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GROWING FOOD • PEOPLE • PROSPERITY

GRAIN SA MAGAZINE FOR DEVELOPING FARMERS

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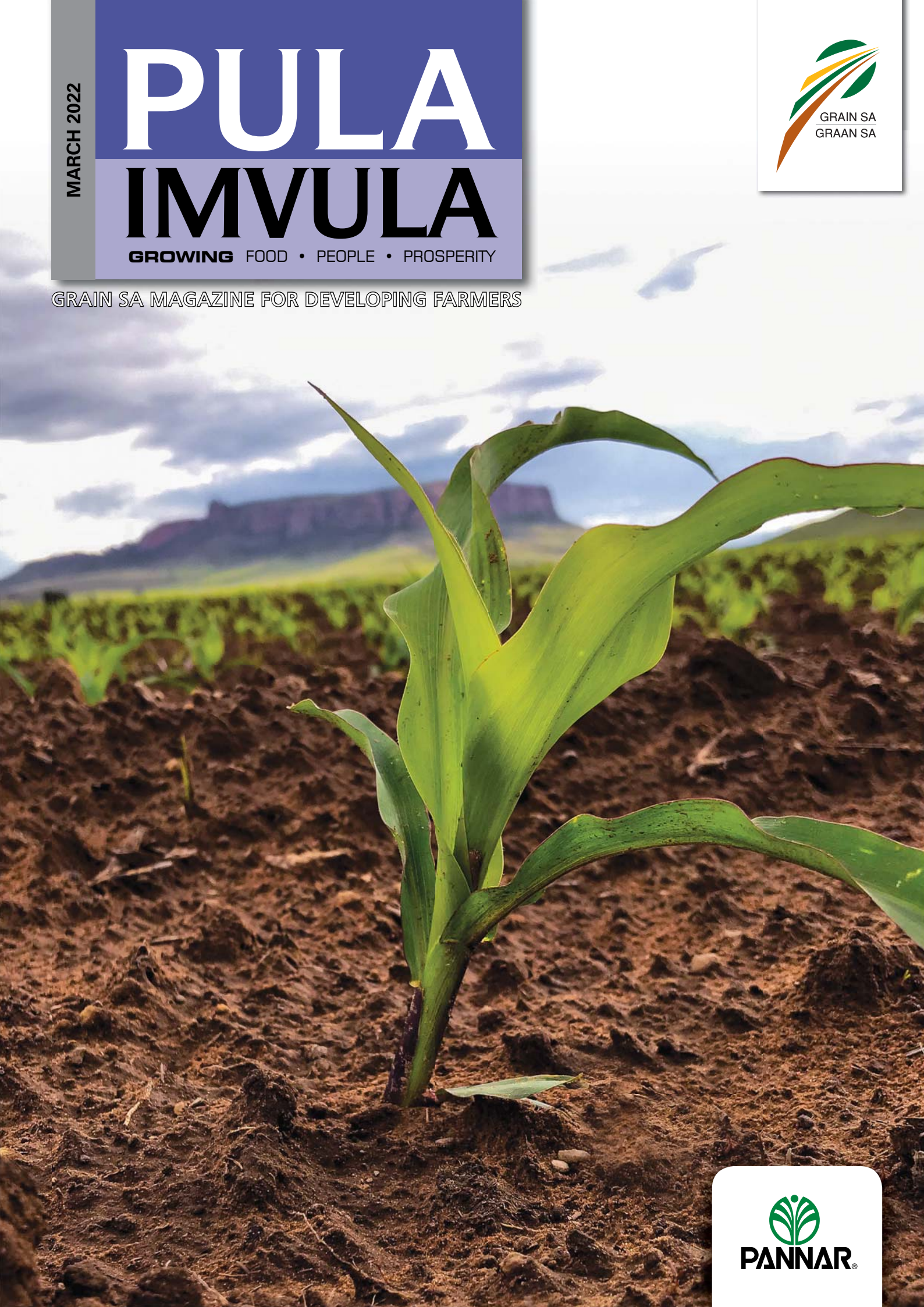

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A Word From...

Johan Kriel

AT THE TIME OF WRITING THIS MESSAGE, IT WAS PLANTING TIME IN THE COUNTRY'S SUMMER GRAIN REGION. HOWEVER, PLANTERS WERE IN STORAGE BECAUSE IT WAS TOO WET TO PLANT WITH OUR AREA DRENCHED IN THE RAIN THAT HAS BEEN FALLING ALMOST DAILY. CROPS ALREADY IN THE GROUND ARE DROWNING. THIS HAS MADE ME AWARE OF HOW EASILY CIRCUMSTANCES CAN CHANGE. THE COVID-19 PANDEMIC AND UNREST IN JULY 2021 ALSO SHOWED US HOW VULNERABLE WE REALLY ARE.

Producers will have to dig deep, think innovatively and plan for the future. Here are a few guidelines:

1. Know what type of farming operation you want. You cannot plant maize on a sheep farm in the Karoo.
2. Know the potential of your lands. With the rising input costs, you can no longer take a chance on low potential land.
3. Moisture conservation is critical if you want to plant successfully.
4. Modern tillage practices work. Removing compaction layers is essential to unlock your soil's full potential.
5. Cultivar selection and planting dates are important to get your harvest started on time.
6. Upgrading tractors and implements is vital to get the job done on time.
7. You will have to contribute part of your production capital yourself as it is becoming increasingly difficult to obtain full production loans. Expenditures must therefore be strictly monitored.
8. Arrange your grain marketing on time and make sure you know the market.
9. Chemical weed and pest control must be handled with great care so that you can deliver a safe, healthy product to the consumer.
10. Extend a helping hand to a neighbour or co-producer to support him through a difficult time – or help a beginner farmer to get started.
11. You are responsible for the safety of your family, workers, land, grazing and animals.

Farming, producing food and seeing something grow out of nothing remains one of the most valuable, most satisfying occupations on earth. Do not waste the opportunity you have been given. ■

How to do your own CROP ESTIMATE

USING THE FOLLOWING INFORMATION AS A GUIDELINE, YOU CAN ESTIMATE YOUR POTENTIAL CROP YIELD AND POSSIBLE INCOME FOR THE SEASON. KEEP IN MIND THAT THERE ARE MANY VARIABLES THAT CAN AFFECT THE ACCURACY OF A CROP OR YIELD ESTIMATE. THE CLOSER YOU COME TO HARVEST TIME, THE MORE ACCURATE ARE THE DETERMINATIONS THAT CAN BE MADE, BECAUSE THE CHANCE IS SMALLER OF MAJOR VARIABLES OCCURRING.

An area that is studied in depth is the determination of crop yields or crop estimates. Certain formulae are developed and adjusted, but a thorough knowledge of, among other things, the farming branch and region remains important in determining a crop yield.

One of the most critical factors is the kernel mass. It not only varies considerably from one season to the next, but also within one season. Even after the crop is mature, factors like ear rot and other pathogens can affect the kernel mass. The guidelines are as follows:

WHEAT

With wheat a good average seed count is approximately:

- Dryland – 3 500 seeds/100 g
- Irrigation – 3 000 seeds/100 g

Two general practices, sowing and planting, are described separately to determine yields.

Sowing or planting wheat in very narrow rows

1. Firstly, the number of ears or stalks per square metre (m^2) are determined.
2. The average number of seeds per ear are determined by counting the seeds in a sample of wheat ears, including small and big ears in proportion. If the seeds cannot yet be counted, a good average count for the cultivar concerned can be used.
3. The following formula can be used to calculate the yield where wheat was sown:

Dryland:
$$\frac{\text{Ears or stalks per } m^2 \text{ x seeds per ear}}{3\,500} = \text{t/ha}$$

Irrigation:
$$\frac{\text{Ears or stalks per } m^2 \text{ x seeds per ear}}{3\,000} = \text{t/ha}$$

Wheat planted in distinguishable rows

1. Determine the row width as follows: The distance over 10 row spaces is measured, in other words from row 1 to row 11, and the distance thus obtained is divided by 10 to determine the row width.

Example

Distance over 10 row spaces = 3,5 m

Row width is $\frac{3{,}5\text{ m}}{10} = 0{,}35\text{ m}$

2. The number of ears or stalks in the row over a distance of 3 m is counted.
3. The number of seeds per ear is determined by counting a sample of ears, which includes small and large ears in proportion. If the seeds cannot yet be counted, a good average count for the cultivar concerned can be used.
4. The formula below can be used to calculate the yield where wheat has been planted in distinguishable rows.

Dryland:
$$\frac{\text{Ears or stalks per 3 m x seeds per ear}}{\text{Row width (m) x 3 x 3 500}} = \text{t/ha (yield)}$$

Irrigation:
$$\frac{\text{Ears or stalks per 3 m x seeds per ear}}{\text{Row width (m) x 3 x 3 000}} = \text{t/ha (yield)}$$

MAIZE

1. A guideline of 0,28 g/kernel can be used for the average kernel mass of maize where the seeds can be counted in order to calculate the potential crop.
2. When the seeds cannot be counted, 120 g to 180 g per ear, depending on the population and occurrence of multiple ears, can be used.
3. First determine the average number of ears per 10 m. When the plants are in the vegetative stage, factors like the population, multiple ears and the sprouting ability of the plants must be taken into account.
4. Determine the average mass in gram per ear.
5. The formula below can now be used to calculate the yield.

$$\frac{\text{Number of heads per 10 m}}{1\,000} \times \frac{\text{grams per head}}{\text{Row width}} = \text{t/ha (yield)}$$

SUNFLOWER

1. Use the following guidelines to determine the average seed mass per head at a young stage before the seeds on the head can be counted.

Population/plants/ha	Grams seed/head
50 000	34
40 000	41
30 000	48
20 000	55
10 000	62

2. Use the following method to count the seeds per head:
   - Measure the diameter of the head.
   - Measure the diameter of the centre seed set if applicable.
   - Count the number of seeds per cm^2 and divide this number by 10 to obtain the number of seeds per cm^2.
   - Calculate the productive area as follows:

Diameter of head	= 15 cm	
Diameter of centre seed set	= 5 cm	
Total area	= 15 x 15 x 0,79	= 177,75 cm^2
Unproductive area	= 5 x 5 x 0,79	= 19,75 cm^2
Productive area	= 177,75 cm^2 - 9,75 cm^2	= 158,00 cm^2

   - Multiply the number of seeds per square centimetre (cm^2) by the productive area to get the number of seeds per head.
   - Multiply the number of seeds on the head with the average mass per seed to obtain the mass of the head. Use a mass of 0,04 g per seed as guideline.
3. Count the number of heads per 10 m.
4. Measure the row width.
5. Use the following formula to calculate the yield:

$$\frac{\text{Number of heads per 10 m}}{1\,000} \times \frac{\text{grams per head}}{\text{Row width}} = \text{t/ha (yield)}$$

DRY BEANS AND SOYBEANS

Follow the steps below to do a crop estimate for dry beans and soybeans:

1. Determine the number of plants per 10 m and the average row width.

Plants per 10 m ÷ row width x 1 000 = plants/ha

2. Determine the average number of pods per plant and seeds per pod.
   Soybeans, ± 1,8 seeds/pod: Mass: ± 0,16 g/seed
   Dry beans: Seeds/pod and mass/seed vary according to cultivar:
   Small white canning types: Mass ± 0,19 g/seed
   Red speckled types: Mass ± 0,47 g/seed
3. Allocate a mass per plant using the above guidelines, but always keep the following in mind:
   - Evenness of plant population and plant height.
   - General appearance and colour of the plants.
   - Moisture conditions (drought or waterlogged).
   - Weed, insect and disease control.
4. Plant population guidelines:

Dry beans:	**Large seed types**	**Small seed types**
Eastern areas	± 120 000	150 000 +
Central areas	± 100 000	± 140 000 - 150 000
Western areas	± 80 000 - 100 000	± 120 000 - 140 000
Soybeans:		
Eastern areas	± 300 000 - 400 000	
Central areas	± 280 000 - 300 000	
Western areas	± 280 000 - 300 000	

5. Now calculate the yield with the following formula:
   Plants/10 m ÷ row width x mass/plant (g/plant) ÷ 1 000 = ton/ha
6. Make provision for losses during the harvesting process as follows:
   - Adjust the calculated yield for dry beans by a factor of 80%.
   - Adjust the calculated yield for soybeans by a factor of 85%.
   - Also remember to take the height of the harvester blade into account for soybeans.

Santam Agriculture is constantly working on research to refine the methods for determining accurate hail damage and yield estimates for a range of crops. This research is never regarded as completed. New fields are continuously being studied and existing procedures are tested and adapted to keep pace with, among other things, new cultivars and changed farming techniques. ■

KOBIE DE BEER, FORMER MANAGER, INSURANCE SERVICES (HARVEST), SANTAM AGRICULTURE

These factors influence *product prices*

IN THE CURRENT ECONOMIC CLIMATE, RETAIL PRICES ARE STRUGGLING TO STAY REASONABLY PRICED FOLLOWING COUNTRY WIDE UNREST AND PRODUCTION PRESSURE FOR RAW MATERIAL PRODUCERS. THESE PRODUCTION PRESSURES INCLUDE STEEP INCREASES IN INPUT COSTS, THAT ARE HIGHLY CORRELATED WITH THE TOTAL PRODUCTION COST OF RAW MATERIALS SUCH AS MAIZE AND SUNFLOWER. TO WHAT EXTENT DOES IT INFLUENCE THE PRICE THAT A CONSUMER PAYS FOR HOUSEHOLD ITEMS?

Maize meal and sunflower oil are some of the most common items found in the pantry of a South African consumer. The Consumer Price Index (CPI), which refers to a weighted average basket of consumer goods and services purchased, includes both these items.

THE VALUE CHAIN FOR COMMON HOUSEHOLD GOODS

The chain of producing a product has many links. A value chain starts off with the raw product and each link in the value chain adds value to the product until an end-consumer product is finalised. **Figure 1** represents a general value chain for common household products.

The participants in the value chain flow are as follows:

1. The input suppliers include companies that supply inputs like fertiliser, seed and agro chemicals.
2. The grain producers form the second link of this value chain. Once the soil has been prepared and the necessary inputs have been acquired, production can start. Production processes differ according to the needs of each grain type and cultivar. The days until harvest and weather conditions are specific to each commodity.
3. Once the commodity is harvested, the producers transport the raw material to the nearest silo or milling operation which then processes and refines the raw material into products as per consumer preference.
4. After the raw material is refined into the respective products, the miller either distributes the products under its own brand or sells the refined product to established brands.
5. The respective brands distribute the product to retailers and wholesalers.
6. The retailers and wholesalers then distribute the product to the end consumer.

INFLUENCE OF PRICES ON PRODUCTS

Influence of white maize price on a 2,5 kg bag of maize meal

Table 1 represents the data used to derive the percentage contribution of producers to the retail price of maize meal. The derived producer price is calculated by the average annual Safex price for each marketing year then deducting the relevant location differential as well as handling and storage costs.

Figure 2 visualises the derived percentage contribution of producers to the retail price of maize meal. From Figure 2 it can be concluded that the price of maize contributes up to 50% of the retail price a consumer pays for a 2,5 kg bag of maize meal. The remaining percentages are contributed by value added through the value chain, this includes packaging, processing and milling.

Influence of sunflower producer price on a 750 ml bottle of sunflower oil

Table 2 represents the data used to derive the percentage contribution of producers to the retail price of sunflower oil. The derived producer price is calculated by the average annual Safex price for each

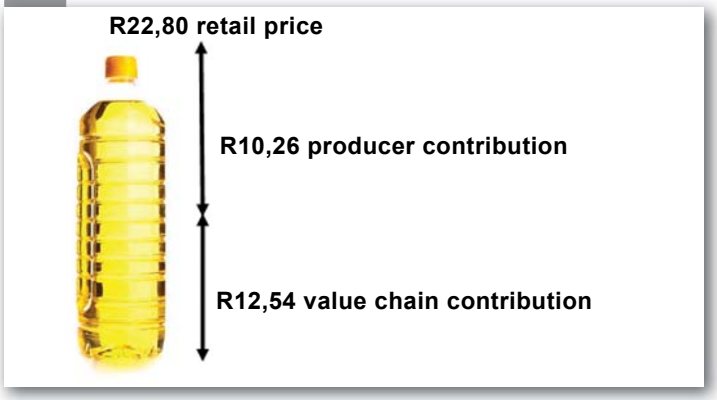
1 *Value chain for common household products.*

1 *Maize producer price vs maize meal retail value.*

Year	Safex price (R/t)	Producer price (R/t)	Producer value of maize meal (R/t)	Maize meal price (2,5 kg) price	Retail value (R/t)	Producer contribution to retail price
2019/2020	3 315	2 692	1 480	23,65	9 460	52%
2020/2021	3 287	2 841	1 563	25,27	10 108	51%
2021/2022	3 242	2 768	1 522	27,67	11 068	48%

2 *Maize producer's percentage share of the retail 2,5 kg maize meal price (2021/2022).*

3 *Sunflower producer's percentage share of the retail sunflower oil price (2020/2021).*



2 *Sunflower producer price vs sunflower oil retail value.*

Year	Safex price (R/t)	Producer price (R/t)	Producer value of oil (R/t)	Oil (750 ml) price	Retail value (R/t)	Producer contribution to retail price
2019/2020	4 932	4 609	11 522	22,18	27 004,88	43%
2020/2021	5 380	5 049	12 623	22,80	27 753,17	45%
2021/2022	9 885	9 546	23 865	27,46	33 431,63	71%

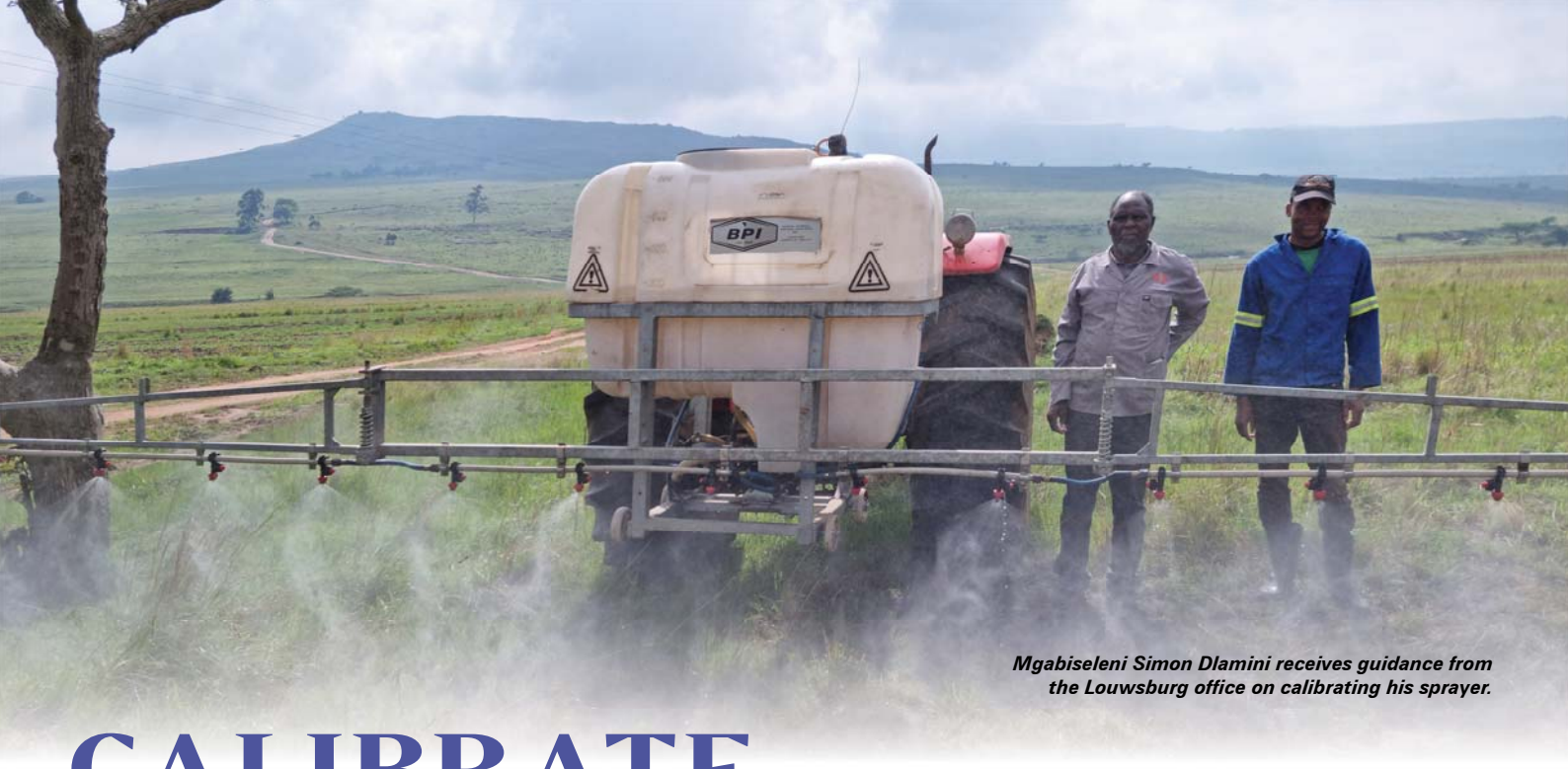
marketing year then deducting the relevant location differential as well as handling and storage costs.

Figure 3 shows the derived percentage contribution of producers to the retail price of sunflower oil. For the purpose of this illustration, prices from 2020/2021 were used. This is due to the significant sunflower price increases during 2021/2022 that may give an inaccurate representation of the producer's contribution to the sunflower price.

CONCLUSION

Consumers often believe that high prices of a household's goods are attributed to raw material producers which, as shown in this article, is not always the case. Raw material producers are not solely responsible for the retail price of goods. Value is added by the different links in the value chain, each contributing to the final price of the product. ■

HELEEN VILJOEN, INTERN ECONOMIST AT GRAIN SA



Mgabiseleni Simon Dlamini receives guidance from the Louwsburg office on calibrating his sprayer.

CALIBRATE your boom sprayer

TO ENSURE MAXIMUM ACCURACY FROM A SPRAYER YOU HAVE TO CALIBRATE IT BEFORE THE SPRAYING SEASON BEGINS, AND RE-CALIBRATE IT FREQUENTLY THROUGHOUT THE SPRAYING SEASON.

The process of sprayer calibration is designed to ensure that you are spraying the correct amount of liquid (water and poison) onto the desired area.

The tools required for calibration are:

- a timer;
- measuring jug (marked in ml); and
- a tape measure.

THINGS TO REMEMBER

- A nozzle with a smaller hole will deliver less liquid than one with a larger hole. The nozzle may have a wider or narrower spray pattern.
- As you pump harder, the pressure is increased and more liquid is released. The higher the pressure, the smaller the droplets.
- When spraying with a tractor, the pressure of the pump is affected by the revolutions/min (rpm).
- The gears of the tractor affect the speed of the tractor.
- The operator of the tractor needs to decide on the rpm as well as the gear that will be used and keep this constant once the calibrations have been done.
- Change the amount of poison in the mixture. More poison means that more active ingredient is being applied with the same amount of water.

CALIBRATION METHOD

- Fill the tank of the sprayer.
- Decide which gear will be used and at which rpm (e.g. 4th gear at 2 500 rpm).
- Measure a distance of 100 m.
- Using that gear and the correct rpm, measure the time that it takes for the tractor to cover the 100 m – for example 21 seconds.
- Run the tractor in a stationary position, at the agreed 2 500 rpm, and check the spray cover that you are achieving on the ground.
- Set the pressure on the sprayer to give the desired effect (e.g. 3 bar).
- Using the same time that it took the tractor to cover the 100 m, engage the spray, and measure the amount of water produced by one nozzle, for example 1 200 ml/1,2 litres.
- Repeat this process with two or three nozzles and take the average reading.
- Use the amount of liquid produced by one nozzle (for example 1 200 ml/1,2 litres) and multiply this with the number of nozzles (for example twelve nozzles) so that you know how many litres you are spraying out over 100 m.
  With all the nozzles: 12 x 1,2 litres = 14,4 litres.
- Measure the width of the boom (for example 4,7 m). Now you know the width that you are spraying, and you know the amount of water you are spraying over that width over the 100 m. The area covered by the sprayer over the 100 m: 100 m x 4,7 m = 470 m^2.

On this area 14,4 litres of water was used. An area of 1 ha is equal to 10 000 m^2 (100 m x 100 m). The volume to be used on 1 ha will be 10 000/470 = 21,27 x 14,4 litres = 306 litres/ha.

The label on the chemical container will indicate the amount of water required per hectare as well as the number of litres of poison required per hectare.

If you discover that the amount of liquid being sprayed is not within the norm, repeat the calculation adjusting the pressure of the sprayer or the gear of the tractor or the nozzle size. Once the amount of water is correct, you need to calculate the number of litres of poison that should be added to each spray tank. ■

An opportunity to ‘Grow for gold’

YIELD PLAYS AN IMPORTANT ROLE IN A GRAIN PRODUCER’S PROFITABILITY. GRAIN SA’S NATIONAL YIELD COMPETITION FOR GRAINS, CALLED GROW FOR GOLD, OFFERS A PLATFORM FOR SOUTH AFRICA’S TOP PRODUCERS TO COMPETE IN VARIOUS CATEGORIES AND TO SHARE THEIR SUCCESS STORIES.

Categories include dry and irrigated land. Producers are further divided into both regional and national participation. Innovative production practices and smart farming plans are encouraged to achieve the highest yields per hectare, regardless of the cultivar planted.

The competition is structured in such a way that it creates interaction between individual seed companies’ regional competition and an overhead national competition. Each seed company still offers their own yield competition, from which entries can progress to the national competition hosted under the Grain SA banner. The competition entails consultation with all seed companies for the creation of a standard protocol, thus ensuring that all participating seed companies and grain producers are judged on the same level of criteria.

Initially only commercial producers of maize, sunflower and soybeans could enter, but two new categories have since been added for **wheat** and **small scale farmers** (1 ha minimum to 2 ha maximum).

With a yield of 14,7 t/ha Bheki Mabuza who farms in Amersfoort, Mpumalanga, finished in third place in the category for maize production in the eastern Highveld region in the 2021 Grain SA Grow for Gold National Yield Competition. He competed against some of South Africa’s top commercial maize producers.

Gardner Khumalo who farms in the Amajuba district on the outskirts of New Castle was the first winner in the small-scale maize farmer category of Grain SA’s Grow for Gold National Yield Competition with a yield of 8,01 t/ha.

Scan the QR code to read more about the competition on the Grow for Gold website.

HOW TO ENTER

- Enter your own seed companies’ yield competition. Contact your seed marketer for more information.
- If a region/company does not form part of an existing competition, the entry can be sent directly to Grain SA by completing the form on the website, *http://groeivirgoud.co.za/en/register/*.
- You have to register at least two weeks before the start of the harvest. The entry fee (to show commitment) is R1 000 per entry and payment must be made per entry. **Grain SA members can enter free of charge**.
- Entries must include the producer’s name and identified block (a minimum of 2 ha). For small scale farmers the identified block is a minimum of 1 ha and a maximum of 2 ha. ■

PULA EDITORIAL TEAM

WORDS OF WISDOM

Without hard work, nothing grows but weeds.

~ GORDON B. HICKLEY
(American religious leader and author)

Meet the partners of the Farmer Development Programme

COINCIDING WITH GRAIN SA'S DREAM OF A UNITED AND PROSPEROUS AGRICULTURAL SECTOR IS THE DREAM OF SOUTH AFRICAN BREWERIES (SAB) THAT 100% OF THEIR DIRECT AGRICULTURAL SUPPLIERS SHOULD BE SKILLED, EMPOWERED AND CONNECTED BY 2025. THAT IS ONE OF THE MAIN REASONS WHY THESE TWO ROLEPLAYERS TOOK HANDS FOUR YEARS AGO WITH THE SHARED VISION TO UPLIFT THE LOCAL AGRICULTURAL SECTOR.

SAB has been entirely owned by the global holding company, Anheuser-Busch InBev (AB In-Bev) since 2016. Originating in Belgium more than 800 years ago, this company significantly expanded to have breweries like Mexico's Grupo Modelo, South Korea's Oriental Brewery and SAB united under their umbrella.

Josh Hammann, director: Agricultural Development and Support in Africa, says they have a global policy of local sourcing on the condition that prices are competitive. Normally 100% of their barley requirements are sourced locally, but in last years' tough agricultural conditions only some 60% were sourced locally and the rest had to be imported.

White and yellow maize are entirely sourced locally. Hammann emphasises that SAB does not use genetically modified (GM) maize. 'In cases where emerging farmers do plant GM maize in a bid to be competitive, we exchange these through our grain brokers for the non-GM product.'

DEVELOPING OUR FARMERS IS KEY

SAB's involvement with Grain SA involves the co-funding of the Farmer Development Programme which comprises of input support (as budgeted by Grain SA), training and mentorship.

At the end of the harvest season these crops are bought from the supplier, costs recuperated and re-invested for the following season.

Besides its involvement with the Farmer Development Programme, SAB also runs their own development programmes. 'We have been involved in this field for the past 25 years to create skilled and confident emerging farmers,' says Hammann.

'Sustainability can be debatable, but our idea is to support farmers to become self-sufficient even though there is great risk involved, it is part of farming and therefore not always possible to reach a 100% recovery.'

As mentioned, SAB became involved in the programme four years ago, but due to the restrictions during the COVID pandemic only saw three harvest seasons.

Success stories are plentiful. Hammann explains that only 40% recoveries were achieved at their start-off in the programme. During the last season 90% recoveries were reached. 'The developing farmers have learnt from the work done how to measure their abilities and how to farm profitably.'

SAB's mission with the Farmer Development Programme is in the first instance to make the farmer profitable and secondly to increase the number of developing farmers taking part in the programme. Thus far 1 000 upcoming farmers have benefitted from the programme by cultivating commodities such as barley, maize and ground nuts.

PARTNERS WHO SHARE THE SAB GOAL

When selecting suppliers, SAB looks for enterprises that can help them deliver the products and services their customers appreciate. That means access to high quality raw materials, products and services, but also access to innovation. They are committed to selecting suppliers who work with them to achieve sustainability goals, uphold principles of fair working conditions, environmental protections and ethical conduct.

> *The developing farmers have learnt from the work done how to measure their abilities and farm profitability.*

To further collaborate with suppliers, their Supplier Value Creation team engages with vendors to help find improvement opportunities in manufacturing and logistics areas. With smaller suppliers, they go beyond those two areas to provide backing in general management and best practices. Besides Africa, these endeavours are also ongoing in Latin America and Colombia.

All AB In-Bev associates are contributing to the United Nations' Sustainable Development Goals and broader global sustainable development agenda, while building resilient supply chains, productive communities and a healthier environment. They have placed a conscious focus on contributing progress toward the goals where they can use their scale and partnerships to drive meaningful positive change.

The future involvement of SAB in the Farmer Development Programme will be determined by its financial position and the achievement of minimum service levels, and is reviewed annually, concludes Hammann. ■

PULA IMVULA EDITORIAL TEAM

Plant population – a balancing act

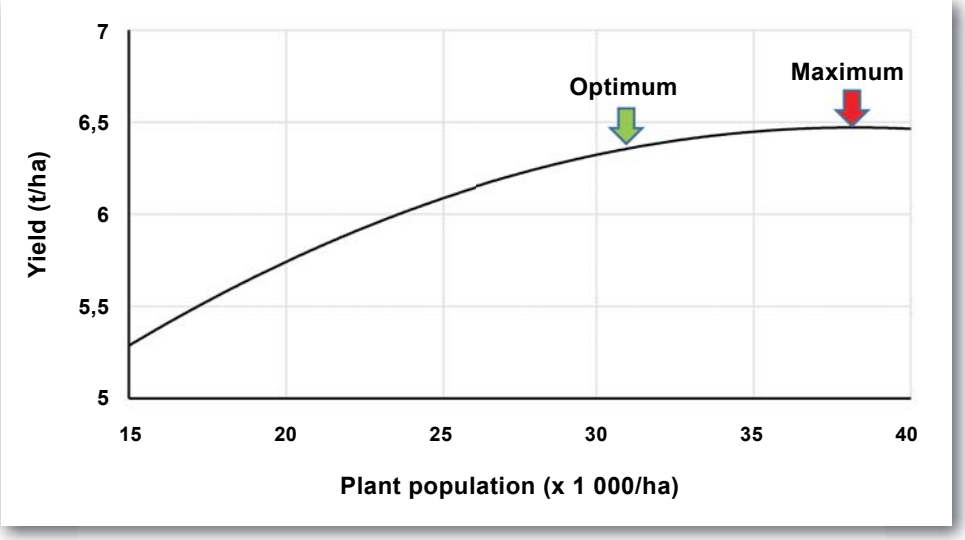
TO PRODUCE MAIZE IN AN ECONOMICALLY EFFECTIVE MANNER, IT IS IN THE FIRST PLACE ESSENTIAL TO FULLY UTILISE THE YIELD POTENTIAL OFFERED BY THE SOIL AND RAINFALL.

On the one hand, this requires inputs like seed and fertiliser to be sufficient to enable the maize to utilise the yield potential. On the other hand, overuse and overspending on inputs should be prevented.

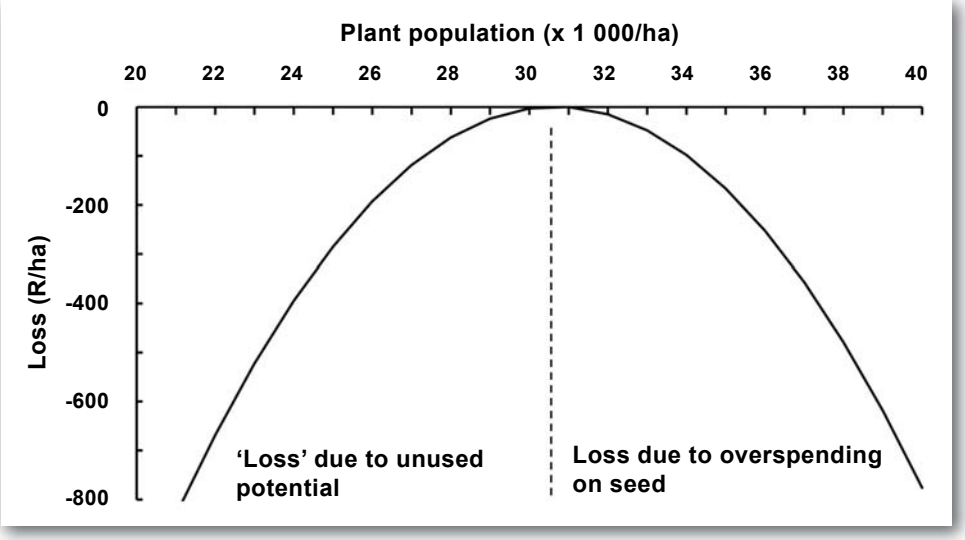
Plant population is one of the inputs that must comply with these two requirements, and all things considered, it is a balancing act. In the water-table sandy soils of the north-western Free State with its sensitivity to compaction, low water-storage ability, inherently low nutritional status and low organic matter content, this balancing act is so much more difficult.

Expectations are that refined guidelines on the optimum population of maize should be available, but this is not necessarily the case. Available information, which is mainly provided by seed companies, is often vague. However, this is rightly so, as plant population is not a simple matter and is affected by different factors. The Sandy Soils Development Committee (SSDC) in the north-western Free State and the Ottosdal Conservation Agriculture Club, which are both supported financially by the Maize Trust, realised this and made the investigation of optimum plant population part of its research objectives.

1 ***A typical yield curve showing the reaction of maize to plant population. The green and red arrows respectively indicate the economically optimum and maximum population and yield.***



2 ***The loss in potential income if the population is lower than the economic potential and if it is higher than the optimum population.***



YIELD CURVE

Grain yield does not increase in a straight line as the plant population is increased, but follows a curve like that in **Graph 1**. A characteristic of the yield reaction is that the yield unit decreases as the population per unit is increased. One of the yield curves obtained by the SSDC offers a good example. If the population is increased by 3 000 plants from 20 000 to 23 000 plants/ha, the yield increases by 0,24 t/ha, while it increases by only 0,1 t/ha if the population is increased by 3 000 plants from 28 000 to 31 000 plants/ha.

If the cost of seed and the grain price are taken into account, it is clear that the economically optimum yield is lower than the maximum yield that can be obtained. The economically optimum yield is where the last one rand that is spent on seed renders a yield increase of only one rand. If the population is lower than this optimum point, yield and income are therefore sacrificed, and if the plant population is higher than the optimum, too much money is spent on seed, which reduces the profit (**Graph 2**). If maize is therefore cultivated with a profit motive, the final plant population should be as close to the economic optimum as possible.

Plant population...

The curve in Graph 1 also highlights another important point: a fair yield of 6 t/ha can be obtained for the area with a (low) population of only 24 000 plants/ha. This can create the erroneous impression that 24 000 plants/ha are sufficient and that a higher population is unnecessary and just increases the risk. However, in Graph 2 it is clear that about R400/ha is lost in unutilised potential if the population is 24 000 instead of 31 200 plants/ha.

FACTORS

But what influences or determines what the optimum population of maize must be? Known factors include the yield potential, how 'hot' the area is and the cultivar. The seed-to-grain ratio and even the physical condition (density or porosity) of the soil also play a role.

YIELD POTENTIAL

It is common knowledge that the yield potential is extremely important. Guidelines by the Agricultural Research Council (ARC), for example, recommends 10 000 and 28 000 plants/ha for yield potentials of 2 t/ha and 6 t/ha respectively in the hot western maize production area. Cooler regions require a higher plant population.

The optimum population and accompanying yield have been calculated for eleven trials already. These were conducted by the SSDC in the Kroonstad, Wesselsbron and Bothaville districts and are depicted in **Graph 3** together with the existing ARC guidelines. A grain price of R2 700/ton and a seed price of R4 280 per 60 000 kernels were used. Six of the eleven trials carried out in the Bothaville and Wesselsbron districts were an extension of the 1997 ARC guideline, which covered only up to 5 t/ha. This is also a confirmation that the ARC guideline is still valid.

Six of the optimum populations deviate from expectations, particularly that of the farm Hamiltonsrus in the Kroonstad district. The deviation of one trial, the point circled in Graph 3, can be attributed to severe waterlogging damage, and the result therefore cannot be used. The reason for the deviation of the other data points is not obvious, however. As the SSDC results further show, the optimum population of eight of the ten usable trials is more than 30 000 plants/ha, compared to the general practice in the area to keep the population below 30 000.

SEED-TO-GRAIN PRICE RATIO

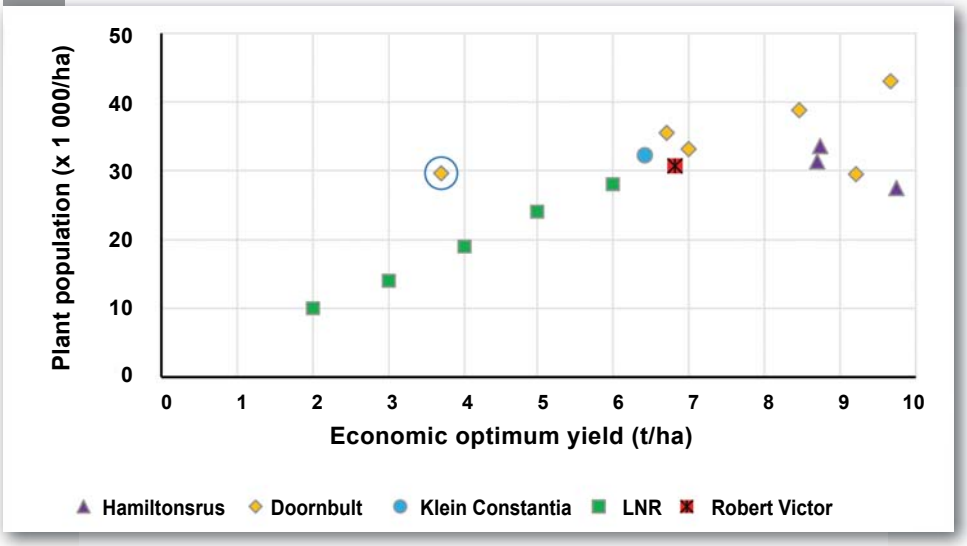
The grain price varies constantly, while the seed price is usually adjusted every year. The difference in the price of cultivars also varies a lot. The seed-to-grain price ratio, for example, can vary from 0,013 to 0,029, which requires an adjustment of up to 11% upwards or downwards to the plant population.

PHYSICAL CONDITION OF THE SOIL

The ease with which the roots can grow in the soil probably has a major influence on the optimum population. Maize is usually judged only by the growth above ground.

The discussion of plant population often includes the importance of catching sunlight, while the focus is rather on the spreading of the root system in the soil profile. The sandy soils of the north-western Free State are compacted in a natural manner, which is severely aggravated by agricultural implements. That is why the rip-on-row practice is followed almost always. This tillage creates a temporary loose soil structure or, in other words, it reduces the density of the soil. The root system then has the opportunity to grow

3 ***The economically optimum yield and corresponding plant population of trials carried out in the north-western Free State by the SSDC, as well as ARC guidelines.***



unhindered in the soil profile to gain access to a larger volume of soil with accompanying water and nutrients and the temporary shallow water table, if present.

Under no-till, the density of the soil is much higher than that of tilled soil, which restricts the growth tempo of the roots. This can be seen clearly in the growth of the maize above ground early in the season, with the growth of maize under not-till usually being restricted compared to that of maize on tilled soil.

This difference in the ease with which the root system grows has an important implication for the plant population. Results of the Ottosdal Conservation Agriculture Club on soils that differ considerably from those of the SSDC, but with the same rainfall, showed abundantly clearly that the optimum population of maize is equal or close to 40 000 plants/ha in a row width of 0,5 m, apparently without much influence on the yield potential. The physical condition of the soil profile is the overriding factor here that determine the plant population. The finding is a surprise here too, as the conventional practice is to plant 18 000 to 24 000 kernels/ha.

CONCLUDING REMARKS

Matters rarely work out in practice like the theory says, and this is true in the case of plant population too. The first problem is that the rainfall – and therefore the yield potential – of a coming season is unknown, and yet a decision on the population must be made beforehand. Being accurate with the population in a particular season will merely be accidental.

However, a decision must be made – but how? The long-term average yield (preferably the median) is a useful guideline. Theoretically, the population in half the seasons should be lower than the optimum and above the optimum in the other half of the seasons.

Producers are encouraged to check the correctness of the choice of plant population with a simple trial. With the precision equipment that is now used, it is easy to vary the plant population in planting strips across a field repetitively from a little lower to a little higher than the population that was selected, measure the grain yield and then assess the relationship between the population and the yield. Such trials should be repeated over seasons and soil types to eventually draw a meaningful conclusion.

A second practical problem is that the final plant population is seldom equal to the number of kernels planted. The loss is not often taken into account in the assessment of a crop and unfortunately this is also unpredictable. Because of unfavourable weather during planting, the final plant population in the current trial was even 20% lower than the intended population. Usually the figure varies from 3% to 12%. The implication of this is that the number of kernels planted must therefore be 3% to 12% more than the population being aimed at. It is also essential to measure the final population of a maize field thoroughly every year to be aware of losses and not to draw the wrong conclusions on the population-to-yield relationship. ■

SOURCE

- *Du Toit, W. 1997.* Handleiding vir die verbouing van mielies in die somerreënvalgebied*. ARC-Grain Crops, Agricultural Research Council.*

DR ANDRÉ NEL, INDEPENDENT AGRONOMIST, DR DANIE BEUKES, INDEPENDENT SOIL SCIENTIST.

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ETHANOL is a DEMAND driver

THE USE OF ETHANOL ORIGINATED IN 1826 WHERE IT WAS USED AS FUEL FOR ENGINES. IN THE 1850s IT WAS USED AS A MEDIUM TO LIGHT FIRES. DURING THE AMERICAN CIVIL WAR THESE USES WERE STOPPED AS ALL FORMS OF ALCOHOL WERE TAXED TO FINANCE THE WAR. THE FIRST ETHANOL-FUEL BLEND WAS USED IN THE 1920s AND 1930s DURING THE SECOND WORLD WAR AS FUEL SHORTAGES WAS A HUGE PROBLEM FOR ALL SIDES.

The story of modern large-scale ethanol production starts in the 1970s. Between 1967 and 1979 an energy crisis came into existence in America due to unrest (conflicts, wars, and political reasons) in the middle east. The biggest of these unrests of course was the boycott that Arabic nations implemented against the United States of America. This boycott is the result of America throwing its weight behind Israel during the Yom Kippur war against Egypt in 1973. The price of Brent crude oil soared from $3/barrel to $12/barrel (300%) in only twelve months' time.

US CORN AND ETHANOL PRODUCTION

Table 1 illustrates US corn production and the uses thereof. The table clearly shows how ethanol production has increased through the years. Initially it took 17 years to cross the 1 million bushel mark between 2002 and 2003. To increase from 1 million to 2 million it only took three years. To reach 3 million bushels only a year was needed and in 2009 and 2010 the 4 million and 5 million marks were crossed.

Graph 1 illustrates the ethanol production boom from 2004 to 2006 due to increasing demand. Currently about 5,2 million bushels of corn is used ethanol production and more than 98% of American fuel is mixed with ethanol.

US subsidies of ethanol production

The US currently has ten laws and 15 incentives which applies to ethanol production and the use thereof. Yet, there is only one which has a direct effect on producers. The incentive which is applicable to producers is the 'Advanced biofuel feedstock incentive'. From the Biomass Crop Assistance Programme. (BCAP; section 9010)

1 *US corn production and its portion used for fuel ethanol, feed and other uses (million bushels).*

Year	Total production	Feed and residual use	Ethanol use
1986	8 226	4 659	290
1987	7 131	4 789	279
1988	4 929	3 934	287
1989	7 532	4 382	321
1990	7 934	4 609	349
1991	7 475	4 798	398
1992	9 477	5 252	426
1993	6 338	4 680	458
1994	10 051	5 460	533
1995	7 400	4 692	396
1996	9 233	5 277	429
1997	9 207	5 450	488
1998	9 759	5 452	518
1999	9 431	5 643	566
2000	9 915	5 822	630
2001	9 503	5 849	707
2002	8 967	5 548	996
2003	10 087	5 781	1 168
2004	11 806	6 135	1 323
2005	11 112	6 115	1 603
2006	10 531	5 540	2 119
2007	13 038	5 858	3 049
2008	12 043	5 133	3 709
2009	13 067	5 101	4 591
2010	12 425	4 777	5 019
2011	12 314	4 520	5 000
2012	10 755	4 315	4 641

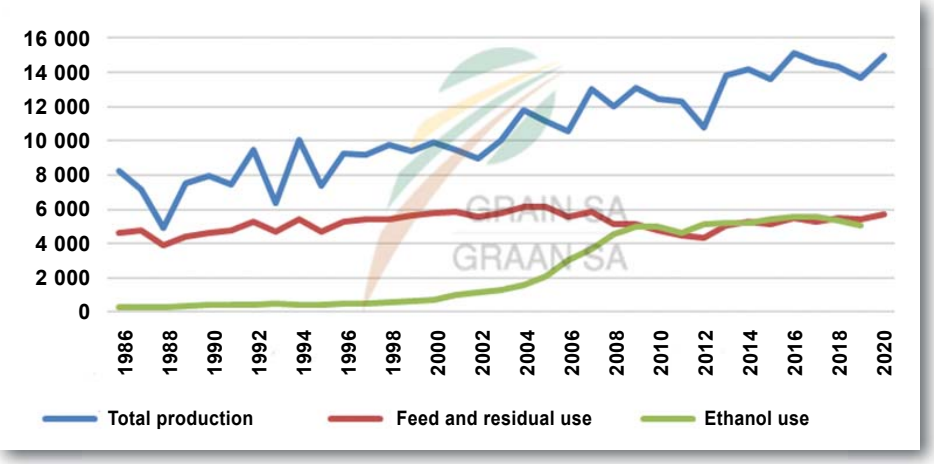
The incentive works as follows:

- Producers in a designated BCAP area may apply for production assistance of biomass crops.
- The biomass product must adhere to certain criteria regarding production and harvesting of the crop.

Producers can receive the following:

- Yearly payments for land applied for the programme.
- Partial payments for the establishment of multi-year biomass crops.
- Payments covering the cost of planting, harvesting, storage and transport of the biomass to a qualified processing facility.
- Yearly payments up until five years for herbaceous biomass (single/multi-year).
- Yearly payments up until 15 years for woody multi-year biomass.

1 *US corn production, feed and residual uses and ethanol production.*



Payments will be reduced according to the following rules:

- 1% if the biomass is harvested for cellulose biofuel which meets the criteria of the Renewable Fuel Standard (RFS).
- 10% if the biomass is harvested for advanced fuels.
- 25% if the biomass is harvested for heat, power or other bioproducts.
- 100% if the biomass is harvested for any other reason than heat, power, biofuel or other bioproducts.

Partial payments for the establishment of multi-year biomass crops works as follows:

Participants qualify for 75% of the establishment cost which includes preparations, seed, and the planting process.

BIOFUEL AND SOUTH AFRICA

Starting in 2005, the Department of Mineral Resources and Energy drafted South Africa's Biofuel Industry Strategy (BIS). The BIS was approved on 5 December 2007. This strategy entails the production of bioethanol from sugar cane, sugar beet and biodiesel from sunflower, canola, and soya beans. The exclusion of other crops is based on food security concerns. The initial proposal stretched over a five year period and entailed a penetration level of 2% which amounts to 400 million litres per annum. Even though biofuel production in South Africa is very little to non-existing, international biofuel production will cause demand for agricultural products to rise. This is a positive projection for producers which will benefit the whole agricultural supply chain.

2 *Advantages and disadvantages of ethanol fuel.*

Advantages	Disadvantages
Higher international demand	Lower quality fuel
Less greenhouse gas emissions	Higher wear on machinery
Increased job creation	Increased costs
	Energy losses

INTERESTING FACTS ABOUT ECONOMY OF POWER

- America produces 0,4 ha (1 acre) at 3,55 ton on average of maize to produce 1 241,62 litres of ethanol.
- Production of this maize requires 530 litres of fossil fuel and costs around R5 262,48 ($347).
- The energy economy: The grain is crushed and fermented. The grain then goes through three distilling processes to separate the 8% ethanol from the 92% water.
- It takes 38 kilowatt (131000 Btu) to produce 3,79 litres of ethanol. 3,79 litres of ethanol only has 22,5 kilowatt (77 000 Btu) of energy. That means that it takes 70% more energy to produce ethanol than ethanol possesses.
- It costs $1,74 to produce 1 litre of ethanol and only 95 cents to produce 1 litre of fossil fuels. That is the reason fossil fuels are used to produce ethanol.
- If America relies 100% on ethanol, they will have to plant 97% of its surface to produce that much maize.

CHRISTIAAN VERCUEIL, INTERN ECONOMIST AT GRAIN SA

Highest rainfall in 100 years WREAKS HAVOC

ALTHOUGH PRODUCERS ARE ALWAYS GRATEFUL FOR RAIN, THE SEASON SO FAR HAS CREATED MANY CHALLENGES WHERE PRODUCERS COULD NOT ACCESS FIELDS ON TIME DUE TO HIGH RAINFALL FIGURES, AND WHERE PRODUCERS MANAGED TO PLANT, WATER DAMAGE HAS OCCURED.

The current South African summer grain production season is being subjected to extremes. Not long ago, grain producers in the country experienced long cycles of drought which had a severe negative impact on their financial position.

At the beginning of the planting season there was great excitement for the season and the prospect of favourable production conditions. This excitement was dampened by excessive rainfall in certain areas of the country, especially where soil profiles were already full. In some cases it has affected individual producers' total expected production. Several reports have confirmed that the rainfall figure for December was the highest in 100 years. Furthermore, compared to the past, much more hail damage has been reported in certain areas.

Regional development manager Du Toit van der Westhuizen shared these images of the damage caused to David Molo's crop, who is from Deelpan in North West.

QUESTIONNAIRE TO DETERMINE DAMAGE

Although it is difficult to quantify the extent of the damage so early in the season, Grain SA, through a questionnaire, conducted an investigation to determine the exposure of summer grain plantings to water damage. The questionnaire was completed by 434 producers. The report and results are available at the following link *https://bit.ly/3Gv84lp*.

The questionnaire clearly indicates the negative impact of water damage in certain production regions. In extreme cases, individual producers report a total loss of plantings.

- Overall, 20% of producers indicated that more than 60% of their white maize plantings were exposed to water damage (yellow maize 15%, soybeans 13% and sunflower 17%).
- In the Western Free State in particular, 39% of the producers reported water damage exposure to white maize. The east of the country and parts of the North West also experience challenges regarding water damage but the intensity is lower than in the Western Free State.

The questionnaire is only an indication of the possible exposure to waterlogged conditions. The impact of the water damage on production will only really be determined and evaluated with the first summer grain production estimate on 27 February.

Grain SA is concerned about the effects of the extreme weather patterns, especially in certain areas such as those experienced in recent seasons. This, even more so, after the previous drought cycle, where some producers already had to leave the industry and others are still recovering financially. Thankfully international grain prices are at favourable levels.

Grain SA advises producers to contact their financiers well in advance if large-scale damage is experienced or expected. The early planning provides financiers with the opportunity to plan for loan restructuring timeously. In addition to the production challenges, there is also damage to important infrastructure and Grain SA is working with organised agriculture at provincial level to put the necessary actions in place for possible support and recovery.

Visit Grain SA's website, *www.grainsa.co.za* for the complete press release. ■

In Bultfontein a farmer even had fish swimming in his lands.

The result of 100 mm rain within an hour in North West.

A hail storm in the Welkom area completely destroyed David Phike's watermelon crop.

Grain SA press release, 13 January

THE CORNER POST

VIEWPOINT

EDWARD MAGWAZA
'With information, farming is even better'

EDWARD MAGWAZA (53) THOUGHT HE KNEW HOW TO FARM. IT WAS ONLY WHEN HIS PATH CROSSED WITH THE EXPERTS OF THE GRAIN SA TEAM THAT HE REALISED HOW LITTLE HE ACTUALLY KNEW. THROUGH SKILLS DEVELOPMENT HE IS NOW ABLE TO PERFORM HIS DAILY DUTIES ON HIS FARM TO A HIGHER STANDARD AND UNDERSTANDS WHAT FARM MANAGEMENT IS ABOUT.

THE IMPORTANCE OF INFORMATION

This former store manager grew up on a farm and helped his father who was a farmer. After he finished his school career he started working and later married his wife, Eunice, whose father was a farmer. In 2001 his father-in-law passed away. His mother-in-law then asked him to resign from his job as store manager to take over the farming activities. Edward jumped at this opportunity because he always wanted to follow in his father's footsteps. 'I loved the farm growing up and am so happy that I got an opportunity to come back to my roots,' he says. 'I just love everything about farming – all the farming activities – from caring for the animals to seeing the plants grow. My dream really came true.'

About three years after he took over his father-in-law's farming enterprise the Department of Agriculture gave him good advice. 'They told us that if we wanted to succeed we should find an organisation like Grain SA to help us.' As Edward didn't see himself as an unexperienced farmer, he initially didn't understand the importance of this advice. 'I just wasn't interested and continued doing things the way it had been done for years.' If he was unsure of something he would ask the labourers who had been on the farm for years or one of the neighbours. 'I realise now I actually had very little background and some of the important things were just passing me by.'

When his path crossed with Jerry Mthombothi, Grain SA provincial coordinator in Mpumalanga, he realised why it was important to have an organisation like Grain SA on your side. He eventually joined Grain SA four years ago and soon realised that he actually had very little farming knowledge. He soon discovered the importance of developing as a farmer and the difference correct agricultural practices can make. He has attended several training courses and is a regular attendee of the Matabane study group.

INCREASED KNOWLEDGE, BETTER FARMER

Edward's farm, Seringboom in the Stofberg area, has 120 ha of arable land available where he plants maize and sugar beans. He is planning to plant soybeans in the future if his finances allow it. Currently 70 ha of the land is leased to a neighbouring farmer as his capital is not enough to plant on all his land himself.

Some of the skills that really made a difference in Edward's farming enterprise was learning about plant population and the importance of fertiliser as well as skills like how to calibrate a planter and boom sprayer. 'I used to just plant and spray and had no knowledge about the importance of the right amount of fertiliser or what a difference plant population makes. Now I can work out everything and can clearly see the difference in the field.'

When he joined Grain SA he was planting only 2 ha of maize. With the help of the Grain SA Beyond Abundance project and the fact that he has been assisted to buy inputs at discount prices for the past three years, Edward could increase to 5 ha and was able to plant 50 ha last season. Unfortunately he had tractor problems this season which depleted a large amount of his available capital. He was therefore only able to plant 8 ha of maize and at the time of the interview was getting ready to plant 5 ha of sugar beans. He also plans on planting 5 ha of yellow maize next season and dreams of planting more hectares every year until he is utilising all his land. To Edward farming is like a business which you must try and grow yearly.

> *If I can make a difference on just one other person's life and prevent hunger through my farming, I have achieved my goal.*

He is very excited to know that he is now no longer just providing food for their household, but producing food for other people in the country. 'If I can make a difference on just one other person's life and prevent hunger through my farming I have achieved my goal.'

ADVICE TO OTHER FARMERS

Edward's advice to beginner farmers is to work hard and to learn from his mistakes. Here are some of his other suggestions:

- Get knowledgeable people like Grain SA's experts to help you develop. 'Knowledge is very important. I wasted ten years by doing things my way and not the way things should have been done. Now I know that with information, farming is even better.'
- Attend study groups and training workshops. Information is powerful and if you equip yourself with detailed information about your farming activities, you will stand out among other beginner farmers.
- Do things the way it is supposed to be done and not what you think is right.
- Buy the right inputs and use them correctly even though it is expensive. If you do not use the correct agricultural practices, your money will be 'gone with the wind' in any case.

Knowledge is power and more valuable than money because it can never be taken away from you. ■

LOUISE KUNZ,
PULA IMVULA CONTRIBUTOR

A programme that is changing lives

Ensuring successful PLANTING

GRAIN SA'S AGRICULTURE DEVELOPMENT TEAM FOCUSES ON THE DOUBLE EDGE OF 1) FARMER EMPOWERMENT IN TERMS OF KNOWLEDGE TRANSFER AND SKILLS DEVELOPMENT; AND 2) AGRICULTURAL BEST PRACTICES. TO THIS END WE WALK A ROAD BESIDE THE FARMER AS HE GROWS HIS COMMERCIAL GRAIN FARMING ENTERPRISE.

December 2021 saw various critical activities playing out:

- Early December saw the team supervising **fertiliser deliveries**, assisting with calibration and application.
- **Weed control** was a focal point and the team was monitoring the effect of the early burn down, monitoring weed population and discussing the use of herbicides with the famer. In one instance there had been herbicide damage evident on the young maize plants – usually the result of an incorrect dosage of the chemicals. In another case the unfortunate farmer had sprayed Roundup on non-Roundup maize seed. It is a hard but important lesson to learn – always check that the seed you have planted is Roundup Ready if you are going to spray Roundup.
- Some farmers had to deal with the problem of **rat infestations** in their maize fields.
- Farmers were **planting** maize and soybeans so our team was kept very busy monitoring planting depth, planting population and germination of the seedlings.
- Farmers were taught how to examine the plants and look at **leaf/foliar nutrition** to see if there are signs of trace element deficiency.
- It is also the time to alert farmers to the importance of carefully monitoring their fields for early **signs of insects** to limit the damage they could cause.

Grain SA's team is very active during the planting season. We recognise that doing things right at this stage is critical to harvest time success. The team reinforces the value of each farmer being present in his fields on a daily basis. We must control what we can and then practise damage control where necessary, for example where high rainfall has caused damage to the newly planted crops, it may be necessary to replant altogether.

The early season has been wet. Rain is (almost) always very welcome, but it means there is pressure on the farmers to be ready to use every window of opportunity to get into the fields and work. Equipment and farm vehicles must be kept serviced and ready to roll.

STUDY GROUPS

Although the **study group sessions** are quieter during December because farmers do not want to be distracted from working in their fields, we did still check in with **53 study groups** to monitor progress and assist with advice.

- Most farmers were planting their last few lands. Small scale and subsistence farmers were assisted in networking with contractors to do the pre-emergence spray for them.
- Tractors in Ntunjini were busy disking and planting. The contractors were working well with the Ntunjini farmers and everyone was satisfied with the progress made. The only challenge was the rain causing lengthy delays.
- Eastern Cape farmers had a lot of difficulty completing soil preparation, planting and spray programmes at the outset of the season as a result of the heavy rainfall.
- Luke Collier from our Kokstad office visited the Amantshange Study Group to check on the spraying of the pre-emergence spray. It was also challenged by the rain and the fields were too muddy.
- Farmers also reported that they had some difficulty guarding their lands from troublesome livestock.
- One of the biggest challenges facing the smaller farmers is weed control. Grain SA's team has to repeatedly emphasise the importance of fighting this war to limit the negative impact of competing weeds on the young crops.

AT GRASS ROOTS

Organ Serema in his lands. Mentor Du Toit van der Westhuizen from the Lichtenburg office checked on the soil preparation.

The members of the Amandengane study group in the Eastern Cape planted early and their crops are looking good.

Alfred Manqoba of Blinkpan farm, Mpumalanga in his soybean field. He is overseen by the Louwsburg office.

Hlalele Joseph Khahleli from the Free State preparing lands where sunflowers will be planted.

The Grain SA team – a farmer's helping hand

A quick glance at the diary of farm visits within the first two weeks of December tells the story of Grain SA's Farmer Development team. A total of **70 visits** occurred to **43 farmers** who are participating in the AB InBev, Advanced Farmers, Recapitalisation, SACTA and Standard Bank projects this year. The team is involved with the farmers every step of the way – including all the paper work, the planning and the budgeting, the sourcing of quotes and placing orders.

We also consistently teach farmers the importance of whole season planning and then keeping a paper trail throughout. Because we are partnering with stakeholders who are equally invested in successful farmer development, we are pedantic about good record-keeping from the get-go. All quotes, orders, delivery notes, invoices and proofs of payments should be neatly filed for future reference. After all, good record keeping is the foundation of a successful business. Record management is knowing what you have, where you have it and how long you have to keep it!

Heavy rains on the farm of Themba Bambaspha in the Ermelo area disrupted his farming activities. His mentor paid him a visit to help him with his planning.

Chairperson Lesole David Thama, of Hanbury Ranch Pty Ltd 1 with his mentor.

One of the farmers from the Free State who form part of the Standard Bank project, Joseph Mohlomi, discusses land preparation with his mentor.

Keen to know more

THERE is a great demand for mentoring. Even late in 2021 there were farmers who were eager to join and participate in Grain SA's Farmer Development programme. They have been inspired by the success of long standing members who keep achieving better yields. Jurie Mentz, regional development manager from the Louwsburg office, had a meeting with a group of farmers at Emahlatini in Mpumalanga who are very anxious to join the programme. He discussed Grain SA's structures and functioning and then talked to the farmers about basic principles of conservation agriculture.

Jurie Mentz had a meeting under the trees with enthusiastic farmers at Emahlatini who want to join the programme.

Jerry Mthombothi, regional development manager from the Nelspruit office, reported on a study group meeting with the newly registered **Ga-Riba Study Group**. He finalised their registration as members and discussed the basics about planting of maize so that they could start planting using the correct production practices. The following topics were covered: Selection of maize varieties, soil preparation, soil depth, plant population, fertilisation and weed control. The farmers were advised to plant the correct plant population, apply the correct amount of fertilisers and to use chemical weed control. They were also encouraged to attend study group meetings in 2022 and to attend courses that will be organised for them.

Limpopo farmers who attended the newly formed Ga-Riba Study Group, are hungry for knowledge.

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