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PULA IMVULA

GROWING FOOD • PEOPLE • PROSPERITY

GRAIN SA MAGAZINE FOR DEVELOPING FARMERS



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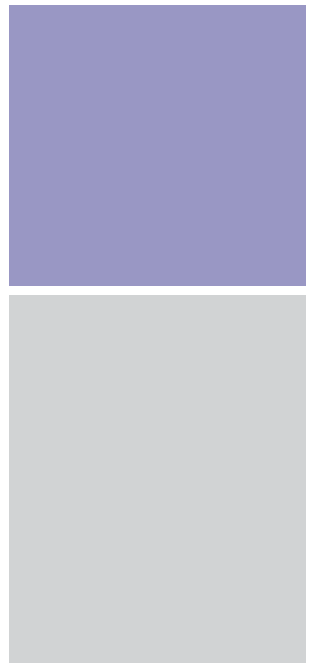
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A WORD FROM... *Jannie de Villiers*

IT WAS A GOOD AGRICULTURAL YEAR IN SOUTH AFRICA THIS PAST SEASON. CROPS WERE GOOD, DESPITE THE FACT THAT THE RAIN CAME LATE. THE FORECAST FOR THE NEW SEASON SO FAR IS ALSO VERY POSITIVE. THE AREA WHERE NEW FARMERS ARE REALLY EXPERIENCING DROUGHT IS CROP FINANCING. THE RISK APPETITE FROM COMMERCIAL BANKS TO FINANCE OUR CROPS IS DISAPPOINTING. IF NOTHING IS GOING TO CHANGE, WE WILL NOT SEE ANY GROWTH IN THIS AREA.

Maybe it is time to have a proper look at the Credit Act to allow more room in the regulations for food production. We are also experiencing drought when it comes to government projects. There are enough funds, but why it has to be late every year is an answer that we still can't get. The liquidity problems of the Land Bank are not helping either. This is the government institution that needs to perform well if development is their mandate. I find it hard to believe that the government consider digging SAA out of their misery, but not the Land Bank.

Yet, despite all these issues to get the crop farmers financed, the tonnages produced are increasing. The resilience that makes the South African farmers world renowned is also in the new farmers. *'n Boer maak 'n plan'*, is in the DNA of every farmer, irrespective of size. The Grain SA Farmer Development Programme has signed new agreements with donors to assist our farmers with finance. Some of these agreements are running over four years. This is very encouraging. The farmers in these programmes managed by Grain SA have done well and the donors are encouraged with the results.

Lastly, Grain SA made a new investment in developing farming. We founded a new Company: Phahama Grain Phakama. This company will focus solely on grain farmer development and will be led by the Grain SA leaders and managed by Grain SA staff.

I want to wish you a good harvest in 2021. May the good Lord provide us good rains, just as He sent us His only Son to give us a chance to grow and to yield good fruit upon His return one day. Merry Christmas and a prosperous new COVID-free year. ■

Change is inevitable – growth is optional

IS THERE PERHAPS AN ATTITUDE, AN ACTIVITY OR A HABIT IN YOUR LIFE THAT MAY NEED TO CHANGE? AND WHAT ABOUT YOUR BUSINESS ROUTINES AND FARMING PRACTICES – DO THEY PERHAPS ALSO NEED UPDATING, SHIFTING, REFRESHING IN ORDER TO KEEP YOU RELEVANT AND REACHING YOUR GOALS?

When my 86-year old dad was widowed three years ago, he sank into a deep sadness and a dark desperation threatened to overwhelm him since he felt his life no longer had purpose. One day I said, 'You know Dad, Mom did not have the choice to stay, but you ... you have the choice to live in a way that honours both your lives through living your life well!' My dad was quiet, but the next day he made an appointment to have his hearing tested, and booked himself a medical check-up. He also resolved that instead of waiting for people to phone him, he was going to phone someone special every day to catch up on their news ... and he does!

The following week he took out a piece of old furniture and started sanding it down and within hours it was transformed and looking brand new – so much so that all the children were asking if they could please have it. This set a chain of events in motion. He began attending auctions and bought old pieces of wooden furniture which he has restored beautifully and gifted to people. Suddenly his days were full and busy and happier. During his very lonely and solitary lockdown there were no auctions and no-one to talk to, so in spite of zero woodworking experience, he began making beautiful wooden toys. At the age of 86 he is still learning new skills every day. His confidence grows daily. My dad has changed. He is good company and spreads his unique brand of loving and caring. He still misses Mom every day –but he lives life well and is an inspiration and his great grandchildren love playing with the cars and trucks he makes! No progress is possible without a change; and those who cannot change their minds cannot change anything!

All of an organisation's human and material resources must be well used in the right way and at the right time to create high quality products at minimum cost.

'BUT WE'VE ALWAYS DONE IT THIS WAY!'

This has to be one of the most dangerous phrases. Some old ways are good but one still needs to examine the value of doing things the way they have always been done and question whether there may be new, different or better ways of doing. To change oneself or one's plans is challenging, but being willing to adapt and change means you are prepared to do what it takes to build new things for a better



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future. Change is necessary and sometimes we need to pause and examine our lives, our business, our goals and our motives. We need to ask ourselves what we ought to think about changing. Winston Churchill once said: 'To improve is to change; to be perfect is to change often!'

PERFORMANCE PRODUCTIVITY

A fundamental principle in business management says: 'All of an organisation's human and material resources must be well used in



the right way and at the right time to create high quality products at minimum cost'. This means staying current and introducing timeous changes, for example we need to build a better food bank to reduce stress and costs incurred in feeding our livestock in the dry months so we are looking to plant more grass pastures and a diverse cover crop.

The performance productivity of any business can be analysed by asking questions like:

- Performance effectiveness – how am I reaching my business goals?
- Performance efficiency – what costs are incurred on the path of achieving my goals?

A manager is the person who plans, organises, directs and controls the allocation of human, material, financial and information resources in pursuit of the business enterprise goals and if you are the farmer that means YOU! How clinical and analytical are you as you plan your farming activities? Are you gathering information, monitoring the agricultural environment, measuring the performance of your labour, your vehicles and implements, your fields? How much critical thinking are you bringing to your farming?



Disrupting old familiar patterns in the agriculture sector

Sometimes change is gentle and of one's own choosing, for example, perhaps we need to bring a third crop into our crop rotation system or perhaps we need to hire another field to get better rotations going; but there are more times when the need for change is so much 'in your face' that it is uncomfortable and very challenging. None of us ever invited droughts or climate change into our lives but we sure have to confront the issues and adapt our farming systems to better cope with these challenges.



Being willing to listen, learn and change is the beginning of success.



It is easy to simply say no to change but not necessarily wise

Make sure your reasons are not just excuses and an attempt to stay in an old familiar comfort zone: I don't have enough time; there is not enough money; I am too old to change; I don't know how to; how do I know it will be worthwhile ... change requires courage.

How many times have we not had to face new schools of thought in the agricultural sector?

In the 40 years we have been farming we have had to absorb many changes, new technologies, changes in consumer demands, better systems, pressures on performance in the face of declining profitability; changes in insurance plans and financing opportunities. Then we hear:

- 'Bigger is better' – does this mean my small farming operation is impractical or unsustainable?
- 'Minimum tillage', 'no – tillage', 'conservation tillage' – the new buzz word is 'regenerative farming'; – which one is right for me? Which one can I afford?
- 'Climate smart farming' – I am a small-scale farmer; how do I adapt to climate smart farming? Who knows what's best in my region? Who do I listen to?

CONCLUSION

Take courage and recognise that pressure to change is ever-present. Not everything has to change. We do however need to network, educate ourselves, plug in to the expert opinions and recognise that adaptation in many forms is integral to the life and work of a farmer. Successful and dynamic farmers are essential to building our country. Developing both as an individual and in one's farming is a constant and necessary force. Being willing to listen, learn and change is the beginning of success. And a final thought: 'Yesterday I was clever so I wanted to change the world. Today I am wise so I am changing myself!' ■

Be on the **LOOKOUT** for **LEAF DISEASES** on maize

THIS TIME OF THE YEAR THE MOST MAIZE PRODUCTION INPUTS SHOULD HAVE BEEN DONE IN THE EASTERN PARTS OF THE COUNTRY. THE HERBICIDE APPLICATION AND TOP DRESS CAN STILL BE DONE IN THE CENTRAL PRODUCTION AREAS LIKE THE FREE STATE AND NORTH WEST. IT IS ALSO IMPORTANT TO BE ON THE LOOKOUT FOR MAIZE STEM BORERS.

There are different pests in this category so contact your representative to make sure that the correct chemicals are correctly applied.

To ask for help is not a sign of weakness but of strength. This is also applicable for maize leaf diseases. The incorrect application of chemicals will not control the disease, yield losses will occur and the chemicals still need to be paid. Double whip beating.

Grey leaf spot, bacterial streak and sunburn damage are sometimes confused by the untrained eye. Management of these problems is very different, and in some cases not even possible. Pannar Seed's free smartphone app, *Sprout* is a good source of information. It summarises and provides a brief description of the most important diseases found on maize in South Africa. This enables the farmer in conjunction with his local agriculturist or chemical representative to manage the relevant disease correctly.

Before they occur, the most important maize leaf diseases have unique needs in terms of environmental conditions. Furthermore, the physiological growth stage of the plant determines when certain diseases appear.

The most important maize leaf diseases for which the farmer should be on the lookout are combined in **Table 1**.

NORTHERN CORN LEAF BLIGHT

The most common leaf disease that occurs in most of the maize-producing areas of South Africa is northern corn leaf blight (white rust) **Photo 1**. Environmental conditions that promote the disease are moderate temperatures (18°C - 27°C), moist conditions and long



1

Northern corn leaf blight.

dew periods. The fungus survives on maize leaf residues, and multiple secondary infections develop throughout the season from existing lesions.

The lesions are usually noticed on the bottom leaves first, and as spores are released under favourable conditions from these lesions, the upper leaves are infected and it seems like the disease creeps up the plant.

COMMON RUST

Common rust (**Photo 2**) is usually noticed for the first time during the season on the young maize plants. Environmental conditions that promote the disease are moderate temperatures (16°C - 25°C) and moist conditions (>95% humidity). Common rust infection is promoted by dew/fog conditions – especially during the night when spores on the leaf surface germinate and penetrate the leaf through the stomata.

Early signs of rust infection are visible approximately five days after initial infection as small flecks on the leaves, and proper rust pimples (ten to 14 days) (**Photo 2**) then develop and release spores. On release these spores can be distributed across great distances by the wind. These spores can even infect the same plant again within the same season.

GREY LEAF SPOT

Another important maize leaf disease is grey leaf spot (**Photo 3**). Environmental conditions that promote the disease are moderate to high temperatures and high humidity (>95%).



2

Common rust.



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1

More general leaf diseases on maize in South Africa, the disease-causing organisms and growth stages in which they are commonly observed, and the control strategies for them.

Leaf disease/symptom	Type	Growth stages	Conditions	Fungicide	Control
Common rust (Photo 2)	Fungus	Later V stages (V8+)	Moderate temperatures (16°C - 25°C).	Yes	Fungicides and hybrid selection.
Northern corn leaf blight (Photo 1)	Fungus	V6 to R stages	Moderate temperatures (18°C - 27°C); long dew periods/high humidity.	Yes	Fungicides, hybrid selection, crop rotation and ploughing in of plant residues.
Grey leaf spot (Photo 3)	Fungus	Fungus From flowering (VT - R1+)	Moderate to hot temperatures (22°C - 30°C); long dew periods/high humidity (>95%).	Yes	Fungicides, hybrid selection, crop rotation and ploughing in of plant residues.
Maize streak disease (Photo 6)	Virus	V stages	Tropical areas here hosts are present all year, as well as conditions that increase vector activity (particularly hot irrigation areas).	No	Control leaf hoppers (systemic seed treatments and sprayings) and weed control.
Bacterial streak (Photo 5)	Bacterium	From flowering (VT - R1+)	Warm, irrigation areas.	No	Crop rotation, fallow fields and destroy infested plant residues.
Sunburn (Photo 4)	Environment	All stages	Heat/sun inhibition.	No	Hybrid selection and moisture management.
Phaeosphaeria leaf spot	Fungus and possible bacterium complex	R3+	Areas with high humidity and cool night temperatures.	Less effective	Not usually necessary, but hybrid selection destroys infested plant residues and moving of planting date can help.
Downy mildew	Fungus	Early V stages	Warm, moist areas (tropical areas), particularly in fields where the disease was observed before. Soil temperatures above 20°C promote infection.	Yes	Soil treatments with metalaxyl, earlier planting date in infested fields, good quality seed and avoid crop rotation with sorghum.
Diplodia leaf streak	Fungus	All stages	Warm, moist areas and minimum tillage.	Yes	Crop rotation, good agl practices and ploughing in of plant residues.
Eyespot	Fungus	R3+	Cool, moist conditions, minimum tillage, insect pests like thrips and aphids an promote infestation.	Yes	Crop rotation, ploughing in of plant residues and insect control.
Polysora rust	Fungus	R3+	Tropical areas, warm (24°C - 28°C), humid weather.	Yes	Fungicides and earlier.

The disease symptoms become particularly visible around flowering – although they can be visible earlier under high disease pressure conditions. This is a leaf disease that occurs specifically in KwaZulu-Natal and the eastern Highveld, where fog and/or high humidity and high temperatures prevail.

A misperception exists that the spores of the fungus are only airborne and distributed by the wind and the rain. Spores can indeed be spread by the wind, but these are secondary spores that can be spread from one planting to the next later in the season – and usually over shorter distances.

The real source of the disease is plant residues from the previous season in which the fungus survives, and as soon as the conditions become favourable in the new season, spores are released that can affect the lower leaves of plants.

These lesions produce new spores that, as the growing season progresses, are released and distributed by rain droplets and wind to newer leaves higher up on the plant. Grey leaf spot is often confused with sunburn/drought inhibition (**Photo 4**). Needless to say, the drought damage cannot be controlled and the unnecessary administration of fungicide causes a double setback for the farmer. None of the fungal leaf diseases mentioned is seed-borne.

BACTERIAL LEAF STREAK

Bacterial leaf streak (**Photo 5**) is a disease that specifically occurs in the western production areas and these symptoms are confused with those of grey leaf spot. A bacterial disease cannot be controlled with fungicides and spraying for it can be an expensive mistake – without any result.

Be on the lookout for...



3

Grey leaf spot.



5

Bacterial leaf streak.

MAIZE STREAK DISEASE

Maize streak disease (**Photo 6**) is caused by the maize streak virus. It is a complex disease, where the virus is transferred by a leafhopper. The environmental conditions affect the incidence, survival and distribution of the leafhopper – which determines the incidence and intensity of the disease.

Maize streak virus cannot be controlled with fungicide. Controlling maize streak virus involves a combination of measures to reduce or limit the risk of the disease. Although insecticides are effective as seed treatments and prevent the leafhoppers from feeding on the young plants and transferring the virus, they are no guarantee or instant solution for the disease.

CONCLUSION

There are various other leaf diseases that were not mentioned in this article because they are less common or occur sporadically. However, this does not mean that they cannot cause huge yield losses under the right conditions. In order to react timeously, it is wise to still consult a good source or expert if suspicious symptoms are observed. ■



4

Sunburn/drought inhibition symptoms on maize leaves.



6

Maize streak disease.

Working towards a **committed** and **enthusiastic** workforce

FARMERS ARE UNDER A SEVERE COST PRESSURE CAUSED BY THE STEADY INCREASE OF THE PRICES OF INPUTS INCLUDING MINIMUM WAGES. A WAY TO COUNTER THE PRESSURE IS TO INCREASE PRODUCTIVITY. IN PREVIOUS ARTICLES WE HAVE DISCUSSED ALTERNATIVE WAYS TO EITHER INCREASE INCOME AND/OR TO DECREASE COST TO MAINTAIN A SUSTAINABLE PROFIT.

Basically, farmers must attempt to farm bigger and/or better to maintain sustainable profits. It is therefore necessary to approach the attempt to maintain profits from different angles.

In this article we will focus on the employees of a business and their relationship with their employer known as labour relations. Financial pressure is forcing owners/managers of a business to look differently at their workforce. Employee costs have risen considerably and are these days one of the higher costs of a business.

Productivity on a farm relates to the number of employees performing a task, the time taken to perform the task and the result of the employee's efforts. When employees are more productive, they save time and/or use resources more efficiently with better results. The result being lower costs and/or higher income.

HOW DO I IMPROVE PRODUCTIVITY?

To get a job done people are involved and they use other resources (tools and equipment) therefore **job = people x resources**. People are thus a fundamental part of getting a job/task done and their attitude is important. The principles to be discussed are applicable whether you have only one employee or more.

In the early day's employers did not realise the importance of the attitude of employees on productivity. The general idea was that people did not want to work, they had to be forced and were abused to get them to do a job. The result was very poor labour relations. Things went so bad that eventually government attempted to regulate this relationship by law. In South Africa we have several labour laws including the Labour Relationship Act. By abiding to the prescripts of the laws, employers are already addressing an improvement in relations. However, there is more to establishing sound relations than just the matters addressed in the laws.

It has been widely reported that the attitude of employees has a major influence on productivity. Employee relations are a key element of workplace happiness and employee engagement. With poor management of staff, the result is a negative attitude of the staff, and vice versa. Employees with a negative attitude will work slowly, do a specific task haphazardly, damage tools and other resources, deliver work of a poor standard, come late for work, take unnecessary sick leave, and so forth. These are all counterproductive actions leading to lower productivity.

When employees are motivated and managed properly, they will have a positive attitude and will be committed to perform responsibly and will be loyal employees. The result – improved productivity. The challenge for employers is how to treat employees to motivate them to be productive. Working with people can be rather difficult because of differences in personality traits, emotions, abilities, behaviour, and actions.

Briefly, you must treat your employees as human beings and as you would like a manager to treat you. Treat your employees with dignity,



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Having good relationships with your workforce will increase productivity and thus increase your profits.

respect, be fair under all circumstances, recognise their efforts, give them responsibility, train them properly and reward them appropriately. Communicate regularly with your employees regarding your vision and mission and aims of the business and their role in achieving this. Do not forget to communicate with your employees regarding their performance and provide recognition and appreciation when necessary for a job well-done. Do not bad-mouth your employees. But also, be firm and strict in what you expect from them. If an employee has transgressed, take the necessary steps according to your disciplinary procedure and code. In this regard also treat them fairly and strictly.

When advising that you must treat your employees as human beings, we are not implicating that you must treat them as a 'pal', far from that.

To achieve high productivity and ensure all-round business excellence, you need buy-in from your employees. You need a committed enthusiastic workforce. To achieve this, you must also consider the way you appoint people. Ensure you know what qualities you are looking for. Have you got a proper job analysis? Do you provide any in-house training? Do you know the strengths and weaknesses of each employee and do you utilise them accordingly? The point is, how can you manage your workforce if you do not know every individual? To be productive a person must be motivated and have a positive attitude and the necessary abilities and skills.

Manage your workforce with wisdom to increase productivity and thus increase your profits. Higher productivity can result in reducing costs and/or increasing income, resulting in better profits which will be to the benefit of all involved with the business – employer and employees. ■

Maize market prospects for next season

IN THIS ARTICLE WE WILL GIVE AN OVERVIEW OF THE 2020/2021 MARKETING SEASON, IN TERMS OF SUPPLY AND DEMAND AS WELL AS PRICES.



Ikageng Maluleke, Agricultural Economist, Grain SA. Send an email to Ikageng@grainsa.co.za

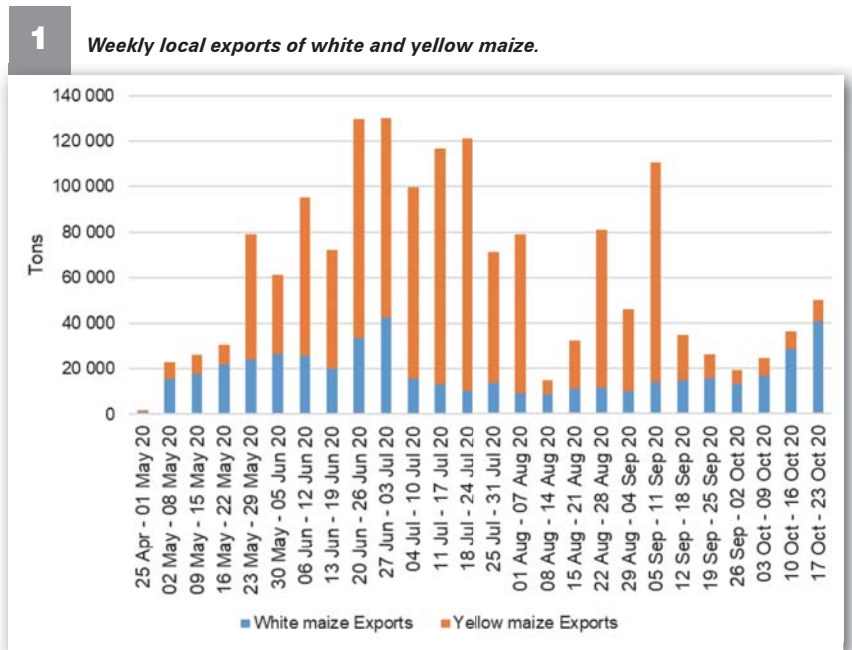
INTERNATIONAL MARKET TRENDS

Global maize prospects for the new season are looking good, with production expected to exceed the previous season by 2,8%. However, there are less than favourable weather conditions in certain parts of the major producing countries delaying harvesting as well as sowing, this coupled with strong demand, especially from China. The impact is reflected by increasing prices for major producers like USA, Ukraine, Brazil and Argentina; as a result, we have seen price increases also in South Africa, due to the influence that production conditions and the exchange rate of those countries have on our local market.

LOCAL MARKET TRENDS

According to recent SAGIS figures, producer deliveries for maize at the end of October totalled 13,8 million tons, 7,9 million tons of white maize and 5,9 million tons of yellow maize, which amounts to about 93,6% of the estimated production by the Crop Estimates Committee (CEC) (**Table 1**).

It is no surprise that we have no imports of maize, given the large crop for the season. Projected closing stocks for the end of the season (30 April 2021) are



Source: SAGIS

1 Local supply and demand.

	2019/2020	2020/2021
Supply	Tons	Tons
Opening stocks	2 663 086	1 000 601
Producer deliveries	10 887 053	14 750 220
Imports	509 684	0
Early deliveries	15 057	-1 241
Surpluses	22 336	28 000
Total supply	14 082 159	15 777 580
Demand		
Local demand	11 106 412	11 269 000
Exports	1 745 000	2 560 000
• Products	360 812	300 000
• Whole maize	1 448 761	2 150 000
Total demand	13 081 558	13 890 500
Ending stocks (30 April)	1 00 601	1 887 080

estimated at 1,887 million tons. If we process about 939 083 tons per month on average, this means we will have enough stock levels to last us two months or 61 days at the end of the season, before new deliveries arrive or we import.

The forecast for the new season in terms of production planning is looking favourable, therefore, it is expected that the local production may be good in the 2020/2021 season.

Domestic demand for maize remains good. About 5,6 million tons of maize, was processed for human consumption, animal feed and gristing, this is a 4,5% increase compared to the same period last year. Looking at **Table 2**, white maize processing increased by 25%, with animal feed taking up most of the white maize. There has been an overall decline of 14% for



2 Maize processed for local consumption.

	2019*	2020*	y/y % change	2019*	2020*	y/y % change
Processed for local market	White maize	White maize		Yellow maize	Yellow maize	
Human	2 322 589	2 655 545	14,34	312 310	311 126	-0,38
Animal	206 218	519 948	152,14	2 562 390	2 159 822	-15,71
Gristing	5 325	5 664	6,37	5 539	3 224	-41,79
Total	2 534 132	3 181 157	25,53	2 880 239	2 474 172	-14,10

Source: SAGIS
*April - September

processed yellow maize compared to the same time last year, with the most decline attributed to gristing.

According to the supply and demand estimates, the projected export quantity for maize is 2,150 million tons for the 2020/2021 season and 1,613 million tons has been exported already. About 475 915 tons of white maize was exported to neighbouring countries and recently to Italy. Yellow maize exports were mainly destined for Vietnam, Taiwan, Japan, Korea and our neighbouring countries (Figure 1). There is also 300 000 tons of processed maize products estimated for exports for the 2020/2021 marketing season and about 148 927 tons have been exported already.

PRICE MOVEMENTS

Local prices have been on the rise for the past few months; the main driver has been higher international prices and the weak exchange rate. Since

June 2020, December white maize futures prices increased by 37,8% and December yellow maize futures prices increased by 29,5% (Figure 2).



Domestic demand for maize remains good. About 5,6 million tons of maize, was processed for human consumption, animal feed and gristing, this is a 4,5% increase compared to the same period last year.

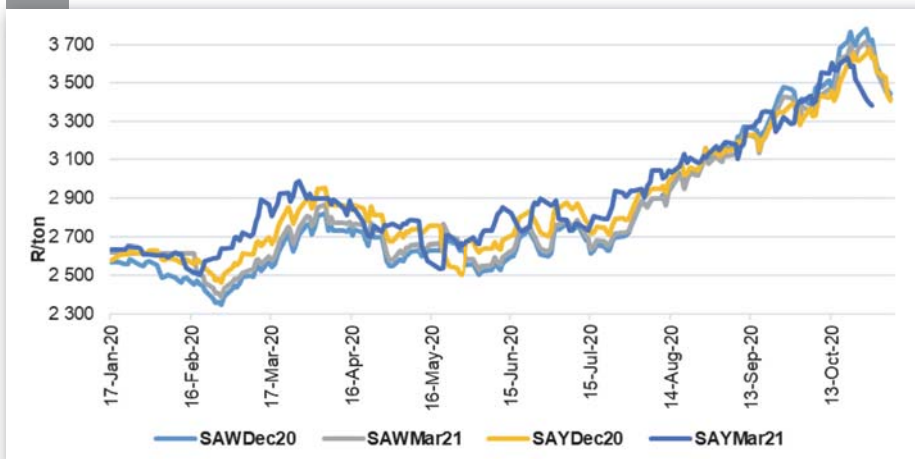


The forecast for the new season in terms of production planning is looking favourable, therefore, it is expected that the local production may be good in the 2020/2021 season. According to the latest report by the CEC, intentions to plant for 2021 is 2,746 million ha of maize which is 135 200 ha more than last season. At the time of writing this article, most of the actual plantings still need to take place so there is still a lot of production risk, therefore weather conditions will play a critical role in the next few months.

Looking at possible price movements, if a good crop is realised, prices are likely to move closer to export parity levels, but the other determining factors will be the exchange rate and international prices. If the international prices remain high and the exchange rate remains weak as current levels, we could see prices of between R2 800 and R3 400 for the 2020/2021 season.

If the international prices drop and the exchange rate becomes stronger, the local prices can come down to below R2 500. In summary, prices can range between below R2 500/ton up to R4 500/ton. The most likely scenario given current market fundamentals is that the prices should be between R2 800/ton and R3 200/ton. ■

2 White and yellow maize futures price movements.



Source: Grain SA



CONSEQUENCES of not liming your acid soils

WE HAVE HAD A LOOK AT SOIL FERTILITY, MANAGING YOUR CROPS AND CROP ROTATIONS IN A PRODUCTION SYSTEM TO BUILD HUMUS, THE MAIN PLANT NUTRIENTS HELD BY THE SAND CLAY AND LOAM COLLOID AND ENHANCING THE COMPLEX SOIL MICROBES TOGETHER WITH THE APPLICATION OF FERTILISERS IN PREVIOUS PULA IMVULA ARTICLES. PLEASE REFER TO THESE TO REFRESH AND IMPROVE YOUR KNOWLEDGE BASE.

An important aspect of growing commercial crops on your soil is to know and understand what the pH or acidity level of the soils is, in the various soil types, occurring on your farm by measuring them when doing soil testing or prior to planning a comprehensive liming programme. If they are extremely acid or alkaline then the soil can be 'corrected' by applying various compounds including calcitic or dolomitic lime in a carefully planned short, medium and long-term application programme to each land in turn.

If your high potential and deepest soils are very acid you might be missing out on obtaining the highest crop yields in optimum rainfall



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years. Adding a ton or more of maize yield per year over many years can amount to a considerable increase in income and thus economic sustainability in future years. At a value of R2 500 per ton over five years this would be R12 500.

Delaying the analysis of a potential acidity problem and the implementation of a properly planned liming programme can be very costly especially when profitable crop production demands high yields. The direct costs for maize depending on the yield target or potential of the soils under consideration can cover a range of R7 000 to R10 000 per hectare for dryland production. This implies that a yield of 2,8 t/ha to 4 t/ha is required to cover the direct costs per hectare. Any yields over this will go towards your fixed costs such as bond repayments,

land lease payments, rental, electricity as defined by your accounting methods and programmes. It is vital to assess your yield potential from detailed farm records. Most farmers over-estimate their actual long-term yields when doing their gross margin analysis.

UNDERSTANDING PH

pH can be measured in a water medium or in a chemical buffer medium of water and calcium chloride. Be sure to know which one you are using. The range of pH and ideal plant growth and pH (CaCl₂) is shown in **Figure 1**.

Table 1 gives an indication of the potential yield to an ideal soil pH reading. For example, if you are planting maize in a land that has a

1 Crop yields relative to pH.

Crop	Soil pH				
	4,7	5	5,7	6,8	7,5
Relative yield (100 is best and 0 is worst) ratio to ideal					
Maize	34	73	83	100	85
Wheat	68	78	89	100	99
Soybeans	65	79	80	100	93
Oats	77	93	99	98	100
Lucerne	2	9	42	100	100
Grasses	31	47	66	100	95

pH of 4,7 compared to a pH of 6,8 you might only realise 34% of the possible maximum yield for that soil. In the deep but extremely acid soils in KwaZulu-Natal yields have been increased from 2,5 t/ha to over 8 t/ha by correcting the soil pH through a long-term liming programme. This might take several applications amounting to between five and seven tons of the recommendation of calcitic or dolomitic lime. Dolomitic lime containing magnesium is recommended when the calcium to magnesium ratio in your soils needs correcting as well.

These are general observations that indicate trends. Each farmer would get a feel for what are the ideal applications and results of lime applications on his own soils over many years. The general rule of thumb is that a particular application of lime reacts in the soil colloidal complex over about three seasons to affect the planned for change in pH desired. Seasonal tests in your lands will show the progress being made towards an ideal pH of 6,8. Increasing crop yields realised will also indicate the effectiveness of the current liming programme.

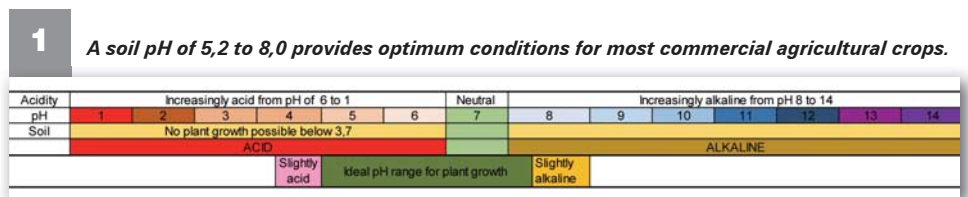
In considering total cation exchange capacity (CEC) your test might come back showing an acid saturation of 30% to 40% which is a very acid soil. In simple terms this means that 30% to 40% of the spaces, in the soil colloidal medium, to hold the major nutrients such as potassium, sulphur, and calcium are taken up by hydrogen ions. The soil is thus not able to hold or keep the nutrients required to enable the crops grown to achieve maximum yields. Liming will improve the ability of the soil to retain nutrients that the plants can access over the vegetative and seed forming stages.

SOIL CORRECTION PLAN OR STRATEGY

A total soil correction strategy might involve the application of calcitic or dolomitic lime to improve pH, gypsum to balance sulphur, MAP to improve phosphate status and KCL to correct the potassium status. If applied by a contractor this recipe might cost between R1 850 and R2 500 per hectare. This might be a bridge too far for some farmers and the ideal soil will rather be created over several years.



Making a plan – applying lime with a fertiliser spreader.
Photo: Jenny Mathews



Considering only liming, the costs depending on the farm's distance from the lime source could range for delivered product from R600 to R700 per ton with and an application cost of R200/ha for farmers using contractors. KwaZulu-Natal farmers in the main apply the lime with their own equipment.

Work out your costs of a liming programme, together with an agronomist you are comfortable with, and weigh up this cost against the estimated financial gains from the increased yields over several seasons. Start with your highest potential soils and plan to correct each land on the farm in turn over several years to spread the financial cost and risk to you farming business.

CONCLUSION

Experienced farmers, agronomists, fertiliser agents, consultants, and other experts in the field are of the opinion that 'liming works'. But consider the financial implications and risk before launching into a full liming programme. Do it systematically for every high potential land on your farm. Those farmers that have access to grant funds should use any opportunity offered, as soon as practically possible, to apply lime as a start to creating an ideal soil that will ensure higher yields into the future. ■



Lime spreading. Photo: Jenny Mathews

What does CEC on your SOIL TEST mean?

ONE COLUMN IN YOUR SOIL TEST REPORT HEADED CATION EXCHANGE CAPACITY (CEC) IS OFTEN OVERLOOKED OR NOT UNDERSTOOD. THIS IS A VERY IMPORTANT ASPECT OF SOILS TO TAKE NOTE OF IN ORDER TO MONITOR SOIL FERTILITY, EFFECT OF LIME APPLICATIONS OVER THREE YEARS OR MORE, THE BALANCE OF MINERALS HELD IN THE SOIL AND THE AVAILABILITY OF THE FERTILISERS APPLIED AS WELL AS GENERAL SOIL FERTILITY LEVELS.

SOILS

Soils are made up of four basic components – minerals, air, water and organic matter. A typical soil might be made up of 45% minerals, 25% water, 25% air and organic matter from 2% to 5%. The mineral portion consists of three kinds of particle sizes classified as sand, silt or clay. The representative portion of these is used to identify a soil as sand, loamy sand, sandy loam, fine sandy loam, loam, silty loam, silt, silty clay loam, clay loam, and clay.

SOIL ORGANISMS

Within the complex structure shown above the soil is teeming with many different organisms including bacteria, actinomycetes, moulds, algae, protozoa, nematodes, insects, worms, and plant roots. The mass of all these organisms in the top 175 millimetres of topsoil can be about 7 000 kg/ha. The soil is thus a dynamic living environment into which we plant our crops together with chemical fertilisers.

ORGANIC MATTER AND HUMUS

Organic matter is the fraction of soil that is made up of both the living organisms above and then once living plant residues from a previous crop or grass ley in various stages of decomposition. Humus is a very complex long chained molecule that can only be examined under a microscope that gets built up from the final decomposition of organic matter. Humus can be made up of brown or grey portions and can be seen appearing in soils after minimum tillage or conservation tillage methods.

The CEC is thus a measure of how good your soil is at holding the essential plant nutrients.

Look at a soil that has been abused by too much disc tillage with no plant residues and very little organic matter and compare it, if possible, to a neighbour or land nearby under conservation tillage. Compare the two by digging profile holes. The humus layers can be seen. Keep in mind it takes several years of conservation tillage to achieve a constant presence of humus. Soil containing 4% organic matter together with the humus can supply up to 200 kg of nitrogen to a crop. What a potential saving in fertiliser nitrogen (N) costs.

If you can research Dr William Albrecht's papers on soils it will be very enlightening and rewarding and help in your knowledge of



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how to improve the soils on your farm. Soils and soil management is indeed a complex subject.

WHAT ARE CATIONS?

Plant nutrients are held in the soil sand, clay and silt complex or colloid. In a well-balanced soil the colloid complex can hold the main and other



trace elements in place. The plants can use these nutrients when required during the various vegetative and seed forming growth stages.

Cations are positively charged chemical entities that are always found in conjunction with other chemical entities or on the soil colloid. The various entities are in constant motion, changing from one combination to another within the dynamic basic soil colloid structure and complex of microorganism life cycles.

Soils are tested for Calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), ammonium nitrogen, other cations and several essential trace minerals. These positively (+) charged nutrients are generally known as bases. They can have one or two positive charges. Negatively (-) charged entities are known as anions.

If you think of two magnets each with a north and south pole – when you bring the north poles or south poles together the two ends are



repulsed by a magnetic force. A north and south pole brought together will have a strong attraction and be strongly held together. Likewise, in simplistic terms, the positive charged plant nutrients or cations will be strongly attracted to a negatively charged surface.

The negatively charged surfaces are found in the soil colloid and especially soil humus fractions. The cation molecules differ in size and charge. The mix or percentage of each within all the cations attached to the soil colloid complex is known as base saturation. Or in simple terms how much of each nutrient needed by the plants is held in a particular soil.

An ideal balance determined by Dr Albrecht and other researchers is as follows:

Calcium 60% to 70%, magnesium 10% to 20%, potassium 2% to 5%, sodium 0,5% to 3%, other cations or bases 5%.

The acidity or pH levels of soils and a liming programme will largely determine whether the above ideal balance of nutrients is achieved. The above balances are now shown by many laboratories or can be calculated from the separate amounts shown in the soil test report. Compare your soil test to the ideals above. The amounts are usually shown in milligrams of each nutrient per kilogram of soil.

The CEC is thus a measure of how good your soil is at holding the essential plant nutrients. Some labs show this as Total Exchange Capacity (TEC). A very sandy soil with very little or no organic matter or humus will show a very low CEC and a highly fertile organic soil will have a high CEC or TEC.

CONCLUSION

Look at your soil test results and see how your soils match up to the ideal. Then make the changes needed in your cultivation and fertilisation practises to improve your soils for a sustainable future. ■

Know the planting thresholds relevant to your growing seasons

TRADITIONALLY SPEAKING A THRESHOLD IS THE FLOOR AT THE VERY POINT OF THE ENTRANCE INTO A BUILDING OR A ROOM – WHEN ONE ENTERS THAT SPACE, ONE CROSSES THE THRESHOLD. IT CAN ALSO REFER TO A PARTICULAR MOMENT IN TIME, FOR EXAMPLE ON OLD YEARS EVE AT 12H00 WE STAND ON THE THRESHOLD OF A NEW YEAR, AND WHEN A BRIDE IS DRESSED IN HER WEDDING ATTIRE READY TO BE MARRIED SHE STANDS ON THE THRESHOLD OF A NEW LIFE WITH HER HUSBAND.

In the same way we can look at the farmers' calendar and recognise there are a few special moments in the season which are threshold moments. An experienced farmer will instinctively know what the thresholds are, but a new or developing farmer must learn about thresholds in farming and more especially, he or she must learn to ask questions about thresholds specific to the region he or she is farming in by picking the brains of older farmers and agricultural experts with experience. Knowing threshold dates for each crop is important ammunition in the farmer's toolbox!

So what are these thresholds that a farmer needs to know about? There are optimum thresholds for planting, weed control and pest control and for harvesting. In this article we will look at planting thresholds.



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to get to work early on putting together a convincing and credible business plan and then presenting it to potential financiers. We have also seen so many instances where the farmers have been nominated as beneficiaries of a wonderful project – but then either the financing is released too late, or the inputs are delivered too late and this prevents the farmer from action in the fields in good time and he cannot capitalise on the optimum planting dates.

This is so frustrating because the crop is already disadvantaged before it is even out of the starting blocks and the yields will most certainly be compromised. One of the responsibilities we have taken seriously as the Grain SA Farmer Development team is to lobby and educate other role-players about how critically significant threshold or optimum planting dates are to the success of a crop.

Warm months

On the practical side we know that maize is a warm weather crop. Maize needs a certain guaranteed number of heat units in order to thrive and grow. Ideal temperatures should be between 10°C to 15°C for planting your maize. So it does not help to get a crop in the ground too early either.

The secret is to wait for the season to reach more stable and consistent temperatures as this ensures more uniform emergence of the young plants. If late rains force you to plant later than ideal, then it is important to know that you must adapt and possibly look at planting one of the ultra fast growing maize cultivars or alternatively not plant maize at all and look at another shorter growing crop. The first three weeks post planting are critical to the success of the crop and the prevailing conditions will influence crop potential.

There needs to be a plan of action in the back of every farmer's mind as to how he will address fluctuations to the norms.

IDEAL PLANTING DATES

A common challenge faced by developing farmers is sourcing the finances to buy the inputs for their crops in good time. Farmers need

Success isn't always about greatness. It's about consistency. Consistent hard work leads to success. Greatness will come.

~ DWAYNE "THE ROCK" JOHNSON



Make sure you know the optimal planting thresholds as well as the 'it's too late to plant anymore' thresholds.

Colder months

We cannot forget that another threat to the crop comes at the end of the growing cycle with the onset of the colder months. A maize plant needs between 120 to 140 frost free days depending on cultivar. For this reason one can't risk planting the maize seed too late because frost on still-maturing maize plants can cause significant yield losses.

There is also an ideal harvest time threshold – that moment in time when most plants have fully matured. We know many developing farmers who are pressured by livestock owners to get their crops off the fields so the cattle can be let out to graze on the maize lands. Time and again this spells trouble. A maize cob harvested with too high moisture content will shrivel, lose weight and more worrying, is very likely to get damaged or diseased. The yield will be unnecessarily compromised if the harvesting window is ignored.

Region specific dates

We talk about a window of opportunity but it is also important to remember that planting dates are region specific. A good time to plant maize in Mpumalanga is quite different to what is a good time to plant maize in the North West. Both the moisture levels in the soils and the temperature of the soils will need to be at the ideal threshold levels for the seeding to be successful.

If you know your ideal planting thresholds and can stick within those dates, the crops will have the best chance to produce the highest yields because it is then that a plant is afforded every opportunity to thrive and reach full physiological maturity in favourable climatic conditions with (hopefully) good rainfall, adequate sunlight and heat units with moderate evening temperatures.

KNOW YOUR OPTIONS

Farmers need to be informed and alert. There needs to be a plan of action in the back of every farmer's mind as to how he will address fluctuations to the norms. ■



*Make sure you know the optimal planting thresholds.
Photo: Jenny Mathews*



*Just managing to complete topdressing.
Photo: Jenny Mathews*

FACE THE FINANCIAL WOES of South Africa

THE MOTIVATION FOR THIS ARTICLE WAS INSPIRED BY AN ARTICLE BY ANDRIES WIESE – ‘HOW SA’S FINANCIAL WOES AFFECT YOUR BUSINESS,’ PUBLISHED IN THE *FARMER’S WEEKLY* OF 29 NOVEMBER 2019. THE WOES ADDRESSED WERE CURRENCY DEVALUATION, SOVEREIGN CREDIT DOWNGRADES, INVESTOR CONFIDENCE AND CAPITAL OUTFLOWS. ONE COULD ALSO ADD THE LOW GROWTH RATE OR GDP AS A WOE.



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It is almost a year later, and the predictions in the article have come true. The rand has devaluated meaning the value of the rand has decreased resulting in higher prices for imported products, such as several of our farming inputs. South Africa has been downgraded to so-called junk status. This means investors worldwide see South Africa as a risk to invest money in. This affects confidence of investors, locally and foreigners, in South Africa negatively because investors are not sure of a good return on investment and even if they will get their money back.

At the beginning of the year it was also announced that South Africa is in a recession because the Gross Domestic Production is negative. In comparison to a business this means the country is not making a profit – income is lower than expenditures. Therefore, more money needs to be borrowed to pay for all government expenses such as salaries. For a business this will be an indication of poor management.

Moreover, we have also been hit by the corona virus pandemic and the resulting lockdown. Apart from the challenges posed by the lockdown, as discussed in a previous article (*Pula Imvula* September 2020) and the woes indicated in the previous paragraph, a very gloomy picture of terrible corruption regarding corona virus relief funds are unfolding. The corruption affects the already negative view of South Africa as far as investment is concerned.



Let us be positive and prepare to face these curved balls and explore the opportunities they represent.



These are a few terrible curved balls thrown at our farmers, big or small. Regarding the management of your farming business you can either face these balls or duck. The challenge being these curved balls are all beyond the control of any farmer, they are external factors.

In practical terms, the effects of these woes on a farm are briefly that imported inputs such as fuel, chemicals, fertilisers and machinery has become more expensive, borrowed funds became more expensive and, funds to invest into your business became scarce. On the other hand, it is also true that a devaluation of the rand presents an opportunity for exporting goods if possible.

Let us be positive and prepare to face these curved balls and explore the opportunities they represent. One can at least protect your wickets instead of being bowled out. We cannot underestimate the

risks involved when faced with these financial realities, but they can be a wake-up call. It will be worthwhile to face these curved balls to remain a sustainable farmer. People must eat.

ENSURE MEASURES ARE IN PLACE

To face these curved balls put on your gloves and helmet and take up your bat:

- See to it that you have a **proper record-keeping system** to be able to evaluate the financial aspects of your farm properly. Applying the principles of precision farming will be helpful to ensure better records and provide improved information.
- Manage your cash-flow diligently by applying your **cash-flow budget** especially as far as purchases are concerned. Be very aware of buying at the spur of the moment especially with reference to more expensive capital items (machinery, implements). A special is not always a special. Without a proper **cash-flow statement** you will not be able to manage your cash-flow properly.
- Control your private or household expenses – it is very helpful and advisable to have a separate budget for these expenses. Do not live beyond your financial means.
- Manage the costs of your inputs by means of a farm business plan and take steps to reduce the costs. With a **proper income statement**, it is possible. Ensure that you use the correct quantity of inputs as advised and/or as planned.
- Evaluate the financial position of your farming business thoroughly. Use your **balance sheet** and have a good look at your liabilities. Debt is not your friend and too much debt has been the downfall of many a farmer. At present interest rates are low due to the pandemic, but refrain from seeing this as an opportunity to borrow more money. The rates will increase again in future. Should you really need to borrow money, negotiate the lowest possible interest rate.
- Evaluate your production methods. Farm with nature and improve the health of your soils. Apply the principles of conservation farming, this will assist in reducing your production costs.
- Most important – do you have a **proper business plan**?

CONCLUSION

Some of the measures mentioned have been discussed in previous articles from different angles but the repetition only emphasises the utmost importance of these measures. Do remember that assistance to re-evaluate your business is available. Make use of the expertise available from agricultural businesses and institutions such as Grain SA. ■

Lentils – a possible alternative food crop of the future

LENTILS (*LENS CULINARIS*) ARE AN ANNUAL PULSE CROP TRADITIONALLY GROWN IN WEST ASIA, EAST AND NORTH AFRICA, THE INDIAN SUB-CONTINENT AND IN THE RECENT PAST IN NORTH AMERICA AND OCEANIA. IT IS AN IMPORTANT CROP IN FOOD, FEED AND FARMING SYSTEMS IN VARIOUS COUNTRIES.

Lentils, among other food legumes, play a significant role in human and animal nutrition and in soil health improvement. Its cultivation enriches the soil nutrient status by adding nitrogen, carbon and organic matter, which promotes sustainable cereal-based crop production systems in the regions. It has an ability to withstand drought and poor soils. It is the most desired legume because of its high protein content of up to 35,5% and fast cooking characteristics. It is used as a starter, main dish, side dish or in salads.

Additionally, it may be deep-fried and eaten as snack, or combined with cereal flour in the preparation of foods like bread and cake. Lentils are a key source of protein, especially for the poor, who often cannot afford animal products. It is rich in starch, protein, calcium, manganese, crude fibre, fat, trace elements and minerals, which makes the crop an ideal supplement for traditional cereals or tuber-based diets, which are generally protein deficient.

Lentils are among the pulses that can be used to diversify the legume base of South Africa because it has the potential to be grown in various







provinces of South Africa, as it can tolerate extreme environmental conditions. This means provinces like Limpopo, North West, Mpumalanga, KwaZulu-Natal and Free State which are characterised by low rainfall and hot temperatures, as well as droughty conditions can be ideal. Lentils prefer any soil type with good drainage. Some varieties can be grown in cold areas which can ensure a continuous supply of lentils in and out of the season. Additionally, lentils can be grown in rotation with cereals to improve the soil structure and fertility. Hence, the production of this crop can benefit the South African farmers.

Lentils are similar to beans (soybeans/common beans). They grow in pods that contain either one or two lentil seeds that are round, oval or heart-shaped disks. They may be sold whole or split, with the brown and green varieties being the best at retaining their shape after cooking (**Table 1**). Various lentil varieties are used worldwide including brown, red, green, Lentilles Du Puy, French green lentils and black lentils amongst others. Their major attributes and cooking times are shown in Table 1. ■



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1 Some of the most common lentil varieties.

Lentil type	Major attributes	Cooking time	Images of various types
Brown lentils	<ul style="list-style-type: none"> Roundish type, even-keeled, mild and have an earthy flavour and creamy texture. Good as a stand-alone side dish, tossed in salads, adds heartiness to soups and stews and good for pureeing. 	20 - 30 minutes	
Red lentils	<ul style="list-style-type: none"> Have colours ranging from between yellow/gold to bright orange or red, with a slightly sweeter taste. May lose shape and break down or crush while cooking. 	15 minutes	
Green lentils	<ul style="list-style-type: none"> Pale greenish brown, similar to dried peas, or spotted with brown hues. Stays relatively firm and has a mild flavour. 	10 - 20 minutes	
Lentilles Du Puy	<ul style="list-style-type: none"> Small, round and have an olive-green and black colour with mottling. Vibrant and earthy flavour and firm-tender texture. The rounded shape holds up the best in cooking. 	20 - 40 minutes	
French green lentils	<ul style="list-style-type: none"> Small, dark, greenish black, mottled lentils and have a slight peppery flavour. Hold their shape well and have a nice chew, making them great additions to soups, stews or as a side dish. Very similar to appearance as Lentilles Du Puy. 	20 minutes	
Black lentils	<ul style="list-style-type: none"> Are small and glistening; hold their shape well and take on the look of caviar when cooked. Have a soft texture and deep, robust flavour when cooked and these allow it to be used in any recipe calling for lentils, especially when you want some colour variation. 	25 - 30 minutes	



PIGEON PEA – a potential crop for food and health security

FOOD AND NUTRITION SECURITY AS WELL AS CLIMATE CHANGE ARE SERIOUS CHALLENGES IN THE WORLD TODAY. HOWEVER, MANY PRODUCTION COUNTRIES ARE ENDOWED WITH UNIQUE CROPS THAT CAN GROW IN HARSH ENVIRONMENTS AND PROVIDE UNIQUE NUTRITIONAL VALUE.



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Some of the potentially useful crop species, however, are underutilised and have not been scientifically evaluated and bred as food crops (Padulosi *et al.*, 2002). Among these crops is pigeon pea (*Cajanus cajan*), which ranks the sixth worldwide in comparison to other grain legumes such as dry beans (*Phaseolus vulgaris* L.), peas (*Pisum sativum* L.), groundnuts (*Arachis hypogaea* L.), soybeans (*Glycine max* L.) and chickpeas (*Cicer arietinum* L.).

PRODUCTION

The crop originated in India with the major production occurring in India and Myanmar (83%) ahead of Malawi, Tanzania, Kenya and Uganda as major producers in Africa (14%). In West Africa, pigeon pea is a minor crop, but it plays a key role in the subsistence of smallholders in other countries such as Benin, Nigeria and Ghana. In South Africa, pigeon pea is produced in Limpopo, Mpumalanga, and KwaZulu-Natal in backyards. Moreover, pigeon pea has a huge untapped potential for improvement both in quantity and in quality of production in Africa.

1 Nutritional content of some of the legume crops.

Constituent	Pigeon pea	Cowpea	Chickpea
Carbohydrates (%)	64,2	74,8	60,7
Protein (%)	20,5	26,1	22
Fat (%)	3,8	1,05	6,4
Fibre (%)	5,0	2,60	22
Ash (%)	4,2	3,93	40,5
Lysine	6,8	6,8	6,7
Threonine	3,8	4,0	5,1
Methionine	1,0	0,8	2,1
Cystine	1,2	0,3	2,0
Calcium	296	34,7	210
Iron	6,7	5,8	4,60
Thiamine	0,6	1,05	0,4
Riboflavin	0,2	0,21	0,26
Niacin	3,1	2,2	1,22

FAO/WHO (1991); What and Merril, 1975 (µg/mg)



Pigeon pea is rich in protein, tolerates harsh conditions and is able to withstand drought, making it an ideal crop for smallholder farming.

Pigeon pea is a pulse crop that is able to tolerate harsh conditions where other crops such as maize fail. Its ability to withstand drought makes it an ideal crop for smallholder farming. It has a deep tap-root system whereby it can withdraw water and nutrients from the secondary level of the soil profile and it helps the plants to survive during periods of water deficit. Similar to most leguminous crops, pigeon pea has root nodules and it helps improve soil quality by atmospheric nitrogen fixation. Due to this, pigeon pea is cultivated in intercropping systems with maize and sorghum leading to reduced need for commercial nitrogen and phosphorus fertilisers.

Neglected and underutilised crops, such as pigeon pea, could play a prominent role in sustaining the livelihood of poor rural African populations by increasing food availability, including protein uptake. In recent years, there has been a continuous and increasing demand for nutritional foods rich in proteins, vitamins and essential minerals. Pigeon pea is among the crops rich in proteins and it has about 18% to 26% with some wild types having protein content of 30% and above. It is also a rich source of minerals such as potassium, phosphorus, calcium, magnesium, sodium and zinc. Generally, pigeon pea contains most of the minerals, as compared to other food legumes such as cowpea and chickpea (Table 1).

CONSUMPTION

It can be consumed as dry or green seeds and green pods. In South Africa, it is mainly prepared as a snack, soup, mixed with samp, dahl, or as porridge eaten with or without meat. In India and other African areas, it is largely used in diets to supplement cereals and tubers, which are protein deficient. Moreover, its high nutritional value has also made it a good source of fodder. It provides primary or supplementary high-quality forage at a time when other forages are less productive. There are reports of improved performance of poultry fed with pigeon pea.

The dry leaves, the left-over pods and milling products form feed for livestock. This is because pigeon pea plants produce a high biomass and provide edible forage or grazing vegetation in dry seasons. On the other hand, the crop has pharmaceutical benefits. The green leaves and pods are used for medicinal purposes. Extracts from the leaves are rich in antioxidants and widely used in traditional medicine to treat several diseases. Extracts from the roots are used as a relief for fever and as an anthelmintic. Fresh seeds are believed to help problems of urinary systems in males while immature seeds are recommended for treatment of kidney problems.

GENETIC DIVERSITY

Unlike other legumes, the crop has been largely neglected by science. Generally, in Africa, farmers currently grow unimproved and heterogeneous landraces in seed mixtures that hold distinctive and divergent genetic features. For example, the perennial pigeon pea types provide material for fuel wood, basket weaving, and roofing in African villages. Thus far, the full genetic diversity of the crop remains largely unexploited in Africa. Hence, only farm level selection has been practiced wherein existing landraces are not intensively evaluated and their seeds multiplied for production. There are limited studies done on pigeon pea in South Africa targeted at breeding of the crop and consequently improving varieties in the major growing areas of the country such as Limpopo, Mpumalanga and KwaZulu-Natal.



Strategic collection, characterisation and preservation of genetic resources are major components in plant breeding programmes, especially with new and under-utilised crops. This will help for targeted breeding involving various characteristics and for germplasm conservation. It will also contribute to alleviation of poverty, food and nutrition insecurity. This is because the world population growth was projected to increase to 10 billion by the year 2050.

HIGH DEMAND FOR PRODUCTION

Furthermore, there is high demand of pulse production worldwide including countries like India where pulses are a major staple food. Low yields reported in many regions calls for further improvement. For instance, yields of 0,5 tons to 0,1 tons were reported in sub-Saharan Africa landraces as compared to the Malawian varieties, which yielded within a range of 2,7 t/ha to 3 t/ha. Careful selection and classification of the pigeon pea germplasm is imperative for further use using qualitative and quantitative traits as well as nutritional value. ■

The influence of cover crops on the flow of *FODDER*, *STOCK* and *CASH*

COVER CROPS AND GRAZING THEM ARE BECOMING INCREASINGLY POPULAR. INITIALLY THE COVER CROPS WERE ONLY PLANTED, BUT THESE DAYS THEY ARE ALSO USED AS A SOURCE OF FODDER FOR THE STOCK. ALTHOUGH THIS SYSTEM ALWAYS APPEARS NICE, IT ALSO HAS PITFALLS AND PROBLEMS.



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The aim of the system is mainly to improve soil health, retain cover on the soil and increase biodiversity. It is important to realise that this is a production system with which producers have to become comfortable. Profits have to be ploughed back in order to expand the system, but there should also be a shift in assets.

Producers have to understand how the system works, what the most important aspects are, and how these aspects can complement or penalise one another. The cover crops produce a certain amount of material that can be utilised by the stock, and it is the task of the producer to ensure that there is enough fodder for the stock for every stage of the year. The first two 'flows' that should therefore receive a lot of attention from a producer are feed flow and stock flow.

THE IMPORTANCE OF FEED FLOW

Every fodder crop that is planted has its own production curve. Some crops start quickly, grow fast and decline rapidly. Other crops start out slowly, but continue growing for longer, with a peak in production that realises only considerably later. Given the crops that are planted together, a certain quantity of fodder will be produced.

It is important for the producer to know how much fodder will be available when. If possible, you should also determine how the crop will perform when the fodder is grazed. Decide whether there will be enough regrowth to leave the required cover and whether the stock should be managed to leave sufficient material to ensure a good cover. It is important that there should be sufficient cover after the grazing and that enough living roots remain behind in the soil.

The nutritional value of the fodder will determine how the animals grow. It is important to know what the energy values of the different sources of roughage are. These values of the different crops are expressed in metabolisable energy (ME) and as MJ/kg. The total digestible nutrients (TDN) of fodder is also important information – it is a further indication of the energy value of the fodder.

Energy absorption (in terms of TDN or ME intake) sets the pace for production. The higher the animal's energy intake, the higher the production is – provided the other essential nutrients are consumed in the correct proportion and quantity. If the animal has a high energy intake but the protein intake is too low, the animal's system will start breaking down the muscles to supplement the protein deficiency. For optimal utilisation of the nutrients consumed the energy and protein intake should therefore always be in a specific ratio. For each produc-



tion function or stage the animal requires a certain amount of energy to ensure optimum performance. The producer must ensure that the ratios between the elements are always right.

To ruminants, dry material is the basis in terms of which their fodder consumption is expressed, whether it comes from veld or from cultivated pastures. All fodder must be converted to dry material to be able to compare them. The rule of thumb is usually that every animal will consume approximately 3% of his body mass as dry material. A weaner weighing 200 kg and growing 500 g per day will therefore require approximately 6 kg of dry material, together with 518 g protein and 3,4 kg energy. There are various tables that indicate animals' nutrient requirements. The *Nutrient requirements of domestic animals* of the National Research Council (NRC) is a very good source that is used widely in the industry.

The production of fodder must also be converted to dry material. The fodder could sometimes be ensiled. If maize is used as example, it would be easy to produce 31 tons of material per hectare. A large part of this (approximately 65%) is moisture, however. This means that only 11 tons of dry material are produced per hectare. The yield of feed sorghum, a crop that is often planted, can vary between 4 tons and 20 tons of dry material per hectare, depending on the rainfall.

It is important to establish the production of every crop that is planted. It must then be converted to dry material in order to establish how many animals can be maintained. If the crop that was planted is

known, the combined composition of the fodder must be determined. Determine the moisture percentage, protein composition and energy content of the crop. This fodder composition will determine what additional licks must be provided.

From **Graph 1** it is clear that the amount of fodder differs during the season. With the extra cover crops, more fodder is available in the summer, while the amount of fodder in the winter is less. With the additional cover crops, there is approximately 325 tons of dry material extra. This means that the producer will have to reconsider his utilisation of feed. The weeping lovegrass could perhaps be cut and baled and fed to the stock in winter, or perhaps the weeping lovegrass can be used as bales or as mature sward with secondary regrowth as grazing for the livestock.

The cover crops can also be used on a small scale to make silage, but just make sure that you get cover on the soil again in some way. Some producers already make silage in silo bags, and the quality of the feed is very good. This silage can be fed to the animals later, when they are not yet market-ready. A high-energy diet can also be considered to ensure that stock are market-ready when they are slaughtered.

When cover crops are brought in, the entire stock management system must be adapted, but the reasons why the cover crops were initially planted should not be forgotten. It is essential that there should be sufficient cover after the grazing and that enough living roots remain behind in the soil.

THE IMPORTANCE OF STOCK FLOW

As soon as the fodder sources on a farm are adapted, the stock have to adapt too. With the cover crops the carrying capacity can be easily over- or underestimated. You should therefore cut a sample and weigh it to obtain the correct figure.

Not only will the stock numbers have to be adapted, but the stock production system too. It is vital for the meat produced on the cultivated pasture or cover crops to be marketed. It does not help if the cows are in prime condition and then return to the veld to lose the fat there. The fat must be sold. With the additional summer cover crops you can look at oxen production or consider keeping the calves for longer. This will ensure that the first year will have an enormous impact on the cash flow and on the feed flow.

The farm in the example can accommodate 300 cows in a weaner system. If the cover crops are planted, more stock will have to be kept to utilise the additional 325 tons of dry material. If we assume that a weaner eats 10 kg of dry material per day, and that the animals have to remain there for 120 days, it would mean that the 325 tons of dry material can provide an additional 270 animals with food. Producers should know that the stock have to be there when there is surplus food – in this case from December up to and including March. The stock can be purchased or, if the feed flow permits, own calves can be held back to market them later. In this case the stock will have to be purchased.

It is vital to remember that the stock have to be taken to the grazing, and not the other way around. Stock are equipped with their own milling and transport machines to convert grazing to meat.

CASH-FLOW IMPLICATIONS

Expanding a stock component to graze the cover crops will dramatically increase the operating capital needs of the business. Provision now has to be made for establishing the cultivated pastures, for the stock to utilise the grazing, and for the additional operating capital to get the animals market-ready.

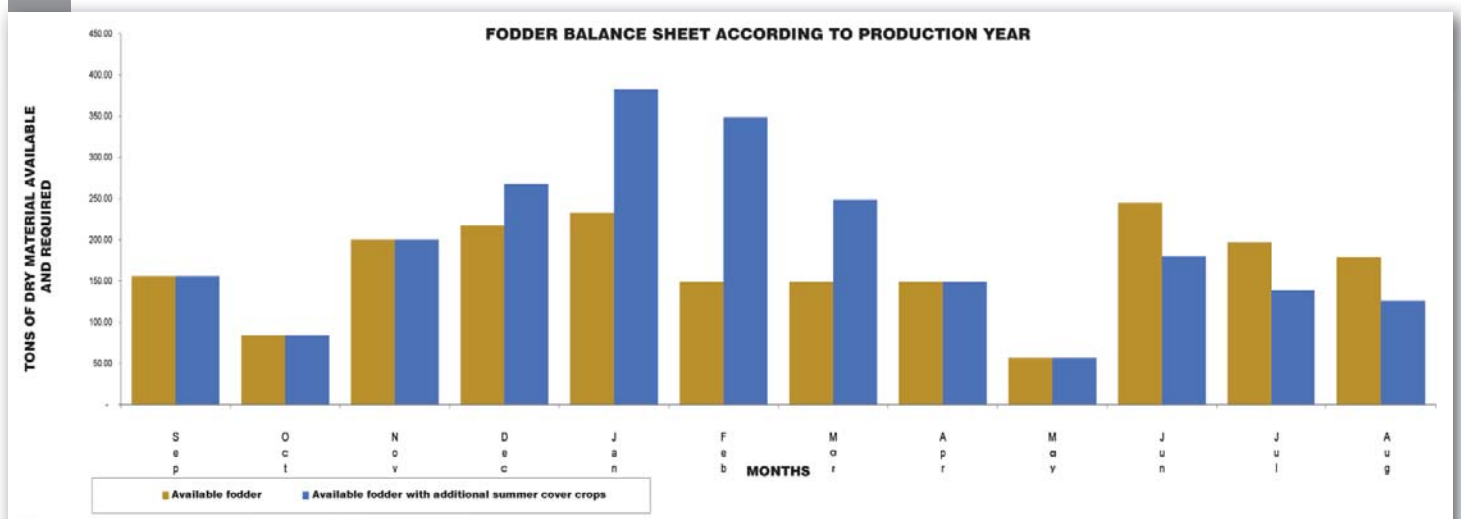
In this system the main expense – roughly 85% – is purchasing the stock. If we assume that the weaner price is R30 per kilogram and that a calf weighs 220 kg, you will have to budget for R1 782 000 to purchase the additional 270 animals.

This capital outlay must be managed very well. Meat prices are very elastic and this will determine the profits to a great extent. It is true that cover crops have a hidden income. The subsequent crops planted on cover crop fields can perform better and this can increase the profits of the system. Without taking the additional income as a result of crop rotation into account, the system can show a profit of approximately 12%.

When the cover crops are established, do not make your initial steps too big. Grow into the system – use the profit you make to expand the planting of the cover crops. If this type of system is to become a long-term part of the farming, consider selling unused assets to convert this capital to buy stock. This will definitely increase profits.

Future articles will refer to grazing of cover crops, and to the additional fodder to be provided to finish stock on grazing. ■

1 A farm with 500 ha of veld, 170 ha maize, 90 ha soybeans and 40 ha of weeping lovegrass, compared to the same farm with 500 ha of veld, 120 ha of maize, 90 ha of soybeans, 40 ha of weeping lovegrass and 50 ha of cover crops.



Optimising livestock production without degrading the ecosystem

RUMINANT LIVESTOCK ARE IMPORTANT TO MANKIND SINCE MOST OF THE WORLD'S VEGETATION BIOMASS IS RICH IN FIBRE.

Only ruminants can convert this high fibre vegetation into high quality protein sources such as meat and milk for human consumption. Livestock agriculture is the world's largest user of land resources and southern Africa is no different to the rest of the world. In South Africa, approximately 84% of the surface area is available for farming, but only 13% of this area is arable. The greater part of the country (71%) is only suitable for extensive livestock farming and primary beef cattle and small stock farming are largely extensive in South Africa.

The continuing deterioration of the natural vegetation is at present one of the most burning agricultural issues in southern Africa which impacts negatively on the competitiveness and efficiency of the livestock sector. It is thus imperative that role-players within the livestock industry (research institutions, government departments at national and provincial level, primary producers as well as the related secondary industries) must recognise that the natural resource is vital to sustain livestock production.

That is why Red Meat Research and Development SA (RMRD SA) puts special emphasis on natural resource utilisation.

RANGELAND AND HERD MANAGEMENT

Many of the important management decisions a livestock producer make, relate to the management of the forage resources of the land unit. Both biological and economic efficiency are influenced by a producer's ability to match animal type and nutrient needs to forage availability and quality on a year-round basis. Animal type as defined primarily through species and breed differences, has a large influence on the nutritional requirements of animals. Therefore, the type of animal can have an impact on the level of performance of the animal and the economic returns of a grazing system on different rangeland types/forages.

Producer decisions, such as timing of parturition to match the lactation curve to the forage production curve or choosing to graze steers rather than cow-calf pairs, should be considered in the choice of management decisions related to forage and grazing systems.

A further aim of rangeland and herd management is to ensure the maximum quantity and quality forage/mm rainfall, which will contribute to optimum livestock production without degrading the ecosystem. In reality, however, rangelands have deteriorated considerably. The challenge ahead is to reverse the situation and to ensure that they improve through sound rangeland and herd management systems.

MATCHING SPECIES, BREEDS AND COMBINATIONS WITH THE PRODUCTION ENVIRONMENT

Matching animals to both the environment and the production system is a key challenge in sustainable livestock agriculture. By integrating information on the production environment with information on species and breeds, stock-owners will be able to make a more

Gerhard Schutte, chief executive officer, Red Meat Producers Organisation. First published in SA Graan/Grain November 2019. Send an email to gerhard@rpo.co.za



informed choice as to the breed and combination best suited to individual production inputs.

The challenge is not to change the vegetation to suit a specific animal type or production system, but to use the animal type and production systems as determined by the environment. Given the large variation in rainfall and the consequent impact on grazing capacity, the challenge is to exploit this variability and develop sustainable livestock production systems within the different ecological regions. If the environment (especially rainfall) is analysed, some current livestock systems within specific regions can be questioned. This especially relates to commercial livestock farming in certain areas which is not according to recommendations and the requirements of the vegetation.

FODDER PRODUCTION PLANNING AND LIVESTOCK PRODUCTION SYSTEMS

Any pastoral system's efficiency primarily depends on the following factors:

- The amount, quality and seasonal distribution of fodder production, which is a function of soil type, the amount and seasonal distribution of rainfall and the availability of irrigation.
- Proportion of the feed consumed by the animal.
- The efficiency with which the animal uses the food consumed.

The objective should be to match fodder demand with fodder supply. Whereas the general principle of fodder production planning applies to all pastoral livestock enterprises, each has distinctive characteristics which merit special attention. These specific requirements are a function of the system being adopted within each enterprise. For the system to operate effectively, a particular set of conditions needs to prevail irrespective of where in the country the system is used.

ALTERNATIVE FODDER CROPS

Given the current state and limited potential of some vegetation resources over much of South Africa, and the low productivity of the national livestock herd, alternative fodder crops should be established as a priority. It is important to appreciate that rangeland and cultivated pastures can play complementary roles in providing quality fodder to livestock. It can also significantly increase forage production. There is undoubtedly considerable and, as yet, untapped potential for cultivated pastures in many parts of the country.

A strategy to develop this potential would make it possible to increase forage production and improve productivity and efficiency of livestock to such levels that South Africa can become self-sufficient in livestock products and also compete in the international arena. ■



Safety of farm workers

HANDLING PESTICIDES NOT NEGOTIABLE

IN A COUNTRY THAT IS OFTEN COMPARED TO THE MOST ADVANCED FARMING NATIONS IN THE WORLD, FARM WORKERS ARE AN IMPORTANT COMPONENT OF THE AGRICULTURAL SUCCESS STORY. A HEALTHY WORK FORCE IS A VALUABLE ASSET; PRODUCERS NEED TO ENSURE THAT WORKERS DO NOT FACE UNDUE RISKS WHILE WORKING.

Pesticides – insecticides, fungicides, herbicides, plant growth regulators and adjuvants – are compounds that are potentially hazardous to human beings. Farm workers most often handle and apply these essential plant protection products, with varying levels of risk to themselves and the environment. The safe handling of pesticides should be gospel on farms. Sometimes, however, there are incidents of undue exposure because of irresponsible practices – often with dire consequences to those who were exposed.

LIMITING ACCESS IS THE STARTING POINT

Not all farm workers need to be involved with pest management on the farm, therefore producers should hand-pick those who show a high level of responsibility to work with pesticides. The pesticide store manager is the first defence against any pesticide risks. He or she is responsible not only for stock control and dispensing of plant protection products, but should also oversee and supervise the preparation of spray mixtures. It is essential to equip this valuable person with the best set of personal protective clothing that money can buy. The store manager's most important task is access control. No one apart from the store manager and the producer must have access to the pesticide store.

USING PERSONAL PROTECTIVE CLOTHING IS NOT NEGOTIABLE

Certain elements of personal protection are universal for all, such as full body cover in the form of an overall (mostly good quality cotton will suffice), butylene rubber boots and long butylene rubber gloves.

A hat is highly recommended, while some form of facial cover is also required. This may be a simple eye shield to prevent spray drift from contaminating the eyes, to something more elaborate like a chemical breather mask when working with highly toxic pesticides such as methamidophos during spray mixture preparation. It is not only required to prevent the inhaling of spray mist, but also to prevent the discomfort of the putrid odour of many organophosphate insecticides. The filter canister must be replaced regularly to ensure the breather mask functions properly.

SIMPLE PROTECTION FOR SPRAY OPERATORS

The spray operator is the one who is perhaps at greatest risk of undue exposure to pesticides, because of the nature of the work. Fortunately, the risk is generally low due to the significant dilution of the pesticide in the spray tank. However, this does not warrant a slack approach. Full body cover (overall), rubber boots, rubber gloves, hat as well as nose and mouth cover are required to keep the worker safe. Knapsack spray operators should also wear a polyethylene apron back to front to protect the back against spray mixture dripping from the knapsack. Once the work has been completed, the worker

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needs to clean the personal protective clothing, wash the hands and face and take a shower to decontaminate the body. When working with tractor boom sprays, this set of clothing is adequate, but a mist blower requires total facial cover because inhaling the fine mist and eye contact become real risks.

ADVANCED PROTECTION FOR SPRAY MIX PREPARATIONS

Preparing spray mixtures is a risky business due to the high concentration of the active ingredients in the formulation. Here the worker must wear full protection plus a facial cover and a splash-proof apron, especially when pouring liquid concentrates into measuring beakers or directly into the spray tank. A splash of glyphosate can at worst burn the skin, but a splash of chlorpyrifos or paraquat may cause more serious problems. Prevention is better than cure. As with spray operators, such specialist workers need to clean their personal protective clothing after work and sanitise themselves properly.

NO EATING, DRINKING OR SMOKING

Eating, drinking or smoking are high risk activities as it offers an easy conduit for pesticides to enter the body. It is best to allow ample time for the removal of gloves and facial covers, to wash the hands and face properly and then proceed to eat or drink. Food and drinks should not be allowed anywhere near a pesticide store or in fields where pesticides are being applied.

COMPROMISED INDIVIDUALS MUST NOT WORK WITH PESTICIDES

Any person will fall ill at some time or another. Ailments such as common colds, influenza and gastroenteritis are reasons for not allowing people to work with pesticides. While the body is fighting a medical condition, it may not be able to cope with even a small exposure to pesticides. The liver is a wonderful detoxification organ, but it will battle to fend off endotoxins produced by a microbial infection as well as some pesticides that enter the body.

RE-ENTRY AFTER SPRAYING CROPS

Pesticide labels will show what the safe pre-entering interval is under Warnings and Precautions. That is to allow the pesticide molecules to metabolise sufficiently to minimise the risk to producers and farm workers. Should farm workers have to work in treated crops for whatever reason before the re-entry time has expired, they need to wear the full set of protective clothing and decontaminate themselves and their clothing afterwards.

FARM WORKER FAMILY SAFETY

Most farm workers and their families live on farms and often close to crop fields. Before any spraying commences, family members should



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Safety of farm workers...

be evacuated to safe areas until the spraying has been completed. Also warn them not to enter the treated crops for at least seven days as an additional safety measure. This is also important for their livestock, chickens and dogs – keep them out of treated areas. Instruct workers to warn passers-by to evacuate and stay away from the spray area. When applying very toxic products such as paraquat or chlorpyrifos to a crop, warning signs have to be put up to inform people that it is a high-risk area and that they must not enter or approach it.

CONTINUED TRAINING ON THE SAFE USE OF PESTICIDES

Training is a never-ending process and since these are potentially dangerous substances, farm workers need to be trained on a continuous basis to embed the principles of responsible use in their minds. Many of the CropLife SA supply and distribution members offer training or at least assist with training of producers and farm workers. Contact your CropLife SA accredited crop advisor and ask for assistance with farm worker training. CropLife SA members have access to a series of booklets on responsible use in eight languages that are invaluable for farm worker training. Farm workers with higher education levels may even consider enrolling for the CropLife SA Basic Crop Protection course that is an online AgriSETA-accredited course. For enquiries contact CropLife SA on info@croplife.co.za or visit www.croplife.co.za.

NO EMPTY CONTAINERS FOR FARM WORKERS

One of South Africa's worst agricultural legacies is the practice of giving empty plastic pesticide containers to farm workers. If food or beverages are stored in such containers, the outcome is a guaranteed human catastrophe. There have been a number of incidents where farm worker families have been poisoned because they used empty containers for drinking water or cooking oil. Empty containers must be triple-rinsed and disposed of via one of the CropLife SA approved service providers who collect and recycle empty plastic pesticide containers. See Container Management on the CropLife SA website.

EMERGENCY SITUATIONS

Should a farm worker accidentally be exposed to or ingest any pesticide, immediately call the emergency helpline on 082 446 8946 for advice and support. Do not give the person milk, water or anything else to drink, unless strictly advised so by the poison information centre. Whatever the level of exposure was, does not change the fact that such a person needs professional medical attention. The poison information centre will only advise how to stabilise the person and what the first steps after that should be. Healthy farm workers are a great asset to a farm; they should be adequately trained, properly informed and appropriately clad in protective clothing. ■

THE CORNER POST

JOHAN KRIEL

*To make a difference in people's lives
has been wonderful*



AFTER TRAVELLING MORE THAN 1 MILLION KILOMETRES TO DO FARM VISITS IN THE FREE STATE, JOHAN KRIEL, FORMER DEVELOPMENT COORDINATOR OF THE GRAIN SA FARMER DEVELOPMENT PROGRAMME, HUNG UP HIS BOOTS AT THE END OF SEPTEMBER THIS YEAR.

At a low point in his life after having to sell their family farm in the Clocolan area where they grew crops, asparagus and also had livestock and a dairy, he joined Grain SA on 14 July 2006. Although farming will always remain his first career choice, he says that this position changed his life. 'I spent my days making a difference in people's lives and it was wonderful. It transformed from being just a job to my passion.'

Johan once described a mentor as follows: 'A mentor is a father, a grandfather, a shoulder to cry on'. Ntate Kriel or 'oom' Kriel as he is fondly called by his mentees, was however much more than this. As mentor he became a brain to pick, an ear to listen, and someone who would push his mentees in the right direction so that they could reach their potential.

A WORTHWHILE EXPERIENCE

When Johan was born, he was given the Sotho name, Moeketsi, which means to 'add on', as he was the second born. In his time as development coordinator he has definitely added on by bringing hope to beginner farmers and helping them believe in themselves. He has helped build relationships between developing farmers and commercial producers, and he has ensured that agriculture profits.

He is especially pleased that his time as development coordinator gave him the wonderful opportunity to get to know the Free State. 'I don't think there is a town in the province where maize is produced which I did not visit since I started in 2006.' He can't recall how many farms he visited, but wherever he went, he encountered kindness, acceptance and incredible support from the beginner farmers. 'It has been an amazing experience.'

Although there are only 350 farmers who are now actively part of the programme in the Free State, Johan has approximately 1 500 names on his database. Many of these farmers were not part of the programme, but joined the study group sessions as a result of a radio programme on Lesedi FM. It was Ntate Johan's voice that gave advice for six years that inspired them. 'This programme, which was broadcast at 20:20 on Thursday evenings, attracted many interested parties who did not have land, but wanted to see if farming could be their future.'

To Johan, who always looks 'cool, calm and collected', the most difficult part of being involved with beginner farmers was that he became emotionally involved in their lives. 'I feel heart-broken when one of my farmers pass away.' However, it is also this attribute that contributed to many of the farmers being there to offer their support when he himself lost loved ones. When his father passed away farmers even came from Edenville and Vrededorf to sympathise.

A CAREER FILLED WITH WONDERFUL MEMORIES

His time as development coordinator is full of highlights. At the top of the list is witnessing two second generation farmers take over their



Louise Kunz, Pula Imvula contributor. Send an email to louise@infoworks.biz

father's farming operations. 'To begin mentoring a farmer with very little knowledge about farming, and ending this mentoring with a next generation farmer taking over this farming operation from his father, is indescribable,' he shares with fatherly pride.

One of these success stories is William Matasane who farms in the Senekal district. He was one of the first farmers Johan took on board. This former waiter was crowned the Grain SA Emerging Farmer of the year winner in 2010. 'His son, Johannes, has helped his father on the farm from an early age. He has now completed his B.Agric studies and will join his father on the farm.'

The other is Koos Mthimkulu (also from Senekal) who won the award in 2011. Koos's son, Clifford, took over the farming operation about six years ago and is now a finalist in the farmer of the year competition.

Another highlight has been seeing growth in a farming operation, and the consequent growth in the farmer. In the Tweespruit region Frans Makoena began his farming days on just 58 ha in 2000. Johan is thrilled to have been part of this operation and shares in Frans's excitement of planting nearly 1 500 ha this season.

'It was also wonderful to walk into a study group and to find within two or three sessions that I had won the trust of these farmers. On the other hand it has been humbling to see how anxious they are to learn more in order to improve or to get their farming operations going. This in spite of immense problems like not being able to get title deeds, not having access to production credit and not having any form of mechanisation on the farm.'

The relationships that formed are also on his highlights list as are life-changing farming moments. One of these is of a farmer whose pivot system hadn't worked for 18 years. 'When we eventually managed to get it going, he jumped off the tractor and ran and stood under the irrigation water because he was so happy.' Sadly this farmer passed away after only seeing his irrigation system in action for three seasons.

A MESSAGE TO BEGINNER FARMERS

'Please remember that agriculture and the production of food is of the utmost importance – not only in South Africa, but worldwide. Agriculture can solve many problems in the country – unemployment, food security and racial tension. It is hard work – persevere during the good and the difficult times, and you will be successful.'

'A big thank you to every farmer for your support and positive attitude throughout the years. *Tsamaya ka kgotso!*' ■



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