PULA IMVULA

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GRAIN SA
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OCTOBER 2013

FARMER OF THE YEAR 2013

THE MAIZE TRUST
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Oil & Protein Seeds special feature

SOYBEANS – our miracle crop

PANNAR

PULA IMVULA

Editorial team

GRAIN SA: BLOEMFONTEIN
Suite 3, Private Bag X11, Brandhof, 9324
7 Collins Street, Arboretum
Bloemfontein
▶ 08600 47246 ◀
▶ Fax: 051 430 7574 ◀ www.grainsa.co.za

EDITOR IN CHIEF
Jane McPherson
▶ 082 854 7171 ◀ jane@grainsa.co.za

EDITOR
DISTRIBUTION
Liana Stroebel
▶ 084 264 1422 ◀ liana@grainsa.co.za

DESIGN, LAYOUT AND PRINTING
Infoworks
▶ 018 468 2716 ◀ www.infoworks.biz

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Grain SA Farmer Development Programme

DEVELOPMENT CO-ORDINATORS

Danie van den Berg
Free State (Bloemfontein)
▶ 071 675 5497 ◀ danie@grainsa.co.za

Johan Kriel
Free State (Ladybrand)
▶ 079 497 4294 ◀ johank@grainsa.co.za
▶ Office: 051 924 1099 ◀ Dimakatsi Nyambose

Jerry Mthombothi
Mpumalanga (Nelspruit)
▶ 084 604 0549 ◀ jerry@grainsa.co.za
▶ Office: 013 755 4575 ◀ Nonhlanhla Sithole

Naas Gouws
Mpumalanga (Belfast)
▶ 072 736 7219 ◀ naas@grainsa.co.za

Jurie Mentz
KwaZulu-Natal (Vryheid)
▶ 082 354 5749 ◀ jurie@grainsa.co.za
▶ Office: 034 980 1455 ◀ Sydwell Nkosi

Ian Househam
Eastern Cape (Kokstad)
▶ 078 791 1004 ◀ ian@grainsa.co.za
▶ Office: 039 727 5749 ◀ Jenilee Buntting

Lawrence Luthango
Eastern Cape (Mthatha)
▶ 076 674 0915 ◀ lawrence@grainsa.co.za
▶ Office: 047 531 0619 ◀ Cwayita Mpotyi

Toit Wessels
Western Cape (Paarl)
▶ 082 658 6552 ◀ toit@grainsa.co.za

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NKGONO JANE SAYS...

IN THIS ISSUE...

COVER ARTICLES

INSIDE

The month of October can be one of the most beautiful months (if there has been spring rain), and yet it is often one of the most difficult months from the perspective of feeding livestock after the winter. Even if there has been rain, the grass will not have grown enough to allow for good grazing and the livestock is usually thin – this is the time when the farmer has to take responsibility for his/her livestock and ensure that they are getting enough to eat.

There is a lot that goes into planting a crop long before the crop can be planted. The lands have to be ripped (to remove any compaction layer), and then worked either with a disc or tyne implement to break up the clods. This is usually followed by a shallow tyne operation so as to prepare the seedbed which is loose, wet and free of weeds.

Another challenging aspect of crop farming is planting the crop at the optimal time.

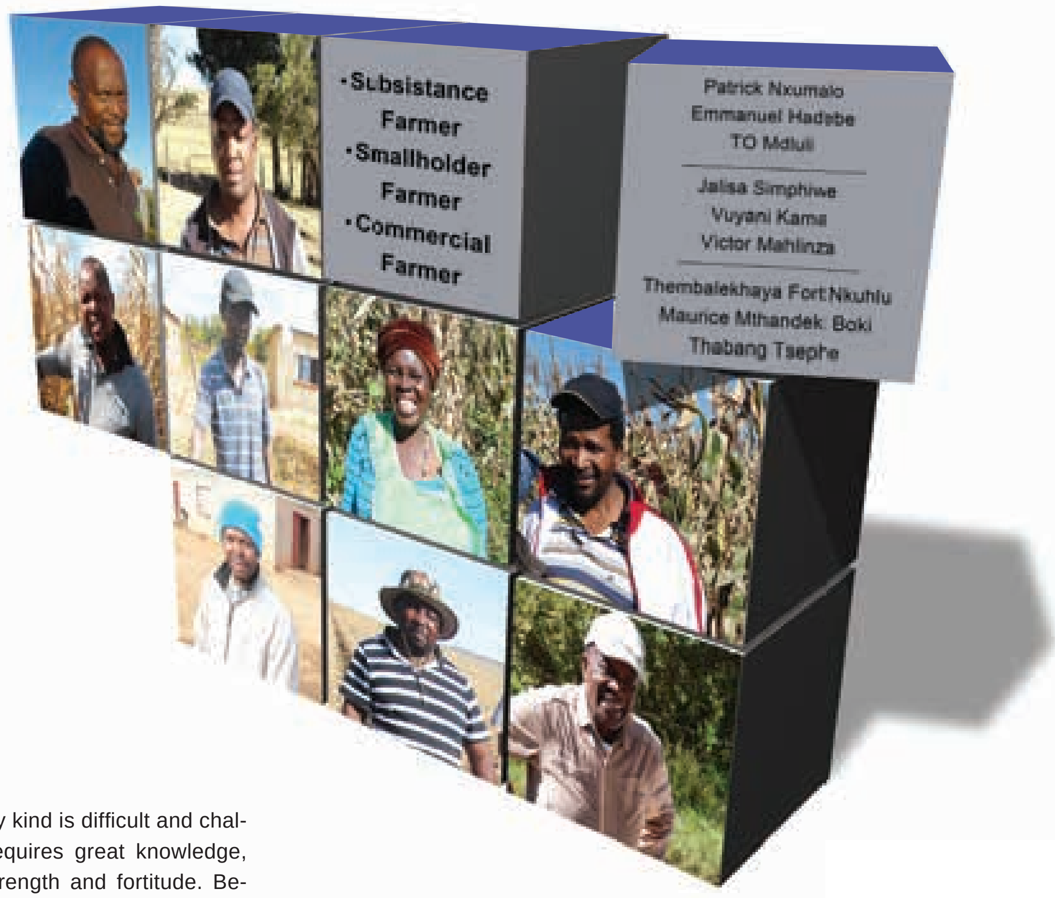
Planting dates

Below is a table of planting dates showing both the optimal planting dates as well as the cut-off dates. It is essential that we start to aim at planting during the optimal period rather than trying to get the crop planted before the cut-off dates. There are a number of activities that have to be done before planting can commence (primary tillage which includes ripping, discing and seedbed preparation). The yield expectation is at its highest when the optimal planting dates are used.

If you are hoping to harvest a good crop, please aim at the optimal planting time – this can make a huge difference in the yield you can expect.

Crop	Optimal planting date				Cut-off planting date	
	East	Central	West	East	Central	West
Maize	15 Oct - 15 Nov	15 Oct - 15 Nov	1 Nov - 16 Dec	30 Nov	20 Dec	25 Dec
Sunflowers	Not recommended	15 Nov - 25 Dec	15 Nov - 31 Dec	Not recommended	15 Jan	25 Jan

The time has arrived for our FARMER OF THE YEAR award



Farming of any kind is difficult and challenging. It requires great knowledge, character, strength and fortitude. Being a grain farmer is more challenging than most, as you work outside (not under a roof), you have high input costs, you carry the risk of droughts, floods, fires and hail, and at the end of it all, there is not much profit.

Being a developing farmer carries all these risks and more – commercial farmers can usually draw from generations of experience on that same farm and yet the "new" farmers have to manage everything on their own, competing with the rest of the world so that their crops can be sold at world prices.

As Grain SA, we have a Farmer Development Programme whose mission is "To develop capacitated black commercial grain farmers, and to contribute to household and national food security through the optimal use of the natural resource available to each farmer". We believe that as the population of the world increases, we have to keep abreast of changes with regard to all aspects of modern life. We also have to understand that not everyone can have access to a large commercial farm (as there is simply not enough land on earth).

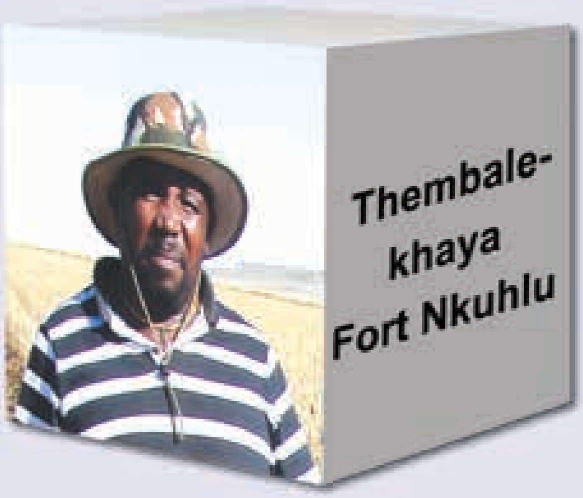
In our programme, we try to assist any person who would like to improve their farming techniques so as to produce more from the land that they have at their disposal. We work with farmers who have access to as little as 1 ha, and also those commercial farmers who have more than 1 000 ha. If we are to feed the nation, then every piece of land must be productive.

As already explained, farming is difficult and we have realised that we must encourage people to keep trying. We must also show the youth of today that farming is not just hard work for no gain. In order to showcase the successes and encourage those already farming, we have a Farmer of the Year competition at three different levels – those producing on less than 10 ha (subsistence), those producing on 10 ha up to 250 tons of grain per year (smallholder), and those who are viewed as commercial farmers. Read more about the candidates on page 5 to page 9 in this issue of Pula/Imvula. This year, we will have our day of celebration on 17 October in Bloemfontein.

We salute those who have worked so hard to overcome all the obstacles along their path. These candidates of the competition have made an enormous effort so that the people in South Africa can have enough food to eat every day. We would like to not only congratulate these farmers, but also thank them for their efforts – without you, we would not have food! You make us proud and keep us focused on our goal of developing farmers.

Article submitted by Jane McPherson, Programme Manager of the Grain SA Farmer Development Programme. For more information, send an email to jane@grainsa.co.za.

Meet this year's COMMERCIAL FARMER finalists



Thembalekhaya Fort Nkuhlu believes in diversity. He produces maize and soybeans and also owns a piggery, chickens, and a substantial livestock enterprise on his farm, Denemark, in the Vrede district.

He grew up in the Eastern Cape, where his grandfather, who was an extension officer in the Cala district, taught him the basic principles of crop production.

Fort completed his secondary schooling at Hgangelizwe Junior Secondary School. After school he completed a short Marketing Management course for a year at Boston City Campus followed by an Office Administration course at Damelin College and a Bookkeeping course at Varsity College.

He believes that when you are farming, learning is something that happens continuously and never stops. His interest in farming started when his father bought the farm near Vrede in 1999.

Fort would like to steer his farm in a direction where he has a reliable market for all the produce of the farm on a continuous basis and create a platform to teach the new generation of farmers and agricultural students and give them an opportunity to practice what they are being taught.

Maurice Mthandeki Boki was born in Matatiele. He attended St Columbus Primary School and thereafter went to Mariezell High School in Matatiele. He left school in grade 10 and went to St Anthony's Mission where he obtained his matric certificate.

He then moved to Johannesburg and worked at Germiston Municipality for three years. After leaving the municipality, he started working for Twins Pharmaceuticals (Adcock Ingrams) for twelve years. He left the company in 1977 and bought a trading station in Matatiele, which still exists.

In 1995, with the aid of Land Bank, he bought Horncroft farm, which is situated between Cedarville and Taylorville, and has been residing there ever since.

Maurice grew up with and has a passion for agriculture. He has also farmed on his own since 1995 without any assistance from any organisation.

Maurice married Kholiswa in 1977 and they have four children. He attended Crop Production, Beef Production, Farm Record Keeping and Farm Business Management courses at Cedara.

Thabang Tsephe grew up in Matatiele. He attended school at Mehloloaleng Junior School, where he obtained a grade 7.

After school, he worked on a farm for a short while and then went to work on the mines for ten years.

He returned home in 1986 and managed a trading shop until he started farming in 1999. Thabang is married to Matau and they have two sons who help their father on the farms.

Thabang operates on two farms where he plants maize, oats and pastures. In addition to the crop production, he also operates a dairy and owns beef cattle as well as sheep for diversity.

Article submitted by Landi Kruger, Pula Imvula contributor. For more information, send an email to landi@grainsa.co.za.

Jalisa, Vuyani and Victor in line for SMALLHOLDER FARMER award

Jalisa Simphiwe

Jalisa Simphiwe was born on 15 September 1958. He grew up at Manzimdaka near Ngcobo. His dad farmed on communal land, practicing mixed farming, with the permission to occupy the land. Simphiwe attended Centu Primary School near Tsolo and attended St Cuthberts until he matriculated in 1981.

Jalisa married Nonene in 1991 and out of this marriage three children were born. Jalisa worked as a security guard in Westonaria for some time till 1997. In 1998 he joined the taxi industry and stayed there until 2006.

During 2008 Jalisa ventured into farming when he managed to secure a farm in Elliot through the LRAD programme.

It was only after he managed to have access to his "own" land that he was exposed to commercial agriculture. Up until then he was only exposed to some form of subsistence farming.

Once he joined Grain SA's study group and started attending regular meetings, he attended training courses which opened up a new world to him. Some of the courses he completed are: Record and Bookkeeping as well as Tractor and Implement Maintenance Course. For the first time in his life he also learned about soil sampling and the value of keeping his own rainfall records.

Jalisa tries to apply what he has learned at study group meetings and the training courses. He is motivated and aims to become a 250 Ton Club member. Jalisa remains committed to improve on his farming practices. His yield used to be in the region of 3 tons/ha, but this year he is aiming for 4,5 tons/ha.

Vuyani Kama was born in Ugie and is 43 years of age. He grew up with his mother, who sent him to school in Ugie where he completed his grade 12.

For the greatest part of his life he worked for the Department of Forestry and Fisheries. This is also where his interest in agriculture was triggered. What he saw on commercial farms in the Ugie district also made a difference in his life and impacted his outlook towards agriculture. His interest grew over time, but his main obstacle was getting access to land in some way or the other.

In 2006 things changed when he managed to buy a 450 ha farm on which he produces maize and potatoes in a crop rotation system. Vuyani also owns a farm in Elliot where he farms with sheep and maize.

In 2009 he joined Grain SA and became a member of a study group within the Farmer Development Programme. Vuyani attended various training courses such as: Introduction to Maize Production, Contractors Course and a Tractor Maintenance Course. Since he joined Grain SA, the support, skills and knowledge that he gained, has helped him to improve his yield production of his maize. The yield on his property increased from an average of 3,5 tons/ha to 5 tons/ha in the Elliot region. His crop estimated on one portion of his lands in the Ugie area, is estimated on 7,5 tons/ha.

Vuyani is excited about the future of agriculture and wishes to continue and improve his farming skills and knowledge.

Vuyani Kama

Victor Mahlinza

Victor Mahlinza was born in Estcourt, KwaZulu-Natal on 14 July 1961. He grew up in Estcourt, near Ntabamhlophe. He started his primary education at Cornfield Primary School in 1968. In 1976 he went to Mtshezi High School where he completed his grade 11 in 1982. In 1983 Victor decided to go to Johannesburg where he worked as a secretary in one of the construction contractor's offices for one year. In 1984 he worked as a storeman in a chemical company in Johannesburg until 1986. Between 1987 and 1988 he worked for M&L Distributors as a truck driver delivering canned stuff. In 1989 he started a delivery subcontract with AMCA Construction up until 1995.

In 1996 he went back home when he decided to become a farmer. At that point he was still using oxen to cultivate his lands, until he bought a tractor in 2003.

He is married to Linah and they are blessed with five children; three daughters and two sons. Fikile (27) who left school in grade 11 and has two children. Sizwe (20) completed grade 12 at Zakhe Agricultural College in Pietermaritzburg. After school he went to Delmas where he attended a Vegetable Course at Buhle College. He is currently working with his father on the farm. Zandile (16) is in grade 11 at Abantungwa High School. Mcebisi (14) is in grade 8 at Mathamo Primary School and Mpumelelo (12) is currently in grade 6 at Mathamo Primary School.

Victor is also engaged to Norah and they have three children.

Victor has four tractors, namely a Massey Ferguson 440 4x4, a Massey Ferguson 5465, a Massey Ferguson 399 and Landini 7500. He also owns two cars: a Colt 2.8 and Mitsubishi. He owns 78 cows which are grazing on 250 ha of communal land and 83 ha of leased private land. Victor does not make use of a financier, but finances, his own crops. This is not easily done as he uses 40 ha of communal land and hires an additional 42 ha arable land from a commercial farmer.

Victor does not only rely on crops, but also has a piggery, goat farming and chicken farming. He sees diversification as very important in order to stabilise his crop farming. His survival strategy for this year remains diversification, since he plants maize, dry beans, vegetables and chicory under contract for Nestlé.

Victor is the chairman of the local District Farmers Association and Mtshezi Study Group and is very passionate about farming. He is also the chairperson for the Working Group in the Farmer Development Programme of Grain SA.

Article submitted by Jane McPherson, Programme Manager of the Grain SA Farmer Development Programme. For more information, send an email to jane@grainsa.co.za.

The candidates for the 2013 SUBSISTENCE FARMER are...

Patrick Nxumalo

Patrick Nxumalo was born in Emangweni near Winterton, where he also grew up. He started school at Emangweni Primary school and then went to Sizathina High school where he completed grade 10.

He started to work in Welkom in 1979 as a factory worker until 1983. He then worked in a plastic manufacturing company in Johannesburg until 1989. Looking for another opportunity he started to work in Estcourt for Masonite, until the end of 2000. From 2001 he started to work for a local Bakery business. After the untimely death of his wife in 2006, Patrick was forced to stop working and look after his children.

He has five children. Nkanyiso was born in 1986 and completed grade 12 in 2009. He is a qualified hyster operator. Nomalungelo was born in 1990 and she completed grade 12. Nqobile was born in 1992, she completed grade 12 in 2011 and is currently furthering her studies at Mnambithi FET College. Aphiwe was born in 1995 and is in grade 11, while Ntombizethu (born in 1999) is in grade 9.

He is a member of Emangweni Study Group since 2009. He attended three different courses: Introduction to Maize, Introduction to Soybeans and Farm Management. The land he uses is communal land falling under the tribal authority. He has 1 ha of arable land and 100 ha of shared grazing land. He owns 15 cows. On his one hectare of land, he planted yellow maize, which is in demand. His neighbouring farmers, who are chicken farmers, buy from him and the rest of his produce he uses to feed his cows.

Patrick would like to expand, but he sees financial constraints as his main obstacle. He has no tractor of his own at this stage and needs proper implements to do the farming operations properly. He has the knowledge and the will to become a commercial farmer one day, he says.

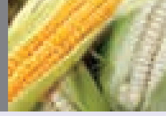
Emmanuel Hadebe was born on 16 September 1971 in the area called Thokoza near Estcourt. He is the fourth of eight children.

He started his primary school education in 1979 at Themba Primary School. From 1982 to 1984 he looked after his grandfather's cattle. In 1989 he attended Amahlubi High School where he matriculated in 1994. He then went to Johannesburg with the aim of looking for employment, but that dream was not to be. As time went by he decided to attend security courses and managed to progress and obtained a Grade C Security Certificate. Mid 1996 he got a job with one of the contractors where he worked as a security guard. While he was working, he managed to do short courses, such as Project Management and Human Resource Management at the University of KwaZulu-Natal.

In 1999 he returned home where he started working for Tatazela High School as a security guard. In 2006 he started farming with potatoes (which he stopped doing in 2009). He then started farming on 1 ha with maize. From 2007 until now he joined a non-governmental organisation (Bhekuzulu Self-sufficient Project) which helps and supports the orphanage children. He married Philisiwe in 1997 and they are blessed with seven children, two sons and five daughters.

He is a committed member of the Emangweni Study Group for the past four years. He has successfully completed three training courses, namely Maize Production, Farm Management and Introduction to Soybeans. He owns nine cows. The land he uses is communal land falling under the tribal authority. He currently does not have a tractor and uses a contractor to plough his fields. Emmanuel started small on a 1,8 ha piece of communal land, but decided to expand by planting 9,5 ha of Roundup Ready maize. He is very positive and is already thinking of acquiring more fields to plant next season. He would also like to buy himself a tractor and equipment in the near future. Since applying the acquired knowledge, he has exceeded his wildest expectations.

Emmanuel Hadebe



TO Mdluli

TO Mdluli was born at Mhlozeni tribal area high up in the Drakensberg Mountains, about 60 km from Winterton in KwaZulu-Natal. Her parents had 17 children of whom only seven survived. She is the fifth child and has four brothers and two sisters. She never attended a formal school, but did attend school in the evening to learn to read and write. She got married in 1992 and has five children, one girl and four boys. Her firstborn was born in 1985, Senzile, who is currently attending a FET College in Johannesburg. In 1989 Sakhile was born, who has finished school and is working on a farm nearby. In 1995 Simcayi was born, who is currently in grade 11. In 1997 Buyisane was born, who is currently in grade 8 and her lastborn, Mafanelo, was born in 2000. She is very proud of the fact that her children can attend school and is adamant that they will get a proper education.

Mdluli's husband, Ndlala Mbhele, worked in Johannesburg for a company selling meat. Tragedy struck when her husband passed away in 2002. Since then she has had to take care of the children on her own.

She grew up living off the land and it became the only way to survive and to provide for her children. Her main source of income is the piece of land where she plants potatoes, dry beans and maize. All the work is done by hand. She also repairs clothes and sews some garments for the local community for extra income. There is no electricity in that area.

The land she uses is communal land falling under the tribal authority. She has 2 ha of arable and 50 ha of shared grazing. She owns three cows.

On about 1 ha of the arable land they plant maize. She used to cultivate the soil by hand with a hand hoe. Then she would plant the seed and try to keep the land clean by hand. She used to plant the old "Zulu maize" (traditional open pollinated cultivar), seed kept from her own maize after harvesting. Part of the maize they eat as green mealies and the rest they harvest for mealie meal. The harvesting is done by hand and the cobs of corn are shelled by hand. From the "Zulu seed" they need two bags of cobs to get a 20 litre bucket full of kernels. It was a struggle to survive because they have to harvest enough maize to survive, for 12 months.

In 2011 she met Jurie Mentz, Development Co-ordinator for the Grain SA Farmer Development Programme, KwaZulu-Natal (Vryheid). Jurie established the Emmaus Study Group in the region and she attended the meetings. In fact she is now the chairperson of the Emmaus Study Group.

In 2012 she bought herself a little hand planter, which she uses with great success. She also has three knapsack sprayers she uses for spraying chemicals for weeds and pest control. Because she has no implements, she practises no-till. Since she joined Grain SA, she started to plant hybrid maize cultivars and obtained excellent results. She now needs far less bags of cobs to fill a 20 litre bucket with maize kernels.

Article submitted by Jane McPherson, Programme Manager of the Grain SA Farmer Development Programme. For more information, send an email to jane@grainsa.co.za.

Production and value of soybeans as a food source

The soybean plant is classified in the plant kingdom as "Glycine max" and is often called the miracle crop. The production of soybean plantseed is by far the most important oilseed produced in the world.

World oilseed production

The world production data for 2011 shows the total dominance of soybeans for oilseed production, with 56% or 251,5 million metric tons (MMT) of the total production of the estimated world total production of 452,5 million metric tons. To put this in perspective, the number translates into 452 500 000 metric tons.

Other oilseed crops that contribute to this production in MMT are as follows: Rape seed including canola 60,80 at 13%, cotton seed 46,60 at 10%, sunflower seed 38,90 at 9%, peanut 35,50 at 8%, palm kernel 13,40 at 3% and copra seed 5,80 at 1%.

World soybean production

The 2011 data indicates that the total world soybean production of 251,50 MMT by country is as follows: USA 83,2 at 33%, Brazil 72,0 at 29%, Argentina 48,0 at 19%, China 13,5 at 5%, India 11,0 at 4%, Paraguay 6,4 at 3%, Canada 4,2 at 2% and others 13,1 at 5%.

World vegetable oil consumption

The 2011 data shows that world vegetable oil consumption in MMT is as follows: Palm oil 49,6 at 33%, soybean 42,6 at 28%, rape seed 23,2 at 15%, sunflower 12,9 at 9%, cotton seed 5,2 at 3%, peanut 5,2 at 3%, palm kernel 5,1 at 3%, coconut 3,9 at 3% and olive oil 3,0 at 2%.

South African production

The above production statistics help put the South African soybean production amounts in perspective. South Africa is one of about 50 counties producing soybeans.

South Africa produced about 800 000 tons last season, or in other words 800 metric tons. This is really a tiny amount when compared to the world production. At a value of R4 700 per ton, this represents an income for farmers of about R3,760 million or R3,76 billion. In the context of this country, this is a significant contribution to the agricultural sector and the country as a whole.

Oilcake imports

The current soybean production in South Africa is not high enough in order to supply South Africa's requirements with regard to the soya oilcake, which is a very valuable by-product of the soybean seed expressing industry. The soya oilcake is an important and even critical component of feeds for the livestock industry and is an important protein source in feeds for pigs, poultry, dairy cows and cattle finishing in the feedlot industry. Traditional rations contained fish meal. This resource is under increasing threat and has become a very expensive source of protein for livestock rations valued at about R11 900 per ton.

> *"It is up to the South African farmer to research proper soybean production methods in order to increase national average yields. In so doing, our farmers will be able to continue to contribute this important crop as a component of this country's future food security.*

South African imports are about 900 000 metric tons per year of oilcake at a total import value of about R4 billion. If the rand depreciates against other currencies to more than R10 to the US dollar, then the foreign exchange required will rise even further. There is thus a huge potential for increased soybean production by farmers. There is however not enough expressing capacity for soybean seed that should take place in modern plants and factories designed specifically for this purpose. Soybean oil can only be efficiently extracted by using a recoverable solvent process in order to extract the maximum amount of oil from the primary soybean seed.

Soybeans – food value and other uses

The soybean seed is made up of soybean oil and protein, which accounts for 60% of dry

soybeans by weight. The oil content of dry seed is about 18% to 20%, with the protein content making up about 36% to 40%. The remainder consists of 35% carbohydrate and about 5% ash or mineral content. A wide range of very useful amino acids makes up the protein content as well as the vitamins in the B, C, E and K groups and the minerals such as calcium, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc.

As can be seen, soybean seed is a very valuable, highly nutritious food source for humans as well as livestock. Ruminants such as sheep and cattle can eat the raw seed from grazing lands after a soybean crop has been harvested. Single stomach or monogastric animals, such as pigs and chickens however, require the protein to be processed before consumption. The trypsin content is also toxic to humans.

The soybean plant, when cultivated under irrigated and dryland conditions and in symbiosis with the rhizobium bacterial root nodules, fixes nitrogen from the air. This nitrogen provides up to 65% of the nitrogen needed to produce the seed. It is indeed the “miracle” plant.

Human consumption

Soy protein is relatively stable and can thus be used in high temperature cooking to make, amongst many, tofu, which is a high protein food with a soft cheese-like consistency, soymilk, which is made from the whole seed that has been ground up, seeped in water, and is heated by steam, and textured vegetable protein. The textured vegetable protein products can be found in most supermarkets in South Africa and is a valuable source of protein that can be included in human diets.

The soymilk product is a combination of carbohydrates and proteins, which is very similar to the makeup of milk. The soymilk can in turn be made into plain yoghurt or mixed with natural flavours and marketed as a semi-liquid product known as yogi-sip. All of these products can be prepared with simple cooking utensils in any family kitchen or on a large industrial scale with complex stainless steel equipment. Soybean protein is the nutritional equivalent of meat, eggs and casein for human growth and health.

Soybeans were cultivated in Eastern Asia long before written records existed and remain a major food crop in China, Japan and Korea as in other parts of the world. Many of these countries have perfected the manufacture and distribution of fermented soybean based products, such as soy sauce, tempeh, natto and miso. The useful bacteria introduced during fermentation helps to break down the protein into easily digestible amino acids.

Cultivars from these countries have been intensely selected over the last 2 000 years for agricultural cultivation. These cultivars spread throughout the West and form the genetic cultivar basis for the natural and trans-genetically altered cultivars of today.

The development of trans-genetic cultivars has included genes for the resistance of soybean plants to the chemical glyphosate used for weed control in modern commercial soybean production.

Summary

Soybeans are a critical food resource for an ever expanding world, including the South African population and livestock factor. It is up to the South African farmer to research proper soybean production methods under dryland and irrigated conditions in order to increase national average yields. In so doing, our farmers will be able to continue to contribute this important crop as a component of this country’s future food security.

Article submitted by a retired farmer.

Sprayer fundamentals
– water quality and nozzles

Because it is convenient and effective, the widespread use of chemical pesticides has become an important tool in the control of weeds and insects in the agricultural industry.

This has however led to concerns because of the potential the same chemicals, which are on the one hand a solution, to become a problem on the other hand by, for example, contaminating ground water supplies or "drift" effects where the chemical can be carried to where it can cause harm to other crops or even to communities. Farmers and managers have a responsibility to ensure that the use of chemicals takes place with good equipment, necessary safety gear and accurate knowledge regarding application.

Water quality

The mixing of the chemicals is important. Water is the main carrier for herbicide applications and usually makes up to 99% of the solution so it should not be any surprise that the quality of the water used is important. Water needs to be clean and clear for all pesticide applications. For the mixing of chemicals like Roundup or Gramoxones, the water must be absolutely clean and free of all suspended solids like sand or soil or organic matter too, as this affects effectiveness. Hard water usually contains high levels of calcium, magnesium, sodium or iron, while alkalinity means there are high levels of carbonate and bicarbonate in the water. A good farmer will have the water analysed and take corrective action by using a buffer solution. Buffer solutions are used as a means of keeping pH levels balanced.

Water quality is important.

The incorrect use of pesticide application rates, spray patterns and droplet size can create even worse problems than the spray is meant to be resolving, because it reduces pesticide effectiveness on the targeted area.

The first step in sprayer calibration is to discover which is the correct type and size of the nozzle.

Nozzle selection

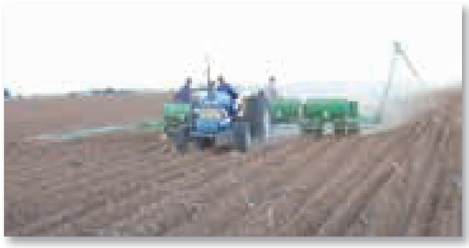
The first step in sprayer calibration is to have the correct type of knowledge to use for the selected chemicals and what size the nozzle must be to determine the flow rate.

- Flat-fan nozzles are used for the broadcast spraying of most herbicides and some insecticides where a medium sized droplet is desired;
- Flooding type and full cone nozzles used for many pre-planting herbicides produce drift-resistant large droplets and so wide nozzle spacing can be used;
- Hollow cone nozzles produce smaller droplets and are used to apply insecticide and contact herbicides that need to penetrate a canopy of leaves.

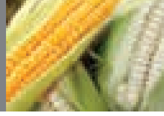
It is very important to check the condition of the nozzles for wear and tear as worn-out nozzles can also result in inaccurate applications. The material used to make the nozzles, influences the lifespan and usefulness of the nozzles and materials like tungsten, carbide, ceramic and hardened stainless steel, help nozzles maintain a constant flow rate for long periods of use. On the other hand, nozzles made from plastic and brass are less durable and the flow rates increase after a short period of spraying. Farmers think they are saving money by buying the cheaper nozzles, but in fact end up paying more for chemicals, because the flow rate has increased.

It is important to know that it is the responsibility of the company which sells you the chemicals to make sure you know how to use the chemicals and it is quite normal for the chemical agents to come to the farms to help with spray rig preparation and calibration. In the November issue of Pula/Imvula we will focus on sprayer fundamentals – calibration and field checking.

Article submitted by Jenny Mathews, Pula/Imvula contributor. For more information, send an email to jenjonmat@gmail.com.



Accurate knowledge, good equipment and the necessary safety gear is needed to ensure that chemicals are applied correctly.



Planting season is knocking on the door:
Ready, steady...Go!

The key to successful farming lies in planning. It is important to be organised and to have a clear plan of action, so go through the new season's processes in your mind and consider all your questions for one of your local agricultural experts, so that no expensive mistakes are made which cost money and waste valuable planting time.

Consider matters like the fact that maize needs between 450 mm to 600 mm of water per season and at maturity, each plant will have absorbed about 250 ml or one cup full of water, all of which is mainly acquired from the soil moisture. About 15 kg of grain are produced for each millimetre of water and by the time it reaches maturity, the total leaf area could exceed a whole square metre per plant.

How do we know how deep to plant our seeds?

Seeding depth is something we can control, so it is important that maize seed is placed so that there is good soil contact. The seeds need to be pressed down into the moist soil, so they can absorb up to 30% of their weight in water, as this enables the germination process to begin immediately.

Also, if they are well placed, the seeds are able to develop strong nodal root systems, so it is important that seed depths are consistent across the whole seed bed. This nodal root development should normally start about 2 cm below the soil line. The nodal root system serves to support the maize plant and is responsible for the uptake of the majority of the water and nutrients, which the maize plant will need throughout its lifespan. So the early establishment of a good nodal root system is the secret to reduce early season root lodging and will help the maize plant cope better should it experience drought stress.

Planting the maize seed at the ideal depth of 4 cm to 5 cm deep will ensure the nodal root system starts growing below the soil line. If the seeds are planted too shallowly however, it could result in the nodal roots beginning their development at or even above the soil line. Some farmers mistakenly believe that the shallow planted maize seed will emerge quicker, but scientists have conducted research which has shown this is not the case and the trials have showed how the seed planted 4 cm deep still actually emerged faster than seed planted 2 cm deep. The difference in the speed of emergence can be attributed to a better seed-soil contact at a depth of 5 cm where soil moisture levels are more stable. The other influence is the temperature of the soil, which strangely enough is often ever so slightly warmer at a 5 cm depth, because it is "insulated" (the soil acts like a blanket) – especially in the early season when the sun may be less intense.

> *"First plan and prepare – then plant. Be very sure of the actions you plan to take and be prepared to get going with the planting of your new crop the minute optimum conditions arise.*

What is the best time to plant maize?

Maize crops utilise sunlight very efficiently and are excellent converters of energy. They absorb the energy from the sun to convert into grain. The ARC-Grain Crops Institute's J du Plessis (refer to reference) reports that at maturity, the total energy used by one plant is equivalent to that of 8 293 x 15 watt electric light bulbs in one hour.

Maize is a summer rainfall crop and is not cultivated in regions where the daily temperature (average) is below 19°C. The lowest temperature at which maize seed will germinate is 10°C, but ideal temperatures are 16°C to 18°C. Maize is sensitive to frost and needs a frost-free period of 120 days - 140 days, so timing of planting must be carefully considered and all threat of late frosts should be past. It is only while the growing point is still beneath the surface of the soil that frost will not cause serious damage, as new leaves will still be able to form. If your crop is planted too late, an early frost at the close of the summer season can cause significant damage, and negatively affect the grain filling stage, so yield is reduced.

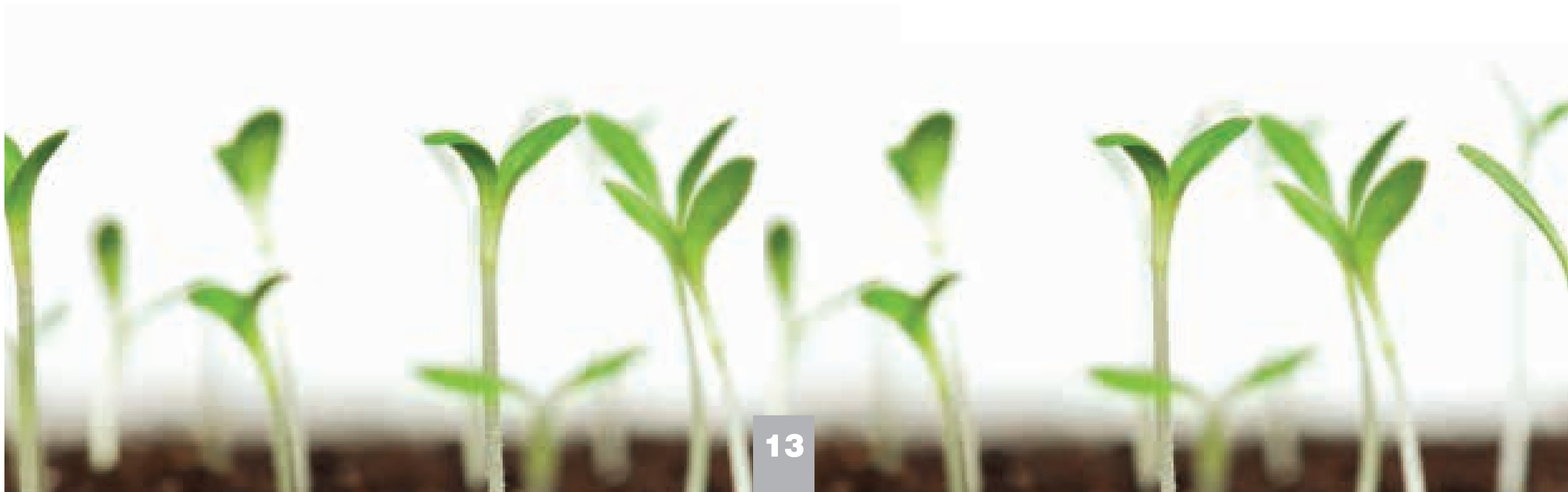
Different seed hybrids have different growing periods and this becomes a useful tool for farmers. If for example the planting season is delayed and results effectively in a shorter season, farmers can decide to switch to a seed which reaches physiological maturity earlier so that maturity is reached before the likely onset of frosts.

Planning your inputs and production phase is critical to the success of your farming operation. Farmers do not control the weather and neither do they have much control over the market forces or prices, but they do control how much they spend on inputs and they do control how well and how efficiently the crop is managed.

Reference

Du Plessis, J. 2003. Maize Production. Directorate Agricultural Information Services with ARC-Grain Crops Institute, Dept Agriculture, Pretoria, South Africa.

Article submitted by Jenny Mathews, Pula/Imvula contributor. For more information, send an email to jenjonmat@gmail.com.



Soil tests and fertiliser recommendations

Previously published articles in Pula/Imvula have highlighted soil sampling, interpretation of the soil test results and different fertiliser forms and their optimum application. How do we use this critical information to plan an adequate but effective fertiliser plan for the crops that we are planning to plant this season?

Soil test highlights

If we refer to the critical or important soil test data results shown in **Table 1**, certain conclusions can be drawn. A suggested fertilisation plan using these factors as a basis can then be compiled for several of the crops to be planted on your farm.

pH

As was discussed in a previous article, the correction of pH by liming is a longer term management consideration. If a recommended amount of lime has been applied on certain lands to adjust the pH to a higher value and thus lessened the acidity level in the soil, this will result in a better uptake of the available nutrients in the soil. Remember that lime applied will only adjust the soil pH status gradually over the next three to four years. The liming operation will thus not have a great influence on the fertilisation planning for this season, but might result in improved yields in the short and longer term.

Some companies sell a granular mix of nitrogen, phosphates and potassium that includes a 7% lime component. This compensates for the temporary increased acidity near the fertiliser granules and allows the plant to have a balanced uptake of the fertiliser applied.

A farmer with the low pH soil above should strongly consider using these sort of products. Practical experience has shown very good results.

Phosphate (P)

A phosphate status of 24,7 parts per million is regarded in most soils as being high enough to be at a production optimum. In the current grain farming economic climate with the high total costs of production, it is not the time to spend any extra money on building the soil phosphate level any higher. This means that the fertilisation target for the coming production season will concentrate on providing enough nutrients to the plants for an achievable yield that is in line with your soil depth, soil type and the average rainfall received in your area. The fertilisation programme in this instance will thus be based on the plant nutrients that are removed from the soil in order to provide for the targeted yields.

Potassium (K)

Most soils in South Africa have adequate levels of potassium with the exception of some very fine sandy soils found in the Orange River irrigation schemes and elsewhere. The potassium component of fertiliser is expensive. With adequate amounts of potassium in your soil test, the application of potassium can be reduced or foregone. However, some crops will remove large amounts of potassium so each situation should be carefully evaluated with your fertiliser agent or soil fertility consultant. A soil test level of between 80 mg to 120 mg per kilogram is regarded as enough for the soil to provide the potassium required by the crop.

Clay (%)

The clay percentage of 10% indicates a sandy soil. The cation exchange capacity (CEC) test shown in a previous article also indicated that the nutrient holding capacity of the soil was low. It will thus be advisable to allow for side dressing of nitrogen for any maize that is planted in high rainfall areas to compensate for any nitrogen leaching that might occur.

Zinc (Zn)

Most soils in South Africa are deficient in zinc. Your soil might have a high level of zinc, but it is always good management practise to fertilise all crops with zinc at planting to ensure that no shortage occurs. This is especially important for maize production.

Extraction of soil nutrients for various crops

The amount of nutrients extracted from the soil by various crops is well documented and researched. One method of fertilisation planning works on the principle of making sure that grain plants have all the nutrients required to produce a targeted yield. These are supplied from the existing soil fertility and nutrient levels assessed by the soil test and the fertiliser applied at planting and during the growth of the crop.

The mass of nutrients that are extracted per ton of grain (per ha) from the roots and from the stems of the plant and are shown for sunflowers, maize and soybeans.

Estimated extraction and replacement values in kilograms per ton of crop produced in dryland maize production

These nutrient values at the various yield targets are then used to compile the suggested fertilisation programme. The requirements shown above can be used for the yields that have been targeted according to soil and climate potential for each land to be planted. It is always advisable to fertilise your top potential soils to their potential rather than to plant a particular recommendation over all soil types on your farm. Provide the correct nutrients for each land that has been soil tested.

As can be seen from **Table 3** the extraction/replacements values for a 4,0 ton crop are as follows: Nitrogen 108 kg/ha, phosphate 18 kg/ha, potassium 80 kg/ha and sulphur 20 kg/ha.

We thus have to supply the crop with these nutrients in a balanced fertiliser mixture. This can be done in many ways, depending on the type of fertilisers supplied by each individual fertiliser company.

From **Table 3** it can be noted that about as much sulphur in kg/ha as phosphate in kg/ha is required together with relatively large amounts of nitrogen and potassium. It is particularly important to supply maize with adequate nitrogen to achieve your yield targets. The crop rotations followed within the crop farming system will influence the fertilisation requirement planning. High organic soils will require less nitrogen than sandy soils under conventional tillage. The fertiliser nutrient budget for maize following soybeans can allow for about 25 kg of nitrogen from the previous soybean crop. This will result in a huge saving in nitrogen costs.

Table 1: Soil test data results.

Sample no	Sample reference	pH (KCL)	Phosphate P (mg/kg)	Potassium (K)	Clay %	Zn (HCL) p/m
2581/2582 combined	L1 – Top and sub soil	4,0	24,7	136	10	1,16

Table 2: Maize.

Description	Nitrogen (N)	Phosphate (P)	Potassium (K)	Sulphur (S)
Grain/ton	15,00	3,00	3,50	4,00
Stalks and cobs	12,00	1,50	16,50	1,00
Total	27,00	4,50	20,00	5,00

Table 3: Total requirements required or extracted at various yield targets per hectare.

Yield target in tons of grain produced per hectare	Nitrogen (N) Kg/ha	Phosphate (P) Kg/ha	Potassium (K) Kg/ha	Sulphur (S) Kg/ha
3,0	81,00	13,50	60,00	15,00
3,5	94,50	15,75	70,00	17,50
4,0	108,00	18,00	80,00	20,00
4,5	121,50	20,25	90,00	22,50
5,0	135,00	22,50	100,00	25,00

Table 4: Composition of mixture per ton of product.

Fertiliser	N	P	K	Ca	Mg	S
4.1.0 (28)	22,4	5,6	0	1,1	0,7	11,20
Total kilograms required for 4,0 ton maize yield/ha	108,00	16,00	80,00			20,00
Total fertiliser required						
280 kg's of the above mixture will supply	63,00	16,00	From soil	3,30	2,10	33,00
Shortfall	41					
Provided by 100 kg of UAS	38					7,7

Composition of balanced fertilisers

A fertiliser combination that will supply all the above nutrients at planting and side dressing could be for example a 4.1.0 (28) + 2% Zn + 7,0% Lime + 11,2 % sulphur. The nutrient content is shown per ton of fertiliser product. It is not advisable to put more than 45 kg of nitrogen down with the seed at planting. Remember the fertiliser must be placed at least 50 mm to the side and below the maize seed.

The amount of kilograms to be supplied per hectare can then be calculated as shown in **Table 4**.

The phosphate recommendations for various yield targets in relation to the phosphate content of soils have been compiled by various research institutions, such as the Fertiliser Society of South Africa (FSSA) and fertiliser companies. In checking the requirements for the 4,5 ton target, the FSSA guidelines show that for a 21 mg/kg - 27 mg/kg phosphate test, about 18 kg of phosphate per hectare is required. This compares well with the extraction value of 16 kg shown in **Table 4**. The initial recommendation is then balanced for phosphates requirements and the shortfall is shown in the above table.

The shortfall in nitrogen could be provided by the side placement while a tractor can still operate in the row crop. Urea ammonium sulphate will provide nitrogen as well as a sulphur boost which has been shown in practice to produce excellent results.

This regime, if applied correctly and in normal climate conditions, will give you an excellent chance of reaching and exceeding the targeted 4 tons per hectare.

Cost

The cost per hectare of the above fertiliser regime will be as follows:

280 kg of 4.1.0 (28) at R5 200 per ton delivered and 100 kg of UAS at R5 300 per ton will cost R1 456 plus R530 to give a total fertiliser cost of R1 986 per hectare.

As a comparison, the 4 ton crop will bring in about R8 400 for a cost of R2 000 in fertiliser.

At harvesting, only the grain is removed and the plant residues, depending on the farming system used, would be recycled to the soil through livestock or tillage to be used for the next crop.

Fertilisation of sunflowers and soybeans

Fertilisation guidelines for sunflowers and soybeans are calculated using the same principles and some examples for particular yield targets are summarised and shown below. Trials in the Eastern Free State with fertilised and unfertilised soybeans showed an R1 600 advantage for the soybeans planted with 100 kg of MAP at planting, but placed below and to the side of the seed.

Sunflowers

Removal of nutrients in kg per 1 ton of sunflower seed produced, is as follows:

Plant portion	N – kg	P – kg	K – kg
Seed	25,80	1,90	8,50
Stalks and leaves	41,20	5,20	87,60
Total	**67,00**	**7,10**	**96,1**

As a guideline, allow for 25 kg of nitrogen per ton of yield target. The soil test indicates that no potassium is required at fertilisation.

A recommendation using the 4.1.0 (28) mixture to realise 2 tons of sunflower seed per hectare would require 50 kg of nitrogen and 10 kg of phosphate in the fertiliser applied per hectare.

200 kg of the 4.1.0. (28) mixture would supply the requirements for the targeted yield of 2 tons per hectare and cost R1 040 per hectare. At 2 tons, the total income for sunflowers would be about R10 000 per hectare. The fertiliser cost to income ratio at the 2 ton yield level for sunflowers is thus more advantageous than the same ratio for maize production.

Soybeans

It is not advisable to fertilise soybeans with too much nitrogen at planting, as it is understood that the availability of N suppresses the development of rhizobium bacteria that forms nitrogen, fixing nodules on the root system. The preference to use nitrogen or not to use nitrogen at planting depends on the farmer's preference, soil conditions, soil fertility in general and experience with soybean fertilisation in a particular farming area.

As can be seen, the soil and rhizobium complex must supply a large amount of nitrogen per hectare.

Removal of nutrients in kg per 1 ton of soybean seed produced is as follows:

Plant portion	N – kg	P – kg	K – kg	S – kg
Seed	60,00	8,00	19,00	8,00
Stalks and leaves	8,00	1,50	6,00	1,00
Total	68,00	9,50	25,1	9,0
Removal at 1,5 tons	102,00	19,00	38,00	13,5

The fertiliser recommendation using 150 kg of a 2.3.4 (30) fertiliser mixture would supply 11 kg of nitrogen, 15 kg of phosphate and 21 kg of potassium needed per hectare in the fertiliser applied. This recommendation would allow the yield target of 1,5 tons per hectare to be realised. The nitrogen content can provide for any initial soil deficiency of N, but must be placed below and away from the seed.

The above mixture would cost R 870 per hectare, compared to a potential income of R7 500 per hectare.

Summary

Consult with your fertiliser agent and become familiar with the methods used to calculate your optimum fertiliser needs. Do not over- fertilise with phosphates if your soil test is adequate.

Article submitted by a retired farmer.

A look at conservation agriculture and the developing grain farmer

Conservation agriculture is a new concept for the vast majority of developing grain farmers in South Africa. In large parts of the summer rainfall area, these farmers apply conventional production methods such as mouldboard ploughing and maize mono-cropping.

Conservation agriculture requires a high level of management and switching over to this production system will take the farmer through various learning phases. It is an integrated system built on the following basic principles:

- Minimum soil disturbance – conventional tillage methods are replaced by reduced or no-tillage and crops being planted by adapted planting equipment.
- Establishment and maintenance of an organic soil cover in the form of a mulch.
- Implementation of crop diversification and rotations, as opposed to mono-cropping.

A lesson from abroad

Although farming conditions in the South Americas might be more favourable compared to that in South Africa, there is one important lesson to be learned from the recent advances that occurred on the grain production front of that continent.

During the 90's the practice of no-till, a key component of conservation agriculture, took countries such as Brazil and Argentina by storm. The lesson to learn from this is that the main actors in all this, often called "zero-till revolution", were farmers. It was the farmers themselves who pioneered and demanded the development of a more sustainable system.

Implementing conservation agriculture in the developing sector

Reducing the risk of dry seasons

The impact of conservation agriculture appears to be less striking in dry areas than in areas known for more favourable climatic conditions. The challenge to farmers in dry regions is to minimise all soil water losses as far as possible, as this will determine the level of water available to plants, which in turn will determine the yield of the crop.

The implementation of conservation agriculture creates such an opportunity. Establishing a mulch of crop residue on the soil surface over time can make a significant contribution to reduce runoff, improve water infiltration and the water holding capacity of the soil.

Maintaining a soil cover

A conflict of interest often occurs, as developing grain farmers in general rely on crop residues to be utilised by livestock. Some commercial conservation agriculture practising farmers with livestock in their farming system, apply controlled grazing.

No-till planter in action in the dry north western parts of Mpumalanga.

> *"The implementation of conservation agriculture includes more than no-till or "spray and plant" as it is called by some farmers who have been very superficially introduced to the concept.*

Their practice is to withdraw the livestock once there is no evidence of maize kernels in their dung. The minimum mulching requirement for conservation agriculture systems is a 30% cover of crop residue at planting time. Farmers are sceptic about the attainability of a proper soil cover, especially in dry seasons when crop yields are low. Under such circumstances, the establishment of fodder type sweet sorghums should be considered, as the high biomass of the crop can help to supply the fodder as well as crop residue reserves.

Effective weed control

Proper weed control is one of the difficulties associated with reduced tillage systems. Experience has shown that when developing farmers are exposed to the advantages of chemical weed control, usually seen as an advanced form of technology, they will start their own experimentation on certain herbicide combinations.

Developing farmers exposed to Roundup Ready maize cultivars and the implication of these cultivars for effective weed control, responded almost surprisingly positive. Even when the relative high cost of the seed was emphasised, farmers remained optimistic about the potential benefits of this group of cultivars.

Grain legumes as rotation crops in conservation agriculture

Although developing grain farmers in South Africa acknowledge the value and potential of

No-till field with crop residue less than the required 30% soil cover – a result of dry conditions on the previous maize yield. Note the weed-free surface.

grain legumes, such as soybeans and cowpeas in a cropping system, they in many cases still fail to expand in growing these crops.

This is mainly due to the lack of a reliable market for the grain, especially in the case of cowpeas. The only way to fully exploit the value of grain legumes in crop rotation is to improve the seed supply system and to create better market opportunities for the farmer.

Conservation agriculture equipment and the gap

A number of suppliers of mechanised agricultural equipment in South Africa have recently started to exploit the demand for no-till planters. The current price of a two row no-till planter varies between R40 000 and R80 000 per unit.

Much more should be done to close the existing gap between developing farmers and these agri-businesses, since obtaining a suitable planter supported by an effective after-sale service is a crucial step in starting with the practice of conservation agriculture.

Preparing to make the shift to conservation agriculture

Farmers need to be convinced that conservation agriculture can be successfully implemented under their unique production conditions. On-farm experiments provide an ideal "classroom" to expose farmers to conservation agriculture practices and to compare it with the conventional system over time.

> *"In 2004 it was reported that 45% of the total land cultivated in Brazil, is now estimated to be managed with no-till. In the case of land cropped by smallholder farmers (<50 ha), this figure is even reported to exceed 80%.*

Farmers considering conservation agriculture as an alternative production system are encouraged to become engaged in such activities through their local organisational structures. In this way many valuable lessons can be learned and much money can be saved.

Conservation agriculture is no cure for poor farming practice and the basic principles of good crop management should always apply. Prior to any attempt to change to conservation agriculture, farmers should make sure to remove all possible conditions that will limit the production potential:

- Brake any plough pan that might exist in the soil.
- Rectify all problems of soil acidity the year before entering conservation agriculture.
- Correct any soil nutrient imbalances.
- Get rid of high infestations of problem weeds, such as coach grass.

Stopping the degradation of our vulnerable soils and opting for a more sustainable grain production system should also now rank much higher on the agenda of farmers in the developing sector of our country.

Johannes Simelane farms in the Balfour district in Mpumalanga and cultivates 300 ha of maize. He is already doing his own experiments on certain aspects of conservation agriculture.

This been said, we should remember that such a significant change in a system as in Brazil for example, could not have happened without the purposeful devotion and team effort from all relevant role-players.

Article submitted by Phonnie du Toit, ARC-Grain Crops Institute, for SA Graan/Grain October 2012. For more information, send an email to dutoitp@arc.agric.za.

Management of natural pasture for higher profit

All facets of farming should display a constant pursuit of better effectiveness and greater optimum utilisation of every available resource. This is the only way in which the pressure and stranglehold of the cost-pincer reality can be alleviated. This reality also exists in stock farming and the utilisation of natural pasture – just like in cash-crop production.

In view of the cost of pasture and other inputs, the application of a precision approach to stock farming is just as critical to the long-term sustainability of this production system.

The key resources here are probably in principle the pasture (natural veld and planted grazing), the stock utilising this, and the capital investment in the above resources and in the infrastructure.

In essence, every stock farmer therefore in the first place produces grass (or leaves) and uses the stock only to "convert" the grass (or leaves) to a form of product that can be sold. The principle is therefore actually simple: To be able to market more meat from the same area, more grass or leaves have to be produced and the available grazing should be utilised as effectively as possible.

A measure of effectiveness that can be used to establish this effectiveness is to express it in kilograms of live mass per hectare (kg LM/ha), or kilogram of meat produced per hectare. To "remove" the limits of regions and rainfall, it can also be expressed per 100 mm of rain.

The right approach here is to work on the principle of "stock in" and "stock out", with all the stock on the farm being weighed every year, say between 15 August and 15 September. The difference between "stock in" and "stock out", plus the mass of all the animals that left the farm (or production system) for that production year and never returned (for example, all weaners, old cows and old bulls), divided by the number of hectares applicable, then gives the kg LM/ha produced. Initially only the mass of all the animals that left the farm and never returned can be used to obtain an indication.

In practice, the results of good veld management are accepted slowly. The reason for this is probably because the results of good veld management are not immediately visible, the reaction to it is manifested over a long period, and it requires constant correct or good management.

Although there are various questions that every farmer can ask himself to determine where he can improve his grazing system, that are four main critical questions, namely:

- Are my types of veld separated correctly?
- Do I have enough or the right number of camps per herd?
- Do I have the right camp size for the size of the herd? (Or even the other way around?)
- Are my grazing periods in the growth season short enough and the rest periods long enough?

It is also important to keep in mind that if a farm can, for example, carry 100 large-stock units (LSU), this does not mean 100 cows. Meissner points out that for small-frame type of cattle (for example Angus and Afrikaner – 500 kg), 67 adult cows of three years old and their calves, and the three bulls required for mating, are already just more than 99 LSU. For medium-frame type of cattle (e.g. Bonsmara and Beefmaster – 525 kg), 67 adult cows of three years old and their calves, and the three bulls required for mating, are equal to 100 LSU. For large-frame animals (Charolais and Simmentaler – 575 kg), 100 LSU constitute 58 adult cows of three years old and their calves, and the two bulls required.

Research has shown that within the normal four-camp system principle, with grazing periods of 30 days per camp and normal grazing pressure, redefoliation of the same tuft of grass occurs roughly every 14 days.

This research also found that the growth vigour of palatable grazing plants and intermediately palatable species in particular is jointly harmed by as much as a third in the next growing season when grazing periods in the previous growing season were 30 days and longer, compared to the production of veld that rested for a full growing season.

The interesting finding was also that the total production was more or less the same as that of veld that had rested for a full growing season, but that the loss in production of the palatable and intermediately palatable species was absorbed by the production of the unpalatable species, which produced up to approximately a third more.

The important thing to remember here is that our animals graze the palatable species first, then the intermediately palatable species, while the unpalatable species are avoided as far as possible. This means that if the grazing periods per camp in the growing season are too long, we "lose" up to a third of the "acceptable" grazing for the cattle in the next growing season – hence the principle of resting for a full growing season.

In regular trial treatments of six weeks, defoliation was simulated at varying intensities and frequencies (**Photo 1**). A high intensity and frequency (severe) of defoliation is simulated by cutting grass plants 2 cm above the surface of the soil on a weekly basis. For a moderate intensity and frequency (moderate) of defoliation, the grass plants are cut 4 cm above the soil surface every second week. The low frequency is simulated by cutting the grass plants 4 cm above the soil surface at the beginning of the trial period, and then only six weeks later once more.

This can lead to the following conclusion: With grazing periods of 30 days and longer per camp,

Photo1: The reaction of a high intensity and frequency (severe – left), moderate intensity and frequency (moderate – middle) and low frequency (rest – right) of defoliation on the root development of tall fescue. (HA Snyman)

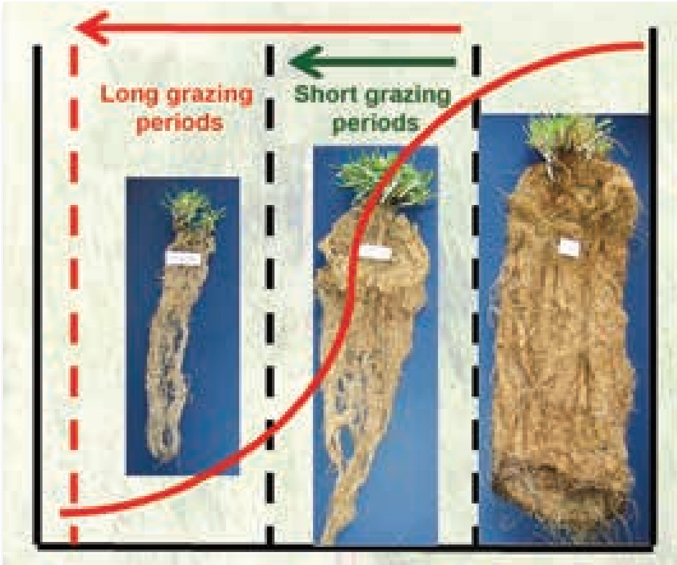


Photo 2: The projected impact of short and long grazing periods under normal grazing pressures on root systems of palatable grazing plants.

re-defoliation of the same plant should take place at least every 14 days and the roots of the palatable species will die off to a "status" of something between the "severe" defoliation and the "moderate" defoliation (see **Photo 1** and **Photo 2**).

When we experience midsummer droughts, the palatable species cannot compete for the limited amount of available moisture to the same extent as the unpalatable species (whose root systems probably look like those of the "rested" plants). The risk in such cases is consequently that palatable grass species can wither and die, with the condition of the veld therefore deteriorating further.

The risk lies not only in the deterioration of the veld, but also in the fact that the regrowth of such severely defoliated plants is much slower, as regrowth in this severe defoliation regime constantly has to occur from reserves. The result is that some of the total potential production for the growing season is lost.

If grazing periods are limited to no longer than 14 days per camp in the growing season, the roots of the palatable grazing plants should maintain a root status of something between moderately defoliated and rest (**Photo 1** and **Photo 2**). In this case the palatable plants are able to compete much better for the available moisture during a midsummer drought because of a still relatively well-developed root system. The regrowth rate of these grazing plants is generally also good in normal climate conditions. Where the principle of shorter grazing periods is applied, it has been found that the total lick consumption per head is reduced in most cases, compared to the scenario of the longer grazing period per camp.

In a case study applying the principles discussed here, it was found that the numbers of producing cows on the same area over a three-year period could be increased by approximately 72% without experiencing fodder shortages.

In this production system there was a summer and a winter calving season, and the average weaning mass improved from 225 kg to 240 kg. The kilogram live mass produced per hectare also increased from 24 kg LM/ha to 43 kg LM/ha – which is almost double the quantity of live mass produced from the same area.

The gross margin per hectare increased from approximately R311/ha to R456/ha within three years. After five years (taken at the same cost and income) the gross margin per hectare changed to R589/ha (plus R133/ha). The R133/ha (which expires after five years) is the cost taken as a "loss in income" for the heifers held back and the female animals that were purchased to increase the producing cow numbers as well as the cost of making infrastructure adjustments, taken as a loan for five years at 12% interest.

In another case study the kilogram of live mass produced was recorded as 142 kg LM/ha after optimisation in a backgrounding system.

However, it is important to remember that the order size of the shift that can be made depends absolutely on how far away from the optimum the system is when the optimisation approach commences. In principle the approach that is followed is based on proven research.

To ensure the success of this approach and change virtually the whole approach into a self-regulating system, there are a few rules of thumb that are followed in conjunction of the principles discussed here. However, these rules of thumb are not discussed here.

Article submitted by IB Oosthuizen, Terratek, for SA Graan/Grain October 2012. For more information, contact Terratek at 018 581 1016.

Transmission of maize streak virus from grasses to maize

Photo 1: Typical symptoms of maize streak virus on young infected maize plants. Photo: Prof BC Flett

Maize streak virus is economically the most important foliar disease of maize in Africa and belongs to the genus *Mastrevirus*, which is in the family *Geminiviridae*.

Maize streak virus is widely distributed throughout sub-Saharan Africa. In South Africa, maize streak virus is prevalent in parts of Limpopo, KwaZulu-Natal, the Northern Cape and Mpumalanga, particularly in areas experiencing high rainfall and temperatures.

Reports by the International Service for the Acquisition of Agri-biotech Application (ISAAA) indicated maize streak virus to be an increasing problem to Africa's subsistence farmers as many plant susceptible traditionally open-pollinated maize varieties.

Maize streak virus is thought to have evolved from grasses and transmitted to maize plants by virus-infected leafhoppers.

Symptoms

Plants infected with maize streak virus develop symptoms 10 to 14 days after infection. Symptoms appear mostly on young growing tender leaves, which are preferred by leafhoppers for feeding (**Photo 1**).

However, this does not mean that the virus cannot infect older leaves. Symptoms vary from severe narrow, broad to mild chlorotic streaks centred on secondary and tertiary leaf veins and are uniformly distributed on the leaf surface (**Photo 2**).

Parallel yellow streaks also appear and the plants remain stunted, producing small ears. Infection increases where susceptible crops or alternate hosts are continuously available under favourable environmental conditions, such as high rainfall and temperatures.

Transmission of maize streak virus

Like many other viruses, maize streak virus depends on insect vectors for transmission between host plants. Maize streak virus cannot be transmitted through seeds or any other method. *Cicadulina* species are the only insects known to transmit maize streak virus from one maize plant to another.

Overwintering of the virus and vectors occur primarily in grasses and areas with hydromorphic soils or tropical environments with irrigation where maize can be grown during the dry season.

Leafhoppers feed on many species of grass and also use them for oviposition. Some species of grasses, such as *Setaria barbata* (Lam.) Kunth and *Brachiaria lata* (Schumach) Hubbard, harbour both the vector and the virus.

Photo 2: Typical leaf symptoms of maize streak virus on mature maize plant.

Female leafhoppers lay eggs onto the living tissue of the host, which might be dormant or develop and hatch within a few weeks. After hatching, the nymph feeds on vascular tissues. Infected leafhoppers transmit the virus from symptomless grasses to maize host plants.

In areas where maize is grown throughout the year, both maize streak virus and the vector could survive on maize and/or grasses. Once infection has occurred, increased spread of the virus will occur over time. Maize streak virus causes severe losses if maize is infected at an early growth stage, approximately three weeks after emergence. Severe infection can result in 100% yield losses, depending on time of infection and plant growth stage when initially infected.

Cicadulina mbila and *C. chinai* leafhopper species are able to accumulate and transmit the virus. Difference in virus accumulation is that the vector (*C. mbila*) accumulates the virus over a period of time whereas *C. chinai* quickly attains saturation level.

Maize streak virus is found in the head, thorax and abdomen of both active and inactive transmitters after feeding. Leafhoppers have sucking mouthparts, which enable them to penetrate the plant cell wall either by mechanical force or by using salivary and gut enzymes.

Vector insects are capable of obtaining the required amount of virus, which even after bypassing through the gut to the haemolymph, transmission could still occur. However, in some vectors the gut serves as the first physical barrier for movement of viruses towards the haemolymph, with the salivary glands being the second transmission barrier.

The gut may be considered as the major storage compartment for viral particles, with the haemolymph being only a transit compartment. Regular increase in the amount of viruses during sustained feeding of *C. mbila* on diseased plants, suggest that the vector is capable of accumulating a significant amount of maize streak virus particles.

Leafhoppers acquire the virus through their food canal during feeding from a plant cell, from which the virus then move towards the midgut and spread through the insect. The minimum acquisition time is less than 15 seconds and the virus may be transmitted to host plants in less than five minutes.

Some members of the leafhoppers, such as *C. mbila,* are capable of transmitting the virus immediately after feeding on the infected plants or after it has been injected into the haemolymph. However, there are some species of leafhoppers, such as *C. chinaï*, where transmission takes place only after the virus has passed through the haemolymph.

Maize streak virus is located in the mesophyll tissue of infected maize and initial contact may occur when insects feed on the mesophyll cells. Leafhoppers feed on the phloem sap inside the plant, releasing the virus to the phloem sieve tube of the host, where it will then replicate, thus increasing the chances of infection.

Control

Maize streak virus is difficult to control and as a result, farmers suffer high yield losses when infections are severe, particularly subsistence farmers. Planting maize in an open area where there are no trees could reduce the number of infections, as leafhoppers prefer shade.

Weeds harbour insects and diseases that could result in infection spreading to the crop. Leafhoppers that transmit maize streak virus survive on several graminaceous weeds species as alternative hosts, therefore intensive control of weeds can minimise maize streak virus incidences.

Intercropping can also reduce the number of infections, as this might lead to confusion for the vectors in finding the maize plant for feeding. Use of barriers, such as bare ground, between early and late-planted maize to limit movement of leafhoppers could also reduce the spread of the virus. Maize hybrids that are resistant to maize streak virus play an important role in reducing maize streak virus incidence in integrated pest management systems.

Although insecticides such as Gaucho® and Cruiser® are available for the control of maize streak virus, most subsistence farmers do not use them for disease control, because of their high cost and potential health risks.

The complexity of maize streak virus epidemiology makes control achievable by implementing an integrated pest control strategy. Farmers are therefore encouraged to cultivate treated seed of improved hybrids every season in order to obtain good yield production.

Article submitted by Moses Ramusi and Bradley Flett, for SA Graan/Grain October 2012. For more information, send an email to FlettBC@arc.agric.za and RamusiM@arc.agric.za.

The Maize Trust

A partner in development

Grain SA has a dream of a united and prosperous agricultural sector and realises that food security needs to be addressed. Income generation for all who have access to land, protection of the natural resources and job creation are of the utmost importance to Grain SA.

However, in order to be able to realise this dream, Grain SA needs partners. One such very important partner is the Maize Trust. The sole and principal objective of this trust is to provide funding for the benefit of the maize industry in the Republic of South Africa and more specifically, to ensure financial support for:

- Market- and production-related scientific and/or technical research in respect of maize;
- The acquisition, assimilation and dissemination of market information for maize and in respect of the maize industry (the ARC-Summer Grain Centre, the Maize Research Division of the Grain Producers' Organisation or any other organisation can apply for such funds);
- Market access in respect of South African maize (inter alia by providing marketing infrastructure, training and assistance in rural areas where the need therefore exists);
- Very important for Grain SA, funds for training and development of emerging farmers.

Without the generous support of the Maize Trust, you would not be reading this magazine. Thank you, Maize Trust.

The Maize Trust is governed by a board of six trustees: One trustee each from the white maize producers and the yellow maize producers, one for the maize processors as well as three representatives from the Ministry of Agriculture, Forestry and Fisheries. These trustees ensure that the money of the Maize Trust is spent wisely and in a sound manner.

To be able to train and develop emerging grain producers, Grain SA needs funds and in this respect, the Maize Trust is a very important partner. Grain SA's Farmer Development Programme (Grain SA's FDP) annually applies for funding from the Maize Trust. This process includes a thorough report of training and development funded with money from the Maize Trust and an application that gives detailed information on what Grain SA's Farmer Development Programmes' plans are for the following year.

Without the support of the different grain trusts as well as the membership fees from farmers, there will be no Grain SA. Keep an eye out in the next issue for more information about the partners of Grain SA in ensuring a united and prosperous agriculture in South Africa.

Article submitted by Susan Engelbrecht, Communication and Media Liaison at Grain SA. For more information, send an email to susan.engelbrecht@grainsa.co.za.

The Corner Post

Feedback on the Grain SA Schools Programme

The Grain SA Development team is privileged to receive funding from the Maize Trust, Winter Cereal Trust and AgriSETA to implement a schools programme to make learners more aware of the significant role that agriculture plays in their daily lives.

Agriculture is so basic to human well-being that it would be safe to say, without it, there is no well-being. However, in our modern society, households are living far away from basic agriculture and children are no longer aware of its value – both as a source of food, fibre and energy, as well as a career choice.

The implementation of this new schools programme has been very rewarding – there are thousands of children out there who are not aware of the agricultural industry and who are not consciously exposed to any aspects thereof. We know that it is the agricultural sector that has taken them from naked neo-natal to clothed teenagers – but they don't see it that way. Our message to them is: **"Without agriculture, you would be naked, hungry and thirsty."**

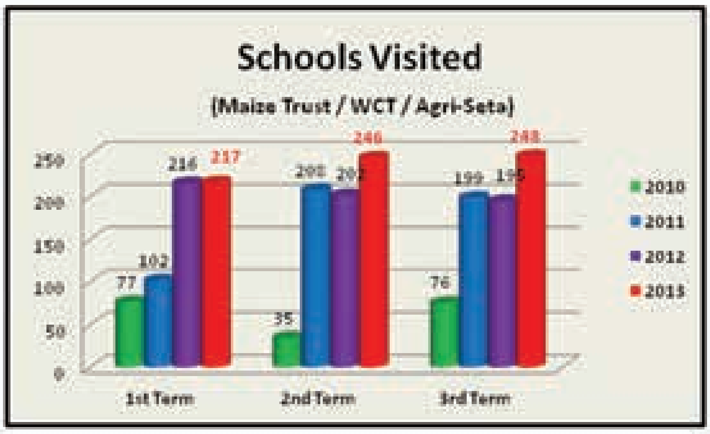
We decided to focus on the children in Grade 9 as they are at a crossroad in their lives and at the end of this school year – they have to make subject choices that affect the rest of their lives. It also sadly happens that many learners leave school at the end of grade 9 and therefore we would like to provide them with alternative career choices that agriculture can offer. We developed three DVD's which are presented to schools in all provinces throughout South Africa. We visit each school in the first, second and third terms to do a presentation to the same group each time. The first presentation is titled "Agriculture, the source of food and fibre", the second is a general Introduction to Farming and the economy to make them aware of all aspects of the sector, and the last presentation is about "Careers in Agriculture". During 2012 alone, we managed to reach 33 000 learners throughout South Africa.

The DVD's cover many areas in the curriculum for grade 8 and 9 learners which we will specify to the educator. For example, "World at work for career choices" cover almost 7 lessons of the third term curriculum and we are happy to present this to the learners in an audio-visual format.

The feedback from the schools and the learners has been very positive, in fact they want to see us more often, and many more schools are requesting to be visited. Our thanks to the Maize Trust, Winter Cereal Trust and AgriSETA for their generous support to this programme.

This month's edition of The Corner Post was authored by Dr Willie Kotzé, Grain SA Farmer Development Training Manager. For more information, send an email to willie@grainsa.co.za.

Graph 1: The number of schools visited from 2010 to 2013.



Graph 2: Since 2010 the number of learners reached has increased significantly.