia detected in the native soil belong to *B. japonicum* and *B. elkanii*, as compared to other fast-growing rhizobia.

This could be an indication that the inoculant strains (seed treated or in furrows application) applied many years ago could have persisted and survived in the soil for up to eight years since the

last time Randell treated his seeds with rhizobia inoculants.

Such persistence of inoculant strains of rhizobia has been reported before (Lindstrom *et al.*, 1991). The report indicated that two inoculant strains of *Rhizobium galegae* that nodulate and fix N in the perennial forage legume, *Galega officinalis* (goat's rue), remained persistent in the soil for five years.

Similarly, another inoculant strain, *Lotononis bainesii*, remained in the soil for 12 years. It is therefore imperative to note that, although in some instances non-inoculated soya bean plants perform better than the *Rhizobium* treated ones, this is most probably only because of the occurrence of a large population of naturalised *B. japonicum* and *B. elkanii* strains, which persisted and survived in the soil from the previous inoculation events.

It is worth noting that if native rhizobial populations are absent or not effective, it is always important to inoculate exotic legumes such as soya beans with exotic rhizobial strains of known potential. That is why the exotic strain *B. japonicum* WB74 (=CB1809) was introduced in South Africa in 1998 as a

soya bean inoculant after confirming its efficacy under field conditions.

Finally, while modern agriculture plays a significant role in the attainment of food security, it is our belief that producers' indigenous knowledge has a huge contribution to agricultural research to improve the global food sustainable system. 🌱

### Acknowledgements

We would like to acknowledge the NRF for funding this research under Grant Nr 135456 to Dr Ahmed Hassen, and for the PhD postgraduate bursary to Khumbudzo Ndlhovu.

Due acknowledgement also goes to Jantjie Randell, soya bean producer at Mooiegelegen Farm in Mpumalanga, for allowing us to do a survey and sample collection on his farm.

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# Rhizobia:

## What do nodule numbers tell us?

By Dr Ronel Hendriks, chief scientific officer, Microbika

**S**oya bean nodulation is a very complex interaction between a legume host plant and its symbiotic bacterial co-worker. Nodule number is a topic with many diverse opinions. What is our current scientific understanding of the process of nodulation, the communication between the host plant and *Rhizobium* bacteria, as well as the factors involved in determining nodule number?

### Nodules: Nitrogen factories

Nodules are plant structures but for the sake of the simplicity of this article, we will call them nitrogen factories; factories that do not initiate or become active in the absence of factory workers (rhizobia). When a legume plant senses nitrogen limitation, it will produce signalling molecules (called flavonoids) to inform rhizobia of its intention to put up nitrogen factories.

In response to this recruiting signal, rhizobia will respond by signalling molecules (called nod factors). This complex exchange of signals is essentially an agreement between the employer (the legume plant) and the employees (the rhizobia) to put up nitrogen factories (Figure 1).

Different employers (legume cultivars) and employees (*Rhizobium* strains) have diverse and multifaceted skill sets. For example, some *Rhizobium* strains are more competitive, better communicators and more productive (Narožna *et al.*, 2015; Mendoza-Suárez *et al.*, 2021).

The same goes for different cultivars (employers) and how they manage their resources (i.e., water and nutrition) and perform (photosynthesise) under a specific set of conditions. Some employers perform better under stress, while others are more vulnerable to disease or nutritional deficiencies (Nicolás *et al.*, 2002; Kunert *et al.*, 2016).



It has been suggested that different employers (cultivars) communicate and interact in a diverse manner with different employees (*Rhizobium* strains). Some data has even confirmed that certain cultivars are unable to effectively communicate with specific *Rhizobium* strains (Nicolás *et al.*, 2002; Hayashi *et al.*, 2012).

The nitrogen factories require energy, such as sugars from photosynthesis, to run nitrogen fixation. The production team (rhizobia) consumes a lot of photosynthates to perform the conversion of atmospheric nitrogen to ammonia (Wagner, 2011). Although the exact metabolism inside the nodule is still under investigation, we know that photosynthesis (sugar production) plays a major part in the productivity of the nitrogen factories (Lopes *et al.*, 2019).

### Legume plant plays a key role

The employer (legume plant) is the main decision maker. The decision-making

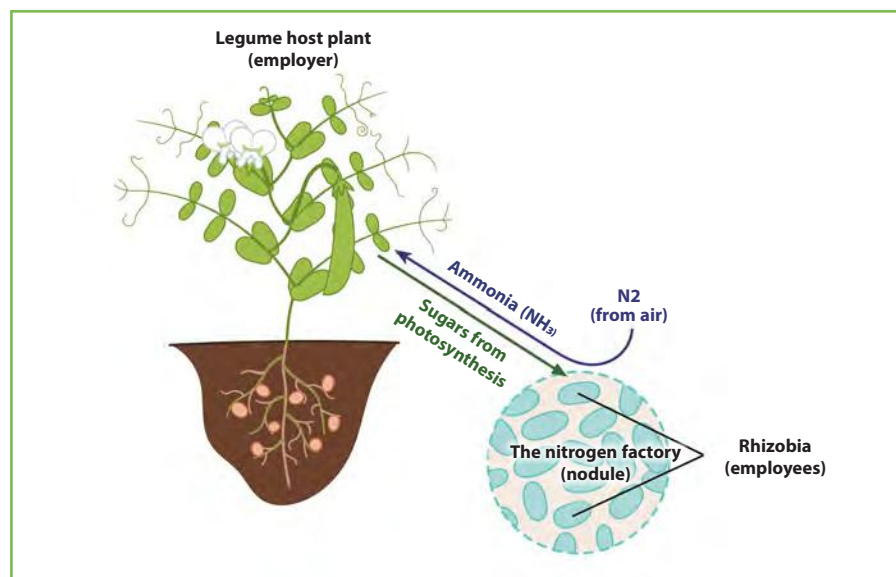
process by which a specific legume cultivar regulates the number of nodules, and the activity of these nitrogen factories, is called autoregulation of nodulation (Kinkema *et al.*, 2006; Ferguson *et al.*, 2010; Reid *et al.*, 2011; Mortier *et al.*, 2012).

When a hypernodulating mutant is constructed, the legume plant is essentially stripped from this decision-making function. The result? Plants with an average of 282 nodules per plant (Lopes *et al.*, 2019). Is this the next step towards record yields? Unfortunately not.

What happens in these hypernodulating mutants is that the nitrogen factories deplete the plant of all its carbohydrate sugars, resulting in the plants becoming stunted and producing no yield.

At this point, it seems that the number of nodules is not only a good indicator of a successful employer-employee match, but it can also be indicative of how effective a specific employer (cultivar)

**Figure 1: Relationship between the legume host (employer) and rhizobia that are employed to work on the production line in the nitrogen factories (nodules).**  
(Source: Wikimedia Commons, 2022)



(King and Purcell, 2001; Lopes *et al.* 2019). Nodule number is a complex interplay between cultivar, *Rhizobium* strain, plant nutrition, stress and photosynthetic efficacy. All these factors play a crucial role in the plant's decision-making process with regard to the number, size and activity of nitrogen factories (nodules).

For now, nodule number is but a single indicator of how a specific cultivar-rhizobia strain combination responds to a specific set of conditions. Although we cannot control nodule numbers, we can support optimal nitrogen fixation by choosing the best cultivars, quality *Rhizobium* inoculants, and optimal plant nutrition to facilitate optimal photosynthesis, the driving force behind nitrogen fixation and yield. 🌱

manages its resources under the specific set of conditions (soil, climate and nutrition) (Nicolás *et al.*, 2002; Kunert *et al.*, 2016).

Photosynthetic efficiency plays a central role in providing the fuel for the production team and increasing production in the nitrogen factories

(Libault, 2014). Larger nodules equal higher nitrogen fixation (King and Purcell, 2001).

#### Size matters too

Nodule number is not as simple as more is better. However, nodule size seems to correlate with more efficient factories

For enquiries, send an email to  
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Denis Leisegang in 'n sojaboonplantasie by Sterkrivier naby Potgietersrus. Foto: Verskaf



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# Detection and quantification of *Sclerotinia sclerotiorum* in soya bean seed

By Dr Lisa Rothmann, Marlese Meiring, Naomi Kleinhans and Neo Hlongwane, University of the Free State

Seed health is critical to ensuring a healthy yield, not only for the producer's pocket, but also for the consumer's wellbeing. However, soya bean yield and quality (protein and oil content) are being threatened by diseases caused by fungal pathogens. These include, but are not limited to, anthracnose (caused by *Colletotrichum truncatum*), charcoal rot (caused by *Macrophomina phaseolina*), leaf rust (caused by *Puccinia pachyrhizi* and/or *P. meibomia*), *Sclerotinia* stem rot (caused by *Sclerotinia sclerotiorum*) and sudden death syndrome (caused by a complex of *Fusarium* spp).

These diseases can either impact yield indirectly by influencing the onset and rate of seed germination, causing seedling death, stunted plant growth and infected pods, or directly through influencing seed quality and quantity. Additionally, *Fusarium* spp and *Aspergillus* spp are known to produce mycotoxins (secondary metabolites) which are toxic if consumed by animals and humans. Most of the aforementioned pathogens (as well as *Cercospora* spp and *Phomopsis* spp) can survive in plant debris and seed for several seasons, making these diseases an ongoing problem if not managed in a timely fashion.

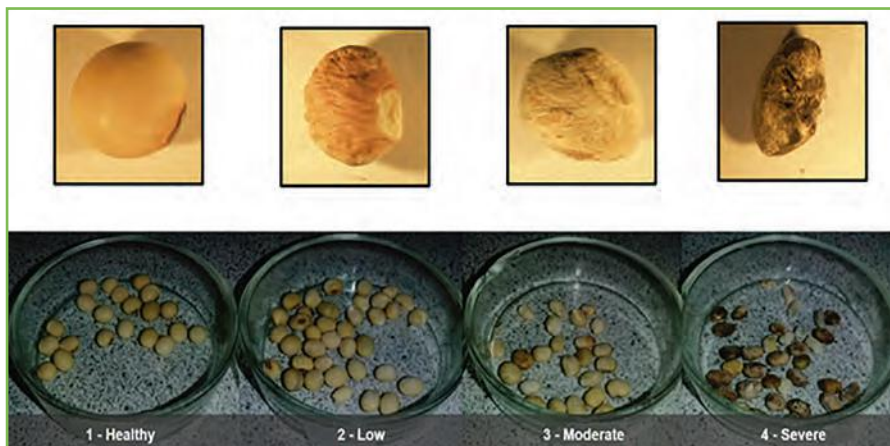
To avoid the introduction of *Sclerotinia sclerotiorum* (*S. sclerotiorum*) into cropping systems, pathogen-free seed should be utilised, and certified seed should be your first defence against *Sclerotinia* (stem rot) in soya beans (Du Plessis, 2018).

A study conducted in 2021 at the University of the Free State aimed to confirm the presence of *S. sclerotiorum* in soya bean seed grown under South African conditions. Soya bean seed collected from experimental field trials from the 2019/20 and 2020/21 seasons

in Delmas were randomly selected and ranked according to seed health classes. Four seed health classes were assigned and determined by seed discolouration, abnormal appearance and size: One = healthy; Two = low disease; Three = moderate disease; and Four = severe disease (Figure 1).

Four hundred seeds – 200 from each season – were surface sterilised to remove any superficial fungal contaminant and were plated onto a semi-selective media. The semi-selective media was initially

**Figure 1: Four health classes grouped according to abnormalities of soya bean seed colour, size and general appearance.**



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neon blue, but in the presence of *S. sclerotiorum* a yellow halo formed around the seed, indicating the presence of the pathogen (Photo 1). Once a yellow halo was present, the colony was grown until sclerotia – the survival structure – had formed in order to confirm that *S. sclerotiorum* is indeed the causal organism. The germination percentage of the seed classes were also determined in this study.

Seed included in Class 1 presented no colonies as expected, which indicated healthy seed that was not infested/infected with pathogens. Additionally, seed from Class 4 hosted the greatest fungal colonies, indicating the greatest presence of disease-causing organisms. The germination percentage of the seed was also as expected – the most germinated among Class 1, and the least germinated among Class 4.

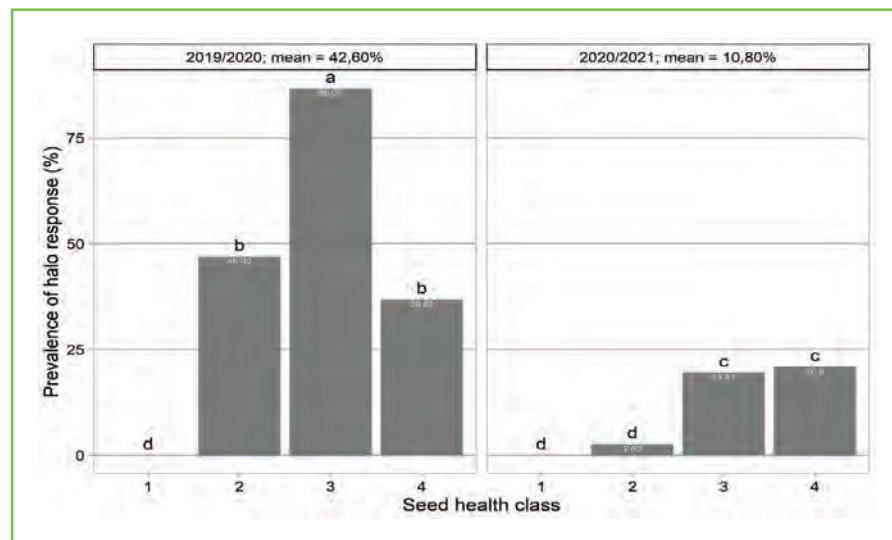
The seed from Class 1 had the highest average germination percentage because no pathogens were found in the seed, and seeds functioned optimally (Figure 2). Seed health Class 3 indicated the greatest average halo formation, indicating the presence of *S. sclerotiorum* (Figure 2). Although seed health Class 4 did not have the greatest halo formation, the lowest germination percentage was associated with this seed health class.

Seed within health Class 4 may have been infected by pathogens that cause more severe effects than seed infected by *S. sclerotiorum*. Seeds infected with *S. sclerotiorum* had a white 'powdery' appearance, as presented in seed Class 3. The seed was also malformed and had a reduced seed weight. Sclerotia



Photo 1: *Sclerotinia sclerotiorum* grown from seed health Class 3.

Figure 2: The prevalence of halo responses of fungal colonies after 48 hours' incubation on Steadman semi-selective media across two seasons.



Mean values in the graphs are the average percentage of the prevalence of halo formation of the four seed health groups; values with the same letter indicate means do not differ statistically.

formation confirmed that it is was indeed *S. sclerotiorum* within the seed.

Additionally, the average halo formation across the two seasons indicated a higher average of halo formation for the seed from the 2019/20 season than for the 2020/21 season, which indicated that there was more stem rot in the 2019/20 season than in the 2020/21 season. The amount of stem rot found in the field on the plant tissue during these seasons (38,33% for the 2019/20 season; 10,80% for the 2020/21 season) correspond with the seed health findings (Figure 2).

Disease management is divided into four critical strategies, namely avoidance, exclusion, eradication and protection. The tactic of disease-free seed, or acceptable thresholds, is included in exclusion. This tactic is critical to mitigating the entry or build-up of primary inoculum in production systems. However, in lieu of disease-free seed, chemical treatments can be applied to seed, a tactic of the protection strategy, to increase seedling survival.

Currently, the active ingredient fludioxonil, as well as strobilurin products such as azoxystrobin, trifloxystrobin or pyraclostrobin, are used to manage soya bean seedborne diseases.

The research group is currently busy with a master's project titled "Identification, prevalence and fungicide control of seedborne fungi associated

with soya bean". The hope is that the study can contribute to identifying commonly associated soya bean seed pathogens and potential seed treatments to reduce future yield losses, as well as inoculum persistence.

As *S. sclerotiorum* was confirmed to be seedborne in seed appearing diseased, producers need to be mindful when sorting retained seed to avoid reinfection in fields. Heeding the advice of Hanlie du Plessis and making use of certified seed will reduce the risk significantly. 🌱



Scan this QR code to read the article by Hanlie du Plessis (2018) from the South African National Seed Organization.

For more information, contact Dr Lisa Rothmann at 051 401 3666 or [lisa.ann.rothmann@gmail.com](mailto:lisa.ann.rothmann@gmail.com).

# International Sunflower Conference: A global overview for industry partners

By Dr Nicky Creux, Forestry and Agricultural Biotechnology Institute, University of Pretoria

**T**he International Sunflower Association is the host of the International Sunflower Conference (ISC) every four years and was expected to host its 20th event in 2020. However, due to the Covid pandemic, the meeting was postponed to 2022 and took place at the end of June in Novi Sad, Serbia.

The 438 participants from around the world attended nine keynote lectures, 74 oral presentations and 80 poster presentations. There were ten different sections, and each was opened by an invited plenary speaker to provide an overview of each topic. The sections could be grouped into four main themes: sunflower breeding, sunflower pest control, sunflower yield improvement and sunflower production.

## Speakers impart their knowledge

Sunflower breeding was a major focus and the plenary speakers included Dr Felicity Vear of the National Research Institute for Agriculture, Food and the Environment (INRAE) in France (retired), who provided a beautiful overview of traditional breeding goals and shifts in these goals in her career. She highlighted several new breeding goals and indicated areas where more efforts should be concentrated, including pollination, predation and abiotic stress.

Dr Sreten Terzić of the Institute of Field and Vegetable Crops in Serbia, discussed the importance of diverse wild sunflower collections. Identifying and incorporating desired wild species traits into breeding populations are important for cultivar improvement. Dr Nicolas Langlade of INRAE provided an overview of the Sunrise Project, a multimillion-Euro initiative to survey the genetic diversity of sunflower to identify important genetic tools for breeding better abiotic resistance. The goal is to incorporate information from

high-powered genetic studies into crop models to better predict yield outcomes in changing environments.

Finally, Dr Stéphane Muñoz, also of INRAE, focussed on using genetic and sequencing tools to understand and breed for resistance to sunflower broomrape (*Orobancha cumana*). It was interesting to note that many breeding programmes are moving away from *Sclerotinia* resistance, as this pest has significantly declined in many European climates due to warmer, drier seasons in the region.

## Tackling challenges

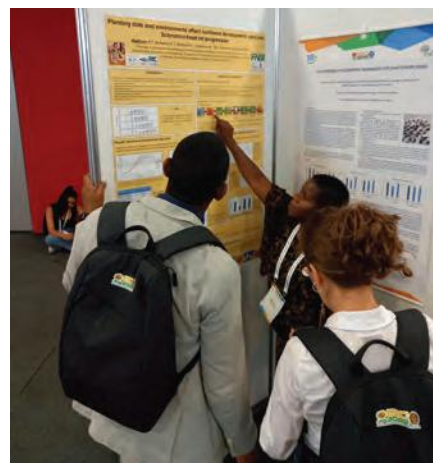
There was a large number of talks and discussions on the different pests and pathogens affecting sunflower production around the world. In the plenary session, Dr Leire Molinero-Ruiz of the Spanish National Research Council (CSIC) discussed the continued efforts to find biological control agents against the major sunflower pests including *Sclerotinia*, *Verticillium* wilt, downy mildew and broomrape.

While there were a few discussions on *Sclerotinia* and its control, the majority of the research was focussed on controlling broomrape and downy mildew. While broomrape is not a current threat for South African sunflower producers, it is important to monitor the situation. Dr Muñoz highlighted that broomrape was recently identified in North Africa and has spread to many other parts of the globe. An interesting study assessed the use of *Trichoderma* to control *Sclerotinia* head-rot with bumble bees as a dispersal method. This work is, however, in the early stages and the effectivity across a field is unclear.

As expected, there were also several presentations focussed on improving sunflower yield, including the role of pollination and alternative agronomical practices. In her plenary session,



On the left is Phrasia Mapfumo, PhD student at the University of Pretoria, who was the runner-up in the best poster presentation. Next to her is Dr Hüdaverdi Gürkan, a postdoctoral fellow at Ankara University in Turkey, who was the winner of the best poster presentation. The award was presented at the gala dinner of the 20th International Sunflower Conference in Novi Sad, Serbia, to early career scientists who showed good communication skills and scientific excellence.



Phrasia Mapfumo (PhD student, University of Pretoria) presenting her poster, which earned her the runner-up award.

Dr Nicky Creux of the University of Pretoria presented an overview of how anthesis and pollination are affected by abiotic factors. Other studies also



Dr Nicky Creux of the Forestry and Agricultural Biotechnology Institute of the University of Pretoria presented her invited plenary talk on the delicate balancing act of climate control during flowering, pollination and seed development in sunflower.

highlighted that even though cultivated sunflower is self-fertile and does not require insect pollination, insect pollination appears to greatly improve seed yield.

Dr Philippe Debaeke of INRAE discussed emerging agricultural practices and growing environments for sustainable sunflower production. He spoke about shifting planting dates and growing regions as a strategy to mitigate the effects of climate change. Dr Debaeke also highlighted the need to explore double-cropping systems and agroforestry as sustainable options in the future.

In the agronomy section, Phrasia Mapfumo, a PhD student at the Forestry and Agricultural Biotechnology Institute at the University of Pretoria, won the runner-up poster award for her presentation on how planting date and environments affect sunflower development, yield and *Sclerotinia* head-rot progression.

### A look at the global market

There were several important discussions about the global oilseed market and Dr Etienne Pilorgé of Terres Inovia in France provided a comprehensive overview, mentioning that South Africa is currently one of the top ten producers worldwide. He said the impact of the global political landscape, where Russia and Ukraine normally produce 80% of the world's sunflower oil, is significantly affecting availability and pricing.

According to Dr Pilorgé, there is a possibility that sunflower could lose its market value due to the increased prices, driving individuals to cheaper alternatives. However, he also highlighted the opportunity for other sunflower producing nations to step up and help fill the current gap. On this same topic, Dr Chao-Chien Jan of the United States Department of Agriculture in Fargo (retired) discussed the

potential of confectionary sunflower as an emerging market.

Overall, this was an important event in the global sunflower community, bringing together industry partners and researchers to discuss the major threats facing sunflower production. Companies such as Syngenta, Corteva, Limagrain Zaad, Sanrui and Feed & Seed were major sponsors of the event and also participated by hosting a field day at the end of the conference and presenting results on new products making their way to the market. 🌱

Much of the research presented at the conference is available online in the 2022 topical issue of the *Oilseeds and Fats, Crops and Lipids Journal*, Volume 27, 2020, under Sunflower/Tournesol. Visit <https://www.oel-journal.org/component/toc/?task=topic&id=1158> to access the issue. The presentation line-up of the ISC can also be viewed at <https://isc2020.com/detailed-program/>.

For any additional enquiries, contact Dr Nicky Creux at [nicole.creux@fabl.up.ac.za](mailto:nicole.creux@fabl.up.ac.za).

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# The impact of inadequate boron levels on canola crop production



By Dr Anneli Heyns, project and communications manager, Nutrico SA

The physiological role of boron (B) during canola crop production is well established. It plays a key role in cell wall biosynthesis, carbohydrate and protein metabolism, cell division, cell elongation, as well as the development of root and shoot growing points.

Boron is essential for the plant during times of rapid growth in autumn and stem extension in spring. It is also required for pollen germination and pollen tube growth, ensuring adequate seed set in the pods. Boron also plays a vital role in the plant's natural defence against invasion and attack from fungal pathogens.

Inadequate levels of B during canola crop production are known to be an inhibitory factor for seed vigour and quality, leading to low seed yield and inferior oil quality when B deficiency is not proactively managed.

## Boron deficiency symptoms

Boron is the only nutrient that, when in inadequate supply, accelerates physiological processes instead of reducing them, and can therefore lead to abnormal cell growth. One of the earliest vegetative signs of B deficiency is the formation of brown necrotic areas within the pith of the stem. The plant leaves may also turn a paler green with interveinal yellow mottling and a reddish tinge around the margin. A reduction in the internodes of the stems gives the plants a stunted appearance.

Severe deficiencies can result in vertical cracking of the stems, which are often hollow at the stem base. Later in the

season, flowering appears restricted and distorted with infertile flowers, leading to a reduced number of pods and fewer seeds per pod, consequently producing significantly reduced yields.

The biggest risk, however, is that B deficiency can markedly reduce the seed and oil yield even when the plants show no obvious vegetative growth deficiency symptoms. For this reason, proactive/preventative management of B levels is advised.

## Soil versus foliar application

Crops grown on soils with adequate B levels may still be at risk of B deficiency where its availability to the plant is restricted. This could be due to a high soil pH, dry conditions during the growth periods or inadequate zinc (Zn) supply.

Foliar application may be used to supply B to a crop when B demands are higher than what can be supplied via the soil. Additional benefits of foliar sprays over soil uptake include uniform application, immediate response to deficiency, and lower application rates.

## When to apply boron

The symptoms of B deficiency are observed when B content in soil drops to 5 to 25mg/ha. Annual recommendations

of B for canola crops should be split up and applied three times a year to match the important physiological growth phases. These include autumn for root growth and frost tolerance, at the onset of stem extension due to rapid plant growth, and at the start of flowering to ensure pod set and the maximum number of seeds.

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For more information on how to use MolboroX® to boost canola yields and increase the quality of the oil produced, contact your local Nutrico representative at 011 392 4072 or [info@nutrico.co.za](mailto:info@nutrico.co.za).

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- IMPROVED tolerance to glyphosate herbicide provided by Round Up Ready 2 (RR2) Technology.

## What is African Bollworm and why is it so important to control it?

The African Bollworm, *Helicoverpa armigera*, is a lepidopteran insect pest capable of causing significant economic losses for growers if left unchecked. It is a polyphagous insect pest meaning that it is able to feed on a whole host of plant species and can cause significant damage in cultivated crops. Besides the obvious yield losses through direct feeding on the pods, secondary infections by opportunistic fungi and bacteria can take place. These secondary infections can significantly reduce the quality of the harvested soybeans and ultimately lead to further economic woes for the farmer. Controlling these insect pests effectively will lead to yields of higher quantity and quality.

## PROTECTION against major pests that attack soybeans like African bollworm (*Helicoverpa armigera*)

One of the main benefits of INTACTA RR2 Pro technology is the protection against

one of the most devastating insect pests in soybean production, the African Bollworm.

## How does INTACTA RR2 PRO technology offer protection?

- Resistance to African Bollworm is conferred through a *Bt* protein produced in INTACTA RR2 Pro Soybeans. The Cry1Ac *Bt* protein is highly efficacious against the African Bollworm
- The larval stage of the African Bollworm feeds on the INTACTA RR2 Pro soybeans, ingesting the *Bt* protein
- The larvae stop feeding and die within 72 hours.

## Increased yield potential through repositioned herbicide trait on the soybean DNA to MAXIMISE yield

INTACTA RR2 Pro technology is helping farmers increase their yield potential by allowing farmers to farm more efficiently, sustainably and ultimately more profitably. Through extensive research on a molecular level, the Round up Ready 2 gene was placed precisely in a region of the soybean's DNA, resulting in a positive impact in the yield performance.

## A number of key factors contribute to this increase in yield potential:

- This higher yield potential is a direct result of the repositioning of the glyphosate-tolerance trait on the DNA of the soybean
- Protection from devastating yield losses caused by African Bollworm feeding through the introduction of the *Bt* gene
- Increased efficiency through a reduction in the number of applications of insecticides to the soybean crop.

## IMPROVED tolerance to glyphosate herbicide provided by Round Up Ready 2 (RR2) Technology

The improved tolerance to glyphosate is a crucial benefit in INTACTA RR2

Soybeans. The insertion of this gene allows farmers to control weeds consistently and effectively right from the very start. Keeping soybean fields weed-free is crucial to prevent competition from weeds which rob the soybeans of important nutrients, water and sunlight.

## What is a refuge area and why is it so important?

A refuge area is a vital tool in insect-resistance management and protecting this technology for years to come.

A refuge area is a portion of the farm or field which is not planted with *Bt* technology so that a portion of the African Bollworm population is never exposed to this technology and remain susceptible. Refuge should be planted according to the minimum recommendations indicated for soybean which is 20% of the total planted area.

It is important that farmers still carry out constant monitoring and use the additional measures of Integrated Pest Management (MIP) to ensure the efficacy of the trait.

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## Innovation in open-pollinated crops driven by SACTA's breeding and technology fee

*By Magda du Toit*

**T**he expansion of South Africa's soya bean industry is a success story that has led to more sustainable cultivation practices, processing capacity, and the substitution of imported soya bean oilcake and oil with locally produced products. In business terms – a win-win situation for all involved.

Three years ago, the grain and oilseed crops industry found a novel way to fund technology and cultivar development in open-pollinated crops in South Africa. A fair and sustainable value capturing system by means of a breeding and technology levy was introduced to drive innovation down the entire value chain.

For many years yields of self-pollinated crops, especially soya beans, in South

Africa lagged behind those of other global production areas. Seed companies have been hesitant to release new varieties and advanced traits in South African self-pollinating crops. 'Farmer's privilege' has resulted in a high percentage of farm-saved seed, which in turn has prevented seed companies from selling sufficient seed to justify their investment in breeding and technology.

This situation limited productivity and competitiveness in the local soya bean sector, and also had knock-on effects on the vegetable oil and livestock sectors.

### **A landmark breakthrough**

In a co-operative industry drive, the South Africa Cultivar and Technology Agency (SACTA) was established in 2016 to collect

and administer breeding and technology levies for self-pollinated crops in the country. SACTA is not linked to a specific commodity and addresses only the need to advance the breeding of self-pollinated grain and oilseeds, by collecting a levy at the first point of sale or delivery and by paying breeding and technology levies to seed companies and plant breeder rights holders based on estimated market shares.

According to Gert Heyns, former CEO of SACTA, an investigation into the future viability of the current soya bean breeding and technology levy system that was recently conducted by the Bureau for Food and Agriculture Policy (BFAP), indicated that the levy system was a landmark breakthrough in keeping the soya bean industry viable and that it

ensured that producers could gain access to the latest varieties and technologies.

Heyns added that the levy system was the missing 'cog' in the seed industry, but with this now in place, the industry has been able to operate more effectively in terms of accessing new seed varieties and biotechnology.

"The system is benefitting the entire value chain – producers can enjoy new germplasm and technology, seed suppliers are receiving an income to reinvest in breeding, and the downstream value chain is benefitting with improved grain and more local material. With new varieties and technology, local producers are now better equipped to compete with producers in other world production areas."

### Notable soya industry growth

The envisaged benefits of the levy may be found in the expansion of the soya bean industry over the past three years. During the 2021/22 production season, the area planted to soya beans was 925 000ha, compared to 46 000ha in the 1992/93 production season. The local production of soya beans increased from 1,3 million tons during the 2016/17 season, to 209 million tons during the 2021/22 season. During this period, the area planted to soya beans increased from 574 000 to 925 000ha.

Although the growth was also driven by profitability, the promise of new improved varieties and technologies created the platform for growth and confidence, and producers started looking to soya beans as a viable rotation crop option in a broader production area.

It is expected that the current upwards trend in production will continue with new technologies and cultivars becoming available to producers.

The 2020, 2021 and 2022 levy collection has been successful and to a great extent achieved the intended goal. With a proven functioning royalty capturing system in place, seed companies are willing to bring more technology to South Africa, even though the country is a relatively small soya bean producer where more than 80% of seed is farm-saved seed.

### More than 50 new varieties

In the recent past, 56 new soya bean varieties have been registered in South Africa, substantially increasing soya

bean variety choices for producers and making the industry more competitive. An additional benefit has been the lowering of seed prices.

Seed companies also commenced with trials to initiate the deregulation process for new traits, and to register new varieties. In August 2021, the first of these, Intacta Roundup Ready2 Pro, was launched. Intacta Roundup Ready2 Pro is the second genetically modified soya bean trait to be approved for cultivation in South Africa after the first Roundup Ready soya bean trait was approved back in 2001. This means that local producers now have access to technology that has been available on the global market for the past six years, but also that newer varieties containing the trait can be imported for cultivation.

These cultivars have a higher yield potential and are currently in registration trials. It is expected that small amounts of seed might even be available for the next planting season.

Two other companies are also in the process of deregulating their traits and it is expected that these could be available for the market by 2025/26, further broadening producers' choices. South Africa's soya bean yield has the potential to increase by 50% over the next five years with new seed germplasm, genetically modified events, precision farming technology and improved farm practices.

### How does the levy work?

The breeding and technology levy is a statutory levy under the *Marketing of Agricultural Products Act, 1996 (Act 47 of 1996)*. The following factors are important.

- The amount cannot be higher than 5% of the commodity price.
- Administration fees cannot exceed 10% of nett income.
- Of the collected levy amount, 20% has to be spent on transformation.

Negotiations between producers, farmer organisations, and seed companies resulted in a technology and breeding levy for soya beans of 1,2% of the previous two years' average SAFEX price for soya beans per ton at the time of application, with 1% allocated towards germplasm owners with plant breeders' rights, and the 0,2% to the company or companies that own the biotechnology

traits. During the Grain SA congress earlier this year, it was agreed to keep the levy percentage at 1,2% for the next two years.

Of the collected amount, about 5% is allocated to administration and collection services, and 20% to development/transformation. Of the remaining 75%, 16,67% is allocated to the genetically modified (GM) trait owner/s, and the remainder to the owners of the germplasm in accordance with their market share.

Payments to seed companies are based on market share and calculated based on seed sales (40% weight in calculation), producer declarations (30%), and additional research that includes surveys and additional industry information (30%).

The agricultural industry in South Africa cannot be self-sufficient when 70% of wheat and 80% of soya beans are planted with farm-saved seed without some return on investment and innovation from seed companies. In the past, the consequences of these practices have been felt in severely reduced investment in new cultivars and breeding programmes which, in turn, has negatively influenced yields and competitiveness.

### The bigger picture

The breeding and technology levy should not be seen as a value-capturing system diverting producer profit into the pockets of officials. The SACTA breeding and technology levy should rather be seen as a method to drive innovation in the value chain and an investment in the sustainability of the grain market in South Africa. It is aimed at driving producer profits and crop productivity.

The levy enables breeding programmes to afford access to new sources of germplasm, biotechnology, better equipment, tools and infrastructure, and to participate in the value chain with international expertise. 🌱

For any enquiries about the SACTA breeding and technology levy or related topics, contact SACTA at 012 807 3958 or [andrew@sactalevy.co.za](mailto:andrew@sactalevy.co.za). Alternatively, visit <https://sactalevy.co.za/crops-with-levies/>.

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# Globalisation and oil incentives: Repositioning the 'stepchild' crop

*By Andries Wessels, product development lead, Syngenta South Africa*

**R**ecent European conflicts have thrust agricultural commodities, particularly sunflower, into the limelight. These events have refocused the impact of globalisation on local sunflower production and the price effect will remain for some time.

Local producers are now re-evaluating the perception of sunflower as a traditional 'stepchild' crop and will likely reposition sunflower as a major contributor to their income. Sunflower in South Africa will play a significant role in driving producer profitability, given this globalisation effect. Add oil incentives to this mix and the stage is set for sunflower to claim its rightful place on high potential soil with early plantings.

When comparing the latest Crop Estimates Committee numbers, there were some significant increases in the 2022 plantings compared to last year, with an almost 40% production area increase year-on-year. This drastic increase supports the notion that sunflower will be a key crop for growers going into the coming planting season.

An additional benefit is the fact that the sunflower market has room to grow and will compete more successfully with maize, which is already at a mature market level.

## Rewards for oil content

When comparing South Africa's oil industry to that of international peers, our value chain lacks a reward system

for oil content. In the United States, the European Union and Argentina, producers are rewarded for oil content on top of their commodity prices. Why is this not also the norm in South Africa since oil is such a valuable plant-based commodity?

Several arguments could be tabled, ranging from a price-sensitive consumer base, a crushing capacity that is concentrated in ownership, and perhaps genetics that do not lend themselves to oil content as they were the casualties of a system that does not reward for oil content. Whatever the argument, the essence is that everyone involved in the value chain draws the shortest straw when oil concentration is not incentivised.

Perhaps the Argentine model gives some much-needed clarity. It allows for producers to be rewarded a 2% price premium for every 1% point above 40% oil content on an 'as is' basis. For example, a producer delivering sunflower with a 44% oil content will receive an 8% price premium. This oil content increase also has significant downstream advantages for crushers who simply procure based on volume needs.

By simply increasing the oil content in a ton of sunflower that is fed into a crushing facility, no additional expenses have to be incurred to extract the oil.

## Selection criteria for hybrids

The Agricultural Research Council's annual sunflower trial report also gives some interesting insights into the difference

between hybrids when comparing oil. Significant value can be unlocked by simply selecting hybrids based on their oil yields, and not getting stuck in the groove of grain yield as primary selection criteria for hybrids.

The 2019 report shows certain hybrids at a whopping 51% average oil concentration. This underlines the value of hybrid selection for oil concentration to easily unlock the largest gains in value capturing in the oil industry, as opposed to grain yield improvements.

Local crusher, the Central Edible Oil Company, has seized the opportunity to incentivise high-oil concentrations by allowing producers exclusive grower contracts for specific high-oil hybrids that are delivered directly to their facility in Boksburg. This end-to-end value chain paves the way for an industry rewarding producers for producing oil, not just grain.

The reset button on the value of oil concentration needs to be pressed for the industry and the consumer to benefit. If producers benefit from improved oil yield hybrids through price premium incentives, the industry is transformed, and the simplicity of a high-oil trait will initiate real market sophistication. 🌱

For enquiries, contact the author at 011 541 4079 or [andries.wessels@syngenta.com](mailto:andries.wessels@syngenta.com), or visit [www.syngenta.co.za](http://www.syngenta.co.za).



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# How to determine which maturity group of soya beans to plant in South Africa

By Jaco Strauss, IntelSeed South Africa

**S**oya bean varieties are categorised into maturity groups (MGs). MGs are based on the time frame from when the seed is sown to when the plant is ready to flower. These MGs are classified according to a scale from one to ten, with one being the MG that takes the least time to reach maturity and ten being the MG that takes the longest time to reach maturity in optimal conditions.

## Maturity group, area and climate

Over the past few years, through the use of trials, we have been able to conclude that we can use an MG range from 4,8 to 6,8 in South Africa.

To determine which MG would be suitable for planting season, we must first identify the area. By identifying the area, we gain an understanding of the climatic conditions and thereafter we can determine the appropriate planting time for soya beans. Should soya beans be planted at the wrong time, the conditions will not be favourable during the growing season.

Rainfall is the main determining factor for soya bean planting time. Soya beans generally have a very high tolerance to drought conditions up to and including the R1 stage; in other words, the reproductive stage when the plant enters the flowering and reproduction phases. In this specific period up to and including physiological maturity, the plant needs sufficient rain and dark hours to ensure optimal yield.

## Know when and which MG to plant

The optimal planting time for soya beans is from mid-October to as late as the first week in January in certain parts of South Africa. Should there be good early summer rainfall, producers can start planting in mid-October with an MG of 4,8 to 5,6. During the early season planting slots, MGs of 4,8 to 5,6 will reach the optimal plant size, resulting in optimal yield. During the later season planting slots, MGs from this range will reach the reproductive stage much sooner. The result is a smaller plant with potentially fewer internodes and fewer pods per plant, ultimately resulting in suboptimal yield.

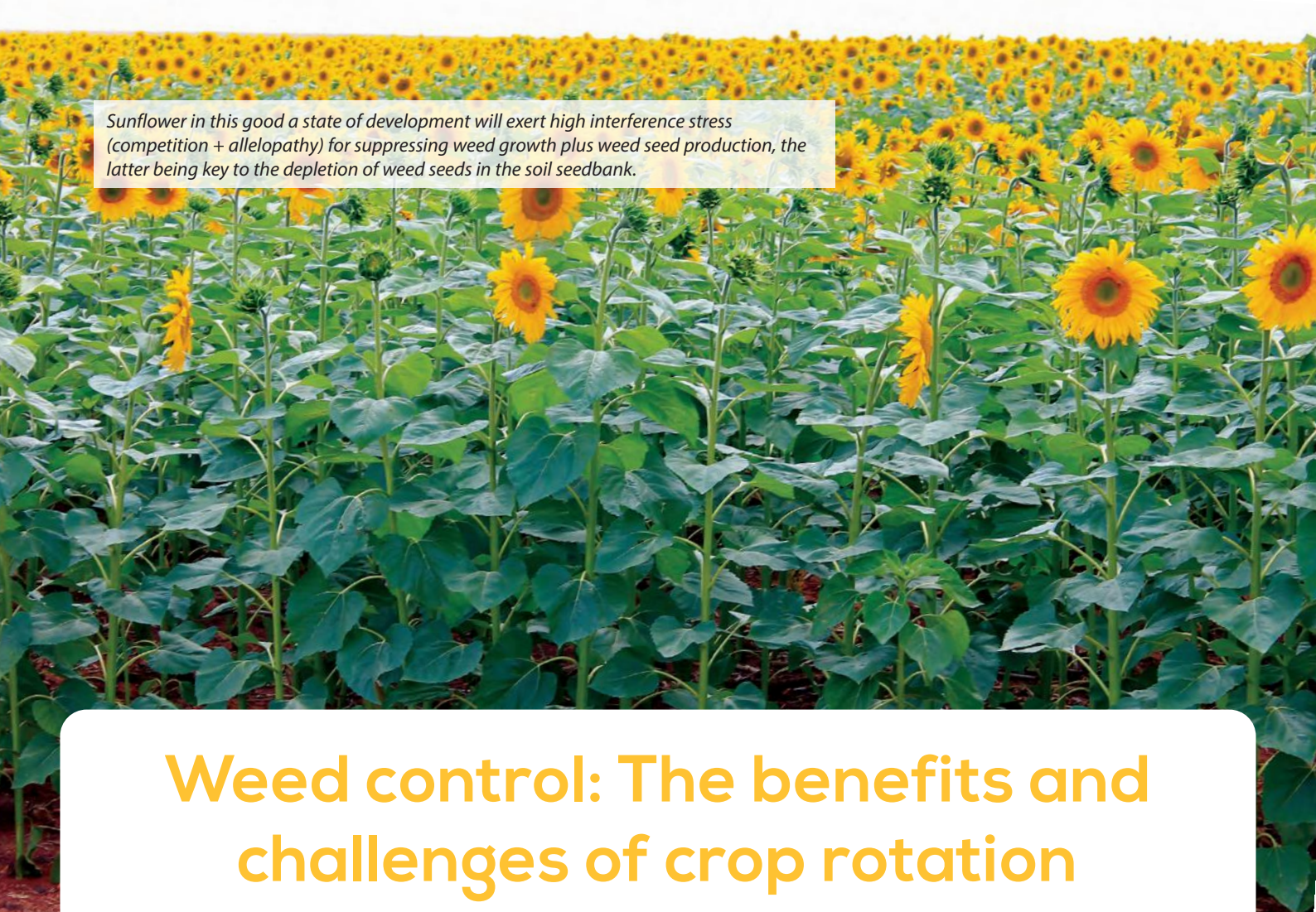
In regions with later rainfall, planting will only be able to take place from November with an MG of 5,8 up to and including an MG of 6,8.

During the early season, the higher MG plants will reach their reproductive stage later, resulting in a larger plant prone to lodging and, subsequently, suboptimal yield. During the later season, the plant will reach its optimal size with more internodes. That means more pods and ultimately more kernels.

To determine the right variety and planting time for your optimal soya bean crop, you need a knowledgeable partner in the field.

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Sunflower in this good a state of development will exert high interference stress (competition + allelopathy) for suppressing weed growth plus weed seed production, the latter being key to the depletion of weed seeds in the soil seedbank.

# Weed control: The benefits and challenges of crop rotation

By Prof Charlie Reinhardt, North-West University

**T**he time-honoured expression 'know your enemy', which originates from military intelligence circles, is also applied in weed management to give credit to the tricky nature of certain plant species which we classify as weeds. For herbicide-resistant weeds, the term 'wicked weeds' is used to denote something perceived as extremely harmful and which defies understanding.

Temporal diversification in crop production systems, better known as crop rotation, is an important step in the right direction for allaying concerns regarding farming practices perceived by some as unsustainable.

## Managing plant diversity

In all crop production systems, the least dynamic or diverse component is that of the crop, given its fixed numbers and

spacing per unit area as well as uniformity in biomass at any point in time. In contrast, the weed community is usually species-rich with high diversity in numbers, spatial distribution and biomass. Thus, a community of plant species exists in crop fields and rather complex interactions occur between them and the environment.

The term 'interference' best describes interactions among plants because it encompasses both the competition and allelopathy phenomena. Competition is when plants compete for the critical growth resources of water, light and nutrients. Allelopathy describes plant interactions that are based on the production and release of natural chemical substances called allelochemicals into the environment. The interference between crops and weeds is not one-directional – crops can also interfere with weed growth through competition and allelopathy.

From a weed control perspective, the biodiversity conundrum is to attain a level of weed control that, on the one hand, is sufficient to prevent unacceptable crop yield loss and, on the other, is also eco-friendly. Herbicides are valuable tools in the management of weeds in ways that are both effective and sustainable in the long run.

Unfortunately, there is still a disappointingly high level of ignorance regarding the potential negative impacts that wrong or inappropriate habits and advice, and consequently, malpractices can have on sustainable crop production.

## Preventing crop interference

Weed management is aimed at reducing diversity in the weed community to levels that prevent interference with the crop to the extent that unacceptable yield loss is incurred. Technological tools for

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weed control are limited to herbicide use, mechanical methods (tillage/ploughing), physical methods (slashing, burning, inorganic mulching) and cultural methods (crop rotation, intercropping, cultivar choice, cover crops, organic mulches, planting date, crop density). In addition, biological methods can include all the aforementioned crop or plant factors, plus natural enemies (insects and pathogens) of weeds.

Technological tools for weed control have not undergone much change in type over the past 80 years or so, but they have become more refined in both design and efficacy, especially through the adoption of the strategy of integrated weed management under the broader concept of integrated pest management.

### Crop rotation for weed control

Crop rotation not only promotes plant diversity in cropping systems, but also contributes much-needed variation to weed control programmes, especially regarding herbicide diversification. Diversity in herbicide mechanisms of action is key to the successful management of herbicide-resistant weeds.

Crop rotation makes other possible changes in practices that automatically benefit weed control, such as shifts in planting date, differences in seedbed preparation, and alternative cultural weed control opportunities, namely crop type and cultivar selection based on the ability to suppress weeds through competition and allelopathy.

Biomass of plants is a measure of their ability to acquire growth resources such as water, nutrients and light, therefore the plant with the most biomass is likely to win the battle against others with less biomass. As far as allelopathy is concerned 'the dose is in the density/biomass', meaning that the amount and type of allelochemicals produced and released are directly related to weed numbers and biomass, as well as the type of weed.

In the case of crop species, the ability to interfere with weeds is vested to a large extent in plant numbers and biomass attained per unit area, although crop type and even cultivar selection also play important roles.

Crop characteristics that promote successful interference with weeds are:

- Dense canopy that shades weeds.

- A root system that is more efficient for better acquisition of water and nutrients than that of weeds.
- Production and release of phytotoxic (plant-toxic) allelochemicals that inhibit or suppress weed growth and development.

Likewise, the aforementioned scenarios would be reversed in favour of weeds, should they possess superior characteristics, as they often do. Successful weed control is all about not allowing weeds to attain ascendancy over the crop.

### Exploitation of crop allelopathy

As is the case with weeds, crop species have allelopathic potential to a greater or lesser extent. This biochemical characteristic of crops is already well entrenched in allelopathic rice cultivar development in support of a reduction in herbicide use. Crop and cultivar differences in allelochemical production have been reported for a wide range of crops, including various cover crops, canola, wheat, rye, oats, sunflower, maize, grain sorghum and soya beans. Because allelochemicals are released from live plants and their dead material, crop allelopathy for weed suppression can be exploited by managing crop litter.

For maximum effect, plant litter should be concentrated more in the vicinity of weeds and to a lesser extent in proximity of the crop (reminder, the dose is in the biomass). In general, allelochemicals do not show selectivity in their effect as most synthetic herbicides do, therefore crops could be harmed by too high concentrations of even their own plant litter (allelochemicals).

In South Africa, relatively little research has been done on the topic of exploitation of crop allelopathy for weed control – glowing exceptions are the PhD studies of Dr Suzette Bezuidenhout of the Department of Agriculture, Forestry and Fisheries, Cedara, KwaZulu-Natal, and Dr Mike Ferreira of the Western Cape Department of Agriculture, Elsenburg, who demonstrated significant weed control ability of various rotational crops in maize and small grain production, respectively.

### Allelopathic effects on soya bean

Mallik and Tesfai (1988) reported that extracts from foliage material of sunflower

and the weeds *Cyperus esculentus* (yellow nutsedge, *geel uintjie*) and *Chenopodium album* (white goosefoot, *withondebossie*) reduced soya bean seed germination. The 2% extract concentration of white goosefoot completely inhibited *Bradyrhizobium* nodulation on soya bean, with 60% nodulation suppression measured at the 1% extract level.

White goosefoot foliage incorporated in soil at levels of 0,5% and 1% (mass/mass) caused a respective reduction of 85 and 95% in soya bean seed germination. Soil-incorporated sunflower material at the 1% level reduced soya bean seed germination by 40 to 70%, but germination was not affected at the 0,5% level. Reinhardt *et al.* (1997) found that the growth of sunflower seedlings was significantly reduced on soil into which dried white goosefoot foliage was incorporated at a 1% level.

Pay close attention to the amount of weed litter left on the soil surface following pre-planting herbicide use, such as the popular 'double-knock' treatment of first glyphosate followed by paraquat if there would be survivors of glyphosate. At planting, be mindful of the amount of both crop and weed litter on the soil surface and in the zone of crop seed placement, because too much may not only suppress weeds but also inhibit the crop's early growth.

Unfortunately, South Africa is sorely lacking this type of research, same as for studies on weed population dynamics (e.g., species shifts and species dominance), crop-weed interference (allelopathy and competition), and long-term effects of crop rotation systems on weed seeds hidden away in a dormant state in the soil seedbank. 🌱

Prof Charlie Reinhardt is a professor in the agricultural sciences programme at North-West University (Potchefstroom campus) and research leader in the South African Herbicide Resistance Initiative (SAHRI) at the University of Pretoria. He can be reached at 083 442 3427 or dr.charlie.reinhardt@gmail.com.

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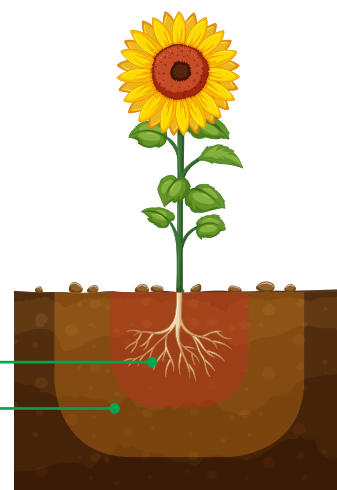
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# Nature-based farming could be the answer to reduced fertiliser use

*By Dr Chloe MacLaren, Rothamsted Research, United Kingdom*

**A**nalyses of 30 long-running farm experiments in Europe and Africa have shown that the high crop yields usually obtained using man-made fertilisers, can instead be achieved through a combination of more environmentally friendly practices. Using an approach more common in assessing drug trials, this is the first time a major study has compared different farm practices which intentionally work with nature to boost yields and explored how they interact with fertiliser use and tillage practices.

## Good practices

Published in the journal *Nature Sustainability*, the report shows that low levels of fertiliser can produce high crop yields if supplemented by practices that support farmland ecosystems, such as growing a greater range of crops, growing plants such as beans or clover that enhance soil fertility, and adding organic matter in the form of manure, compost or cuttings.

In contrast, using these practices along with high levels of chemical fertiliser

generally did not further increase yields, and the highest experimental yields came when using a combination of these 'ecological intensification' practices with some additional nitrogen. These findings show that adopting some or all of these approaches could help reduce and rebalance worldwide fertiliser use – a global imperative given spiralling prices caused by the conflict in Ukraine.

According to research conducted by Dr Chloe MacLaren of Rothamsted Research in the United Kingdom, as well as the Department of Agronomy at Stellenbosch University: "Reducing reliance on chemical fertilisers would help to buffer farmers and consumers against economic shocks, such as the current spike in fertiliser costs and consequent increase in food prices.

"Widespread uptake of these practices could also contribute to a more equitable global distribution of fertiliser. Currently, average nitrogen fertiliser rates in Africa are a small fraction of those in Europe, with smallholders in particular using much less than their fair share. If fertiliser use is reduced where it is currently high, then fertiliser use could be increased where

it is currently low, thereby addressing food security issues without exceeding planetary boundaries."

## Soil fertility at a cost

It is widely acknowledged that while the increased use of man-made fertiliser in the last 60 years has helped feed the rapidly expanding global population, it has not come without a cost. Water pollution, climate change emissions and biodiversity loss are all partly attributable to excessive fertiliser use.

Ecological intensification is where natural, environmentally benign processes that can benefit farming, such as those that enhance soil fertility or suppress weeds and disease, are actively encouraged by farmers.

"Ecological intensification could help return agriculture into a 'safe operating space' for humanity," said Dr MacLaren. "Our results demonstrate that it could play an important role in the development of future sustainable farming systems."

## Improving soil structure

Looking at their results, Dr MacLaren and colleagues concluded that these

practices work in different ways to increase yields. Growing legumes such as beans and clover add nitrogen to soil, which is important when fertiliser levels are low, whereas growing a greater range of crops over the year helps suppress weeds and diseases, which appeared to be increasingly important when higher rates of fertilisers were used.

Organic matter improves soil structure while also adding nitrogen, and manure was found to have a greater impact on yield than adding plant-based composts or cuttings, or leaving the remains of crops in place after harvesting.

According to Dr MacLaren, data from long-term experiments was key to demonstrating that the benefits of ecological intensification hold over long-time scales and across a wide range of contexts. "Short-term experiments can produce spurious results if they take place in unusually good or bad years," she said.

To overcome the challenges of comparing the data from all the individual experiments, which differ in their design and span a variety of crop and soil types and climatic conditions, the team developed a new type of 'meta-analysis' – an approach commonly used in medical research to combine data from different studies.

### The meta-analysis approach

Andrew Mead, co-author and Rothamsted's head of statistics and data science, said: "Our meta-analysis approach is unusual in that we have access to the raw data for each experiment. We chose to first analyse each experiment individually and extract information about the impact of different 'additions' to the cropping systems, then combining the outputs in a series of meta-analyses, each with a focus on a particular type of addition."

The team looked at farm experiments that have been running for longer than nine years from across Europe and Africa – totalling 30 separate experiments and data from over 25 000 harvests. The crops tested were wheat, maize, oats, barley, sugar beet and potatoes.

Each experiment investigated at least one of the three types of nature-friendly farming approaches, so across the full dataset, the researchers could assess the effect of different ecological intensification practices alongside different levels of nitrogen fertilisers and ploughing.



*Organic matter improves soil structure while also adding nitrogen, and manure was found to have a greater impact on yield than adding plant-based composts or cuttings, or leaving the remains of crops in place after harvesting.*

This meant the study could explore how multiple ecological intensification practices interact with each other and with nitrogen fertiliser inputs in their effects on yield, which had not been studied before. The results also showed that a reduction in how much of the fields were ploughed did not strongly affect yields, although other economic and environmental factors mean producers may want to reduce their tillage efforts, said Dr MacLaren.

### Benefits beyond yield

"Future assessments of ecological intensification should include a wider analysis of all social, economic and environmental factors, such as nutritional value or farm profitability. There are undoubtedly benefits beyond just yield, such as reducing costs, reducing pollution, or providing other valuable farm products.

"Conversely, socio-economic factors can also limit the adoption of such practices by farmers. These factors can include a lack of markets for these diverse products and limited access to necessary resources including land, seed and manure. Upscaling these practices will require policymakers and society to create a more conducive socio-economic context." These findings were made possible thanks to partners across Europe and Africa investing in their long-term experiments over decades to generate the data required, she added.

"Long-term experiments make vital contributions to global knowledge of sustainable agriculture by demonstrating how agriculture affects and responds to the environment over long-time scales." The experiments in this study were brought together via the Global Long Term Agricultural Experiment Network (GLTEN), a network of over 200 long-term agricultural experiments and associated researchers spanning six continents and representing a range of climates, environments, crop systems and farming practices, that was established in 2018.

Rothamsted's Dr Jon Storkey, co-author and representative of GLTEN, said their pooling of data and experience was providing exciting new insights. "We recommend that future long-term experiments place the development of functioning agro-ecosystems at the heart of their designs and then explore what level of man-made inputs is necessary to optimise the performance of these systems. Such experiments would assist our progress towards sustainable agriculture that meets human needs for food, fuel and fibres," Dr Storkey said. 🌱

For enquiries or to receive a copy of the paper published in *Nature Sustainability*, send an email to [david.stevens@rothamsted.ac.uk](mailto:david.stevens@rothamsted.ac.uk). Alternatively, visit [www.nature.com/articles/s41893-022-00911-x](http://www.nature.com/articles/s41893-022-00911-x).



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# Weed control in soya bean: Strike early and hard



By Magunya Kalimashe

**T**he soya bean area planted in South Africa continues to increase due to increased local demand. To meet this demand, producers need to deliver exceptional yields. Effective weed control is one of the essential components required to achieve this.

Over 90% of soya beans grown in South Africa contain the glyphosate-resistant gene, and glyphosate is the main weed treatment in this crop. The combination of these technologies has made weed control more economical.

## Drastic rise in glyphosate prices

Glyphosate has been under a lot of pressure globally. Constraints in the production and supply of agrochemicals are currently hampering the industry. Production of raw materials, logistics, and the Covid-19 pandemic are some of the problems that have caused challenges in the agrochemicals industry, and glyphosate has been one of the hardest hit active ingredients.

These challenges have caused the international glyphosate prices to increase by over 90% year on year, making applications more expensive.

Fuel costs have also added to producers' input costs and it is impossible to get past this in spray operations. Glyphosate is a foliar-applied herbicide with limited or no soil activity, so weeds that emerge after the application will not be affected.

Follow-up applications are often required, thus increasing the input costs, including fuel. With the current fuel prices in South Africa reducing the number of herbicide follow-up applications, there are significant economic benefits for the producer.

## A different management approach

Reducing the number of glyphosate applications helps avoid the overuse of the same active ingredient. We are seeing the consequences of the dependence or overuse of glyphosate for weed control over the years.

The evolution of glyphosate-resistant weeds is a challenge, causing great concern among producers and professionals in agriculture. Cases of glyphosate resistance have been reported in various crops in South Africa. Management practices are top of the list in the development of herbicide resistance in weeds.

A different management approach can play a significant role in delaying the development of herbicide resistance. For instance, research has shown that the elimination of pre-emergence herbicides resulting in the intense use of post-emergence glyphosate contributes to the high selective pressure of glyphosate-resistant weeds.

Fields should remain weed-free for a longer period when pre-emergence herbicides are applied, limiting the

number of post-emergence herbicide applications.

## Diclosulam: A clean start

The benefits of including effective pre-emergence herbicides in your soya bean weed control programme are well-documented. At the start of the growing season, the weed seed bank in the soil will give weeds the head start over the crop; therefore weed control as early as possible is essential.

At Villa Crop Protection, we believe that using pre-emergence residual herbicides is the best solution. Our diclosulam-containing dry formulation herbicide, Zeona 840 WDG, gives you just that. It is a selective group code 2 herbicide with good crop-safety properties.

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# Superb solutions to meet micro-element requirements in oilseeds



By Dr FG Adriaanse, for Kimleigh Chemicals SA (Pty) Ltd

**M**icro-element deficiencies should be proactively identified and addressed in a bid to prevent yield losses. Soil and foliar analyses along with advanced products can ensure the cost-effective provision of each element to each soil type, crop and yield scenario.

## Soil concentrations

The threshold values (mg/kg) for topsoil above which we do not expect strong reactions to applications are >2 for zinc (Zn), >2,5 for copper (Cu), >5 for manganese (Mn) and >4,5 for iron (Fe) mg/kg (DTPA). Likewise, this value is >2mg/kg for boron (B) (hot water) and >0,3mg/kg for molybdenum (Mo) (ammonium oxalate). Maximum values for B <4mg/kg and Mn <40mg/kg according to the same methods are indicated to prevent toxicities.

## Soil pH

When the soil pH ( $H_2O$ ) is >8, deficiencies of especially B, Mn and Fe, but also Cu and Zn can occur regardless of soil concentrations. Toxicity levels of Mn and B can be addressed through liming under acidic conditions. However, Mo is more accessible under alkaline conditions, but less accessible under acidic conditions ( $pH [H_2O] < 5$ ). Liming will improve the availability of Mo under acidic conditions, but with acid-tolerant crops such as soya beans it is more economical to spray Mo on the leaves if liming is not yet necessary.

## Foliar analyses

Timeous monitoring of the threshold values for foliar analyses that have been calibrated for specific growth stages is important for the following reasons:

- Elements such as B and Mo can leach to soil layers which are deeper than the rhizosphere.

**Table 1: Micro-element uptake in all above-ground parts for each ton of seed produced.**

| Element | Uptake of whole plant (g/ton seed) |           |            |        |
|---------|------------------------------------|-----------|------------|--------|
|         | Soya                               | Sunflower | Groundnuts | Canola |
| Zn      | 61                                 | 99        | 186        | 163    |
| B       | 39                                 | 113       | 196        | 86     |
| Cu      | 25                                 | 17        | 40         | 26     |
| Mn      | 90                                 | 118       | 113        | 74     |
| Mo      | 7                                  | 2         | 2          | 2      |
| Fe      | 366                                | 209       | 499        | 906    |

- The degree of acidity or alkalinity in the root zone affecting element absorption is not entirely predictable.
- Expected yield may change during the season.
- The effectiveness of specific products can be monitored.

## Application rates

The micro-element uptake/ton of seed differs significantly among oilseed crops (Table 1). Application rates are calculated by multiplying uptake/ton of seed by expected yield. Using only uptake figures is justified when highly effective products are placed in close proximity of roots or sprayed directly onto leaves.

While the best product formulations are not 100% effective, there are usually partial uptake from the soil. Foliar application of more than expected uptake is justified for Zn, Cu, Mn and B under strong alkaline conditions, and under acidic conditions for Mo.

## Fertiliser granule coating

Nano-oxide forms of Zn, Cu, Mn as well as specially formulated B and Mo applied to fertiliser granules, provide a solution within normal pH limits. At pH ( $H_2O$ ) levels of up to about 8, nano-oxide compounds are well absorbed, but an acidifying fertiliser band in an alkaline environment will nonetheless promote the absorbency of most micro-elements. Nano-oxides are more efficiently absorbed by roots, translocated and metabolised as opposed

to sulphates or chelates, regardless of the pH of the growth medium.

Mo will become available as the acidic fertiliser band becomes neutralised under alkaline conditions. When both the soil and fertiliser band are acidic, it is not recommended that Mo be applied to fertiliser granules.

## Foliar applications

Foliar application of Zn, Cu, Mn and B is unavoidable when the pH of the soil is very high, and for Mo, it is essential when the soil is very acidic. Leaching of B and Mo often also necessitates foliar applications.

The use of specially formulated nano-oxide forms of Zn, Cu, Mn and specifically formulated B and Mo for foliar uptake are highly suitable for this purpose. Foliar application of nano-oxides are more effective than sulphates, powder oxides or chelates in terms of yield increases, even at much lower concentrations.

Kimleigh Chemicals can compile different packages for fertiliser granule coating or foliar applications based on each customer's requirements.

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### Clearfield® Plus qualified seed

Before sunflower cultivars can be classified and sold as Clearfield® Plus seed, BASF's seed partners undergo years of internal development and stringent qualification trials. It is important to highlight that Clearfield® Plus cultivars are not genetically modified and contain a naturally occurring herbicide-tolerant gene that is bred into the seed companies' existing cultivars.

### Euro-Lightning® Plus herbicide

Added to the high-performing Clearfield® Plus seed, BASF also offers Euro-Lightning® Plus – the Clearfield® Plus herbicide for sunflower. Euro-Lightning® Plus boasts significant improvements, with the main advancement being its improved formulation designed for improved weed control in Clearfield® Plus sunflower fields through higher levels of herbicide adherence to target weeds.

Euro-Lightning® Plus eradicates yield-robbing weeds. Under no-till conditions, excellent weed control has been observed during the growing season in fields where Euro-Lightning® Plus was applied. There has also been a decrease in stubborn overwintered weeds, which cause challenges during the following season's pre-plant burndown applications.

### Using Euro-Lightning® Plus

Euro-Lightning® Plus can only be used on Clearfield® Plus sunflower cultivars (original Clearfield® sunflower cultivars are also excluded). Refer to the Euro-Lightning® Plus waiting periods on the label.

The following is recommended:

- Clean spray tanks, hoses and nozzles with a suitable tank-cleaning solution prior to mixing the Euro-Lightning® Plus solution.
- Only use a flowable (50%), high-quality ammonium sulphate.
- Do not use any ammonium sulphate that contains additional acidifying agents or additional adjuvants, spreaders, stickers or surfactants.
- Applications must be done within 32 days of planting.
- For good control, thorough coverage of the actively growing target weeds must be completed by the two- to six-leaf stage.
- Do not add any other crop protection products to the spray mixture, other than what is recommended on the label.
- Do not mix Euro-Lightning® Plus with any organophosphate or carbamate insecticides, and do not apply where these products have already been used as soil or foliar treatments.

BASF and its seed partners strongly advise and endorse the use of Euro-Lightning® Plus as the only supported herbicide. If other solutions are used, neither BASF nor the seed company can support the producer if problems occur. Read the Euro-Lightning Plus® label for full instructions and details.

### Bellis®

Bellis®, BASF's flagship sunflower fungicide, contains two key active ingredients: Boscalid and F500®. These ingredients are a powerful combination offering excellent control of *Alternaria* leaf spot, as well as the AgCelence® effect. With AgCelence®, producers can expect

yield increases and therefore a higher return on investment.

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Bellis® Active's optimised formulation and active ingredient composition are more suitable for lower disease pressure areas, while still delivering the AgCelence® effect of yield increase and ultimately a higher return on your investment.

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BASF is known for offering reliable and innovative fungicide solutions across numerous crops, and sunflower is no exception.

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# A shift from maize to soya beans

By Christiaan Vercueil, intern agricultural economist, Grain SA

**T**ight soya bean supplies in South America have boosted United States (US) exports in recent months. In addition, soya bean crushing progressed at unusually high levels in the US and Brazil. While this resulted in a sharp reduction in soya bean stocks in these two countries, soya bean inventories in Argentina are still unusually large.

However, these supplies will not be readily available to the market as long as Argentine producers are limiting sales to a minimum, owing to soaring inflation and mounting pressure towards currency devaluation. *Table 1* illustrates the world supply and demand for oilseeds.

## Sunflower seed

The Russian invasion of Ukraine in late February severely affected global trade flows of sunflower oil in recent months. High prices caused demand rationing. However, demand losses occurred in a small number of countries. World imports of sunflower oil decreased by 16% from March to May 2022 compared to last year. Sunflower oil exports from Ukraine were virtually cut in half starting April to June 2022. Shipments to China, India and Iraq decreased, while deliveries to Europe increased due to exports being possible only via road and rail, with no deep-sea exports.

The dry season experienced in South America is evident by the decline in the total end stocks, and the amount of especially soya bean end stocks. Forecasts for the new season are looking better due to improved weather forecasts. As stated, all the end stocks are not necessarily available as in the

case of Argentina and Ukraine, where grains and oilseeds are unexportable. However, it does look as though large-scale exports will occur in the near future.

## Increase in soya bean production

For many years, soya bean production has slowly been increasing. Reasons for this trend include:

- Higher demand for soya beans for animal consumption.
- Higher demand for soya beans for human consumption to substitute meat as a main protein source.
- Higher demand for soya bean products as a substitute for animal products such as milk.

On the farming side, soya bean production has been increasing due to improved technology (GMO), better resistance to very wet conditions and lower input costs for production, making it more profitable than maize.

## Input costs tip the scales

International maize production is losing hectares due to the major increase in input costs. The production of maize requires more inputs than what are needed for soya beans. Unprecedented spikes in the cost of inputs such as fertiliser, fuel, seed, agro-chemicals and the complexities in the oilseed basket supply leading to higher prices, resulted in a global shift

to oilseeds, with soya beans occupying the largest portion of the uptake.

*Table 2* provides an indication of how much fertiliser prices have increased since June 2021. Many inputs have followed this trend.

Maize has always only just managed to outperform soya due to the latter's lack of quantity produced per hectare, and therefore income. However, with the ratio between maize and soya bean input costs and the newly found higher productivity of soya beans, the scales are tipping in favour of soya beans (*Figure 1*).

There exists a rule of thumb which states that when the maize to soya bean price ratio is higher than 2:1 in favour of soya beans, it is generally better to plant soya. According to the March 2023 contract for both soya beans and maize, which started trading on 7 January 2022, the price has remained on and above the 2:1 ratio since the start of trading.

*Table 3* illustrates the year-on-year change, as well as the change from the current season versus the five-year average of area harvested and production for both

**Table 1: World supply and demand of oilseeds (million tons). (Source: Oil World)**

|                      | Production season |       |       |
|----------------------|-------------------|-------|-------|
|                      | 20/21             | 21/22 | 22/23 |
| <b>Opening stock</b> | 113,3             | 112,8 | 104,6 |
| <b>Production</b>    | 577,8             | 576,3 | 607,8 |
| <b>Total supply</b>  | 691               | 689,1 | 712,4 |
| <b>Total demand</b>  | 578,2             | 584,6 | 597,8 |
| <b>Ending stock</b>  | 112,8             | 104,6 | 114,6 |
| <b>Soya beans</b>    | 100,1             | 86,7  | 96,4  |

**Table 2: Fertiliser price changes in dollar terms from June 2021 to June 2022.**

|                                                                | June 2021       | June 2022       | Change   |
|----------------------------------------------------------------|-----------------|-----------------|----------|
| <b>Fertiliser</b>                                              | <b>US\$/ton</b> | <b>US\$/ton</b> | <b>%</b> |
| <b>Ammonia (Middle East)</b>                                   | 575             | 967             | 68,2     |
| <b>Urea 46 (Eastern Europe)</b>                                | 423             | 460             | 8,7      |
| <b>Diammonium phosphate (Gulf Coast of the US)</b>             | 631             | 998             | 58,2     |
| <b>Potassium chloride (Commonwealth of Independent States)</b> | 312             | 934             | 199,4    |
| <b>Rand/dollar exchange rate</b>                               | 13,93           | 15,81           | 13,5     |



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**Table 3: Performance of maize versus soya bean year-on-year, as well as the five-year average increase.**

|                            | Area harvested | Production |
|----------------------------|----------------|------------|
| <b>Maize</b>               |                |            |
| Year-on-year increase      | -0,8%          | -1,3%      |
| Five-year average increase | 6,2%           | 7,9%       |
| <b>Soya beans</b>          |                |            |
| Year-on-year increase      | 3,3%           | 13,8%      |
| Five-year average increase | 6,9%           | 12,4%      |

maize and soya beans. The trend mentioned can be seen in the soya bean area harvested expanding by 3,3%, while maize decreased by 0,8%. Every 1% increase in soya bean area harvested accounts for a 4,2% increase in production, while every 1% increase in maize area harvested only accounts for a

0,6% increase in production. This clearly illustrates the increase in soya bean yield compared to maize.

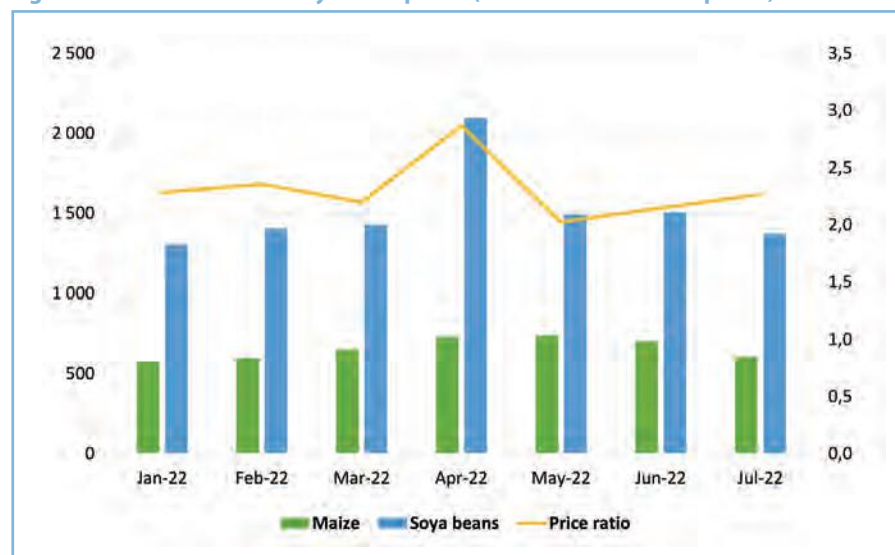
#### Local scenario

South African maize producers are among those who experienced the effects of rising

input costs first-hand, especially given the large amount of fertiliser used for the cultivation of maize in the country. These increases were further exacerbated by the weakening exchange rate, a backed-up international supply chain which caused shipping rates to increase substantially, and record-high oil prices which pushed up transport costs, both to and from the producer.

Grain SA has a general profitability measure that is updated monthly for different regions in the country. These measures indicate that in some parts of the country it is still profitable to produce maize, but the margins are very small, meaning the risk is very high. These parts lie more to the western side of South Africa, where primarily white maize is produced. This creates the possibility of the area planted to soya bean increasing at the expense of white maize production.

**Figure 1: Ratio of maize to soya bean prices (March 2023 contract prices).**



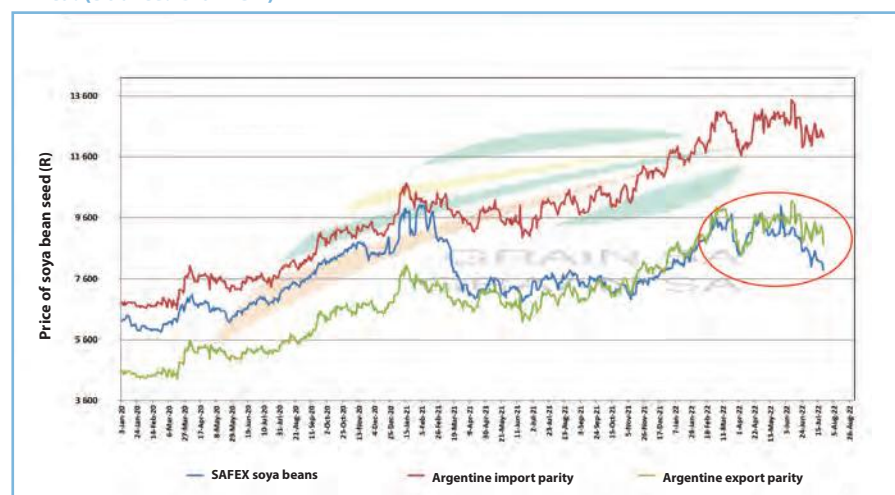
#### The problem with the shift

There are a few challenges relating to the current South African export infrastructure, making it difficult to export numerous bulk grain crops together with wheat imports. Currently, large amounts of maize are still being exported due to carryover stock levels. This automatically puts constraints on possible soya bean exports at the Port of Durban.

The increase in the supply of soya beans and limits to exports, resulted in soya beans moving below export parity. This trend is illustrated in Figure 2 where the SAFEX price trades below export parity.

The value chain is currently working very hard at increasing soya bean exports. An export protocol was signed between China and South Africa with a large number of traders and storage operators registering as export facilities. Recently, one shipment was exported from Maputo to Malaysia, with another two reserved for Malaysia and Bangladesh. This is good news as it will ensure that surplus supplies are managed and that the profitability of soya bean production is protected, given the increase in production. 🟢

**Figure 2: Prices of Argentinian soya bean seed delivered to Randfontein, South Africa. (Source: Grain SA)**



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# Determining animal feed demand in the grain and oilseeds markets

By Dr Dirk Strydom, Grain SA

One of the major role-players within the demand spectrum of the grain and oilseed markets, is the animal feed industry. A question that always repeats itself is what demand will look like in the future. How much grain and oilseeds can still be planted? And how much can be utilised within the local market?

The agricultural product requirement (APR) feed simulation model, funded by the Protein Research Foundation, or PRF, is utilised on an annual basis to analyse animal feed demand. This model determines animal feed demand based on population, per capita consumption (PCC) of products, product imports and exports, and a feed matrix for each species and diet.

Based on the model, the total feed demand was 12 million tons in 2021, with the largest consumer of feed being broilers at 28%, beef cattle and sheep at 26%, and dairy cattle at 21% (Figure 1). Given the animal consumption, the model can calculate the consumption of various raw materials on a least-cost basis.

## Projected increases

According to the APR model, feed requirements will increase to 12 803 849 tons in 2024 and to 13 631 093 tons in 2030. In terms of total oilcake, the local share in consumption has increased from 34% in 2009 to 79% in 2020, and remained constant at 79% in 2021 (Figure 2). It is projected that the local share will increase to 85% in 2024 and 99,7% in 2030.

Projected soya oilcake requirements will be 1 515 659 tons by 2024 and 1 537 560 tons by 2030 (Table 1).

The increase in local soya bean production over the past three seasons is of great value to South Africa. The rise in local oilcake production from locally produced soya beans will make South Africa increasingly self-sufficient in meeting its protein requirements.

On the local market, South Africa showed progress in terms of substituting imported soya oilcake with local oilcake. South Africa produced 73% of its total oilcake requirement in 2021, compared to 2009 when it was able to produce only 16% of the requirement.

The projection for 2024 is at 81% and is set to increase to 100% by 2030. However, the substitution is highly dependent on efficient infrastructure and logistical support, providing internal raw materials to coastal areas at competitive levels.

The usage of oilcake is also very sensitive in terms of prices and competition of raw materials containing protein. For instance, an increase in lucerne production or wet milling of by-products directly affects the use of oilcake. The sensitivity is not only in terms

of availability, but also pricing of high-protein raw materials.

## Impact of FCR on broiler feed

Feed conversion ratio (FCR) in the animal feed industry is very important in terms of competitiveness and being sustainable. The FCR in the South African broiler industry in particular is almost constantly improving on a linear basis and is expected to further improve in future. In the grain and oilseeds industry, the question is then, how will this impact demand?

An analysis was done in 2020 of the model forecasts to specifically test this effect on the broiler industry. The question posed was what the impact on consumption levels would be in terms of this efficiency. To compare the improvement efficiency effect, FCR efficiency was removed from the model to test the net effect and do a comparison.

In terms of the total feed demand given the improvement in FCR, broilers consumed a total of 4 093 900 tons of feed. With the exclusion of the FCR improvement, total broiler feed increased to 4 307 413 tons. This is a

Table 1: Projected soya oilcake requirements.

| Year | Feed requirement (ton) | Oilcake (ton) | Soya oilcake (ton) |
|------|------------------------|---------------|--------------------|
| 2021 | 12 087 124             | 2 069 697     | 1 444 193          |
| 2024 | 12 803 849             | 2 147 953     | 1 515 659          |
| 2030 | 13 631 093             | 2 202 461     | 1 537 560          |

Table 2: Effect of poultry meat exports on broiler feed (BFAP projections).

|                      | 2029 (ton) | 2029 exports (ton) | Growth (ton) | Growth (%) |
|----------------------|------------|--------------------|--------------|------------|
| Broiler feed         | 4 093 900  | 4 004 933          | -88 967      | -2%        |
| Maize                | 2 447 112  | 2 393 932          | -53 180      | -2%        |
| Soya oilcake         | 896 717    | 871 050            | -25 667      | -3%        |
| Soya bean equivalent | 1 179 891  | 1 146 118          | -33 773      | -3%        |

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**Table 3: The net effect (in tons) on the growth in exports.**

| Net effect                  | FCR      | Exports | PCC_POP* |
|-----------------------------|----------|---------|----------|
| <b>Broiler feed</b>         | -213 513 | -88 967 | 471 054  |
| <b>Maize</b>                | -127 540 | -53 180 | 283 778  |
| <b>Soya oilcake</b>         | -65 678  | -25 667 | 82 901   |
| <b>Soya bean equivalent</b> | -86 418  | -33 772 | 109 080  |

\*PCC\_PO = per capita consumption of the population.

total of 213 513 tons which are removed from consumption due to increases in efficiency. The demand decrease effect on total grains used is 127 540 tons and on oilcakes used it is 65 678 tons.

The greatest movements in respect of raw materials pertained to maize and soya beans. Maize consumption decreased by 127 540 tons and soya oilcake consumption decreased by 65 677 tons, which is the equivalent of 86 419 tons of soya beans.

In summary, although an improvement of efficiencies is necessary and very important for the broiler industry, it has a considerable effect on demand figures. By simply evaluating the FCR improvements,

the demand for maize and soya beans decreased by 209 637 tons over the ten-year projected period.

Although the total net growth is positive, which includes per capita and population growth, there is substantial pressure on aspects such as animal product exports to keep up with the growth in local production and yield increases. This is why South Africa needs to ensure that its biosecurity is in place.

#### Effect of broiler product exports

Currently, the poultry industry is focussed on expanding exports. The Bureau for Food and Agricultural Policy (BFAP) incorporated this into its projections and

data, which were used within the model. In 2020, BFAP forecast a 2019 export figure of 106 000 tons of poultry meat. This is double the current exports. This begs the question: If growth in exports does not materialise and is removed from the model, what will the overall effect be on the consumption of broiler feed?

If exports are kept constant over the ten-year projected period, with no growth, there will be a decrease of 2% in broiler feed amounting to 88 967 tons of feed. With regard to the two main

raw materials – maize and soya oilcake – there will be a decrease of 53 180 and 32 084 tons, respectively. In terms of soya bean, there will be a decrease in demand of 32 084 tons (Table 2).

#### Conclusion

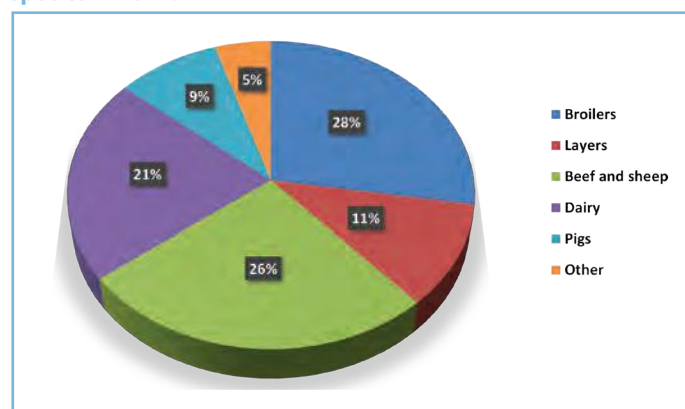
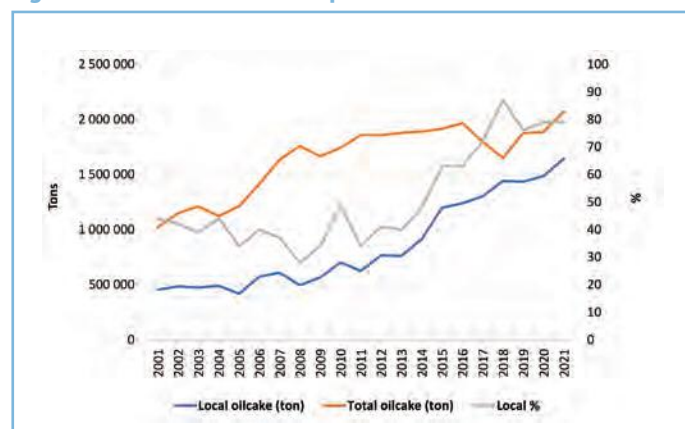
Soya bean production is on the increase, and future projections show that it will increase even more based on the efforts made towards improved yields in South Africa. However, while PCC and population growth are assisting in terms of the growing demand for broiler feed, this alone is not sufficient.

The analysis shows FCR improvements eliminating some of the demand – a total of 213 513 tons of broiler feed. This improvement in FCR is important to keep the broiler industry economically viable and competitive as opposed to imports. A counter to this decrease can to some extent be the exportation of broiler meat.

Based on these scenarios, the growth in exports can add 88 967 tons of feed in terms of demand. However, a more difficult scenario is when FCR improves and the growth in exports does not materialise. This will mean a total loss in potential demand of 302 480 tons of animal feed. In the case of maize, this will represent a loss of 180 720 tons and for soya beans, a loss of 120 190 tons in the projection period.

The good news is the net effect will remain positive due to the increase in population and PCC of 471 054 tons of animal feed (Table 3).

Strategically, this is one of the reasons why it is important to ensure that export markets for broiler meat are expanded and growth takes place. The same effect will apply to other diets such as those for beef and pork production. Equally important is ensuring that infrastructure facilitates exports, and that South Africa has sufficient biosecurity measures in place. Without adequate biosecurity, exports will not materialise. 🟢

**Figure 1: Distribution of animal feed consumption between species in 2021.****Figure 2: Total oilcake consumption in South Africa.**

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# The effect of fertiliser prices on the grain industry

By Christiaan Vercueil, intern agricultural economist, Grain SA

Traditionally, between 30 and 50% of a grain and oilseed producer's existing input costs are spent on fertiliser. Fertiliser makes up such a large portion of input costs that any change, especially a price increase, can affect profitability drastically.

Because South Africa is a net importer of fertiliser, it further aggravates the situation since all imported fertilisers are not only affected by their actual price, but by a whole range of factors such as the exchange rate and transport costs.

## Import volume and price changes

Figure 1 illustrates South Africa's fertiliser imports of monoammonium phosphate (MAP), ammonia, urea, potassium chloride and ammonium sulphate from various countries since 2009. Although not the only fertilisers imported, these are five of the most important products imported.

As of 2009, fertiliser imports for these five products have increased by 165% in total. During 2021, South Africa imported a total of 2 155 233 tons of just these five fertiliser products from various countries. Besides the increase in import volume, the exchange rate of the rand to other major currencies

also weakened sharply from 2009 onwards, which further intensified the effect of price increases. For the year 2022 up until May, more than 500 000 tons had already been imported, which is only 24% of 2021's total.

Table 1 shows the average price changes for nitrogen (N), phosphate

**Table 1: Price comparison of nitrogen, phosphate and potassium for July 2021 and July 2022.**

|                                        | Nitrogen | Phosphate | Potassium |
|----------------------------------------|----------|-----------|-----------|
| <b>Average price: July 2021 (R/kg)</b> | R26      | R60       | R21       |
| <b>Average price: July 2022 (R/kg)</b> | R42      | R94       | R47       |
| <b>Change (year-on-year)</b>           | 65%      | 57%       | 124%      |

Table 2: Change in fertiliser cost per hectare for July 2021 compared to July 2022.

|                                                  | Nitrogen | Phosphate | Potassium | Price: July 2021 | Price: July 2022 | Change |
|--------------------------------------------------|----------|-----------|-----------|------------------|------------------|--------|
| <b>Eastern Free State: Average units (kg/ha)</b> | 100      | 19        | 27        | R4 267           | R7 275           | 70%    |
| <b>West Free State: Average units (kg/ha)</b>    | 72       | 16        | 14        | R3 097           | R5 200           | 68%    |
| <b>Irrigation: Average units (kg/ha)</b>         | 286      | 52        | 80        | R12 122          | R20 717          | 71%    |

Figure 1: The five most important fertilisers imported to South Africa.

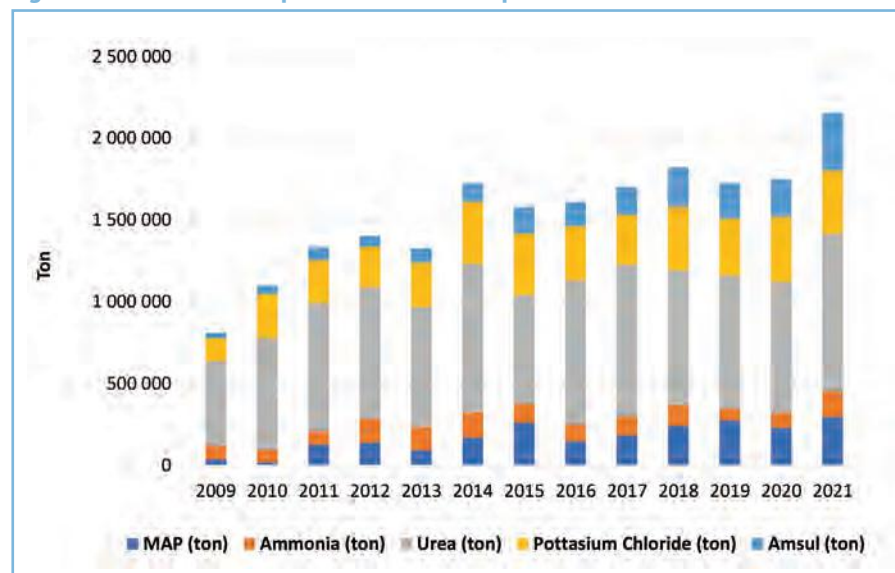


Figure 2: The affordability of fertiliser.



(P) and potassium (K) during July last year, compared to July 2022. It is staggering to see how sharply the prices for these products have increased in a matter of a year.

When looking at the fertiliser requirements of different parts of the country, one notices that the Western Free State uses an average of 72 units of N, 16 units of P and 14 units of K per hectare.

The Eastern Free State uses 100 units of N, 19 units of P and 27 units of K per hectare. Irrigated areas use 286 units of N, 52 units of P and 80 units of K per hectare.

Table 2 provides a comparison of the average fertilisation requirements for these three regions for July 2021 and July 2022. On average, the cost of fertiliser increased by 70%. This means that prices have almost doubled.

### Fertiliser affordability

Figure 2 provides an indication of the affordability of fertilisers compared to the SAFEX price of maize. Fertilisers, which account for between 30 and 50% of input costs, have become less and less affordable, which means that the producer's margin for trade has weakened excessively. This puts pressure on the producer's profitability and can result in fewer hectares being planted, especially maize.

This information paints a clear picture of the extreme challenges that producers face every day to try and stay afloat. Fertiliser is not the only input cost that has seen sharp price hikes; the costs of energy sources such as fuel and electricity have also risen sharply, as has the price of seed and chemicals. It is becoming progressively more difficult for farming operations to remain profitable and sustainable.

Since there is little room for mistakes, producers must make sure they are not being taken for a ride by fertiliser suppliers. Do the homework, make sure the representative's prices are market related, compare offers to find the best price, and select the most suitable offer for your purposes. 🍌

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# Hard work pays off:

## Soya bean exports are here to stay

By Dr André van der Vyver, executive director, and Juan-Pierre Kotze, researcher, SACOTA

**T**he current season has yielded a new record soya bean crop. The Crop Estimates Committee's (CEC) initial forecast in February 2022 of 1,821 million tons grew by 330 000 tons (18,1%), according to the latest data released in July 2022.

It was thought that the disastrous start to the production season, which saw excessive rain and flooding, would have a greater negative effect on soya beans than it would maize. Fortunately, however, this was not the case. Although we all share in the joy producers are currently experiencing, especially since soya bean prices have increased as well, it has resulted in another interesting challenge. For the first time the industry has a significant surplus – enough to plan for consistent future exports.

### Production could exceed demand

With the growth in soya bean production and the possibility of further increases, local production will soon exceed demand and there will be a build-up of stocks. This became evident in June 2022 when the CEC increased soya bean production to a then new record of 2 091 350 tons.

The National Agricultural Marketing Council (NAMC) also adjusted its estimated carryover stock for the end of the season to 377 800 tons – this figure took into account an estimated 50 000 tons of exports. Similar to the previous season, it was anticipated that the bulk of the exports will again go to Zimbabwe for local consumption and some to Mozambique.

In July, the crop increased by another 60 000 tons, but by then the NAMC had adjusted its export estimate to 100 000 tons and its end-of-season surplus to 376 800 tons. This was *inter alia* based on a South African Cereals and Oilseeds Trade Association (SACOTA) report regarding imminent exports.

Experts have already predicted new record soya bean plantings the coming

spring. The main reason is that soya beans are more profitable than most other summer grain commodities. This can be attributed to new and improved cultivars that produce higher yields, and the high prices of fertiliser – less fertiliser is used for soya beans than for maize, for example.

Over the past seven years, the average annual growth in production was 16% compared to 8% for local demand. Production increases would have been even higher if the 2019/20 and 2020/21 seasons did not suffer setbacks, as can be seen in *Figure 1*.

*Figure 1* also indicates that local demand comprises crush as well as animal and human consumption of raw soya bean as calculated by the South African Grain Information Service. For a more comprehensive calculation, the volumes of imported cake should be converted to raw soya beans. This is assuming that in future a substantial portion of imported cake will be substituted by local oilcake. In turn, this means the demand for local soya beans will continue to grow.

The new season production cost estimates indicate that the profitability

of maize will increase with approximately R4 000/ha, while soya bean will be roughly double this. Calculations and yields, of course, vary between areas.

It is therefore no surprise that the exporting members of SACOTA have started to investigate the possibility of suitable export markets. The oil content of South African soya beans is typically lower than South American and United States (US) soya beans. International contracts normally trade on a basis of 18,5% oil with a reciprocal allowance.

The oil content of South African soya beans varies greatly, depending on the region, with some being more than 21% while others are as low as 17%. Therefore, any export contract should specifically accommodate a more lenient specification and/or potentially a discount on the sales price.

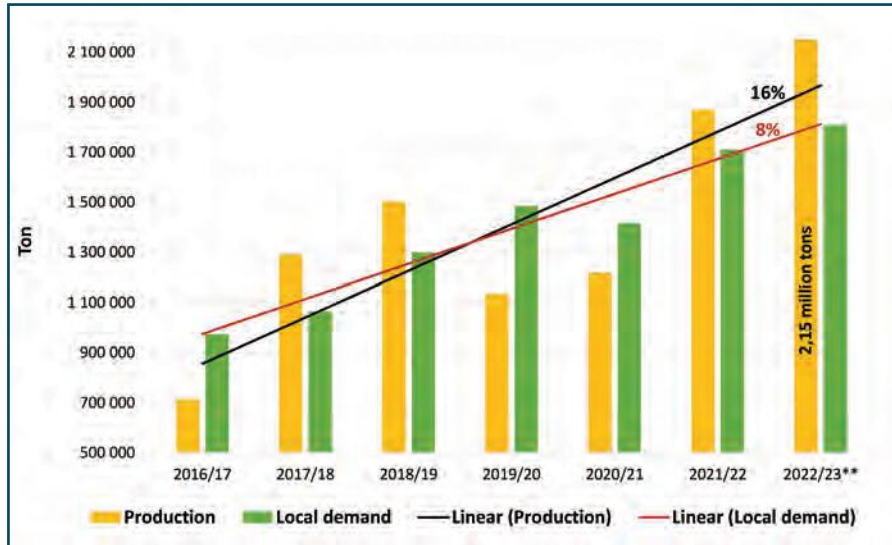
### Logistical constraints

Another challenge has been logistical constraints. The Port of East London recently opened up, but has been facing some challenges, although lately significant volumes of soya beans are



Exports of South African soya beans via the Matola Silos and Grain Terminal in Maputo in July 2022.

**Figure 1: Average annual growth in soya bean production and demand in South Africa.**



produced in the Southeastern Free State. Several agricultural industries have investigated the Port of Maputo as an alternative. It has always been a natural choice for exports out of Mpumalanga, but it had limitations.

However, the challenge of exporting through Mozambique has been overcome. The Export Trading Group, a SACOTA member, confirmed that the first soya bean export vessel of approximately 30 000 tons completed loading towards the end of July and left for Malaysia.

Soya beans have been transported from Mpumalanga by road across the Lebombo Border Post (Komatipoort border) and offloaded at the Matola Silos and Grain Terminal in Maputo. Two more vessels out of Maputo have been scheduled (one to Bangladesh and another to Malaysia), as well as a vessel out of Agriport, Durban, to Malaysia in early November. This will be the first significant deep-sea export of soya beans in many years.

### Cost and profitability

Using Grain SA's production cost and profitability calculations for the past season – adjusted according to June/July 2022 prices (R8 650/ton) and the CEC Free State average yields (2,1 ton/ha) – we noticed that the net profit per ton is approximately R4 300 ex-farm for soya beans produced in the eastern production areas. This far exceeds storage and transport costs (currently around R600 to R700/ton) to deliver the products to

the Durban harbour. Early costs and price predictions for 2022/23 indicate a similar scenario.

The bulk of the export season runs from late March to early November, which means it uses the last of the old-season grain and oilseeds until around June before gradually moving over to new-season products, depending on the harvesting tempo. Export cost calculations and prices are therefore a combination of old- and new-season products combined with low or high storage costs.

Despite all the successes, logistics could remain a challenge. It is already a struggle to transport substantial volumes of maize by rail. Globally, utilising an efficient rail system is key to a competitive export industry.

Soya beans, which are more quality-sensitive than maize and cannot afford long wagon standing or turnaround times, are likely to depend on road transport exclusively. There is one important consolation: although soya bean weighs 7% more than maize per volume, it is worth double its weight in value. This means that only half the tonnage has to be transported and exported to earn the same value for the industry compared to maize.

### Promising opportunities await SA

Grain SA, in collaboration with the Department of Agriculture, Land Reform and Rural Development (DALRRD), supported by SACOTA, has also been working on opening the export market

to China. Since the turn of the century, China has dominated the global import market for soya beans. In 2022/23, China is expected to import 100 million tons, compared to South Africa's new 2022 record production of 2,15 million tons.

If this market could be opened for South African exports, it would mean unlimited offtake, even if local production had to double. However, good news was received in June when the *Protocol of Phytosanitary Requirements for the Export of Soya Beans from South Africa to China* was finally signed by the relevant ministers of both countries. SACOTA is currently co-ordinating the registration of exporting members, export silos, and terminals as per the protocol requirements.

In future, the protocol will require production monitoring during the season, and inspections of storage and loading facilities by the DALRRD.

Opportunities for the soya bean industry look promising. Maputo, like East London, will also add more choices to SACOTA exporting members. This will be highly beneficial for producers and the rural economy. It will create much-needed rural job opportunities and earn foreign exchange for South Africa. At a free-on-board price of around US\$610/ton and a R16,80-to-one-US dollar exchange rate, a soya bean export vessel of 35 000 tons will earn South Africa approximately R360 million in forex.

SACOTA wishes to congratulate those leaders in the oilseeds industry who persevered and believed in the future of soya beans. It would be unfair to single out individuals since many contributed to discussions initiated and facilitated by the Oil and Protein Seeds Development Trust/Oilseeds Advisory Committee, the Protein Research Foundation soya bean value chain initiative, Grain SA oilseeds working groups, the South African National Seed Organization, the South African Cultivar and Technology Agency and the DALRRD. 🌱

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# The subdivision of agricultural land

By VDT Attorneys

The subdivision of agricultural land is not as simple as you might think; there are various aspects one should consider. As a producer, you might want to either sell a portion of your farm, lease a portion of it over a long period, or bequeath it to your children. The *Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970)* might be applicable, and it is imperative that all owners of agricultural land take note of the provisions of the Act.

## Importance of the Act

Should you wish to subdivide your farm in any of the ways mentioned, you have to obtain written consent from the minister of agriculture.

The primary purpose of the Act is to prevent the subdivision of agricultural land into small uneconomic sections that will hinder agriculture. In a report, Statistics South Africa confirmed that from 2011 to 2016, more than 500 000 agricultural households were lost in the old homelands due to them being relocated to agricultural land of approximately 0,5ha. These households previously used their land for agricultural purposes; however, due to the size of the new property, farming had become unproductive and unfeasible.

This demonstrates the importance of the Act, as agricultural land with a high value and yield should be protected. Therefore, before any agricultural land is subdivided, the minister's consent is required. There are, however, instances where the minister's consent is not required, as explained in Section 2 of the Act.

## Subdividing a farm

The process relating to the subdivision of a farm will differ, depending on what the owner/farmer intends to do. The starting point will be to approach a surveyor to draft a subdivision diagram, which must be submitted to the minister together with the application. The minister will

then consider various aspects before making a decision.

It is advisable to consult a professional to ensure that your application is processed in a timely manner. Here are some important aspects to consider:

### Selling a portion of your farm

In the case of a sale of a portion of your farm, it is imperative that you obtain the consent of the minister before you enter the contract. Section 3(e) specifically states that no portion of agricultural land, whether surveyed or not, and whether there is any building on it or not, shall be sold or advertised for sale without the written consent of the minister.

**The primary purpose of the Act is to prevent the subdivision of agricultural land into small uneconomic sections that will hinder agriculture.**

This means you may not take any preliminary steps before having obtained the necessary consent. Furthermore, you cannot enter into a sale agreement with a suspensive condition stating that you must first obtain the consent of the minister before the agreement comes into force and effect. If you do take any preliminary steps, the agreement will be deemed illegitimate.

### Leasing a portion of your farm

Should a producer wish to alienate the right to use a portion of his or her farm by leasing it to a person over the long term, the minister's consent will also be required. The Act states in Section 3(e) that no right to such a portion of land shall be sold or granted for a period of more than ten years or for the natural life of any person, or to the same person for periods aggregating more than ten years.

This clearly prevents a lease that is concluded for ten years or more, which includes a lease that is concluded for five years and thereafter renewed for another five years, or a lease for the natural lifetime of a person, unless you have the minister's consent.

### Bequeathing your farm

It is important to note that no person may own an undivided share in agricultural land, as set out in Section 3(b) of the Act. Therefore, should you bequeath your farm to, for example, two of your children, each will be entitled to an undivided share, which is prohibited unless you have the necessary consent from the minister. Consequently, upon your death, there will be unnecessary delays in administering your estate.

Alternative options would be to bequeath your farm to a company of which your children are directors and shareholders, or to a testamentary trust of which your children will be the beneficiaries. Should any of the aforementioned options not be followed, the only alternative would be to sell the farm and divide the profit between your children.

It is clear that the *Subdivision of Agricultural Land Act* applies in various cases and that the farmer/owner should be aware of its application. If the provisions outlined in the Act are not followed, unnecessary consequences might ensue. 🚫

For more information, contact Shirande Schmidt, associate in the commercial and property law department at VDT Attorneys, at [shirandes@vdt.co.za](mailto:shirandes@vdt.co.za), or visit [www.vdt.co.za](http://www.vdt.co.za) or call 012 452 1300.

# Punitive and precautionary suspension

By Emmirencia Loots, legal advisor, LWO Employers Organisation

## Case study:

The employer's livestock is fast disappearing and he suspects a certain employee's involvement. He decides to install additional cameras to survey the farm and catches the culprit in the act. The employer is free to proceed with criminal charges separately, but in terms of the employer-employee relationship, labour law requires that the employer first holds a disciplinary hearing to ensure that any dismissal is procedurally and substantively fair. Can the employer suspend the employee in the meantime?

Suspending an employee is a common occurrence in the workplace. Employers must, however, take care to follow the correct procedures when imposing both precautionary and punitive suspension to avoid putting their business at unnecessary risk.

## What is precautionary suspension?

Precautionary suspension is imposed when an employer suspects that an employee might have breached either the business's disciplinary code, or the terms and conditions of employment. Due to the nature of the alleged misconduct or breach and lack of proof of guilt, the employer can proceed to suspend the employee on a precautionary basis pending an investigation, especially if there is a possibility that the employee can interfere with the investigation in any way.

Take note that precautionary suspension is with full pay and benefits. The employee should understand that he or she is not being punished and should not suffer any prejudice in general or in respect of remuneration.

Before suspending an employee on a precautionary basis, the employer should ensure that there are justifiable reasons for removing the employee from the workplace, pending an internal investigation.

Typical scenarios where precautionary suspension can be applied include cases of theft, fraud, gross negligence, misuse of the employer's property and the like. Each case must be judged on its own merits, but usually precautionary suspension will not exceed four weeks, although it can be longer if intensive investigation is required.

In order to prepare for the disciplinary hearing, the employee has the right to request additional information (including an interpreter, witnesses, postponement of the hearing, and further information or documentation) by completing a procedural application form at least 24 hours before the disciplinary hearing.

## What is punitive suspension?

Punitive suspension is a form of punishment following a disciplinary hearing where an employee is found guilty of misconduct or a breach of the terms and conditions of employment. Punitive suspension is a sanction which can be imposed on the employee as an alternative to dismissal, and is without pay and benefits.

Punitive suspension can be applied in any case of misconduct where the disciplinary hearing's outcome leads to dismissal, but the employer does not want to dismiss the employee and rather opt for severe punishment in the form of suspension without pay and benefits. Each case must be judged on its own merits, but usually punitive suspension will not exceed two weeks.

## Common mistakes and pitfalls

Common mistakes employers make with regard to suspension include:

- Not following the correct procedure.
- Not clearly informing the employee that he or she is suspended, the reason for the suspension as well as the type of suspension (precautionary or punitive), and the duration of the suspension.
- Not having substantive reason to suspend the employee (insufficient reason to suspend the employee or suspending the employee for the wrong reason).
- Not giving the employee the opportunity to state his or her case.
- Not remunerating the employee (full pay and benefits) during the period of precautionary suspension.

The employer should make it very clear to the suspended employee whether he or she is being suspended on a precautionary or punitive basis to avoid any confusion and possible subsequent Commission for Conciliation, Mediation and Arbitration (CCMA) referrals. 🚫

The LWO Employers Organisation assists employers to comply with labour law, and to use it to their advantage to protect their business. As a registered employers' organisation with the Department of Employment and Labour, the LWO has the right to represent members at the CCMA. Contact the LWO on 086 110 1828 or send an email to [info@lwo.co.za](mailto:info@lwo.co.za).





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