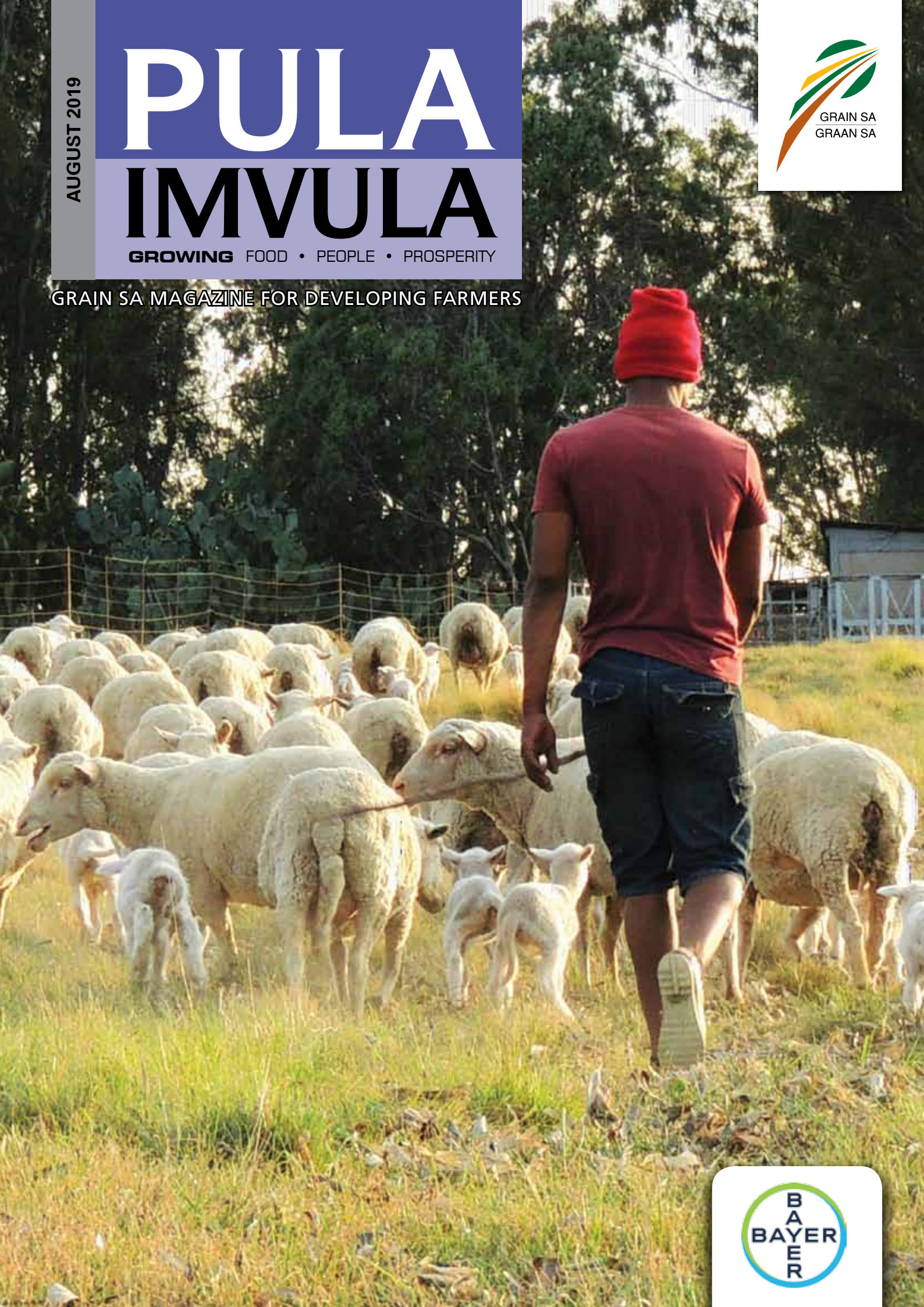


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# PULA IMVULA

**GROWING** FOOD • PEOPLE • PROSPERITY

GRAIN SA MAGAZINE FOR DEVELOPING FARMERS





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# CONTENTS



## MANAGE CLIMATE CHANGE RISKS

11



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06

## LOOKING AT YOUR MAIZE MARKETS

10

## IMPORTANCE OF MONITORING INSECTS IN A MANAGEMENT PROGRAMME

16

## WEED CONTROL FOR HERBICIDE RESISTANCE

17



18



19



## A WORD FROM... Johan Kriel

**T**HE 2018/2019 SEASON WAS A TOUGH ONE. THE RAIN STAYED AWAY AND THE TIME FOR PLANTING SLOWLY PASSED. THEN THE RAIN CAME. RIVERS AND STREAMS FLOWED, DAMS FILLED AND OVERFLOWED. THE FROST STAYED AWAY. THE WORLD OF FARMING IS A WEIRD AND WONDERFUL ONE. NEVER A BORING MOMENT.

Farmers, lift your eyes up, bend the knee and give thanks to your God for the privilege to have the opportunity to work the land. Treat the land with respect and it will give back tenfold.

The following ideas I want to share, is printed on a small clipboard I received at a Farmers Day. It has the Bayer and Grain SA logos on. It is called: **Building Blocks for PROFITABILITY.**

- 1. Planning:** What will I base my decisions on for today? Take the emotion out of financial decisions. Let your head not your heart take the lead. Pressure (financial) can force you to panic and to lose focus.
- 2. Farming happens in cycles:** Am I in-sync with the rhythm of my business? In the Bible, Ecclesiastes 3, it is written: For everything there is a season, a time to plant, and a time to harvest etc. Prepare your soil in time. Plant in time. Spray in time. Harvest in time. Put the bull to the cows in time. Take the bull out in time. Wean in time. Sell when the price is right. Find the golden equilibrium of your farm and stick to it.
- 3. Focus on flexibility:** How many legs does my business stand on? Do not put all the eggs in one basket. Be prepared to use new technology but only if you understand it, can afford it and, it will add value to your business. Ask the question: What am I good at? Stick to it but do it better.
- 4. Collaboration:** How do I pick my partners? The people who make up my support base, input, suppliers, financial institutions, individuals I spend my time with. Distinguish between noise and music. Remember that talk is cheap. Actions speak louder than words. It is all about adding real value to your life and business.
- 5. Relationships:** What type of legacy will I leave behind? Did I leave the world a better place or did I damage what was entrusted to me to use? Did I stand for hard work, honesty, integrity, love and respect for the land I farmed on? How have I treated the people around me? Was it all about self-enrichment and myself, or did I in some small way improve the quality of the lives of my workers, family, neighbours?

Farming is so much more than just working the lands. Farming is a special gift, given to a chosen few. It is up to you: Land owner, food producer, *boer*, employer, grandparents, parents, *plaaskind*, to keep on feeding the world, to be responsible for your land, to make it better for those generations that will follow. You are the past, the present, and the future. May your God bless you and keep you safe. ■

# FARMING KNOWLEDGE IS POWER

**T**HE HARVEST HAS ENDED...BUT OUR WORK IS NOT YET DONE! EVERY PROJECT HAS A CYCLE AND THE SAME HOLDS FOR OUR ON-FARM SEASONAL ACTIVITIES. WHEN YOU SET OUT AT THE START OF THE SEASON TO PLANT A FIELD OF GRAIN FOR FOOD AND/OR PROFIT, YOU ACTUALLY EMBARKED ON A NEW PROJECT.

The project management process for the 2018/2019 season is not complete until every last activity can be ticked off as done, and a post-harvest monitoring and evaluation has been conducted. In fact, no farmer should begin a new season without doing a thorough evaluation of the last project. It is one thing to make a plan; but quite another thing to put it into operation and make sure it works. Control over your farming enterprise is essential and post-harvest assessment and measurement helps you to check if progress is being made or if you need to make adjustments.

This 'control' is managed through key processes such as practical maintenance of your tools and resources, record keeping of every aspect of the enterprise and analysis and correction where necessary to ensure the sustainability of the business.

## IMPORTANT POST-HARVEST ACTIVITIES FOR FARMERS

### Grain marketing and storage

The work does not end on the day the last of the maize has been harvested, in many ways that is when the business side of the project begins. A farmer must assess the yield and make decisions about the marketing and storage of the harvest. Do you know that one of the most serious yield losses are incurred in developing countries due to post-harvest losses?

Although maize can be stored for a considerable period in an unprocessed form without deteriorating, it must be kept safe from rodents and pests and it must be protected from moisture. Mould occurs if the grain was not dry enough at harvesting or if it is exposed to high humidity or moisture due to poor storage management. Fungal infection will cause rot and the development of aflatoxins which are poisonous to livestock and can even cause serious health issues for humans. The risks of home storage need to be measured against the costs of storing the maize at a silo where the grain is kept safe for you.

*Knowledge is power and it can command obedience. A man of knowledge during his lifetime can make people obey and follow him and he is praised and venerated after his death. Remember that knowledge is a ruler and wealth is its subject. – Ancient wisdom*

### Field management

Visit your fields. Are you going to have livestock grazing on the material left on the land or are you going to use that material to build up the health status of your soil? If you are not going to utilise the maize stover



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there is a risk that wind will blow the valuable organic material away, so you should consider disking it in, so it is not wasted. Also assess the soil health using the strategies you have learned including moisture levels, soil sampling and weed bank assessment. Decide what the next processes on the field will be and how best you will manage the field.

### Maintenance – safe storage of tools

Take time to store or service all the equipment you have used during the harvesting process. The tractors will need to be serviced and cleaned. Your harvesting equipment needs to be cleaned, greased and stored carefully until you next need them. It is ideal to already embark on a post-harvest maintenance programme since the problems you experienced will still be fresh in your mind and you can attend to the weak areas. Keep a record of your maintenance programme so you always know exactly when last your vehicles and implements were serviced.

### Analysis – lessons learned

Because farming is tied to the movement of the seasons, project management is challenging. It is quite normal for a farmer to still be tying up the ends of one season while he is already initiating the activities of the next season.

The crop has not yet been sold off and he is worrying about financing next season's inputs, preparing the fields and ordering inputs for the next cycle. It is very easy to be swept along into new season activities and then neglect the CRITICAL process of ANALYSIS AND ASSESSMENT after each cycle. This is asking for trouble and could lead a farmer into a debt trap.

Records are kept for three main reasons:

1. To measure performance.
2. To guide future decisions.
3. To provide accurate data. Records should reveal the strengths of your business and help identify weaknesses which need correction.

Good farm records should have:

- A purpose;
- be easy to keep; and
- be up-to-date.

## WHAT SHOULD WE RECORD?

The true measure of the value of any business leader and management is performance!

- **Financial records** – this is the information you need to provide to your bookkeepers. The information will give you an idea of your whole farm profitability over a specific period.
- **A cash analysis book** – where you keep track of all your receipts and expenses.



- **A list of debtors and creditors** – this will quickly remind you who owes you money – and who you owe money to.
- **Valuations** – we need to know the value of every asset on our books. This includes land, vehicles, tractors and implements, livestock and unsold crops.
- **Enterprise outputs** – this is a record of the financial output of each crop or livestock enterprise for every cycle on its own. This information helps the farmer to determine profitability of each separate farming activity and then decide if it is worth going ahead with it.
- **Enterprise costs** – know exactly what it costs to plant a hectare of maize or to raise a cycle of broilers by keeping track of the amount of money spent on that project during the cycle.
- **Labour costs** – it is difficult to be exact, but one needs to assess labour management, performance and cost and then ask questions about efficient use of time. Are your workers overworked, underworked and are they fairly compensated for their work?



*Those who cannot remember the past are condemned to repeat it.*



- **Machinery costs** – keep a record book for each machine that you own. Know its current value (remember to calculate annual depreciation). Record what you spend on repairs and analyse fuel consumption if relevant. This can alert you to excessive spend and problems that need attention.
- **Record of livestock** – keep accurate monthly records of all your livestock, note births and purchases, log all mortalities and record sales. Breeding records will help you to track the performance of your cows, so you know which your top performers are, and which should be culled.
- **Crop yields** – know what your crops returned in yields/ha. This is the bottom line for determining profitability per crop.
- **Field records and rotation records** – keep a logbook of crops planted in each field so you have a history. Note down the processes e.g. plough, disk, ripped, spray and fertilisation programmes followed every time. Record dates of planting and yields returned.

If you equip yourself with detailed information about your farming activities, you are empowered to make the wisest decisions going forward. Do yourself a favour and take a project management approach to your farming operations – no matter how large or small they might be. It has been said knowledge is more valuable than money – knowledge can never be taken away from you – knowledge is power! ■



*Finalise the current years' records first.*



*Maintain the equipment on a regular basis.*



*Tractors need to be serviced and checked thoroughly.*

# NAMPO

## – the secret is revealed

**O**N HIS FIRST VISIT TO THE NAMPO HARVEST DAY, THE DEPUTY MINISTER OF AGRICULTURE, FORESTRY AND FISHERIES, SFISO BUTHELEZI, DESCRIBED THIS UNIQUE TRADE SHOW AS THE BEST-KEPT SECRET OF THE AGRICULTURAL SECTOR. HE SAID THAT EVERY SOUTH AFRICAN WHO CONSUMES FOOD SHOULD EXPERIENCE IT.

In Chile and Argentina – where he had attended similar shows – the country comes to a standstill to support producers. ‘I cannot understand why this is not the case in South Africa too,’ he added.

If you are one of the people who is making a difference to food security in South Africa, you should at least visit the Harvest Day once in your lifetime. It is an opportunity to see first-hand what agriculture is about and what the future of agriculture looks like.

### SOMETHING FOR EVERYONE

The NAMPO Harvest day is not just for commercial and large-scale farmers, but for everyone who is passionate about agriculture. So, whether you are a crop or livestock farmer or have a small vegetable garden and a big dream of expanding, this is the place to visit.

Farmers know that seed is life and that the right cultivar can make a huge impact to your yield. A variety of seed companies are on site to offer advice and recommendations regardless of your production area. Suppliers committed to keeping your crop healthy include from chemical and fertiliser companies to soil preparation, seeding, spraying, harvesting, baling equipment and much more.

Apart from a multitude of small and large stock breeds on show, animal feed and animal health specialists promote their products and share their insight on how to keep your animals healthy and growing. Other stock related products include handling equipment, theft prevention apparatus and identification collars and much more will keep you interested.

### SHOWING HOW AGRICULTURE HAS DEVELOPED

A visit to the Engen Museum will show you just how far agricultural equipment has advanced over the decades. Although the latest technology and techniques like precision farming, which uses GPS technology to enhance efficiency and productivity are showcased, a lot of equipment for small scale farmers are also displayed because at the Harvest Day size does not matter, agriculture does.

### NETWORKING OPPORTUNITIES TO SHARE HIGHS AND LOWS

NAMPO is a popular gathering place for people involved in or passionate about agriculture. With more than 81 000 visitors your path is sure to cross with someone who shares your needs and challenges, whilst the 775 exhibitors (as there were this year) will give you ample opportunities to find solutions to your problems.

Grain SA members can discuss the highs and lows of the past and current season with other farmers whilst enjoying a delicious cup of coffee. At the Members Hall you can also meet the Grain SA team and maybe even get some advice from them to take back to your farm.

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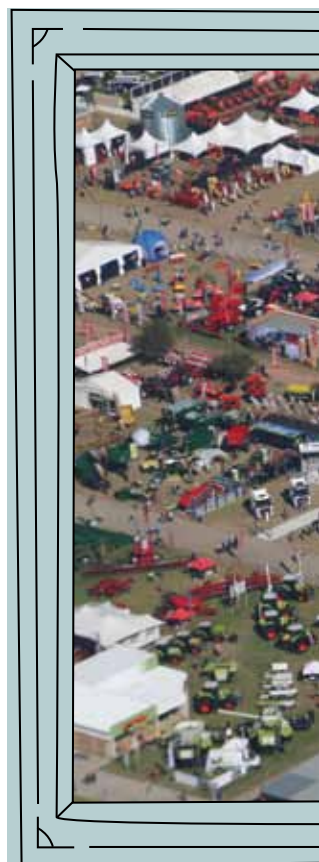
### TECHNOLOGY AND INNOVATIVE THINKING AT ITS BEST

One of the most popular stands at NAMPO Park is the one where farmers can exhibit the plans they have made on their farms. Sometimes it is a very simple solution to an everyday task, but there are those entrepreneurs who think outside the box and make a big difference to their farming operation.

Sometimes a plan leads to a business as Michris Jansen van Rensburg discovered. Michris is well-known amongst small-scale farmers. His Backsaver Equipment has taken small-scale farming to the next level. A visit to his stall will excite you.

### FOOD, FUN AND PHOTO OPPORTUNITIES

However, the NAMPO Harvest Day isn't just about doing business. There are a lot of opportunities for taking selfies, seeing interesting demonstrations, eating delicious meals and just having fun. The date for the 2020 Harvest Day has been set: 12 to 15 May. See you there!



***In addition to the static stalls, you will also be able to see first-hand how different cultivars perform under practical conditions at the seed plots. Informed representatives are ready to provide more information on their various cultivars.***





*Daily sheep-shearing demonstrations are performed by some of the country's best shearers.*



*The future for smaller farmers who own a tractor – the all in one implement. The same frame is used to rip, then the ripper teeth are removed, and the planter cart is attached for planting. Afterwards the cart can be removed to top-dress and skoffel.*



*An aerial view taken at the 53<sup>rd</sup> NAMPO Harvest Day which took place from 14 to 17 May this year.*



*The importance of protective clothing in a farming operation is receiving a lot of attention. At NAMPO suppliers can provide you with the necessary clothing and safety equipment.*



*Animals can be viewed in comfortable and clean pens as well as during a parade like the Chianina, one of the oldest and largest breeds of cattle in the world.*







## NAMPO...



*Visitors from outside the borders of South Africa met up at NAMPO. This group of farmers are from Zambia and Zimbabwe.*



*School children (and adults) find the demonstrations inspiring.*



*Case's JXT tractors are perfect for small farms. This two-wheel drive Case JX45T model is simple, reliable and economical and far exceeds expectations while maintaining high fuel efficiency.*



*An Allis Chalmers from 1949. These and many more ancient models can be seen in the Engen Tractor Museum at NAMPO Park.*



*Grain SA members warming up with a cup of coffee before they start their NAMPO experience.*



*If you have never seen a robot, you can see more than one at the Harvest Day!*





*The Wall of Remembrance with a list of all the names of South African farmers and farm workers who have been killed over the past years, shows the harsh reality of farm attacks.*



*Various sizes of grain storage options for farmers can be seen at a variety of the outside exhibition areas.*



*The Combi planter is also very popular. It is light enough to be drawn by two people.*



*Michris is a master of the hand-held implement to help farmers save on manual effort. More than 10 000 of his Backsaver hand planters are already in use.*



*One of the first prize winners at the 2019 Farmer Plan's Competition made a multi-purpose sprayer which can be used for spraying crops or extinguishing fires. Another plan that has developed into a business is this versatile sprayer, the EZ spray with a 16-litre capacity and made from high quality plastic. It can be used to spray around fences, for weed and pest control as well as treating animals for ticks and fleas.*





# Looking at your maize markets

**T**HIS ARTICLE TAKES A BRIEF LOOK AT THE INTERNATIONAL AND LOCAL MAIZE MARKETS WITH THE FOURTH PRODUCTION ESTIMATES AS A FOCUS.



**Ikageng Maluleke, Junior Economist, Grain SA. Send an email to [Ikageng@grainsa.co.za](mailto:Ikageng@grainsa.co.za)**

## INTERNATIONAL PERSPECTIVE

Production of maize in 2019 is expected to increase by 2,3%, after a 1,9% drop in 2018, boosted primarily by production recovery in Argentina, Brazil and the US (**Graph 1**). Due to continued growth in feed demand in the world, utilisation of maize in 2019/20 is expected to exceed the current season's estimated record level by 1,7%.

For the first time in about two years, we are expecting a contraction of about 1,6% in maize trade for June/August 2019/2020, mainly due to a decrease in the EU, after they made a record purchase in 2018/2019.

World ending stock-levels for 2019 are expected to fall by 5%, with continued drawdowns in China accounting for most of the decreases as well as a forecasted decrease in USA inventories.

### 1 World supply and demand for maize.



Source: AMIS, 2019

\*(2018/2019: Estimates; 2019/2020: Forecast)

*Safex maize prices for the current season have improved somewhat from the previous season mainly due to the dry conditions during planting season.*

## LOCAL PERSPECTIVE

According to the fourth Crop Estimates committee report, **total maize production** is expected to be 10,9 million tons with 5,48 million tons for white maize and 5,41 million tons of yellow maize. Compared to the third crop estimates this will be a 244 900 ton increase or a 3,81% and 0,81% increase for white and yellow maize respectively. Area estimates for 2019 remain 2,30 million hectares compared to 2,31 hectares in 2018, with an expected yield of 4,74 t/ha.

**Total demand** for maize is projected at 11,95 million tons for both domestic and exports, with total demand projected at 10,93 million tons. This mainly includes human consumption (5,19 million tons), animal and industrial consumption (5,48 million tons), gisting (23 500 tons) and an expected export quantity of 800 000 tons of yellow maize and 220 000 tons of processed products.

**Ending stocks** on 30 April 2020 is expected to be 1,46 million tons. With an average processing capacity of 891 000 tons per month, we will have about 50 days' worth of supplies to sustain the country should there be supply disruptions.

**Local maize prices:** Current local yellow maize prices are trading between import and export parity levels, however more closely to the latter (**Graph 2**). As the rand continues to weaken and global maize prices increase, export parity price levels will also increase. Safex maize prices for the current season have improved somewhat from the previous season mainly due to the dry conditions during planting season. ■

### 2 Prices of USA yellow maize delivered in Randfontein.



Source: Grain SA, 2019

(\*Figures as at 30 May 2019)





# Manage climate change risks

**C**LIMATE CHANGE? IS IT REALLY HAPPENING? YES, IT IS REALLY HAPPENING AND IT WILL HAVE A MAJOR EFFECT ON EVERY ONE OF US, EVEN OUR FARMERS.

Unfortunately, this message emphasises that the managerial skills of our farmers will be put to test even more to survive as a farmer. And, this is in combination with other aspects of our farming businesses that are also changing, such as marketing, consumer requirements and preferences. Some of which we have discussed in other articles. The message is quite clear – to be a farmer is very challenging.

## CLIMATE CHANGE MANAGEMENT

The aim with this article is not to discuss the technicalities of climate change but to place the emphasis on the management of climate change. Let's just emphasise that the general consensus is that climate change is taking place. What is changing? All forecasts indicate that South Africa will become hotter and the average temperature is on the increase. Heatwaves will be occurring more frequently, and this will result in more veld fires occurring more frequently. Our country will become even drier and we will experience more droughts, storms, hail, flooding and so forth. The interesting thing is that we have always experienced this in South Africa – the change that will be experienced is that these events will occur more and more and be more severe of nature.

South Africa is already a dry country and the managing of water resources will become more challenging and we will have to improve and conserve our soils (land) to allow for improved water infiltration.

## WHAT CAN BE DONE?

Let's be practical and consider some possible actions to be taken on our farms to soften the severity of climatic changes. Farms differ and regions within South Africa differ. We trust the ideas will act as a stimulus to consider and to gather more information to manage the climatic change – that is the challenge.

First, a few general steps to consider. One of the major actions to undertake is to combat dongas in order to control water run-off. A donga is the result of uncontrolled run-off water and once formed, the run-off becomes worse. Use stones, tyres, even stumps of trees, or mesh wire holders filled with stones to reduce the run-off of water. Do not let a road become a donga – control the water run-off by providing culverts to direct the water into the veld.

Try to cover small dams such as a dam at a windmill to reduce evaporation. Try to harvest rain water as much as possible by collecting

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water from the roofs of buildings in Jo-Jo tanks. Water is a diminishing resource. Make the most of every drop.

See that you have proper and enough fire fighting equipment and adhere to all fire fighting rules and regulations. Burned veld has very little plant growth until it has recovered to control run-off water.

As far as crop production in general is concerned, plan and establish or re-establish your lands/orchards according to the contours of your farm. And establish proper water ways. This will allow you to control water run-off. Remember, according to all predictions rain storms will become more regularly and more severe in South Africa, resulting in more flooding. Thus, the control of run-off water will need more and more attention. Improve water infiltration on your lands by applying conservation farming methods such as minimum tillage practices and cover crops. Apart from improving soil health these methods also improve the water infiltration of the soil and its water holding capacity. Select the best drought resistant crops available to plant.

Should you farm with some form of livestock extensively you must farm with the best adaptable breed to your farm and area. Select smaller and the best adapted animals in your herd. Furthermore, you must farm according to the carrying capacity of your farm and area. Over-grazing is one of the main reasons for dongas to form. The better the plant coverage of the veld, the less the water run-off will be. Continuous overgrazing reduces the plant coverage over time. A proper grazing system must also be applied allowing for proper rest periods of the veld.

As the environment becomes warmer it will be advisable to see to it that your animals have proper shade, even if you have to erect shading. As far as drought is concerned, it has always been advisable to build up a fodder bank to feed your basic herd for at least a year. The fodder bank can consist of silage and/or hay or planted food such as prickly pears or salt bush. It will be a great advantage to have enough fodder available to feed your herd in times of shortages.

## CONCLUSION

In conclusion, climate change and the accompanying catastrophes are seen as the greatest risk facing farmers in the future. As a farmer you should face up to the challenge and manage these risks properly to survive. ■



# The effects of HERBICIDES ON SOIL LIFE

**T**HE INTERNET HAS OPENED DOORS OF KNOWLEDGE FOR EVERYONE TO ENJOY. RESEARCH FINDINGS ARE READILY AVAILABLE, WHICH ALLOWS THE READER TO DRAW HIS OR HER OWN CONCLUSIONS ON ANY TOPIC ONE CAN THINK OF. WHEN APPROACHED TO WRITE A SERIES OF ARTICLES ON THE EFFECTS OF HERBICIDES, SUCH AS GLYPHOSTAE, ON SOIL HEALTH, WE AIMED TO PROVIDE AN OBJECTIVE VIEW OF INTERNATIONAL PUBLICATIONS AS WELL AS EQUIP THE READER TO NAVIGATE BETWEEN THE 'POTHOLES' OF PUBLICATIONS AVAILABLE ONLINE.

These days, anyone can publish online. A popular publication, although based on scientific findings, does not carry the same weight as a scientific paper, however. When compiling a popular publication, the author often presents what he or she perceives to be relevant. Additional information can thereby (un)knowingly be excluded, which could have provided the reader with a better understanding of the impact of the research findings.

One should, therefore, not jump to conclusions when dealing with a popular publication, but rather obtain more information on the topic presented. Contact details of authors are readily available on popular publications so that readers can request the sources used to write a specific article.

When producing scientific publications on the other hand, the research reported on in such a publication must adhere to certain requirements. This does not necessarily mean that all research findings can be seen as equal, however.

The most important criteria of a scientific journal is that it must be peer-reviewed (i.e. the publication is subject to evaluation by a panel of reviewers). The second criteria is its impact factor. The impact factor of a journal indicates to a reader how much information published in this journal is referenced in other studies. The higher the impact factor, the more the information is used.

*Microbial biomass contributes up to 5% of the total organic carbon and N in soil that is available to plants once the micro-organisms die.*

When in doubt as to whether a scientific publication was based on sound scientific principles, researchers at the ARC or tertiary institutions can be contacted for insight into this matter. Lastly, one cannot extrapolate research findings to all situations because the results can easily be misinterpreted, especially by someone that is not a specialist in the relevant field. Our recommendation is rather to contact an expert in the field discussed in the publication to confirm the interpretation thereof.

The current article might accordingly not be in the usual format that readers are used to. It was specifically done in such a way that the reader is able to access the sources used by us. Regardless, the information

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presented in this article only represents a fraction of what has already been published on the effect of herbicides and their impact on soil life. Our hope is that this article might inspire further discussion that would add value to this topic.

## LET'S TALK HERBICIDE IMPACT

Based on the figures of a report presented on the sale and usage of the pesticides industry in the United States (USA) for the 2008 to 2012 period, herbicides are the most widely applied pesticide'. Since the development of the first herbicide, the primary aim of researchers was to understand and predict how herbicides affect soil fertility through their effects on the micro-organisms responsible for the maintenance of soil fertility and on the populations of invertebrates responsible for the recycling and translocation of nutrients.



Grain SA/Sasol photo competition – Lizette Nel 2014



Charles Benbrook<sup>2</sup> states in his research article published during 2016 that no other pesticide is as intensive and widely used in the USA as glyphosate. In 2014, producers sprayed enough glyphosate to apply ~1 kg/ha on every hectare of USA cultivated cropland and nearly 0,53 kg/ha on all cropland worldwide. Because glyphosate will likely remain the most widely applied pesticide worldwide for years to come, he further stated that there will be a growing interest in quantifying the actual ecological and human health impacts.

In this article, we will discuss the outcome of numerous research studies with regards to the effect of glyphosate on soil health.

### WHAT IS MICROBIAL BIOMASS AND WHY DOES IT MATTER?

Microbial biomass is a measure of the total weight of the living component (mostly bacteria and fungi) of soil organic matter. It plays a fundamental role – especially in the flow of carbon and nitrogen from newly deposited plants or other materials to the mineral forms of carbon dioxide and ammonium or nitrate ions in the soil.

It serves as an early indicator of changes in total soil organic carbon (C), because unlike organic biomass, it responds quickly to management changes. It is estimated that approximately half the

microbial biomass is located in the top 10 cm of a soil profile in which most of the nutrient release occurs.

Microbial biomass contributes up to 5% of the total organic carbon and N in soil that is available to plants once the micro-organisms die. The soil microbial biomass acts as the transformation agent of organic matter in soil and is both a source and sink of the nutrients C, N, P and S contained in the organic matter. It is the centre of the majority of biological activity in soil.

Microbial respiration is a measure of carbon dioxide (CO<sub>2</sub>) released by soil microbes from the soil through the decomposition of soil organic matter. It is an important indicator of soil health because it indicates the level of microbial activity, soil organic matter content and its decomposition. It can account for 10% to 90% of the CO<sub>2</sub> efflux from soils, which has a substantial effect on the atmospheric CO<sub>2</sub> concentration.

The rate of soil respiration is an indicator of the nutrients contained in organic matter that is being converted into forms that is available to crops (e.g., phosphate as PO<sub>4</sub>, nitrate-nitrogen as NO<sub>3</sub>, and sulphate as SO<sub>4</sub>). Literature states that in the short term, high soil respiration rates are not always desirable because it may be an indication of unstable systems and loss of soil organic matter due to excessive tillage or to other factors degrading soil health.

### HERBICIDES AND MICROBIAL BIOMASS

The application of herbicides can have both positive and negative effects on different members of the microbial community. It can be toxic to some microbes resulting in reduced microbial biomass. Alternatively, herbicides can be a food source supporting microbial growth. Micro-organisms play a central role in the degradation of herbicides.

Examples of cases in which the application of herbicides had an initial negative impact are readily available. Bromacil reduced microbial biomass significantly for up to eleven months after application<sup>3</sup>. It is possible that this reduction in microbial biomass contributes to the retarded bromacil degradation when this herbicide is repeatedly applied.

During a laboratory study the soil microbial community structure shifted after application of imazethapyr, but were able to recover again after 60 days<sup>4</sup>. Compared to untreated soil, imazamox and benfluralin resulted in a 25% and almost 65% decrease in microbial biomass-C content, respectively. However, the microbial biomass-C content did return to initial values but at varying times, which depended on the incubation conditions<sup>5</sup>.

Numerous studies investigated the impact of glyphosate on soil microbiology. Wardle and







## The effects of herbicides...

Grain SA/Sasol photo competition – Amanda van Blerk 2012

Parkinson<sup>6,7</sup> reported in two separate publications published in 1990 that there was a transitory increase in soil microbial biomass and soil microbial respiration after glyphosate application.

Two other separate research groups<sup>8,9</sup> reported that there was a significantly negative impact on microbial community structure and soil microbial biomass. Some research studies reported no significant effect at all<sup>10,11</sup>. If one only read the first set of articles, the conclusion drawn would not have been based on all of the research conducted internationally. On the other hand, if all of these articles have been read, the reader would have been left confused and unsatisfied because of the variable and contradictory results presented.

During 2016, a research group from Australia, however, investigated the impact of glyphosate on soil microbial biomass and respiration using meta-analysis. They published their findings in the journal *Soil biology and biochemistry*<sup>12</sup>. Based on their method used, they compiled a dataset from peer reviewed literature published up to 2015, which dealt with studies in which glyphosate was applied to soil after measuring soil microbial biomass or soil microbial respiration.

Only studies that had suitable controls and replicating statistics were included. These studies had to adhere to specific inputs made, similar outputs measured and sound scientific approaches. Consequently, out of the total of 191 scientific articles published on this topic, only 36 were selected for this paper. Based on the data generated and meta-analysis conducted, they were able to conclude on how soil microbial respiration and soil microbial biomass would likely react under various conditions in response to glyphosate application.

The authors converted kg glyphosate applied per ha to mg active ingredient (a.i.)/kg soil (note: glyphosate concentration is in general expressed as acid equivalent per litre), thereby establishing a standardised form for application rates used. European regulatory procedures were then used where the bulk density of dry soil is assumed to be 1,5 g/cm<sup>3</sup> and the average depth of surface-applied herbicide penetration into the soil, 50 mm.

Based on the formulations used by the Nguyen group<sup>12</sup>, a glyphosate product with a 480 g a.i./l formulation applied at 2,2 l/ha is the

equivalent of 1,4 mg a.i./kg soil. During this study various factors and not single aspects determined the eventual response of the microbial community observed.

*The application of herbicides can have both positive and negative effects on different members of the microbial community.*

The following observations were made regarding microbial respiration:

- **Glyphosate concentration:** Of all of the factors investigated, glyphosate concentration applied had the strongest influence on the soil microbial respiration response. At concentrations of more than 10 mg/kg but less than 200 mg/kg glyphosate showed a negative effect on respiration while at concentrations greater than 200 mg/kg it generally stimulated respiration. Concentrations of less than 10 mg/kg had no effect on microbial respiration.
- **Days after application:** Over the short term (2 - 60 days after initial exposure), respiration was more likely to increase. However, after 60 days and onward, respiration declined to levels below that of control soils not receiving glyphosate.
- **Soil pH:** Glyphosate generally stimulated respiration in soils with pH <5,5, but in more neutral soils (pH 5,5 - 7,5) glyphosate had a tendency to show a negative impact on respiration. Limited data on alkaline soils with pH >7,5 prevented an assessment of the impacts of glyphosate on soil microbial respiration when applied on these soils.
- **Carbon content:** Although soil organic carbon content played a statistically significant role in moderating the impact of glyphosate, its effect was not particularly strong. Glyphosate was more likely to stimulate respiration in soil low in organic carbon than in soils with a higher organic carbon content.



This study further showed that the effects that glyphosate application had on microbial biomass were, similar to that on respiration, dependent on various variables such as pH, glyphosate concentration, organic carbon content and time after application<sup>12</sup>.

Soil microbial biomass was more likely to increase with short-term exposure (<100 d), low soil pH (<5.5) and high glyphosate concentration (>200 mg/kg), whereas the relative microbial biomass was more likely to decrease in the longer term (>100 d), at neutral pH and at lower glyphosate concentrations.

Soil organic matter had a positive influence on the soil microbial biomass response to glyphosate exposure. The application of glyphosate to high organic carbon soils was more likely to favour higher soil microbial compounds. Mid-range concentrations of glyphosate (10 mg/kg - 100 mg/kg) were associated with significantly lower soil microbial biomass. No effect was again observed at <10 mg/kg.

The Nguyen research group concluded that at field applied rates of glyphosate (<10 mg/kg), there was no significant effect on soil microbial respiration and soil microbial biomass, but that soil microbial biomass was significantly lower at glyphosate concentrations of 10 mg/kg to 100 mg/kg.

Their study ultimately concluded that management and environmental factors regulated the soil microbial response. Research that reports on either the toxicity or safety of glyphosate to soil microbial respiration and soil microbial biomass should, therefore, stipulate details of the conditions under which glyphosate were tested and applied. Before drawing conclusions in this regard, a reader should evaluate the approach followed to obtain the results reported in an article as well as the conditions under which the findings were made.

What is the effect of repeated, long term glyphosate use? A study published by a USA based research group investigated the effects of glyphosate on soil microbial communities maintained in soil from pine plantations. Glyphosate was repeatedly applied for nine to 13 years in these plantations in order to control vegetation<sup>13</sup>.

This study concluded that repeated application of glyphosate had minimal effect on seasonal microbial characteristics despite substantial changes in vegetation composition and growth. This situation does, however, not necessarily reflect what is happening under standard agricultural practices and additional research is required to

evaluate the effect of long-term use of a specific product such as glyphosate on microbial life.

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You get to decide where your time goes.  
You can either spend it moving forward, or you  
can spend it putting out fires. You decide. And if  
you don't decide, others will decide for you.

~ TONY MORGAN





# IMPORTANCE OF MONITORING INSECTS in a management programme

**T**HE AIM OF A MANAGEMENT PROGRAMME IS TO PREVENT PEST INFESTATIONS IN A CROP. MANAGING INSECT PESTS REQUIRES FLEXIBILITY SINCE INSECTS ARE SITE, CROP AND AREA SPECIFIC. MONITORING IS THE ROUTINE INSPECTION FOR THE APPEARANCE OF INSECTS.

The goals of monitoring are to locate, identify and determine the severity of pest infestations. This information can then be used to:

- Determine the success of a current management strategy and make adjustments accordingly.
- Predict population growth and distribution patterns of insects.
- Assess and predict future damage by an insect pest.

Information gained through monitoring will enable the producer to make sound management decisions.

For monitoring to be successful, the scout needs to know exactly what to look for:

- Insect feeding damage symptoms on the plant. The feeding damage of the insect is often more noticeable than the insect itself. Assess the severity of the damage. It is also important to determine the plant parts where most of the damage is located. The damage might be on a part of the plant where it will not affect the yield of the crop. It is also important to note the growth stage of the crop. Certain crops are more vulnerable at certain growth stages. The seedling stage of wheat, for instance, will be vulnerable for insect feeding damage and heavy insect infestations at this stage might affect the yield. Insect infestations after the flag leaf stage will, however, not influence the yield significantly.
- Determine what is causing the damage and whether the damage-causing insect is still present on the crop. Sometimes insects start feeding on the crop and cause initial damage and then move on or are killed by natural enemies (predators, parasitoids or pathogens) or environmental fluctuations. If the insect is still present, follow-up monitoring will be necessary.
- Determine the percentage infestation in the crop field and whether the infestation is in isolated patches or spread throughout the crop.
- Note other insects present in the crop field as well as their function in the crop ecosystem, such as herbivores on the crop or on weeds, predators, pollinators and decomposers.

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- Record the environmental parameters such as temperature, wind, humidity, soil moisture and rainfall.

All these factors need to be considered carefully before a management decision is made. It is important to keep a dated record of all these observations in order to be able to predict patterns of insect colonisation and distribution throughout the growth season of the crop. This can be very helpful in predicting future patterns of infestation.

Advantages of a good monitoring system include:

- Early detection of damage. This will facilitate timeous action and prevention of further, possibly economic, damage.
- Controlling the pest effectively during the most susceptible stage of its life cycle.
- Save costs by deciding on the best management action. Often, when looking at all the observations, expensive chemical spraying might not be necessary. The cost of different management actions has to be weighed against the potential loss of yield ensuring maximum profit.
- Limit damage to the environment by unnecessary use of harmful chemicals.
- Enable target-specific management. Unless the pest is identified, the control programme may have the wrong pest as its target. Identification allows the treatment of the pest problem, while avoiding injury to non-target organisms.
- Identifying the effects of naturally present biological control agents. This means knowing which organisms are beneficial and determining how pests have been affected by them.

Assessing the efficacy of pest management actions that have been taken is a very important part of monitoring. An efficient monitoring programme will enable producers to prevent or minimise pest outbreak and economic damage to a crop and save costs due to unnecessary control. ■





# Weed control for herbicide resistance

**H**ERBICIDE 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.

High levels of weed control are necessary to obtain the maximum yield possible. According to literature, the presence of weeds in a wheat field can reduce wheat yield with up to 33%. This high percentage reduction in yield will cause economic losses.

Various publications focussed on the control/management of herbicide resistance, but herbicide resistance seems to be ever increasing. One of the major reasons for the development/increase in herbicide resistance is the limited availability of herbicides from different mode of action groups in South Africa. This leads to the repeated use of herbicides from the same mode of action groups, as well as unregistered mixtures being used.

During a visit from an Australian study group, an Australian extension officer made the comment that they are starting to re-introduce ploughing into their management systems. This may come as a shock to producers in South Africa who are mainly practising conservation/no-till agriculture. The truth however, is that the Australian producers also practise CA, but the herbicide resistant weeds have become so problematic, that they needed to consider other control measures.

According to Dr Michael Renton (senior lecturer, University of Western Australia), mouldboard ploughing is the best way to control weeds. He suggests that it should not be done every year, as it will lead to other environmental problems. Moreover, it is expensive and time consuming. He ran numerous simulations and found that mouldboard ploughing once every four years was a good option for weed control. He found that even once in every eight years still had some benefits. Occasional mouldboard ploughing can be used to bury herbicide resistant weed seeds, effectively removing them from the gene pool.

Some more research done in Western Australia found that inversion ploughing can also be used with success. Inversion ploughing is used to fully invert the soil to ensure weed seeds that were on or just below the soil surface are placed at a depth where they cannot germinate. This can be practised every eight to ten years, with conservation tillage used in the intervening years.

In Western Australia, annual ryegrass seeds failed to establish and eventually died when soil was fully inverted to a depth greater than 20 cm using a specialist mouldboard plough fitted with skimmers. This single soil inversion event reduced annual ryegrass numbers by more than 95% at Katanning and Beverley, Western Australia, for a period of two years ([www.agric.wa.gov.au](http://www.agric.wa.gov.au)).

## OTHER METHODS OF CONTROLLING WEEDS

Resistance can be prevented or slowed down by keeping to the following instructions:

- Rotate your crops if possible, as this will help suppress weeds through allelopathy (i.e., a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms).
- Herbicides must be rotated so that the same herbicide is not used year after year.
- Implement crop rotation if possible. Crop rotation allows for using different herbicides on different weeds in the different crops that are planted. Herbicides with different modes of action can be utilised.

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Grain SA/Sasol photo competition

- Never make unregistered mixtures. Stick to label recommendations at all times.
- Keep records of herbicides used and also the rates at which the herbicides were applied.
- Regularly monitor your crops so that resistant patches can be observed in time to be controlled with more specific interventions, like spot spraying or physical removal.
- Apply the herbicide at the correct leaf stage of the weed and the crop.
- Make certain that the correct rate is always used, because rates that are too high or too low can select for herbicide resistance.
- Make sure that the spray equipment is correctly calibrated and cleaned thoroughly and that the person in charge of the spraying knows what he/she is doing. This helps to prevent or reduce the introduction of weed rhizomes, stolons and seeds into the fields.
- Always follow the instructions of the herbicide label.

## CONCLUSION

Producers must realise that the herbicide resistance challenge in South Africa is not getting better and that they will have to adapt to make sure that they can keep on farming. Research concludes that producers will have to adapt and that part of that adaptation may include a return to mechanical ploughing.

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# PASSION AND HARD WORK YIELDS SUCCESS

**'N**EVER MISS SCHOOL AND WHEN YOU ARE GROWN-UP, BE A RESPONSIBLE HUSBAND AND FATHER. LIVE AND WORK THE LAND – EVERYTHING COMES FROM THE SOIL. MAKE FRIENDS WITH THE SOIL.' THESE WERE THE WORDS OF ADVICE A YOUNG SANDILE KHUMALO RECEIVED FROM HIS FATHER YEARS AGO.

Sandile was born in the Pongola district of KwaZulu-Natal and grew up with the responsibility to work the fields. He fell in love with farming and realised early in his life that agriculture will play a major role in his future. He graduated from the Lowveld College of Agriculture in 2011 where after he furthered his studies at the North-West University in Mafikeng on a DAFF bursary.

In 2016, Sandile's application for an internship at Monsanto was successful. This was an opportunity the young man grabbed with both hands and it was clear from the beginning that he would be a valuable addition to Monsanto's personnel. He is in his element when meeting with farmers and explaining the technology to them. It came as no surprise that, after his internship, Sandile was immediately absorbed into Monsanto's 'New era commercial and small-scale farmers' division.

This was a dream come true for the young man. Tony Johnson, an agronomist at the then Monsanto now Bayer, took Sandile in under his wing. Sandile says that he still can remember Tony's advice to him, more than two years ago, when he was still an intern: 'No-one will follow you. Your work speaks for you. You need to do your job, be disciplined and your job will speak for you.' Sandile holds the highest regard for Tony and regularly turns to him for inspiration and support.



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**Mr Khoza, chairman of the Oliviershoek Study Group with Sandile.**



**Sandile Khumalo, Bayer's Sales Representative of the Year – Smallholder and Pre-commercial.**

His passion and dedication are clear to see, no wonder that Sandile received the award for 'Sales Representative of the Year – Smallholder and Pre-commercial' at Bayer's posh awards evening earlier this year. The regional sales manager who Sandile works for, Dudu Mashile, confirms that he is a worthy recipient of the award. 'He works hard, with so much integrity and passion. He gives me hope that there is a future for youth in agriculture.'

'I did not expect to win the award. I've been with the company for such a short time. I enjoy my work – I remember my roots and show the necessary respect to the farmers I work with. For me there is nothing better than being a witness to my clients' successes after I have introduced them to new technology and best farming practises', said Sandile.

He is married to Sizakele Khumalo and they have a five-year-old son, Luvo, and 17-month-old twins, Kuhle and Amahle. The family lives in Groblersdal. Sandile dreams of one day owning a farm and carry over his love for the soil to their kids.

'There is no time for politics. Politics is just talking-talking. Farmers need to work united towards taking our country forward and keeping its food secure', says Sandile. ■

# THE CORNER POST

## JACQUES ROUX

*Mentorship should become a way of life*



**W**HEN GRAIN SA INTRODUCED THE MENTORSHIP PROGRAMME THEIR GOAL WAS TO CHANGE THE LIVES OF SMALLHOLDER FARMERS BY IMPROVING THEIR AGRICULTURAL PRACTICES. THROUGH THE YEARS IT HAS BECOME CLEAR THAT THE PROGRAMME IS MUCH MORE THAN THAT – IT HAS BECOME A PROCESS OF REINVENTING COMMUNITY AND SHOWING THAT EVERYONE HAS AN IMPORTANT ROLE TO PLAY.

British author Marc Freedman explains mentoring best: 'Mentoring brings us together – across generations, class and race – in a manner that forces us to acknowledge our interdependence and to appreciate that we are caught in an inescapable network of support.'

### MORE THAN GUIDANCE

Jacques Roux offered his services as mentor in 2016 while he was a crop farmer in the Bethlehem region. He has since moved to the Bloemfontein region and although he is focusing more on livestock now, he still plants maize under irrigation.

He became increasingly aware of the great need that existed amongst fellow farmers who had land available but were lacking in knowledge concerning correct agricultural practices. 'I started enquiring about where I could offer my assistance and then got involved in the mentorship programme through Johan Kriel, development co-ordinator at Grain SA.'

Although he knew that his knowledge about crop production would help the farmers become more skilled, he never anticipated the impact the mentees would have on him. 'It was a real eye opener to see the challenges they face. These are passionate farmers impeded by financing, mechanisation and several other factors – yet, they keep going, determined to succeed.'

Since getting involved in the programme he has become aware of how important teamwork is. 'Mentorship is about setting an example and providing guidance, but in the process, you realise that you can learn a thing or two from the mentees.'

To Jacques the mentorship programme has truly become a way of life. 'I wake up in the morning and immediately think about the programme and what has to be done that day. I just wish I could do more to help additional farmers. It breaks my heart to have to tell a farmer that he cannot be part of the programme as funding is limited.'

The programme has even influenced his dream for the South African agricultural sector. He would love to see producers supporting the vision of a united agricultural sector. 'No matter what the size of their farm, producers should stand together, support each other and share advice.' It is after all towards the same goal of ensuring food security. 'We cannot do much about the land issue, but there are things that we can change. As commercial producers we should support the smaller farmers by sharing advice and giving guidance. We all started as unsure beginner farmers at one stage.'

### A LEARNING CURVE

Jacques is in the Kestell/Harrismith region where he currently mentors five farmers individually using the programme material as guideline.

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At the onset of the programme, it is vital to rectify the soil status as the lands have mostly been unused for many years which has left the soil depleted of nutrients.

The business plan and available funds determine what can be planted. Although more hectares were planted in the previous two seasons, this season they could all plant only 50 ha of sugar beans. 'In planting season, I am on their farms constantly to ensure that soil preparation and the planting itself is done according to correct agricultural practices. When it is time for crop spraying I employ a system for visitations to ensure that I can supervise.' Jacques says with the aftercare of sugar beans being so important, he makes sure that he visits the farmers regularly to check for damage and to ensure a healthy crop.

This mentor is very happy with the yield being achieved in his area. 'Last season the farmers harvested 4,5 t/ha to 6 t/ha which is in line with the area average – this really shows me that the mentees are on a learning curve and that the programme is working.'

### CREATING GOOD MEMORIES

With father and son team, Stoffel and Hudson Ndladla, who qualified for the Farmer of the Year competition this year, Jacques is smiling broadly. 'I have never had a farmer who has qualified for the competition, so to have a mentee, Elias Mtswetwe, who is also joining the 250 Ton Club as a competition nominee, is wonderful,' he shares excitedly.

Jacques would love to see that the mentorship process is done over a period of five years. 'One cannot really learn enough in a year or two as the next year may be the one with a new challenge or drought where you have to know about planting an alternative crop. A five-year period would also show them how to diversify.'

It is said that no man is capable of self-improvement if he sees no other model but himself, so every mentor should also have a mentor. To Jacques it is his dad and late brother, but he also adds his mentee, Elias, to the list. This 60-year old man has shown him exactly what *ubuntu* means. 'He treats everyone – from his workers to authority figures – with such respect that it puts me to shame. He also often phones me just to check in and to make sure that I am well.'

Both Elias and Jacques prove that what the American entrepreneur, Vivek Wadhwa, says about mentorship is true: 'What you want in a mentor is someone who truly cares for you and who will look after your interests and not just their own. When you do come across the right person to mentor you, start by showing them that the time they spend with you is worthwhile.' ■



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