FEBRUARY 2023

PULA IMVULA

GROWING FOOD • PEOPLE • PROSPERITY

GRAIN SA MAGAZINE FOR DEVELOPING FARMERS

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A Word From...

Dr Dirk Strydom

THERE IS A SAYING THAT THE ONLY CONSTANT FACTOR IN AGRICULTURE IS CHANGE. IT IS AN ENVIRONMENT THAT IS FILLED WITH UNCERTAINTY AND RISKS. IF YOU ARE IN THE AGRICULTURAL SECTOR, YOU MADE THE DECISION TO TAKE ON THIS CHALLENGE.

Agriculture is not an easy environment – it is a difficult space to be in and to create a business. It is an environment where everyone does not understand your challenges, frustrations and obstacles. This can sometimes lead to a scenario where you wonder why you are taking all these risks and why you are confronting all these challenges and barriers? I would like to encourage you today and say it is because you have a purpose!

Agriculture is very important for our country. Through agriculture we provide food for the country, create stability in the country and provide hope. The world economy and political environment are in a difficult space, with many unanswered questions and concerns. One thing that stands out, is that people are starting to realise the importance of agriculture.

Food is part of our livelihood. If you look at the history of countries where political dictators were removed from power, you'll see that it started with concerns regarding food security. The conditions in most of these countries meant that there was no more access to food or food prices doubled in a period of a year. Why is this relevant to you as a farmer?

You serve a greater purpose by providing stability, food for many people who are extremely needy and serving your country through dedication. We know it can be tough out there – inputs are expensive, diseases can cause difficulty, fields can be too wet and droughts can strike. However, we urge you to look up, find the light and keep on doing the great work you are doing.

South Africans can be proud of our farmers, who are able to provide food security in a difficult climate and environment. South Africa has the best farmers in the world.

– Dr Dirk Strydom is the Marketing, NAMPO and Research Coordination Lead at Grain SA.

SERVICE YOUR HARVESTER for a good crop

MAIZE, SUNFLOWER OR SOYABEAN HEADERS ARE ONE OF THE MOST IMPORTANT COMPONENTS TO HARVEST A CROP EFFECTIVELY. IF NOT PROPERLY MAINTAINED, THE WEAR AND TEAR WILL HAVE AN EFFECT ON THE COMBINE HARVESTER'S PERFORMANCE AND A NUMBER OF KERNELS WILL END ON THE GROUND.

Make sure that the knives, guards, skid plates and hold-down clips are in good working order on the **cutter bar (Photo 1)** . Remember, if you replace the knives, the guards must normally also be replaced. Make sure that the cutter bar stays in position and that it can move freely.

INSPECT THE MOVING PARTS OF THE HEADER

It is important to read the header manual **(Photo 2)** and to do the maintenance as required.

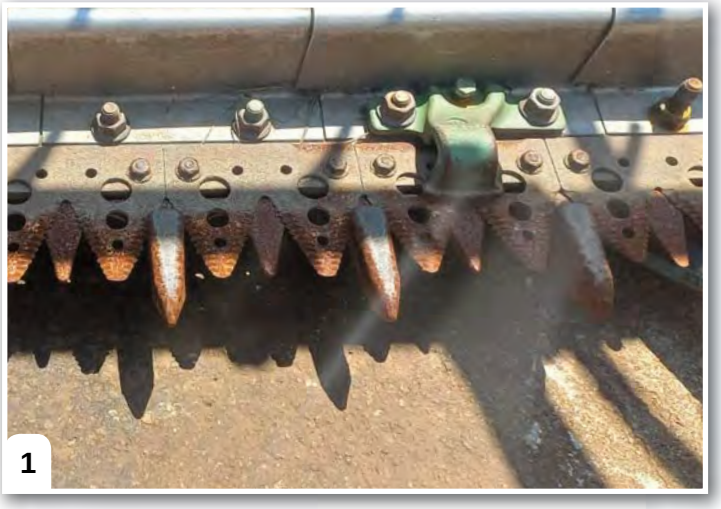
- Check the oils in the gearboxes, as well as the tensions on the fanbelts and driving chains, and oil and grease the power shafts.
- Replace the oil in the gearboxes as required. Grease is a cheap lubrication fluid that can save you a lot of money.

In the older type of headers, check the different clutches **(Photo 3)** and see that they are set according to the manuals. This can save you a lot of money.

Sunflower header

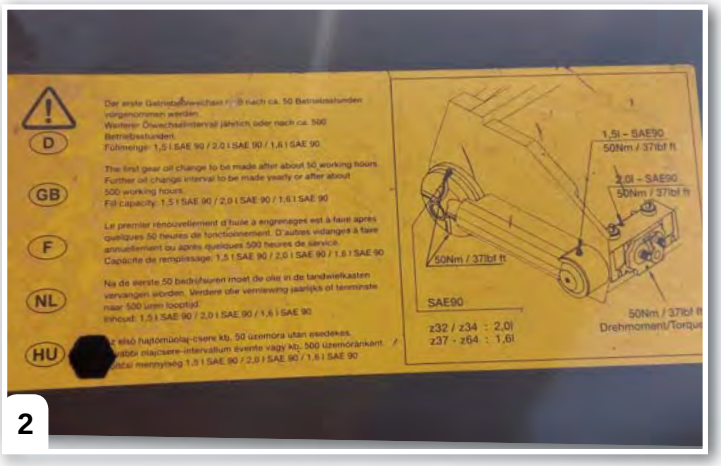
For a sunflower header **(Photo 4)** , make sure that the catch bords are in place and set according to the row widths. Ensure that the bords are tightened and set to catch the sunflower cobs. Check that the cutter bar is working efficiently.

The feed auger fingers, bushings, plastic guides, pins and sleeves must not be worn out, as this will influence the working of the header. If these components are worn out, the material cannot move effectively from the header to the combine machine.



1

The cutter bar – with knives, guards and hold-down clips.



2

It is very important to read the instructions of the header manual before you begin with maintenance.

Maize header

On the maize header (**Photo 5**), the important points to check are the deck plates, gathering chain, snapper and rollers.

Deck plates must be set to catch the cobs and kernels from falling down on the ground. If the deck plates can be adjusted, make sure that they are moving freely. Check for wear and tear on the links to adjust the deck plates.

The **gathering chain** is the chain that moves the material to the header feed auger. Check the tension on the chain and the wear and tear on the chain and sprockets. Make sure that the springs that keep the tension can move freely and are not rusted. Ensure that the drive gearbox is filled with oil or grease.


3

A slip clutch on an older header.


4

A sunflower header.


5

A maize header with the deck plates, gathering chain and snapper rollers clearly visible.


6

The new-generation replacement gathering chain.


7

Snapper rollers on a maize header.

Photo 6 shows a gathering chain from 360 Yield Center. It is a gathering chain equipped with brushes to firstly absorb the shock of the heads on the cover plates and secondly to catch the loose kernels and feed them to the auger. This will help greatly with kernel loss.

Snapper rollers (**Photo 7**) are responsible for pulling the plant through the header. Make sure that the snapper rollers are set according to the manufacture norms. The speed of these rollers should be set according to the speed of harvesting. In the case of high-density maize, 360 Yield Centre markets a product named the chain roll. This snapper roller tears the plant material so that the material can decompose quicker.

For more information, contact your local dealer. ■

PIETMAN BOTHA, INDEPENDENT AGRICULTURAL CONSULTANT

Do your homework on fertiliser prices

TRADITIONALLY, BETWEEN 30% AND 50% OF A GRAIN AND OILSEED FARMER'S EXISTING INPUT COSTS ARE SPENT ON FERTILISER. FERTILISER MAKES UP SUCH A LARGE PORTION OF THE INPUT COSTS THAT ANY CHANGE, ESPECIALLY A PRICE INCREASE, CAN AFFECT YOUR PROFITABILITY DRASTICALLY.

Because South Africa is a net importer of fertiliser, it further aggravates the situation as 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

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

In 2009, fertiliser imports for these five products have increased by 165% in total. South Africa imported a total of 2 155 233 tons of just these five fertiliser products from various countries during 2021. Besides the increase in import volume, the exchange rate of the rand against other major currencies also weakened sharply from 2009 onwards, which further intensified the effect of price increases. For the year 2022 up until August, more than 1 million tons had already been imported, which is about 61% of 2021's total.

Table 1 shows the average price changes for nitrogen (N), phosphate (P) and potassium (K) during July last year, compared to October 2022. It is staggering to see how sharply the prices for these products have increased in a year.

When looking at the fertiliser requirements of different parts of the country, one notices that on average:

- The Western Free State uses 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.
- Irrigation 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 October 2021 and October 2022. On average, the cost of fertiliser increased by 41%.

FERTILISER AFFORDABILITY

Graph 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 the input costs, have become less and less affordable, which means that the farmer's margin for trade has weakened excessively. This puts pressure on the farmer's profitability and can result in fewer hectares being planted, especially maize.

This information paints a clear picture of the extreme challenges that farmers face every day to try and stay afloat. Fertiliser is not the only input cost that has seen sharp price hikes. The cost of energy sources such as fuel and electricity has 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.

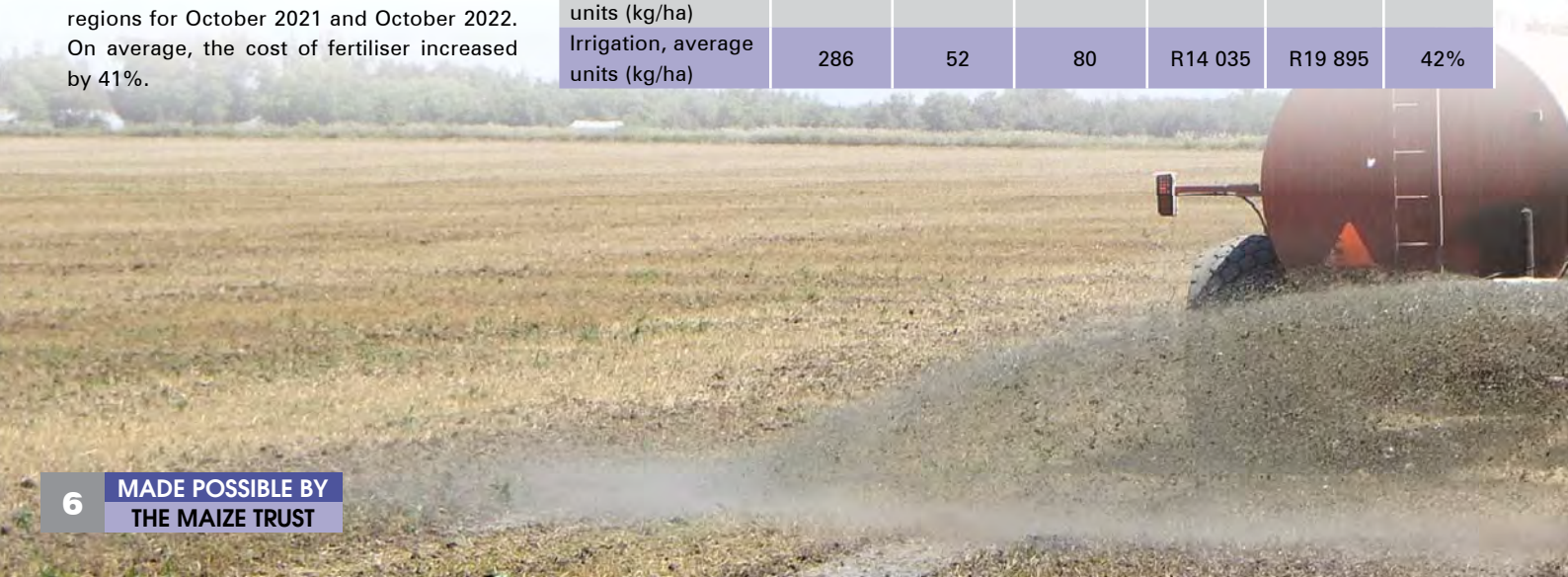
Since there is little room for mistakes, farmers must make sure they are not being taken for a ride by fertiliser suppliers. Do your homework, make sure the representative's prices are market related, compare offers to find the best price and select the most suitable offer for your purposes. ■

1 *Price comparison of nitrogen, phosphate and potassium.*

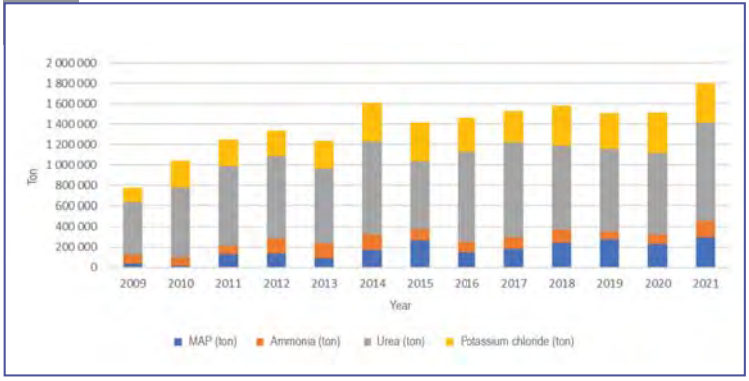
	Nitrogen	Phosphate	Potassium
Average price: Oct 2021 (R/kg)	R30,60	R61	R26,40
Average price: Oct 2022 (R/kg)	R43,90	R78,70	R40,60
Change (year-on-year)	43%	29%	54%

2 *Change in fertiliser cost per hectare for October 2021 compared to October 2022.*

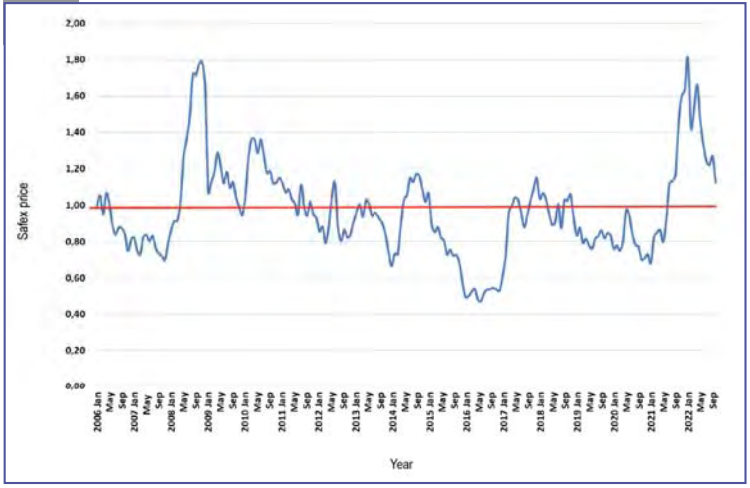
Area	Nitrogen	Phosphate	Potassium	Price: October 2021	Price: October 2022	Change
Eastern Free State, average units (kg/ha)	100	19	27	R4 931	R6 981	42%
Western Free State: average units (kg/ha)	72	16	14	R3 548	R4 988	41%
Irrigation, average units (kg/ha)	286	52	80	R14 035	R19 895	42%



1 ***Four of the five most important fertilisers imported to South Africa.***



2 ***The affordability of fertiliser.***



CHRISTIAAN VERCUEIL, JUNIOR AGRICULTURAL ECONOMIST, GRAIN SA

Keep it *clean* and *tidy*

CLEANLINESS IN THE WORKPLACE IS OF GREAT IMPORTANCE TO AVOID EXPOSING EMPLOYEES UNNECESSARILY TO INJURIES AS A RESULT OF AN UNTIDY AND MESSY ENVIRONMENT.

All farm workers are responsible for good housekeeping. An employer must ensure that storage facilities are available for tools and equipment. Stacking and storage must meet all the necessary requirements. It is also the responsibility of everyone who uses the tools to clean it before putting it back in the designated storage facility. When good housekeeping is maintained, employees will not search for items that need to be used.

Electric cords should not be left on the floor, as this can be a health hazard. Any leakage such as water, fuel or oil should be cleaned up immediately to avoid a slippery surface in the workplace.

Bulk bags, as well as 50 kg bags, must be stacked and stored according to Safety Regulation 8. This will ensure that the workplace is tidy at all times and cannot be an obstacle. Empty oil and chemical containers may not be burned or buried, so the employer must draw up a policy for handling empty containers.

Rubbish bins must be available for waste. These must be emptied and cleaned regularly to avoid attracting pests and rodents. ■

CHARL SAAYMAN, HEALTH AND SAFETY CONSULTANT AT MEGA HEALTH AND SAFETY

Development managers give advice

Be PREPARED and curb crop THEFT

ALTHOUGH THE EXTENT OF AGRICULTURAL PRODUCE THEFT IS VERY DIFFICULT TO QUANTIFY, THESE CRIMES HAVE A PROFOUND IMPACT ON FARMERS' SUSTAINABILITY AND PROFITABILITY. IN ADDITION TO RISING INPUT COSTS, FARMERS ARE FORCED TO SPEND VAST SUMS OF MONEY ON SECURITY MEASURES – SOMETHING THAT FEW CAN AFFORD.

The weak economy and rising unemployment have seen an increase in crime and the agricultural sector has not escaped this. According to Free State Agriculture (FSA), maize theft is now being committed by profit-driven organised crime syndicates. Although there are 'crimes of need', where individuals steal to feed their families, it is the 'crimes of greed' that are a serious concern.

BE BETTER PREPARED

A few Grain SA regional development managers offer advice on how to combat crime and keep your crops safe:

Make the right choice: In the areas serviced by Jerry Mthombothi, Grain SA's regional development manager at the Mbombela office, mostly sugar beans and groundnuts are stolen. There are however areas where the theft of maize cobs is increasing. He advises farmers to avoid planting crops that can be easily processed or cooked – such as groundnuts, sugar beans and green mealies – near villages or residential sites.

The right time: Du Toit van der Westhuizen, Grain SA's regional development manager in North West, says one must be careful of having your seed and other inputs delivered too early. A commercial farmer in North West lost seed to the value of R1,2 million in early in November before he could even start planting.

Private movements: Visiting the fields during the harvesting season is extremely important. Johan Kriel, the regional development manager in the Free State, cautions farmers not to stick to the same daily routine. While moving around on the farm, do an assessment and see if there is anything that may be a potential crime target – try to make your farm more secure.

Fence it: Ensure that boundaries surrounding the farm are secure and well-maintained. If possible, fence off areas that are not secured – like where you have planted your crop, so that people do not have easy access to the produce. Graeme Engelbrecht from Grain SA's Dundee office, urges farmers to fence their plots. If possible, erect an electric fence for extra protection.

Be on guard: 'Farmers should stand together and take shifts to patrol the fields during the harvesting season, when theft increases,' says Jerry. Having a good relationship with your neighbour means you can join forces to guard the crops and help each other when one is away. The alternative is to hire a security company to guard your crops, especially during the night when you and the farm workers are resting, but is a bit more costly.

Caring community: Good neighbourliness is vital. You can't be on the farm at all times. Having neighbours who will let you know if they see anything suspicious and for who you would do the same, means another layer of protection. Take care of your farm workers, as they could become your first line of defence.

Keep strangers at bay: Make sure you know who is on the farm. If someone seems out of place, take note of their physical appearance and their vehicle. Make a note of their licence plate number as well.

BE SAFE:

- Use tamper-resistant locks to limit access to storage areas and control possession of the keys.
- Consider getting alarm systems in your storage facilities or if you already have them, check regularly that they are in working order. 'If you can't afford an alarm system, geese are a good idea as they make a lot of noise when strangers approach,' says Du Toit.
- If your budget allows for more expensive protective measures such as cameras, have them installed very high and out of reach of everyone.
- Graeme says that drones being flown at harvest time over maize fields have become an effective deterrent – for those who can afford them!
- Invest in a good lighting system for around the farm, where it's possible to do so. Many criminals attempt to rob areas at night, when the visibility is poorer, so having proper lighting makes it less attractive as a target.

AFTER THE HARVEST

Ensure that harvested maize is not unnecessarily stored overnight or left in trucks on the fields. Weigh the loads before the trucks leave the farm to ensure that the right load is deposited at the silo.

Graeme says a new issue is raising its head – truck or load theft. It is therefore very important to be vigilant when loads leave the farm. Make sure you know where vehicles are heading.

'It is a good idea to have your own signed delivery book for loads leaving the farm,' says Graeme. 'A 30-ton load of soya is worth more than R250 000. If this was cash you were sending, what measures would be considered adequate? There are farmers who have roving security along their routes at harvest time. You can also use GPS loggers to plot the load and check if any unnecessary stops are being made.' ■

LOUISE KUNZ, ASSISTANT EDITOR

Grain SA ensures sustainable *grain production*

GRAIN SA IS A MEMBER ORGANISATION THAT LOOKS AFTER THE INTERESTS OF ALL GRAIN FARMERS IN SOUTH AFRICA. THE MAIN FOCUS AREA OF GRAIN SA IS TO KEEP GRAIN FARMERS SUSTAINABLE ON THE FARM. GRAIN SA'S STRATEGIC FOCUS AREAS ARE IN LINE WITH THIS VISION OF THE SUSTAINABILITY OF GRAIN FARMERS.

The aspects that Grain SA addresses – to assist in the sustainability of farmers – range from farm level to regulatory aspects at government level. Grain SA is continuously working on, and is involved in, a range of aspects that include macro-level discussions such as the land expropriation issue and the drafting of the five-year agricultural plan. This is to ensure that the grain farmers' needs are also addressed at this level.

GRAIN-SPECIFIC ASPECTS

In terms of grain-specific aspects, Grain SA largely looks at the inputs, market environment, regulatory environment and research.

- Input quality monitoring, maintenance and improvement of the diesel rebate system, as well as dispute resolution for Grain SA members, are some of the main input monitoring that Grain SA does.
- Timely and accurate market information, the promotion of market transparency and the better functioning of the local market are the most important aspects related to the market environment.
- Grain SA also has a great deal of insight into the regulatory environment, with the expansion of local markets, opening and maintenance of export markets, promotion of new technology and product registrations under Act 36, which is the focus here.
- On the research side, the coordination of farmer-driven research is Grain SA's main focus. The list of activities and focus areas is long and we would love to share more information with you as an individual, study group or farmers' association.

LEVIES

Although the value that Grain SA provides to the farmer is not directly quantifiable in all cases, the perspective on the actual cost of the Grain SA levies is important for farmers to capture the return they receive.

Of the farmer's total production cost per hectare, the Grain SA levies account for about 0,15% to 0,2%. The diesel rebate refund to the farmer amounts to 2,5% to 3% of the average production cost per hectare. This is one quantifiable example of returns that a farmer gains from the work done by Grain SA.

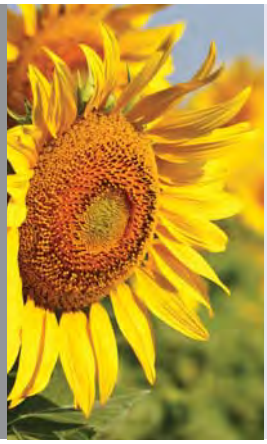
Grain SA offers the farmer the opportunity to focus on the controllable aspects within the direct farming environment, while the organisation focuses on the controllable aspects outside the farmer's direct farming environment.

RECENT GRAIN SA PROJECTS

- **LEAF services:** Grain SA, alongside other industry role-players, was able to prevent LEAF to activate their services since 2016. Grain SA and six other role-players split the legal costs to appeal the implementation of LEAF services. LEAF services would initially cost farmers R4/ton.
- **Alternative differential system:** Together with Johan Strauss from the University of the Free State, Grain SA held workshops with the Johannesburg Stock Exchange (JSE) to propose an alternative differential system, which will be more than just the current system.
- **SAGIS reports:** Out of the Grain SA maize working group, a need arose for SAGIS to publish more details regarding the grade of current stocks. This will make the market more transparent and assist with better price determination in the free market.
- **Maize grading:** Grain SA is pushing for a change in the maize grading regulations to improve the current grading system and create a more transparent system to ensure more accurate grading. This, in turn, will benefit farmers as less of the crop will be downgraded. ■

CHRISTIAAN VERCUEIL, JUNIOR AGRICULTURAL ECONOMIST, GRAIN SA

WORDS OF WISDOM



'Soil is a living ecosystem, and is a farmer's most precious asset. A farmer's productive capacity is directly related to the health of his or her soil.'

~ HOWARD WARREN BUFFETT
American political advisor and philanthropist

Reduce yield loss with weed management

WEEDS ARE THE MOST IMPORTANT BIOTIC CONSTRAINTS TO AGRICULTURAL PRODUCTION IN BOTH DEVELOPING AND DEVELOPED COUNTRIES. THEY ARE THE MOST COSTLY CATEGORY OF AGRICULTURAL PESTS, AS THEY CAUSE MORE YIELD LOSS AND INCREASE FARMERS' PRODUCTION COSTS WHEN COMPARED TO INSECT PESTS, CROP PATHOGENS, ROOT-FEEDING NEMATODES OR WARM-BLOODED PESTS.

Weeds can harbour problem insects, crop diseases and nematodes. Immature weeds can interfere with harvesting operations and weed seeds in harvested crops may increase the risk of spoilage.

Along with other crop pests, weeds are expected to pose a significant challenge to global food security in the future. The global food system faces various challenges in the coming decades, thus a growing world population and changing consumption patterns mean that the food demand will increase considerably.

According to United Nations (UN) estimates, the global population will grow to 9,7 billion people in 2050 (UN DESA, 2015). Developing countries will mostly be affected by this population growth, whereby some countries are already food insecure, especially developing countries, and consumers' preferences are also changing towards higher costs.

The Food and Agriculture Organisation (FAO) of the UN estimates that food production must increase by 70% by 2050 to meet increasing demands, while in the developing countries production has to nearly double (FAO, 2009).

WHAT IS A WEED?

The term 'weed' is often defined as a plant out of place, an unwanted plant or a plant that is a pest as it interferes with crop or livestock production. The term is typically applied to any plant species that often becomes a pest, such as *Chenopodium* spp., *Amaranthus* spp. and *Digitaria* spp.

For example, 'volunteer crops' such as *Fagopyrum esculentum*, *Secale cereale*, *Zea mays* or even *Glycine max* can become weeds when they self-seed and emerge in another part of the crop rotation when they are no longer wanted.

Thus, weeds are to some extent a 'human creation'. Human activities can turn plant species into weeds in two ways: By providing open ecological niches for unwanted plants to grow and by importing new plant species into a given space.

WEED-CROP INTERACTION

Agricultural weeds can negatively affect crop yields or increase the costs of production by:

i) Competing directly for light, nutrients, moisture and space (**Photos 1A and 1B**).
ii) Hosting crop pests or pathogens (**Photos 2A, 2B and 3**).
iii) Promoting diseases by restricting air circulation around the crop (**Photo 4**).
iv) Releasing natural substances that inhibit crop growth (allelopathy).
v) Physically hindering crop growth and development – reproducing prolifically, leading to a greater weed problem in the future.
vi) Interfering with or contaminating the crop harvest (Photo 3).
vii) Parasitising crops directly (**Photo 5**).

This competition, along with the cost of weed management strategies such as tillage, hand weeding and/or herbicides, is responsible for the economic impact of weeds. In addition, the abundance of weeds in a given field and the rate of nematode reproduction on specific weed species determine the magnitude of the effect that they may have on the build-up of plant-parasitic nematode population densities.

Identifying weed species that can act as potential pathogen reservoirs can influence the pest management plan for a given growing season, allowing the farmer to prioritise and plan accordingly. It may be worth the extra time and effort to scout for weeds in areas adjacent to


1A


1B

1A - D: Crop-weed interaction/competition.

2A and B: Sunflower root (2A) and* Chenopodium album *root (2B) infested by root-knot nematodes.

a field that is otherwise ignored. The prevalence of certain weeds and potential pathogens may even inform cultural integrated pest management (IPM) decisions, such as the timing of planting, crop cultivar or variety, or crop rotation schedule.

DEVELOPING A WEED MANAGEMENT PROGRAMME

Yield losses in crops due to weeds depend on several factors such as weed emergence time, weed density, type of weeds or crops. When left uncontrolled, weeds can result in 100% yield loss.

Biology and ecology of weeds

Better understanding of the biology and ecology of weeds will play an essential role over the long term with regard to the development of any weed management programme. It is essential to understand the environmental factors affecting weed seed germination for suppressing

Photo 3: Weeds can be hosts of* Sclerotinia sclerotiorum*, which is a major problem on soybean and sunflower.

Photo. 4. Severe grey leaf spot of maize in a field with a high weed density that reduced the air flow between plants, causing high humidity that increased the susceptibility to foliage diseases.

germination, since there is still lack of basic information on a number of important weed species.

Crop competition

Any strategy in which a crop is used to manage weeds is considered a sustainable weed control practice. However, such strategies still need to be integrated with other tools to enable the achievement of effective weed management.

The effect of weeds on the crop may be reduced through increasing crop competitiveness by narrowing the crop row spacing, increasing the crop-seeding rate, adjusting the crop-planting direction, using a weed-competitive crop cultivar and increasing the precise application of nutrients so that they are available to crops rather than weeds. However, most farmers prefer reduced seed numbers, as such strategies progressively deplete weed seeds in the long run if integrated with other weed management tools.

Although crop competition is not a new technique, the potential for more effective use exists, particularly for herbicide resistant weeds. Weeds emerging after canopy closure are less able to grow and produce biomass and seeds.

Herbicides

Herbicides, like any other tool, are an integral part of any weed

Photo 5: Striga weed directly parasitising maize crop.

Research shows response of genotypes to FOLIAR DISEASES

SORGHUM IS A MAJOR HUMAN FOOD SOURCE IN SEVERAL AFRICAN COUNTRIES WHERE AGRICULTURAL AND ENVIRONMENTAL CONDITIONS ARE UNFAVOURABLE FOR OTHER CEREAL CROPS. THERE IS AN INCREASING BODY OF EVIDENCE AND AWARENESS OF THE BENEFICIAL HEALTH-PROMOTING PROPERTIES OF SORGHUM. IN SOUTH AFRICA, SORGHUM MEAL IS OFTEN EATEN AS A STIFF PORRIDGE MUCH LIKE PAP, WHICH IS REFERRED TO AS *MABELE*.

Other important uses of sorghum include stover and molasses for livestock feed and biofuel. The threat of climate change on crop productivity is high, particularly in the semi-arid regions where higher temperatures and increases in rainfall variability could substantially have negative impacts on food security. To address this challenge, a move toward more climate-resilient crops such as sorghum is of great importance. Development of adapted varieties remains very important, and cultivation of sorghum is expected to expand as an adaptation to climate change.

FACTORS LIMITING YIELD POTENTIAL

Diseases and insects, in addition to abiotic stresses (for example drought, poor soil conditions and heat), are major factors limiting yield potential of sorghum cultivars. Among many foliar diseases of sorghum, anthracnose (*Colletotrichum sublineolum*) and leaf blight (*Exserohilum turcicum*) are the most common to grain and forage sorghum production in South Africa. Anthracnose is widely prevalent under warm, humid conditions. It infects all parts of the sorghum plant, causing yield losses of up to 70% and reducing quality.

Leaf blight is also a most damaging foliar disease of sorghum and is widespread in many humid areas of the world. If leaf blight is established on susceptible cultivars before panicle emergence, grain yield losses may be up to 50%. High levels of loss occur if the disease establishes itself before the boot stage. The grain is not infected, although the debilitating effects of leaf blight may reduce yield and grain weight.

1

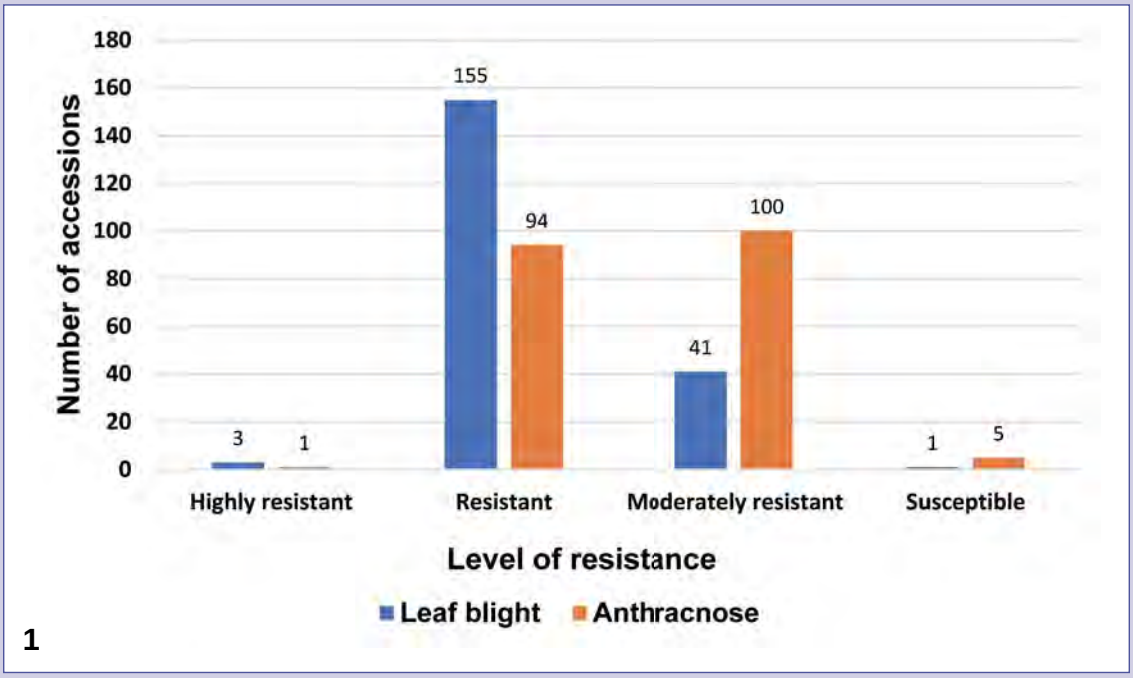
Anthracnose and leaf blight disease symptoms on sorghum leaves: susceptible to anthracnose.

2

Susceptible to leaf blight.

3

Resistance to both anthracnose and leaf blight.



1

Sorghum germplasm accessions resistant/susceptible to leaf blight and/or anthracnose diseases.

Over the last two growing seasons 200 sorghum accessions in the ARC-Grain Crops germplasm bank were evaluated for anthracnose and leaf blight under natural infestation at Potchefstroom and Cedara experimental farms. The common reaction symptoms of sorghum plants to anthracnose and leaf blight disease infections are shown in **Photo 1** to **Photo 3**. The diseases were more severe in the 2021/2022 summer season as compared to 2020/2021, which was due to the higher rainfall that favoured the development of these diseases.

Most of the genotypes evaluated (**Graph 1**) were found resistant to both leaf blight and anthracnose, indicating that they can be useful as sources of resistance in breeding programmes. The best control strategy for these foliar diseases is using integrated pest management methods that include crop rotation, weed control, resistant cultivars, crop debris management, and use of registered foliar fungicides where such practices are economically or practically viable. ■

DR NEMERA SHARGIE AND THULO SEJAKE, ARC-GRAIN CROPS, POTCHEFSTROOM.
FIRST PUBLISHED IN SA GRAAN/ GRAIN, OCTOBER 2022.

Reduce yield loss with weed management...

6

The effect of pesticide application mistakes.

control strategy. However, this strategy needs particular attention, with special reference to developing countries. The use of full herbicide rates, herbicide mixtures and herbicide rotations may reduce the risk of evolution of resistance in weeds. There is a need for research studies on the development and application of nano-herbicides in different cropping systems.

Climate change

An increase in the carbon dioxide (CO_2) concentration, temperature and the severity and frequency of drought and flooding are mainly associated with climate change. Herbicide efficacy also stands to be affected by projected climatic conditions.

Integrated weed management

This approach in the control of weeds is using different, complimentary methods within a system rather than relying on a single method. The main aim of this approach is to reduce the selection pressure for the development of resistance to any single method of weed control.

CHALLENGES

Most challenges faced by farmers are due to a lack of or limited access to information, as well as limited access to the fields, particularly after heavy rainfall. It remains imperative that farmers adhere strictly to the recommendations on product labels in terms of the specific weeds that can be controlled (**Photo 6**), the crop(s) on which the herbicide is registered, the dosage rates to be used and any residual effects the herbicide might have.

- Stay resilient against global economic factors.
- Cope with climate change, the impacts on farm operations and products/inputs transportation as well as biodiversity loss.
- Invest in farm productivity.
- Adopt and learn new technologies.

CONCLUSION

Weeds affect crop production in many ways, including reducing yields, interfering with harvest efficiency, contributing to future weed problems and detracting from field appearance. They are the cause of significant yield loss, even after the application of a particular control method. Hence, a single method of control will not provide adequate long-term weed management – instead it will lead to the development of resistance.

There is an urgent need to reduce this yield loss in order to sustain an increasing human population – thus there is a need to develop effective and sustainable integrated weed management programmes. ■

NANCY NTIDI, ARC-GRAIN CROPS, POTCHEFSTROOM, AND SANDRA LAMPRECHT, ARC PLANT HEALTH & PROTECTION, STELLENBOSCH

WEED RESISTANCE poses global challenge

HERBICIDE RESISTANCE IS A WELL-KNOWN OCCURRENCE IN MANY CROPS IN SOUTH AFRICA. SINCE THE FIRST CONFIRMED CASE OF HERBICIDE-RESISTANT WILD OATS IN 1986, VARIOUS CASES OF HERBICIDE RESISTANCE HAVE BEEN CONFIRMED ANNUALLY. AS HERBICIDE RESISTANCE IS ABLE TO INCREASE AND SPREAD OVER SEASONS, IT IS IMPORTANT TO UNDERSTAND ITS WORKINGS AND THE CORRECT CONTROL MEASURES NEEDED TO MANAGE WEED POPULATIONS.

SA Graan/Grain approached experts in the field to find out how producers can better manage the challenge.

HOW DO WEEDS BECOME RESISTANT?

Dr Gerhard Verdoorn, operations and stewardship manager at CropLife SA, explains that all living organisms have inherent mechanisms to overcome environmental stressors such as heat, cold, drought and natural pests. He adds that anthropomorphic stressors such as pesticides may be foreign to living organisms, but pesticides act upon receptors in the biosystem where the systems may inherently have defence mechanisms against the impacts of pesticides.

1

The most recent major case of resistance was reported with the identification of Amaranthus palmeri.

Photo: Prof J Vorster, SAHRI, UP

'In the population dynamics of a species, the most adaptable individuals are the ones that survive the stressors such as pesticides and become more resistant to the modes of action than the broad spectrum of individuals in the population. This is called sensitivity shift. In simple terms, a population of a species becomes less sensitive to a pesticide over successive generations and may at a certain stage be resistant to certain pesticide modes of action.

'Weeds compete with agricultural crops for water, nutrients and sunlight, hence the need to control them for fear of losing crops. Herbicides are commonly used as a weed control tool, while cultivation practices play a very important role in preventing weeds from impacting on plant health and production. Incorrect use of herbicides, such as not using the correct dosage or applying herbicides at the wrong growth stage of the weeds, inadvertently leads to sensitivity shift and ultimately resistance. Herbicide labels offer sound guidance on correct use of the products, which is sadly often ignored with resultant herbicide resistance issues,' explains Dr Verdoorn.

The problem is that resistance development or sensitivity shift are seldom seen in the early stage of the resistance cycle. Dr Verdoorn explains that it goes largely unnoticed, because producers use higher herbicide dosages to combat weeds that are difficult to control, without considering sensitivity shift. 'It only becomes reality when weeds stretch their muscles and stand tall against double or even higher dosages of herbicides. All weed species should be viewed with suspicion, because individuals in all populations of all species have resistant genes that, at some time, will catalyse resistance to certain herbicide modes of action. Ryegrass is well-known in the Western Cape wheat fields as a problematic weed, but it is likely that summer rainfall weeds will be present, causing challenges of a different nature for producers. It is not only grain producers that struggle with weeds. Fruit orchards and vineyards are also susceptible to weed invasion. If Palmer amaranth ever arrives in the Western Cape, it will place all producers in a serious predicament.'

TYPES OF RESISTANCE

According to Ingrid Boshoff, technical lead: Herbicides at Syngenta South Africa, herbicide resistance can be split into two major classes: and **non-target-site resistance** (NTSR).

TSR, she explains, is the most common form of resistance and refers to changes that occur relating to the target site of the herbicide within the weed plant. One type of change that can occur is a change in the structure of the target protein known as a conformational change. 'Imagine a key fitting into a lock where the herbicide molecule is the key, and the binding site is the lock. When the lock changes, the key no longer fits. This results in the decreased efficacy of the herbicide. Other changes that can occur are an increase in the expression of the protein or a duplication in the copies of the gene containing the target site. Both these result in the plant having an increased number of target sites.'

NTSR, on the other hand, refers to the transportation of the herbicide molecule to the binding site within the weed. According to Ingrid, there are several things that could go wrong along the way as the weed plant tries to protect itself. 'One of these defence mechanisms is to reduce the translocation of the herbicide. Translocation refers to the movement of sugars or nutrients to different areas within the plant. The herbicide will also move along the same path as the sugars. Thus, if the plant reduces translocation, it also reduces the movement of the herbicide, slowing its arrival to the site of action. Another mechanism is increasing the metabolic detoxification of the herbicide. This means that the plant increases production of enzymes that can break down the herbicide. An example of this mechanism is with *Lolium rigidum* against diclofop herbicide – this common grass weed developed the ability to increase metabolism of diclofop by

10%. This increased metabolism was enough to produce a 30-fold difference in sensitivity to the herbicide. Thirdly, the weed can also sequester the herbicide which immobilises or traps the herbicide at a location within the plant. All these obstacles will result in less herbicide reaching the binding site at the site of action.'

The difference between TSR and NTSR gives important insight into how to manage herbicide-resistant weeds. With resistance management, alternating herbicides with different modes of action (groups) are very important. With NTSR there is the added option of considering different formulations as management tools.

Most recently, a major case of resistance was reported with the identification of *Amaranthus palmeri* and possible resistance to several herbicide groups. Researchers are still in the process of publishing results to add this case on the global HRAC list for South Africa. This weed exhibits classic TSR against glyphosate by overexpression of the EPSPS gene. 'It is important to have good knowledge of the weeds in your field to better manage them and prevent resistance from developing. It is also important to know when poor control could be the result of a resistant population or can be attributed to something else,' says Ingrid.

HERBICIDE RESISTANCE FINDINGS FROM ARC-SMALL GRAIN

According to Hestia Nienaber, researcher at ARC-Small Grain, their research shows that ryegrass was the biggest grassweed concern to producers in South Africa. This weed is listed as the most problematic weed with regard to herbicide resistance in the world, resulting in worldwide research programmes specifically focussed on ryegrass. Several other weeds have also been a concern as hard to control or herbicide-resistant. These include grassweeds like wild oats, little seeded canary grass and ripgut brome as well as broad-leaved weeds like wild radish, buckhorn plantain and wild buckwheat.

'When looking at ryegrass, it is clear that confirmed herbicide-resistant ryegrass biotypes have increased significantly. Another significant finding is that although herbicide resistance started in the Western Cape, it has now spread to several other provinces, including the Northern and Eastern Cape.'

Nienaber says resistance to several different herbicide groups have been confirmed. These groups include:

- glycine/group G/9 (for example glyphosate);
- pyridinium/group D/22 (for example paraquat);
- group A/1 (FOPs, DIMs and DENs); and
- group B/2 (ALS inhibitors).

'In recent years, more research has been focussed on identifying target-site herbicide resistance in especially grassweeds in wheat and barley. TSR screening for herbicides from group A/1 and group B/2 was predominantly conducted. The screening for TSR is done with molecular markers and is conducted as an in-season screening method for producers. Molecular marker screening results can be available within two to five days, but only allows the researcher to screen for TSR. Glasshouse trials are conducted to screen for other mechanisms of resistance. Screening for resistance to glycine and pyridinium herbicides are, for example, conducted in the glasshouse.

2

Lolium spp. uncontrolled at the verge of a barley field.

3

Poorly controlled Phalaris minor by a group 1 herbicide.

MONITORING RESISTANCE

The Herbicide Resistance Action Committee (HRAC) of CropLife International (which also has a strong presence in South Africa in

Weed resistance poses global challenge...

collaboration with CropLife SA), was established to monitor resistance development in weeds and to offer mitigation measures, while categorising herbicides according to their respective modes of action. The number of weeds that are challenging producers globally is sitting at a staggering 478 biotypes within 252 weed species. 'South Africa is not as bad as some of the northern hemisphere countries, but we do have a couple of weed species that pose serious challenges to crop producers. The most recent and perhaps scariest of all is *Amaranthus palmeri* that was discovered close to Douglas in the Northern Cape in 2016. This weed species is already resistant against six different herbicide modes of action and poses a very serious sustainability risk to grain producers,' explains Dr Verdoorn.

Close monitoring of weeds that are no longer effectively controlled by herbicides is key to understanding the problem and should initiate the implementation of different control practices. It is also important to report these weed populations to HRAC South Africa. Please report this to CropLife at *info@croplife.co.za* and the HRAC SA chair, Cullen Botes, at *cbotes@winfieldunited.co.za.*

1 ***A list of known resistant weeds found in south africa.***

Year	Species	Modes of action	Actives	Situations
1986	*Avena fatua*/common wild oats	Inhibition of acetolactate synthase; HRAC group 2 (Legacy B), inhibition of acetyl CoA carboxylase; HRAC group 1 (Legacy A)	clodinafop-propargyl, diclofop-methyl, fluazifop-butyl, fenoxaprop-ethyl, sethoxydim, tralkoxydim, sulfosulfuron, imazamox, iodosulfuron-methyl-Na	Wheat
1993	*Lolium rigidum*/annual ryegrass	Inhibition of acetolactate synthase; HRAC group 2 (Legacy B), inhibition of acetyl CoA carboxylase; HRAC group 1 (Legacy A)	haloxyfop-methyl, clodinafop-propargyl, diclofop-methyl, fluazifop-butyl, sethoxydim, tralkoxydim, imazamox	Wheat
1997	*Raphanus raphanistrum*/ wild radish	Inhibition of acetolactate synthase; HRAC group 2 (Legacy B)	thifensulfuron-methyl, chlorsulfuron, tribenuron-methyl, metsulfuron-methyl, triasulfuron, iodosulfuron-methyl-Na	Spring barley, wheat
1999	*Phalaris minor*/small-seeded canary grass	Inhibition of acetolactate synthase; HRAC group 2 (Legacy B), inhibition of acetyl CoA carboxylase; HRAC group 1 (Legacy A)	haloxyfop-methyl, clodinafop-propargyl, diclofop-methyl, propaquizafop, quizalofop-ethyl, fenoxaprop-ethyl, sulfosulfuron, iodosulfuron-methyl-Na, mesosulfuron-methyl	Pastures, wheat
2002	*Stellaria media*/chickweed	Inhibition of acetolactate synthase; HRAC group 2 (Legacy B)	thifensulfuron-methyl, chlorsulfuron, metsulfuron-methyl, triasulfuron	Cereals

**In South Africa MG 4 cultivars are planted in cool/moderate areas, MG 6 in moderate/warm areas*

STEPS TO PREVENT RESISTANCE

1. Move to integrated weed management immediately and incorporate mechanical weeding in cultivation practices.
2. Check labels of herbicides for its resistance codes and switch between different modes of action on a regular basis; the HRAC website (*https://www.hracglobal.com*),smartphone app and the Herbicide MOA poster (*https://croplife.co.za/HRACMOA*) offer good descriptions of herbicide modes of action.
3. Follow label directions to the letter and do not deviate from dosage rates and application volumes.
4. Choose optimal weather conditions for herbicide application.
5. Apply herbicides when weeds are still very young.
6. Remove weeds that show resistance by desiccating and burning to prevent resprouting or seed dispersal.

Scan the QR code to read the complete article.

VALERIE CILLIERS, EDITOR, SA GRAAN/GRAIN. FIRST PUBLISHED IN SA GRAAN/GRAIN, FEBRUARY 2022.

Corner Post

BY LOUISE KUNZ, ASSISTANT EDITOR

THE GRAIN SA/STANDARD BANK SMALLHOLDER FARMER OF THE YEAR FOR 2022, JOSEPH TUELO MOKALENG (54), HAS NEVER KNOWN ANY OTHER WORKPLACE THAN THE FRESH AIR OF THE FARM. TO HIM, AGRICULTURE MEANS LIFE AS YOU CAN LIVE OFF THE LAND AND TAKE CARE OF YOUR FAMILY IN THIS WAY TOO.

JOSEPH'S STORY

Joseph grew up in a rural area, where the community was dependent on agriculture to survive so both his parents and grandparents were involved in agriculture. Although they did not farm for profit but for subsistence, Joseph had a bigger dream and now produces on a much larger scale. The donkeys on the farm which were used for ploughing have made way for mechanisation. His workers have also been trained to ensure that the tractors and equipment on the farm are well-maintained.

His passion for agriculture comes from working hard on the farm helping his father, Semouso. 'I actually became a full-time farmer in 1983. Because of a lack of funds I had to leave school after completing grade 10. I then returned home to help my aging father farm on a subsistence scale.' When he joined his father on the farm they still ploughed with donkeys. After a few years of struggling they were able to buy a Massey Ferguson tractor, which is still in working condition today! When Semouso got too old to work, Joseph took over all the farming duties.

Now his daughter, Mantsho, is showing the same passion. She is working at her father's side to learn as much as possible – from driving the tractors to assisting with the administration of the farm. Joseph is a real community man who is quick to help others and doesn't mind sharing his equipment with his neighbours.

WHAT ROLE HAS GRAIN SA PLAYED IN YOUR FARMING OPERATION?

Grain SA taught me about the importance of knowing your soil, the advantages of crop rotation and about conventional cultivation – to rip, and not plough every year. I also learned about the importance of weed control, which has helped me to improve as a farmer. They showed us how to progress and make a profit.

WHAT ARE SOME OF THE CHALLENGES YOU FACE?

One of the biggest challenges affecting my farming operation is theft. Then weather conditions also present many challenges in our area as do political instability and finances.

WHAT IS YOUR DREAM FOR THE FUTURE?

One day I would love to become a fully-fledged commercial farmer farming on my own farm without the added challenges of communal life.

WHAT ROLE DO YOU PLAY IN YOUR COMMUNITY?

It is important to me that the people in the village are well looked after. Each village has their own communal water pump and it is my responsibility to maintain the pump and service the diesel engine to ensure that the community has water. In some of the other villages the engines had to be replaced, but in our village the engine remains in a good working condition due to maintenance. ■

3 TIPS FROM A WINNER

- Don't think that you know everything – be prepared to learn from others.
- Remain humble and cooperate with those who want to help you.
- Work hard.

FARM FACTS

Farm: Morena Village
Nearest town: Delareyville
Region: North West
Size: 100 ha arable land, which he leases, plus 20 ha communal land.
Type: Mixed (livestock, plants sunflower and drybeans)

GRAIN SA'S CONTRIBUTION

- Joseph joined Grain SA in 2006 after completing his first training course.
- He is a member of the Vrischgewacht Study Group.

Training courses completed:

- Contractor's course
- Tractor and farm implement maintenance
- Advanced maize production and marketing
- Introduction to groundnut production
- Basic engine repair
- Resources assessment and farm planning
- Introduction to sunflower
- Workshop skills
- Farming for profit
- Business ethics
- High application tractor maintenance

A mentor's view:

Du Toit van der Westhuizen, regional development coordinator at the Lichtenburg office, has seen Joseph's dedication over the years. He says that Joseph is a hardworking man, who follows the advice given to him. Despite years of devastating drought, Joseph never gave up and was able to pull through and remain farming.

A programme that is changing lives

Learn what keeps the cogs turning

IF YOU ARE A FARMER WHO REGULARLY WORKS WITH TRACTORS AND IMPLEMENTS, IT'S IMPORTANT TO KNOW EVERY NUT AND BOLT AND WHAT KEEPS THE COGS TURNING. THE SAME APPLIES TO BEING A MEMBER OF GRAIN SA. IT'S HELPFUL TO UNDERSTAND THE WORKINGS OF OUR ORGANISATION IN ORDER TO REALISE WHAT YOU CAN EXPECT FROM THEM – AND WHAT THEY CAN EXPECT FROM YOU.

There is a close relationship between grain farmer members and the management team doing the day-to-day work in Grain SA's offices. It is strategically structured as follows:

- The highest authority of the organisation is Grain SA's annual **Congress**. The selected delegates are all *bona fide* grain farmers and they come together to represent the farmers in their particular regions. When you agree to be a delegate to Congress, you accept the responsibility to serve as the voice of the farmers in your region. Delegates must be prepared to speak up on matters that affect and concern the farmers in their region. It is also their duty to be a channel of communication back from Congress to the farmers 'back home'.
- The Congress further has the responsibility of electing committed and dynamic individuals to the **Grain SA Executive** (the 'Hoofbestuur'). Those individuals are more deeply involved in the continued processes of communication between the farmers and the Grain SA management team throughout the year. Among the key appointments made at Congress are Grain SA's chairperson and two vice-chairpersons, who play an important role in representing farmers' interests and championing farmers in the offices of government officials, policymakers and on numerous other public platforms. They are the face of the grain farmer in the media too.
- Once Congress has ended, the newly appointed Executive immediately meets for the first time. The chairman will preside, and the committee will then elect a core Management committee of the executive (the 'dagbestuur'). This is a smaller committee of the farmer leadership that meets regularly and is directly involved with all personnel matters, appointments, the financial management of the organisation and the day-to-day oversight.
- At the same meeting, the members of the Executive will identify their own areas of interest and volunteer their time to participate in the many different working groups. Each working group (WG) is chaired by a farmer on the Executive and focuses on the more specific issues of an aspect of grain farming – for example, the maize specialist WG, the oil and protein seeds WG, the winter cereals WG, the research and development WG, the farmer development WG and the editorial committees for *SA Graan/Grain* and *Pula Imvula* magazines. Grain SA's personnel who are tasked with responsibilities for work that falls within the scope of each specialist working group, will also attend these meetings. In this way the farmers and the personnel members are always talking to each other, keeping the channels of communication flowing.

Delegates from the Western Cape at the annual Congress in 2022.

AT GRASS ROOTS

Grain SA's Congress forms the highest authority of the organisation.

At the working group sessions, matters that can impact crop production are discussed.

Panel discussions form part of the congress programme.

A member of the Executive, Thomas Sibiya, was the voice of the farmers of Region 29 at the 2022 Congress.

Here to help you farm better

FARMERS have long recognised the importance of using experts in the agricultural field to assist them so they can focus on what they do best – grow the grain, keep their farms on course to produce food and contribute towards stabilising rural economies.

This is why so many farmers willingly pay their annual levies to be members of Grain SA. This dynamic organisation truly keeps its finger on the pulse of all matters influencing the agricultural environment and impacting farming operations. Here are some farmers who have benefitted from the input of the Grain SA experts – regional development coordinators and mentors – in the field.

Johan Kriel (on the right), regional development coordinator in the Free State and one of the Free State mentors, looks at the crops of a potential commercial farmer.

A mentor from the Maclear area helps Sopazi Lunyaweni from the Ugie area with his planning.

A Grain SA mentor checks the moisture content of farmer Sabasaba's maize before harvesting takes place.

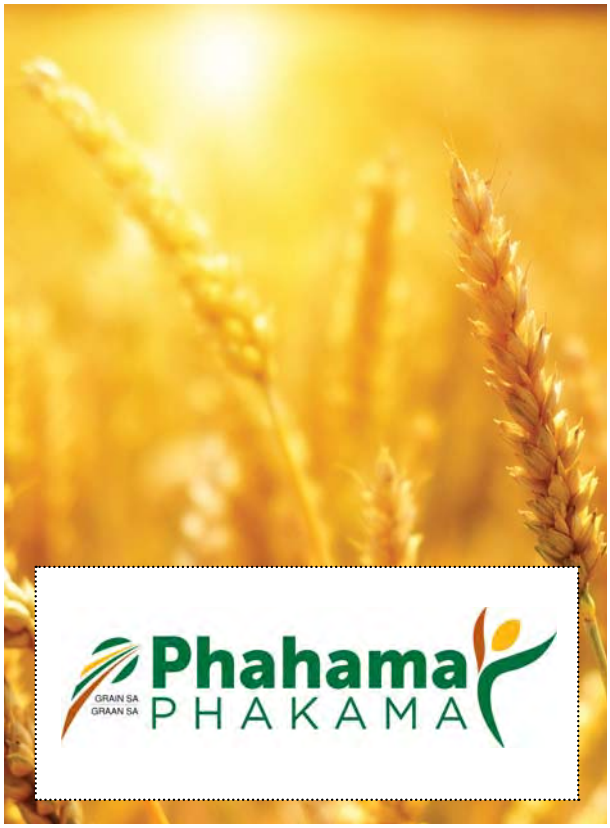
Graeme Engelbrecht, regional development coordinator at the Dundee office, helps farmers with maintenance.

Bridging THE GAP

THE Farmer Development Programme has evolved over many years into its current status, which now falls under the umbrella of Grain SA, but is in the form of a new Section 18A company, Phahama Grain Phakama (PGP) – which means 'growth for grain farmers'.

This new non-profit company is solely focused on grain farmer development through training, skills development and mentorship. It also has all the necessary compliances in place that are required by donors. It will focus on bridging the gap between where farmers are now and what is achievable.

The emphasis is on the commercialisation of new era producers, who will be supported towards achieving the best yields possible from the land available to them – using technology and current best practices – and so find they are positioned to contribute to national food production. At the same time, the existing support services to subsistence farmers and smallholders will remain in place since household food security and enterprise development remain priorities of the organisation. ■



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Farm: *Brookside Farming, Harry Gwala Agri*
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