

PULA INVULA

>> GROWING FOOD >> GROWING PEOPLE >> GROWING PROSPERITY >>



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MONSANTO



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NKGONO JANE SAYS...



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The new season is approaching now and you will be making plans. Farming is different from other businesses in that every year you have to start again (almost from scratch). Where you had your crop last year will be lying bare (hopefully with some stover on the land) and it is ready for the first summer rains which will allow you to start preparations for the coming season.

Many people had a very good crop last year – this year is a new start again and if you are to succeed again then you will need to do everything right again. Remember to buy the correct amount of the right fertiliser, the most suitable variety of seed for your area, and the

war on weeds will never be over. This is a very important time in your crop production season as the decisions you make now will have a huge impact on the crop. Try to take the right decision even if it will involve more work for you, and possibly cost more – you should be rewarded for your increased investments.

Having a really good maize harvest has been good in many ways – your household has food, you can sell the surplus and also the livestock that you keep can be better fed. However, you will have notices that when there is a very big crop, the price drops – this is the result of 'supply and demand'. When something is scarce, people are prepared to pay more for it – when there is a surplus, the price drops

because not many people are needing it (as they can buy it easily somewhere else). We can learn some good lessons from this – build a relationship with your local market, always supply the best quality, negotiate prices early in the season (if you can), and also look into planting alternative crops. Dry beans are often a very good option for smaller farmers as there is always a good demand for beans and the price is good. Keep in mind that consumers need a variety of foods and you can supply a range to them.

While it is quiet on the farm, it will be good if you can attend training courses and study group meetings so that you gain information – the more you know, the better you will do! We wish you a blessed season. 🌱

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Knowledge changes lives



MYCOTOXIN impact on animal health

Similar to their influence on human health, mycotoxins are known to cause many animal diseases (mycotoxicoses) and negative health effects. These factors also severely impact the economics of livestock and animal feedstuff trading.

All the mycotoxins that are important in human health (aflatoxin, fumonisin, deoxynivalenol, zearalenone and ochratoxin A) are also important in animal health, but their disease effects differ greatly from human symptoms, as well as between different animal species (**Table 2**). Agricultural livestock and domestic animals (cats, dogs, etc) can be exposed to mycotoxins either through processed feedstuffs which contain contaminated grain or other agricultural by-products, or by grazing on infected forage, reject maize cobs, contaminated cereal stalks and hay in the field. Other animal mycotoxicoses and their associated fungi, which are often associated with field grazing in South Africa are: Ergotism (*Claviceps* species); stachybotryotoxicosis (*Stachybotrys*); facial eczema (*Pithomyces*); lupinosis (*Phomopsis*); and diplodiosis (*Stenocarpella* species).

In the South African maize milling industry, the “chop” milling fraction is widely used in animal feedstuffs and contains the highest levels of mycotoxins of all the different milling fractions. When highly contaminated maize batches are milled, then the resultant “chop” fractions could result in severe animal health effects if not blended with other less contaminated batches or other raw materials. In many cases, the cheapest and most contaminated material is used in animal feeds in the hope that no disease effects will be noticed, especially when no mycotoxin tests have been done on raw materials, such as cheap imported grain. This has often led to sudden animal deaths in products such as processed dog foods.

Animals exposed to contaminated feed can lead to acute or chronic diseases that will impact on livestock productivity. In some instances, disease symptoms and effects are hidden and may only become evident over time through altered growth patterns, reduced production and reproduction, as well as increased susceptibility to other infectious diseases. The co-occurrence of different mycotoxins in finished feeds (different batches of raw materials mixed to produce a final product), is a major concern as these can exert additive effects

Table 1: United States Food and Drug Administration (FDA) guidance levels for total Fumonisin and Deoxynivalenol in animal feeds.

	Animal species	Feed ingredients and portion of diet	Levels in maize and maize by-products	Levels in finished feeds
Fumonisin (FB)	Horses, donkeys and rabbits	Maize and maize by-products not to exceed 20% of the diet	5 ppm	1 ppm
	Pigs and catfish	Maize and maize by-products not to exceed 50% of the diet	20 ppm	10 ppm
	Breeding ruminants, breeding poultry*	Maize and maize by-products not to exceed 50% of the diet	30 ppm	15 ppm
	Ruminants three months and older being raised for slaughter	Maize and maize by-products not to exceed 50% of the diet	60 ppm	30 ppm
	Poultry being raised for slaughter	Maize and maize by-products not to exceed 50% of the diet	100 ppm	50 ppm
	All other species or classes of livestock and pet animals	Maize and maize by-products not to exceed 50% of the diet	10 ppm	5 ppm
Deoxynivalenol (DON)	Ruminating beef and feedlot cattle older than four months	Grain and grain by-products not to exceed 50% of the diet	10 ppm	5 ppm
	Chickens	Grain and grain by-products not to exceed 50% of the diet	10 ppm	5 ppm
	Pigs	Grain and grain by-products not to exceed 20% of the diet	5 ppm	1 ppm
	All other animals	Grain and grain by-products not to exceed 40% of the diet	5 ppm	2 ppm

** Includes lactating dairy cattle and hens laying eggs for human consumption; ppm = parts per million; No FDA guidelines available for Zearalenone*

which makes the diagnosis of particular mycotoxicoses extremely difficult.

Livestock most vulnerable to mycotoxins are pigs to deoxynivalenol and horses to fumonisin, whereas the co-occurrence of these two mycotoxins would have even more serious consequences on both these animal species. The guidance levels set by the United States Food and Drug Administration (FDA) for

fumonisin and deoxynivalenol are generally accepted worldwide and in the South African animal feed industry to protect livestock against mycotoxin risks (summarised in **Table 1**).

In our next and last article in this series, we will be focussing on methods to reduce mycotoxin exposure in humans and animals. It has, however, been found in several cases that when dealing with animal mycotoxicoses,



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Livestock most vulnerable to mycotoxins are pigs to deoxynivalenol and horses to fumonisin, whereas the co-occurrence of these two mycotoxins would have even more serious consequences on both these animal species.

the quickest and best way to reverse many disease situations is to immediately withdraw any suspect feedstuff from the affected animals' diet, or to remove the animals from a field that might contain contaminated forage or leftover maize cobs.

As it is impossible to deal with every mycotoxin issue in full in this article, it is advised that you consult either a veterinarian, or an extension officer or this article's authors to ob-

tain more information on specific animal diseases and symptoms which might be linked to mycotoxins. 🍷

Article submitted by HM Burger and P Rheeder, Mycotoxicology and Chemoprevention Research Group, Institute of Biomedical and Microbial Biotechnology (IBMB), Cape Peninsula University of Technology (CPUT). For more information, send an email to Burgerh@cput.ac.za or RheederJP@cput.ac.za.

Table 2: Summary of five important mycotoxins and their effects on animal health.

Mycotoxin	Associated animals	Animal disease and health impact
Aflatoxin (AF)	<ul style="list-style-type: none"> Birds: Duck, turkey, pheasant, infant chicks, mature chickens, quail Mammals: Piglets, pregnant sows, dog, calf, mature cattle, sheep, cat, monkey Fish Laboratory animals 	<ul style="list-style-type: none"> Increased mortality in livestock Acute hepatitis Liver cirrhosis and cancer Stunting Immune suppression Genotoxic and carcinogenic
Ochratoxin A (OTA)	<ul style="list-style-type: none"> Pigs Dog Laboratory rodents (rat, mouse) 	<ul style="list-style-type: none"> Necrosis of the renal tubules and periportal liver cells Nephritis, carcinogenic Nephrotoxic, teratogenic Immunotoxic and possibly neurotoxic
Deoxynivalenol (DON)	<ul style="list-style-type: none"> Pigs Cattle Chickens Turkey Horse Dog Cat Laboratory rodents 	<ul style="list-style-type: none"> Acute gastro-intestinal effects Immuno-modulation Growth stunting Reproductive disorders Immunotoxic Haematotoxic Feed refusal and weight loss
Zearalenone (ZEA)	<ul style="list-style-type: none"> Pigs, dairy cattle, Chickens Turkey Lambs Laboratory rodents, guinea pig 	<ul style="list-style-type: none"> Genital and reproductive disorders Acts as a non-steroidal oestrogen Possible reduced fertility (endocrine disrupter)
Fumonisin (FB)	<ul style="list-style-type: none"> Horse, donkey Pigs Laboratory animals 	<ul style="list-style-type: none"> Equine leucoencephalomalacia ("hole-in-the head" disease) Porcine pulmonary oedema Kidney, liver toxicoses and cancers



Meet our nominees for 2017

(Part 2)

In the July issue of Pula Imvula we introduced the Subsistence and Smallholder nominees of the 2017 Grain SA Developing Farmer of the Year competition. In this issue we will focus on the Potential New Era and New Era nominees.

During September this year we will convey who the twelve finalists are, and in November the four winners will be announced.

“It isn't the farm that makes the farmer – it's the love, hard work and character.”
– Unknown

New Era Commercial nominees



Moferefere Jacob Komako – Free State

For Jacob farming is what he grew up with. He enjoys the smells and sounds of farming and even though his life at first took him in other directions, it was always inevitable that this 69-year-old man returned to the land he so dearly loves.

He attended school on the farm where his parents worked as farm labourers and after completing Grade 4 he was told that time for play was over and he had to join the work force. After about 15 years Jacob left the farm in search of a better life.

He went from working as a brick maker to a tavern owner but eventually, in 1991, he was able to return to agriculture. This time, not as

a labourer, but as a farm owner of the farm Driefontein. He bought the farm with a loan from the Land Bank but he soon realised that without the necessary start-up capital and mechanisation it would always be an uphill battle.

After years of struggling and deception, Jacob met Johan Kriel from Grain SA and started to attend study group meetings and training courses. Grain SA opened his eyes and he knows now not to plant the Sotho way, but to plant the correct way. This season he planted 220 ha of dryland maize, 150 ha dry beans and 20 ha Reid maize and looks forward to a very good harvest.

Jacob is of the opinion that the attitude of white farmers in South Africa has changed for the better and he believes that Grain SA has something to do with it.



Remember Wiseman Mthethwa – KwaZulu-Natal

In 1984 Remember started working for the DNC Mining Company on the Lilly Dale farm. He mainly worked with machinery and it was here that his interest in agriculture originated.

He started by investing his free time and spare money in growing crops and buying livestock, with the dream of one day owning his own

farm. This dream came true as he now owns 662 ha of the farm Milindale and leases 150 ha of private land near Dannhauser.

Remember heard about Grain SA in 2014 but only joined in 2015 and is an active member of the Newcastle B29 Study Group with Chris de Jager as mentor.

This season, he planted 55 ha of Reid maize and wishes to grow and become a successful mega commercial farmer. He loves to share his knowledge and try to inspire other people to also become involved in agriculture.



Simon Sello Teffo – Gauteng

Simon's interest in agriculture started when he, as a little boy, helped his father on their subsistence farm in Hamanskraal. But Simon was a clever man and after Grade 12 studied Civil Engineering at the Tshwane University of Technology. He worked in this profession for years until the land called him back in 2006.

He received the farm Doornfontein in the Randfontein district from the Department of Agriculture and at first tried his hand farming part time but soon realised that farming is a serious business and needed his full-time attention.

After meeting Jane McPherson in 2014, Simon signed up to become a member of Grain SA. Soon afterwards he was elected as the chairperson of the Randfontein 28 Study Group. He started off by planting 120 ha of maize two years ago, and showed tremendous growth by planting about 535 ha this season. Simon plants dryland maize and his yield compares good with those of the commercial farmers around him.

He has a heart of gold as he helps to uplift the Elandsfontein community by teaching them how to plant and work their fields. He also provides clothing and sports equipment for needy children at the nearby Rodora Primary School.

Being a member of the Grain SA 500 Ton Club, Simon aims to walk away with the title of 2017 New Era Commercial Farmer of the Year.



Vuyani Lolwane – North West

As a very young boy, Vuyani's favourite times were when his father took him along to farmers days and study group meetings. His father was a subsistence farmer and they lived in the Bapong Village in Gelukspan.

He passed his Grade 12 in 2003 and worked for the SANDF from 2005 until 2010. Sadly, Vuyani's father passed away and he became a full-time farmer in 2011. Vuyani now owns Klippan farm and also leases land on Larestryd.

Vuyani plants dryland as well as irrigation maize and wheat, sunflower, dry beans and barley. He has been a member of Grain SA for years and actively attends farmers days and study group meetings and has also completed several of the training courses.

His plans for the future include diversification and gaining, by participating throughout the complete value chain. He talks about a feedlot, a butchery, food processing units and exporting to Botswana and Lesotho.

In a country where the average age of farmers is over 60, this dedicated young man is loyal to the industry and an excellent example to other prospective young farmers.

Meet our nominees for 2017 (Part 2) – New Era Commercial nominees



Edwin Thulo Mahlatsi – Free State

Edwin was born to be farmer. He worked and lived on the very same farm his parents worked on for most of his life and because of the good relationship between him and his employer, the latter helped him to purchase a farm in 2012.

The farm Swartlaagte was purchased from Frikkie Rautenbach for Edwin by the Department of Rural Development and Land Reform through PLAS. Frikkie also gave Edwin a tractor and implements and helped him with inputs. The understanding was that Edwin would work off the costs of these over the following couple of years.

Unfortunately, Frikkie passed away in 2014 and the implements Edwin used ended up going back into the estate. Edwin was left with no income, no implements and no production capital.

In 2014 he became a member of Grain SA's Farmer Development Programme and he joined the Bothaville Study Group and attended farmers days and training courses. Grain SA introduced him to new technology, input suppliers and financial institutions – this changed his life. Despite the drought in 2015/2016, Edwin was able to harvest 250 tons of maize and with the insurance pay-out on the hail damage he earned in excess of one-million-rand last year.

With the help of Grain SA, Edwin bought himself a brand-new Isuzu Bakkie – the first new vehicle this 75-year-old man ever owned!

Potential Commercial nominees



Tebalo Elias Makubo – Free State

Tebalo is a clever, hardworking young man who successfully obtained his qualifications and worked in the corporate world before joining his father in 2010 on the family farm near Kestell.

He always wanted to become a farmer and for two years his father taught him everything he knew about farming. His father also taught him to chase his dreams and in 2013 he leased

some of the land from his dad and took over the cultivation of the cash crops.

In 2012 Tebalo joined the Grain SA Farmer Development Programme and became an active member of the Kestell Study Group. This young man developed remarkably under the mentorship of the dedicated Grain SA team. He cultivates maize, wheat, soya and dry beans on 130 ha of arable land and improved his yields substantially since becoming a member.

Tebalo is extremely positive about the future of agriculture in South Africa and sees agriculture as a way to heal our country. He warns that hungry people will always be angry people.



Tshediso Daniel Maqala – Free State

Over the last three years 55-year-old Tshediso developed from being a farmer who barely subsisted on 615 ha, to producing an excess of 500 tons of grain this year.

He was born and raised on a farm and became a farmworker on the same farm after his dad passed away when he was only 15 years old. For Tshediso farming was associated with hardship and that is why he ended up trying

to earn a better living by getting his drivers license and working as a driver.

He always dreamt of owning his own land and in 2005 this became a reality for him when he bought the 197 ha farm Kosmos, in the Ficksburg district. He also obtained the 326 ha Die Hoop farm through the PLAS programme and he now has access to over 200 hectares of arable land.

Farming did not come easy for Tshediso, he struggled for years until he joined Grain SA in 2014. He attended study groups and farmers days and his newly found knowledge helped him to yield 168 tons of wheat in 2017. Tshediso has the potential to qualify for a 250 or even a 500 Ton Club certificate this year.



Paul Mvelekweni Malindi – Free State

Agriculture was always in the blood of 48-year-old Paul. He grew up on a farm where both his parents worked as farm labourers and in 2012 Paul got the opportunity to return to the land. He obtained the 441 ha farm Dankbaar, close to Edenville, through PLAS.

In the same year, Paul joined Grain SA's Farmer Development Programme and was one of

the founding members of the Edenville Study Group. It took Paul a couple of years to realise that there are no short cuts in agriculture and things need to be done correctly or not at all.

He now leases land to graze his cattle on and has planted 140 ha of sunflower and 180 ha of maize this season. His active involvement in the study group and attendance of farmers days has had a huge influence on him. Paul now uses the knowledge he obtained and is proud of being a successful farmer.

Paul's first priority is to take care of his family and workers. He believes in his own capabilities and the future of the South African agricultural sector.



Khovhogo Philemon Manenzhe – Free State

Even though Philemon was born in a Sasolburg township, he grew up in Venda, where he lived with his grandparents. It was there where he learnt that if you work hard on the land and God provides the rain, you can earn a good living with agriculture.

He passed his Grade 12 and returned to Sasolburg to complete his tertiary education. After working at Sasol for a couple of years, Philemon started his own construction company. This man, with the keen business sense, al-

ways invested his spare money in speculating with cattle. He always knew that somehow, someday, he will have his own land where he can plant his crops and graze his cattle.

In 2010 Philemon's dream became a reality and he was awarded the farm Birmingham in the Sasolburg district. The farm consists of 665 ha of which 360 ha is good potential arable land. Because he had no equipment and little knowledge, he started by leasing his arable land on a share crop basis to a neighbour, Louis Claassen.

In 2014 Grain SA started a study group in Deneysville and Philemon immediately joined. As an active member, he attended several training courses and farmers days. As a result, he could this year, plant 120 ha of maize on his own and the crop looks promising indeed.

Meet our nominees for 2017 (Part 2) – Potential Commercial nominees



Doki Isaac Moleleki – North West

46-year-old Isaac was born and bred in the Mogosane Village near Mafikeng. He inherited his love for the land from his grandfather, the same man who encouraged Isaac to become involved in agriculture.

He leases 416 ha of arable land on the farm Klippan. Previously he had little success with his crops because of a lack of knowledge and

very dry conditions. Isaac's financier introduced him to Grain SA last year and he immediately joined and became a member of the Vrischgewacht 28 Study Group.

He has planted 106 ha of dry land maize and 310 ha sunflowers this year and with the good rains Isaac looks forward to harvesting his best yield ever. This man dreams of becoming a successful commercial farmer and providing a good education for his children.



Ruben Mothlabane – Free State

Ruben worked on his uncle's farm after he successfully completed Grade 12 and obtained a diploma in Business Management. He eagerly learnt everything his uncle could teach him and worked for a couple of years, whilst looking out for a farm of his own.

In 2011, through PLAS, he applied for the farm Kalkpan in the Bultfontein district. A lack of production capital, support and equipment

forced Ruben to go into partnership with a local farmer and lease out his lands for a predetermined share of the crops.

As he grows in confidence and knowledge, his plan is to take back more and more of his land to cultivate on his own. In the not so distant future, Ruben aims to plant his own crops and make the farm a sustainable, financially viable and profitable commercial entity.

Ruben has been a member of Grain SA since 2012 and diligently attends the monthly study group meetings of the Bultfontein Study Group. He has completed numerous training courses and will definitely, sooner rather than later, develop into a fully fledged commercial farmer to reckon with.

Nominees are in no particular order.

Article submitted by Hanlie du Plessis, Freelance writer. For more information, send an email to hanlieduplessis@telkomsa.net.

DEEP SEA EXPORT UNDER THE SPOTLIGHT

It is no news that South Africa is harvesting the largest maize crop on record for the 2017/2018 marketing season. Due to this, there are a number of factors that have changed within the maize supply and demand estimates for 2017/2018 marketing season.

We have already seen a change in low maize prices which were mainly influenced by large supply of maize and recently we saw a change in the export sales demand.

In its fifth production estimates, the Crop Estimates Committee (CEC) forecasted maize production to reach 15,6 million tons. Generally, the local demand for maize

amounts to 10,5 million tons. This clearly means that South Africa will have a surplus maize crop and thus increasing its export supplies.

South African maize exports

Figure 1 shows the maize production and export figures over the past five years. South African maize exports became more concentrated between 2015/2016 and 2016/2017 due to the drought. This means that maize exports during the drought season were going to fewer countries and mainly within the African continent. Total maize exported in 2016/2017 amounted to about 1 million tons, with white maize accounting 60% and yellow maize was 40%. Prior to the drought, during 2014/2015 marketing season, South Africa exported a total of 2,2 million tons, with about 35% of the total maize accounting as deep sea exports to South Korea, Japan, Italy, Saudi Arabia, Portugal and Taiwan.

Looking ahead into the 2017/2018 marketing season, according to the latest supply and demand estimates, South Africa has an exportable amount of 4,4 million tons of maize. This means that the nation has

capacity to compete at deep seas level and not just within the African continent.

Recent export data from SAGIS indicates that as at 23 June 2017, South Africa has exported a total of 310 791 tons, with 50% exported to South Korea and Taiwan.

Conclusion

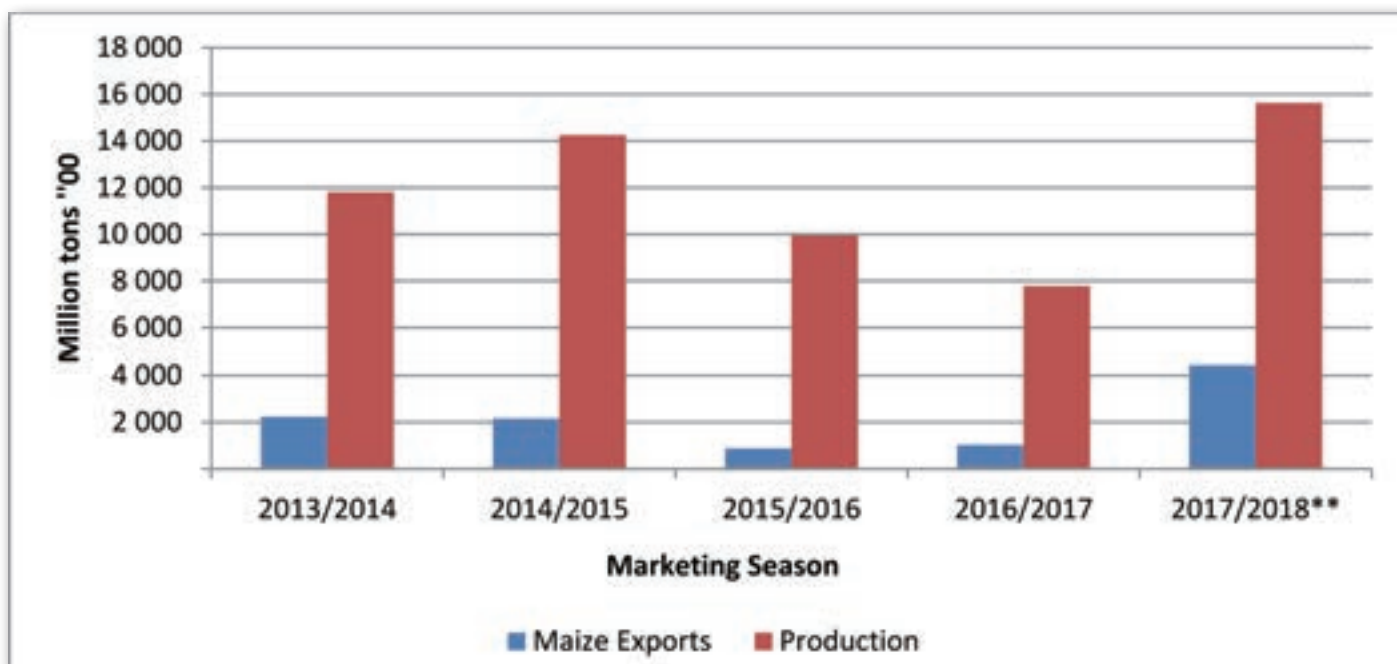
It is evident that a large crop has a positive effect on South African export opportunities. In order to remain as a net exporter of maize and compete at deep sea, the country needs as many export markets as possible to avoid the risk of depending on a few importing countries as seen during the drought season. Given the expected record crop, which also translates to large exportable supplies, this makes international deep sea market ideal for South African maize.

“Given the expected record crop, which also translates to large exportable supplies, this makes international deep sea market ideal for South African maize.”

Article submitted by Michelle Mokone, Agricultural Economist: Grain SA. For more information, send an email to Michelle@grainsa.co.za.



Figure 1: Total South African maize production and exports.



Source: Grain SA & CEC

** Estimates

Buying a TRACTOR is not easy

Large, shiny and beautiful are usually associated with the best, but fortunately, in most cases this is not true at all. Making a wise decision about agricultural machinery purchases requires considerably more research than is generally assumed.

You as the buyer must check out the following beforehand:

What are my mechanisation objectives?

- Why do I need the machine?
 - Do I really need it?
 - Can't I lease it or buy it in partnership with someone else?
- Do I just want to replace or must I replace?
- Am I mechanising to reduce labour and dependence on labour?
 - This mean newer, bigger tractors and a range of implements.
 - Regular replacement to reduce break-ages in operational time is required.
- Should I introduce new technology to increase the effectiveness and efficiency of the business and eventually the profitability?
- Given the new tillage systems and technology, must I purchase new tractors and equipment?
- How important is the resale value of the tractor to me?

Which tasks do the machine have to carry out and for how long does it have to do so?

- Primary tillage is very important, but the machine may have more time to do this and other tractors may also be able to help with this task.



- The planting window determines the time within which many of the other tasks have to be carried out. The cultivation of more than one crop can extend the planting window.
- The application of herbicide and pesticide is subject to time constraints. Make sure that these tasks are carried out timeously, effectively and efficiently.
- Harvesting the crop can also be subject to time constraints. However, more than one crop can extend the harvesting window.

What are the requirements for new tractors to carry out the tasks?

- The power need with which the tractor has to comply (kW).
- The hydraulic capacity of the tractor and the requirements of the implements (flow and pressure).
- Mass of the tractor (kg).
- The energy consumption of the tractor engine (litres of diesel per hour).

How will the tractor or equipment increase or preserve the effectiveness of the farming operations?

- The availability of technicians and parts if repairs or services are required is critical.
- The comfort inside the tractor can increase the effectiveness of the driver.
- Does the tractor have the technology to handle precision equipment, for example auto steering, or to gather the required data?
- To what extent will the purchase of the new equipment increase the effectiveness and efficiency of the business?

Table 1: The amount of power take-off shaft power that will be available at the tow bar to tow an implement given the type of tractor drive and the soil conditions.

Type of tractor drive	Hard soil	Loose chiselled soil	Very soft soil
Two-wheel drive	0,72	0,67	0,55
Four-wheel drive	0,78	0,75	0,70
Caterpillar drive	0,79	0,80	0,78

Sometimes one can wrongly assume that the kilowattage of the tractor is the be-all and end-all. You can believe that if it only has the right kilowatt output, everything is okay. Unfortunately this is not the case, as considerable



energy is lost from the moment the engine is switched on until the implement starts moving. About 10% of the engine's power is lost when the power take-off shaft (PTO) is used. This is just because there are clutches that come into play, gears that turn and hydraulic pumps that work.

The following important point at which power is measured is at the tow bar. At this point the wheel slippage, tractor mass and terrain being worked are taken into account. **Table 1** provides handy information that can be used to calculate quickly whether a tractor will have sufficient power to tow an implement.

“The number of wheels the tractor has, the wheel and tyre size have a direct impact on diesel consumption, wheel slippage and compaction.

From this information it is clear that caterpillar tracks lose the least traction – regardless of the condition of the soil. Do a calculation and then decide whether you should buy a two-wheel, four-wheel or caterpillar tractor. Compare the saving on diesel to the additional costs involved in purchasing the tractor.

It is important for each producer to determine what the wheel slippage of their tractor per action is. The lower the wheel slippage, the greater the effectiveness and the lower the costs. Wheel slippage is one factor that can be managed.

One way to manage this is to adjust the mass and load of the tractor. However, sometimes the wheel slippage can only be reduced by towing a smaller implement. Keep in mind that with some tractor brands wheel slippage is a method of protecting the tractor. It is advisable to consult the tractor's manual to determine optimum wheel slippage.

The number of wheels the tractor has, the wheel and tyre size have a direct impact on diesel consumption, wheel slippage and compaction. The larger and wider the tyres, the less the compaction usually is. However, this can also have a negative effect on wheel slippage. Usually the tyres with which the tractor is issued are the best for the tractor and its general use.

If a track traffic system is used, make sure that the new equipment fits in with the system and that the tractors and combine harvesters can track. Otherwise you will have to think of ways to overcome the problem.

Soil compaction should be a critical measuring point in any tillage. Remember the following rule of thumb: The heavier the tractor, the more the soil compaction, and the less the wheel slippage. It therefore makes sense to adapt the mass of the tractor to the work it has to do. If wheel slippage is a problem, make the tractor a little heavier. If the work is light, remove the weights. The main thing is to utilise the tractor optimally. Do not use a very heavy tractor if a lighter, smaller tractor is available and can do the work well.

This is not always the case, though. Sometimes you need a heavy tractor to handle an implement or trailer. An example is the new tendency to use large transfer trailers. Although a 70 kW tractor has enough power to tow the trailer, the tractor is simply too light to safely handle the trailer with a load.

In the case of implements requiring a lot of hydraulic capacity and flow, for example a precision pneumatic planter, the smaller tractors will not necessarily be able to deliver the amount of oil. The tractor may be strong enough, but cannot tow the implement. There are various ways to overcome the problem, but please note that this will cost more money.

Some implements require actuation from the power take-off shaft. Power used in this way should be added to the power requirement of the implement. The tractor can be strong enough to tow the planter, but as soon as the power take-off shaft is introduced, the power is insufficient. A good example is a pneumatic planter towed by a smallish tractor. The tractor is strong enough to tow the planter, but as soon as the power take-off shaft is used, the tractor cannot make the grade.


Field effectiveness is another factor that is often overlooked. Make sure that the time the tractor takes to turn at the ends is kept to a minimum. This will increase the effectiveness of the tractor. Determine the direction of tillage – if possible – so that the trips are kept as long as possible.

This will lead to the number of hectares tilled per day increasing, thus increasing the effective use of diesel and capital. If smaller tractors are replaced by a very large tractor, working in small fields can be a problem.

If you decide to replace the old tractor with a new one, it would be good practice to test the new tractor on the farm. Make sure you know what the diesel consumption of the old tractor is for a specific action and test the new tractor to make sure that its consumption is in fact less than that of the old one. If the diesel consumption for the new tractor is lower, it would make sense to replace the old tractor. The savings on diesel consumption help to pay the instalment.

A lot of information on certain tractors is available. Visit the tractor testing laboratory of the Nebraska University online to obtain full test reports for most tractors. These tests can be used to compare different tractors.

One of the main points to be considered is whether the farm's profitability can afford the new tractor. Make provision for this by analysing the whole cash stream, use the tax benefits to pay the tractor off as quickly as possible and establish the risk the farm will have to face.

It is important to know whether the tractor or equipment will increase the profitability of the farm. If the answer is yes, buy the tractor with confidence. Otherwise it would be better to think about it a little longer. 

Article submitted by Pietman Botha, SA Grain contributor. For more information, send an email to pietmanbotha@gmail.com.

Water use efficiency of soybeans

The availability of fresh water is under enormous pressure, not only in South Africa, but worldwide. Consequently, the management and use of water is becoming more and more contentious. It has been estimated that approximately 86% of all fresh water in the world is used for food production.

Therefore, the water footprint of products will become increasingly important. The water footprint of 1 kg of animal protein has been estimated at 1,6 to two times more than the production of vegetable protein.

Soybeans (*Glycine max*) are one of the most important sources of oil and protein in the world. Soybean production in South Africa has increased noticeably over the past number of years due to, among other things, the increased crushing capacity (2 300 000 tons) that was developed. The production of soybeans is mainly for use in the animal feed industry, driven by the demand for animal protein.

Soybean production in South Africa exceeded the 1 million ton mark for the first time during the 2015 production season. During the 2015/2016 season, production declined drastically due to the serious drought. This led to a lower production per hectare, but was also due to 26,8% less surface area being planted.

According to the Crop Estimates Committee, only 502 800 ha had been planted, with an expected total production of 691 750 tons. Only about 50 000 ha ($\pm 10\%$) of the total planting is cultivated under irrigation.

The popularity of soybeans as part of a crop rotation system is increasing due to the nitrogen-fixation quality of soybeans, as well as the improved soil structure characteristic of the extended root system of soybeans.

It is important for planning purposes to know the total water requirement of soybeans, and to make the management decisions accordingly. The water-use efficiency of soybeans varies between 4 kg and 7 kg of grain per hectare per mm water usage.

Lower yields usually go hand in hand with a low water-use efficiency, while higher yields have a high water-use efficiency. Therefore, in the case of higher yields, more soybeans are produced per mm water usage than is the case with low yields.

Water requirements of soybeans

Like with all crops, the seasonal water usage of soybeans is determined by the atmospheric evaporation demand and the availability of water in the soil profile. If the evaporation demand is to exceed the supply of water (rain and irrigation), soybeans will only use the water readily available.

The shortage causes the crop to develop a water deficiency – something experienced regularly in dryland cultivation in South Africa, and resulting in yield losses.

The water requirement of soybeans will vary throughout the season according to the weather conditions and the growth stage of the plant, which requires more or less water. Approximately 6 kg per hectare per mm water can be assumed for planning purposes for seed production.

Therefore (3 000 kg per ha/6 kg per ha per mm water) = 500 mm water will be needed to produce a yield of 3 000 kg per ha. Keep in mind that atmospheric demand has an effect on water-use efficiency. Water requirements are therefore higher in areas with high evaporation figures.

By definition, evapotranspiration is the transpiration of water from plants, as well as evaporation of water from the ground. Transpiration in itself is very important, because yield shows a linear correlation with the amount of water a soybean plant transpires.

Knowledge regarding soybeans' water requirements ensures better irrigation scheduling and also enables the producer to make the right cultivar choice where dryland cultivation is concerned.

Factors affecting evapotranspiration

The water usage of soybeans is affected by the weather conditions as well as by the growth stage of the plant. Factors to take into account are:

Weather conditions

Evapotranspiration is affected by the prevailing air temperature, relative humidity, wind and radiation. High temperatures, low humidity, clear skies and strong wind speed up the evapotranspiration process.

Type of soil

Water-holding capacity of the soil and the current water content in the soil profile. The

plant-available water that the soil can hold (plant-available water capacity) is the maximum water available to the plant when the specific soil has reached field capacity.

Factors affecting plant-available water capacity are the soil type, organic matter, root depth and the density of the roots. Soils with a higher clay content and finer texture can hold more water, but are scarcer during times of drought. Therefore, plants' water usage is maximised at field capacity.

The crop can be planted in a variety of soils, knowing that the risk of root knot nematodes (eelworms) increases in sandy soils. Root knot nematodes prevent the plant from properly absorbing nutrients and water through the root system, with consequent crop losses.

Soybean roots are less sensitive than maize to soil acidity and therefore soybeans can survive drought strain in acid soils better than maize. Soils with a shallow water table also increase the risk for waterlogging, because soybeans are more susceptible to waterlogging in the early growth stage.

Growth stage of the plant

The water requirements of the plant vary according to the growth stage of the plant. Young plants transpire less due to the smaller leaf surface.

Soybeans' water requirements are the highest from flowering to seed filling stage. The middle to late reproductive stages are therefore very sensitive to any moisture strain. It is very important to make the correct cultivar choice with respect to the maturity grouping on the basis of the expected rainfall pattern of the area where the planting will be done.

The crop factor indicates the water requirement of the crop at different growth stages. Water stress in soybeans is visible when the youngest terminal leaves, and in time all the leaves, turn upwards.

Growth period

The growth period of the soybean cultivar is indicated by the maturity grouping. Cultivars with a high maturity grouping of, say, 6,5 will need more water in their total growth period than a cultivar with a maturity grouping of, say, 4.

Although cultivars with a higher maturity grouping require more water, they also have

Table 1: The storage ability and plant-available water for different soils.

% clay	Description	Field capacity mm per m	Wilting point mm per m	Plant-available water mm per m
0 - 6	Loamy sand	165	85	80
6 - 15	Sandy loam	190	86	104
15 - 35	Sandy clay loam	245	135	110
35 - 55	Sandy clay	318	200	118
>55	Clay	373	247	126

Graph 1: Typical growth and water-use pattern of soybeans.

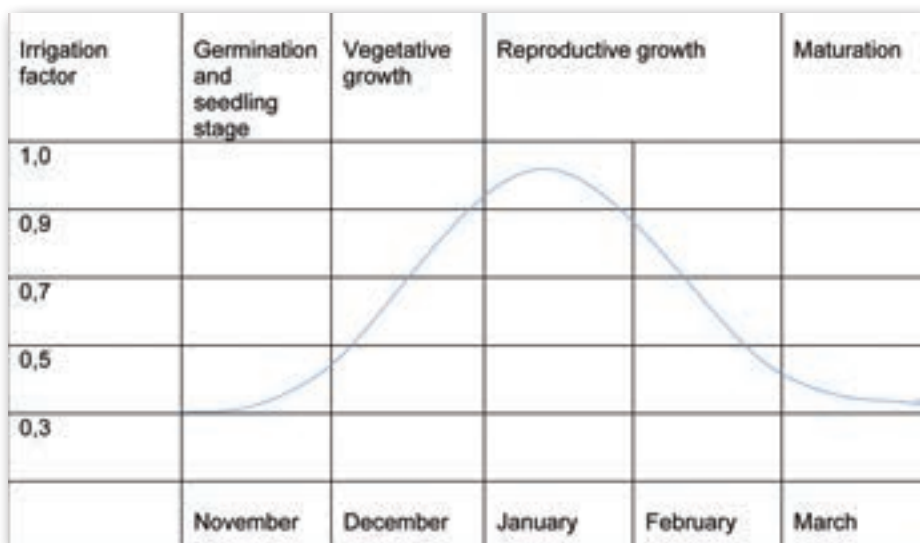


Photo 1: The water requirement is the highest from flower to seed filling.

Photo 2: A proper mulch prevents moisture from evaporating.

Photo 3: Young plants transpire less.



the potential to produce higher yields under optimal conditions.

Plant population

Higher plant populations require more moisture and therefore lower plant populations are recommended for dryland conditions than for irrigation and higher rainfall areas. Soybeans have the ability to adapt their growth and development to compensate for lower plant populations by producing more lateral branches and legumes.

Mulch and minimum tillage

Minimum tillage practices and good mulch reduce the evaporation of moisture from the soil surface and increase infiltration of rain water.

Aspects of interest

A healthy root system that can use water optimally needs to be ensured by eliminating compaction layers and ensuring optimal

nutrition status in the soil. Soybean roots are able to utilise water of up to 1,8 m deep.

Guard against over-irrigation, because drainage loss can occur – especially early in the season when the rate of water usage is still low. Prolonged waterlogging conditions can cause roots to die, which can also induce yield losses and promote diseases.

The yield can be seriously compromised because regrowth of roots usually does not take place after the flowering stage. Plant roots also require oxygen, which is not available if soil is over-irrigated or waterlogged.

The symbiotic fixation of nitrogen is affected negatively by water strain. Due to water usage by weeds, early weed control ensures higher production and lower moisture losses. Soybean seedlings are especially vulnerable four to six weeks after planting.

Knowledge of the water requirements of soybeans provides producers with management guidelines to make informed cultivar choices that take the water requirement of

soybeans into account, compared to the total long-term expected rainfall and distribution in the area.

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Article submitted by Annelie de Beer, ARC-Grain Crops, Potchefstroom, for SA Graan/Grain August 2016. For more information, send an email to DeBeerAnnelie@arc.agric.za.

How do drought conditions affect the effectiveness of herbicides?

Ineffective, and even no weed control, was reported during the past growing season, in which one of the worst droughts yet was experienced. As if the drought conditions were not enough to test the producers, unreliable weed control during drought conditions presents another challenge.

It is generally more difficult to control weeds during drought conditions than during a regular season when rain distribution is more constant. In order for herbicides to control weeds effectively, a few external and internal factors should be in balance – in the plant (weed) and in the environment (soil and air).

Herbicides can be divided into two main groups in terms of time of administration, namely pre-emergence and post-emergence. Pre-emergence administration entails controlling weeds before they emerge (appear above the soil surface), while post-emergence administration takes place when weeds have already emerged and are in the seedling stage.

In order for any herbicide to work effectively, the 'target' should be reached, in other words the germinating weed in the soil (pre-emergence) and the actively growing plant's leaves (post-emergence).

When drought conditions occur, they influence both these targets, directly affecting the effectiveness of herbicides. This article aims to shed light on the effect of drought on

the operation of soil-administered herbicides (pre-emergence), leaf-administered herbicides (post-emergence), as well as the environmental effect (drought) on the absorption of herbicides.

Drought effect on leaf-administered herbicides

For any post-emergence herbicide to be absorbed effectively by the weed, enough of the herbicide needs to be deposited on the leaf surface to be absorbed quickly and transported to the place of operation in the plant (weed).

The place of operation will determine where the specific herbicide molecule will work on the plant's physiological processes and/or tissue to induce the weed to die. Glyphosate (systematic post-emergence herbicide), for example, blocks the physiological path known as the Shikimate cycle, and the herbicide molecule prevents the forming of vital building blocks (amino acids) necessary for the effective photosynthesis by the plant.

Paraquat's (post-emergence contact herbicide) place of operation is in the cell walls, where it forms toxic oxygen compounds (for example peroxide) and thus destroys the cell walls. This type of information may be regarded as unnecessary, but an understanding of the working of herbicides can assist producers in better understanding and/or explaining the ineffective control of weeds

in drought conditions. The knowledge can be used beneficially to properly determine the optimum time to administer a herbicide.

Good absorption and quick transport of enough herbicide molecules are therefore necessary for effective control. The activity of herbicide molecules inside the plant is directly affected by the morphology, anatomy, physiological and biochemical processes in the plant (weed).

When drought conditions occur, all the above processes in the plant are affected, and therefore also the working of the herbicides in the plant. The first obstacle to overcome is the thickened wax layer that most weed species can develop during strain conditions. This thickened wax layer forms a physical barrier that delays or prevents the absorption and penetration of herbicide molecules. Not enough herbicide can therefore be absorbed by the plant (weed) to work effectively.

Because of photosynthetic processes, herbicide molecules are transported in the plant together with water and photosynthate (mostly sugars). Strained (wilted) plants' stomata are mostly closed, transfer processes are delayed and the movement of sugars/water in the plant occurs much slower.

Therefore, the leaves of wilted plants absorb much less herbicide, and delayed transfer of herbicide molecules in the plant causes the molecules to not reach the place



Photo 1: Weed showing no signs of strain. The leaves are green and completely open.



Photo 2: Weed showing drought strain. The leaves are wilted, grey-green and turned upwards.

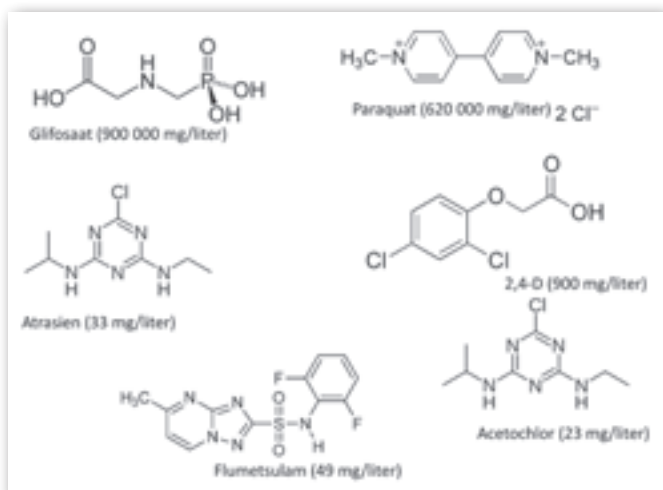


Figure 1: Chemical structures of a few active ingredients of herbicides, with the water solubility in brackets.

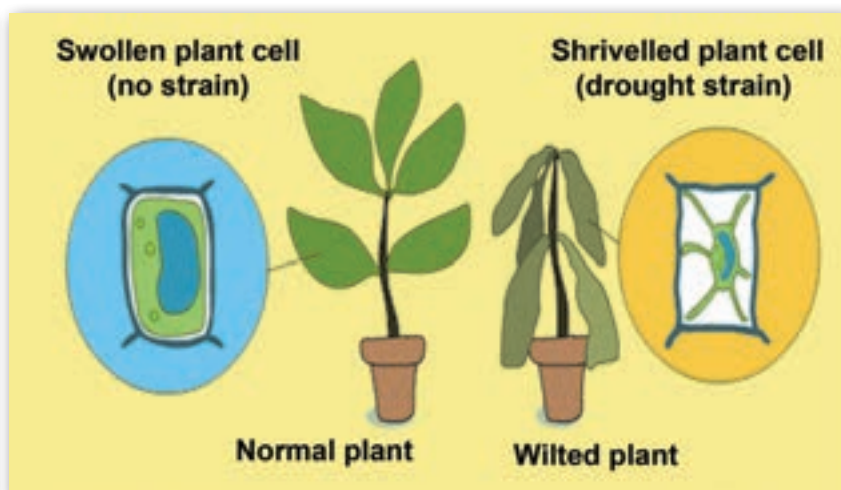


Figure 2: A representation of stomata under strain. Source: eschoolToday.com

of operation fast enough. Due to this delayed movement through the plant there is more time to 'deactivate' and/or break down the herbicide molecules.

Consequently, not enough herbicide molecules reach the place of operation, resulting in poor weed control. The water solubility of herbicides actually goes hand in hand with effective absorption and translocation (transport) inside the plant. The better the water solubility, the quicker the herbicide molecules will penetrate and be transported.

Drought effect on soil-administered herbicides

Once herbicide molecules fall on the ground, they are exposed to various factors that play a role in the breaking down, absorption and spreading of the herbicide, which has a direct effect on the efficiency of the product.

The presence of soil moisture is vital for the effective soil operation (activation) of pre-emergence herbicides. Some labels will allow up to four days after administration for rainfall and/or irrigation, but after the herbicides have been in the soil for longer than four days without any soil moisture, weed control will decline drastically.

Pre-emergence herbicides mix with (dissolve in) the soil moisture and are therefore distributed in the top layer of soil (0 cm to 10 cm), called the germination zone. Most herbicide molecules are absorbed by the germinating coleoptile (first part of the stem), with limited absorption by the roots of the germinating weeds.

Therefore, if the top layer of soil does not have enough soil moisture, the germinating weed seeds cannot absorb enough herbicide. Reduced soil moisture caused the herbicide molecules to not dissolve, so that they

were not activated and therefore they could not be absorbed.

Poor weed control is due to drought conditions and not poor performance of the product. To further complicate matters, the herbicide molecules can also be broken down in the soil if they are not absorbed quickly enough by the germinating seedling. Some herbicides are sensitive to light and when they do not leach into the soil fast enough with the aid of soil moisture or near-surface tillage (as indicated on the label), a large percentage of the herbicide molecules can evaporate.

Some soil microbes use herbicide molecules as a 'food source' and this is directly linked to the amount of organic matter in the soil. The microbe activity increases as the organic content of the soil increases.

In the absence of soil moisture, the herbicide molecules stay inactive in the soil and are broken down over time – poor absorption and deactivation of the herbicide are then the effect of poor weed control. When it rains a long time after administration, the weed seed will start to germinate, but the herbicide molecules will no longer activate to provide control.

There are speculations that the residual effect of soil-administered herbicides can be prolonged, as it is not activated in the soil, but there is not sufficient proof to generalise these theories. When prescribed doses are followed, the chances are slim that the aftereffect of pre-emergence herbicides can be extended due to drought conditions in the soil.

Remember

- Optimal absorption of post-emergence herbicides usually occurs in warm, humid

conditions (high relative humidity). However, with drought conditions the air is too dry (very low relative humidity) and temperatures are too high.

- Droplet sizes that are too small could cause a large percentage of herbicide droplets to evaporate when they land on the leaf surface.
- Herbicides should preferably be administered early in the morning when weeds have not wilted yet and the stomata are still open.
- Excessive dust can also occur during drought conditions, which may cause a further physical barrier on leaf surfaces.
- Do not spray pre-emergence herbicides when no rain is predicted; rather move timeously to a post-emergence control programme before weeds are too mature.
- Use tried and tested additives (*adjuvants*) concurrently with post-emergence herbicides to increase penetration and distribution during drought conditions.
- Ineffective weed control is a given rather than an exception during drought conditions and it requires better management skills from producers.
- Better weed control will not be obtained during drought conditions by increasing doses.
- An advantage is that pollination and seed formation of weed species can generally be delayed during drought conditions and the amount of seed shed declines.

Article submitted by Elbé Hugo, ARC-Grain Crops, Potchefstroom, for SA Graan/Grain August 2016. For more information, send an email to JamesM@arc.agric.za.

Water quality and volume critical for successful weed control

For more than 40 years, Monsanto's Roundup® products have formed the basis of weed control programmes in many crops across the country.

Mode of action of glyphosate

Glyphosate is effective in the control of grasses and herbaceous weeds as the glyphosate is absorbed into the plant through its leaves and soft stalk tissue before being transported throughout the plant. Glyphosate's unique action in plants involves the inhibiting of a single enzyme only found in plants. Therefore, glyphosate only controls plants and not microorganisms or animals and insects.

Once glyphosate is translocated to the roots the plant will die within 7 to 14 days. With the new generation patented TranSorb® technology the product is rain fast within two hours, which enables farmers to control tough,

perennial weeds not normally controlled through residual herbicide programmes.

Roundup PowerMAX® puts you in control of weeds in Roundup Ready® systems, but it is recommended to avoid using Roundup PowerMAX® as a single product in such a system.

Water quality

Water quality, the volume of the spray solution and application practices are critical for successful weed control with Roundup® as it effects the efficacy of glyphosate. Only clean, high quality water must be used. Sometimes a buffer is necessary to keep the pH of the solution between 4 and 6,5.

Application

The Roundup® product range is non-selective and must be used with caution. Effective

weed control with herbicides starts by adhering meticulously to the recommendations on product labels.

Roundup Turbo contains 450 g glyphosate/l. Caution. Herbicide resistant group G, Reg. Nr. L7166 (Act Nr. 36 of 1947).

Roundup PowerMax® contains 540g glyphosate/l. Caution. Herbicide resistant group G. Reg. Nr. L7769 (Act Nr. 36 of 1947).

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Article submitted by Magda du Toit, Corporate Communication Manager, Monsanto South Africa. For more information, send an email to magda.du.toit@monsanto.com.

Pula Imvula's Quote of the Month

The real opportunity for success lies within the person and not in the job.

~ Zig Ziglar

THE CORNER POST

CHRIS DE JAGER

Knowledge changes lives



In this series, *The Corner Post* is featuring the mentors who form part of the Grain SA mentorship programme. A mentor is a person who gives you advice on how to achieve your own goals and dreams.

'I have always believed that although I do not have the finances to make a difference in someone's life, I can share that which I do have, knowledge.' Mentor Chris de Jager loves being involved in the mentorship programme. 'I thoroughly enjoy the time I spend with the farmers, and it seems that they are also satisfied with the guidance I am giving them,' he shares enthusiastically.

Experience is the key to being a mentor

With more than 40 years' experience in agriculture, Chris de Jager, definitely has enough agricultural knowledge to share with emerging farmers. He joined a family farming enterprise consisting of beef cattle, sheep, crops and a dairy in 1970. In 1990 the dairy was abolished and the enterprise diversified even further by adding a piggery. Because of tremendous losses due to theft, they later also decided that sheep farming was no longer a viable option. He retired from the family farming business in 2015 and joined an agricultural chemical company, Farmers Agri-Care, for two years on a part-time basis where he assisted with the calibration of agricultural implements and also handled deliveries.

Chris has been involved in assisting emerging farmers for many years and mentions that he really enjoys showing developing farmers the ropes. He was approached by Graeme Engelbrecht (Development Co-ordinator of the Grain SA Farmer Development Programme in KwaZulu-Natal) early in 2016 about becoming involved in the mentorship programme and as a training officer and had the opportunity

to present his first course at Diatalawa in the Harrismith area during May last year.

As mentor, Chris is involved in the Dundee area where three study groups and two REID (Rural Enterprise and Industrial Development) projects fall under his expertise. Amongst these farmers are 53 members of the Jobs Fund Project. He is also guiding another group Intamo Yenkunzi Co-op with approximately 100 members as well as a family owned operation, Milnedale (fit and proper trading) which is owned by Remember Mthethwa, who is also a farmer being mentored by Chris. This dedicated mentor tries to visit each of these groups on a weekly basis.

Three key areas to address in KwaZulu-Natal

From experience Chris knows the problems which farmers in KwaZulu-Natal face. He focusses on these three areas for successful crop farming with his study groups:

- 1. Weed control:** As weeds are one of the biggest problems in this area, the critical area to tackle is weed control as it is of the utmost importance to ensure a good crop. Topics like the various methods of weed control, the importance of clearing fields after the harvest to ensure a healthier crop for the next season and checking on fields regularly before the problem gets too intense, are addressed.
- 2. Good agricultural practices:** Planting methods and better agricultural techniques like soil sampling, seed variety and no till are explained. It is important for farmers to realise that to improve the crop, the soil must be fed.
- 3. Fertiliser and herbicides:** Thirdly, they have to learn that to ensure a healthy crop the application of fertiliser and herbicides at the right time is key.

Chris believes that increased knowledge leads to increased yields. 'Once the farmers see the difference good agricultural practices make, they are on board and eager to learn more.' With visible results, there are currently several farmers who would like to become part of Chris's study groups.

Highs and lows

When asked about highlights during his time as mentor, Chris says, 'The success of one of your mentees is always rewarding, so a highlight is most definitely the nomination of Remember Wiseman Mthethwa as one of the finalists for the Farmer of the Year competition, as well as my involvement in the REID projects.' Although the Intamo Yenkunzi group was initially challenging due to lack of co-operation, Chris endured and put in a lot of effort to win this group over. With a smile he says, 'The other day they said if Grain SA decides I should no longer be involved in the programme, they themselves will come and fetch me to handle the planter!'

Perhaps American author, Tom Williams, best sums up Chris's point of view, 'You cannot change people by giving them money. Instead give them the thing that is hardest to earn: Experience. Possession does not change a person; knowledge does.'

This month's edition of *The Corner Post* was written by Louise Kunz, Pula Imvula contributor. For more information, send an email to louise@infoworks.biz.



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