Dear PANNAR Customer

This year PANNAR celebrates 60 years of serving Africa’s farmers. What a privilege it is to walk farmers’ fields and know that we are doing our part in ensuring that farms and farmers flourish, agricultural economies strengthen, society develops and our continent moves forward.

We have invested a great deal of time, expertise and research to bring you the excellent products featured in this catalogue; products developed through the most innovative breeding techniques on the market, adapted and widely tested for local success.

More than this, we pride ourselves on offering you our local knowledge and experience in crop production under Africa’s diverse conditions. Our seasoned agronomists are featured throughout this catalogue, sharing their best practices for protecting every gram of yield potential locked up in a bag of PANNAR seed.

Thank you for your continued and loyal support.

Nick Goble
Commercial Manager

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PANNAR Product Catalogue - Published January 2018
Solutions for sustainability

Sixty years of sustaining farmers’ success

1958

PANNAR SEED COMPANY was officially registered on 27 May by Brian Corbishley and Bill Wall (situated on Oakleigh Farm).

1960

Establishment of PANNAR Argentina.

1967

Opening of the first biotechnology laboratory.

1971

Established Delmas research station, the first of many satellite research stations.

1990

Past-PANNAR MD Deon van Rooyen appointed as President of the International Seed Federation.

2000

PANNAR enters the US market by acquiring the retail company Kaystar Seed.

2006

First PANNAR hybrids with a GM trait are sold in South Africa i.e. Bt maize.

2010

PANNAR opens its new Biotechnology Centre. PANNAR Group acquires maize breeding company Pau Seeds in the USA.
PANNAR’s story begins in Greytown in the KwaZulu-Natal Midlands in 1958. We started as a humble seed company focused on supplying hybrid maize seed to farmers in the region. Exceeding even the founders’ expectations, PANNAR grew into a major force in the hybrid maize market in South Africa. Built on old-school values of integrity and hard work and backed by modern, innovative solutions, we are determined to help farmers succeed. Although a lot has changed since the very beginning, the one thing that remains unchanged is that, for 60 years, PANNAR has been putting farmers first. Our decisions are made with the farmers’ best interests in mind – confirmed by the time we spend walking farmers’ fields to ensure that they receive top-performing seed products and personalised service. After all, our success is driven by yours.

**1976**
- Sunflower breeding programme initiated.

**1978**
- Began sorghum breeding programme.

**1979**
- Established Klerksdorp research station.

**1980**
- Started concerted marketing drive into Africa: Establishment of eight African companies followed in subsequent years, starting in 1986 with PANNAR Zimbabwe.

**1983**
- Began legume breeding programmes.

**1987**
- Pasture evaluation and selection programme was initiated.
- PANNAR establishes licensing office in Europe.

**1988**
- Wheat breeding programme started.

**2007**
- Release of PANNAR’s first stacked gene hybrids.
- Merger of Kaystar and Pau Seed in the USA under the name PANNAR SEED Inc.

**2013**
- 1 July 2013 marks the commencement of the PANNAR/DuPont partnership.

**2017**
- Official opening of the DuPont Africa Regional Technology Centre.

**2018**
- PANNAR celebrates 60 years of supporting local farmers.
PANNAR is proud to support farmers and to partner with them to maximise farming enterprise profitability and growth.

Our Value Proposition is based on five key focus areas, summarised briefly as follows:

1. **OUR VALUES**
   We endeavour to keep accelerating our pace of innovation to move agriculture forward and deliver an abundance of high quality food now and for the future. This will require that we reach out across the food system and create shared value with all stakeholders for the greater benefit of society. This is in keeping with our resolve to be a transparent and contributing corporate citizen.

2. **ADVANCED TECHNOLOGY**
   We are at the forefront of technology offering world-class research and innovation towards achieving top product quality and yield performance, with an in-depth understanding of local conditions and culture for 60 years.

3. **MULTI-CROP EXPERTISE**
   Our package of cultivars offers performance, adaptability and stability for superior risk management. Coupled with our local expertise, we offer sound advice to farmers based on their unique needs.

4. **OPTIMISED PRODUCTION**
   We offer a range of exceptional agronomic support and development programmes to optimise crop productivity. This is carried out under the auspices of the PANACEA® (including YIELDBOOST®), PANAGRI® and SPROUT™ initiatives to support farmers with practical agronomic solutions to better manage their risks.

5. **BUSINESS PARTNERSHIP**
   Stewards, businesspeople, heroes – we understand the important and diverse roles of farmers. We are proud to partner with farmers to help them grow their businesses. Together we feed a nation and help to leave a legacy for generations to come.
The constant pursuit of new opportunities to enhance and protect yield potential is inextricably linked to an intimate understanding of our customers’ needs – however unique or nuanced they may be. Catering to farmers’ distinct needs informed the structure of the research centre. The Delmas Research Technology centre focuses on major eastern region research activities, with breeding programmes in maize and sunflowers. A multi-crop research centre at Hoogekraal (near Potchefstroom) conducts multi-crop research with a focus on drought tolerance. A satellite network of strategically placed research centres and testing locations across the continent, including a pathology centre in Greytown, feeds research information into this regional database enabling collaboration between crop researchers, maximising resources and advancing research locally, while also contributing to and drawing from global DuPont expertise from colleagues at similar centres in the US, Brazil, India and China and in other parts of the world.

The Delmas Africa centre also boasts Africa’s largest private insectary, critical to the development of traits to combat local yield-robbing pests, some of which are unique to the continent. Some of the advanced technologies that PANNAR can now access right here in South Africa include doubled haploids, ear photometry and the proprietary Accelerated Yield Technology (AYT), as well as marker-assisted selection. These technologies help shorten crop breeding cycles and improve accuracy toward breeding targets – including improved drought tolerance, insect and disease tolerance, as well as improved yields with limited inputs.

This system and technology provides the elite genetics on which we can build our integrated PANNAR offered of trait options, seed treatments, agronomic advice and sales service that sets our farmers up for success.
Meet our team of agronomists
PANNAR’s cultivars are developed from leading, diverse sources of genetics and best express their full genetic potential under good management practices. That is why our skilled agronomists are here to help you choose the right seed for your fields.

Their objective, unbiased, technical information strives to ensure that your crop performance lives up to your expectations, so use their expertise and service to your advantage. Honest, reliable, involved and knowledgeable, they offer a complete seed line-up and management guidelines to ensure sound crop production and minimise risk whilst protecting the environment and preserving our natural resources.

Trust our agronomists to help you identify environmental risks and devise methods of reducing these risks to boost your efficiency and set you up for success.

The team is led by Pieter Rademeyer – a veteran in the seed industry with vast experience and expertise. Pieter has immersed himself in agriculture, devoting his entire career to the pursuit of deeper understanding of the complexities of agronomy. He has served PANNAR and our farmers for the past 21 years.

“You have to approach every day with enthusiasm and a view to help farmers achieve their goals. This can only be accomplished by bringing them expertise - the foundation of success. You need to learn something new every day to enrich yourself – by being observant and having an enquiring mind, you will find agriculture a gold mine of knowledge waiting to be tapped”.

AGRONOMY MANAGER
Pieter Rademeyer

PRODUCT AGRONOMIST WESTERN PRODUCTION REGION
AK Geldenhuys

WESTERN FREE STATE AGRONOMIST
Hendrik Linde

NORTHERN CAPE AGRONOMIST
Klaas van Wyk

KWAZULU-NATAL AND CAPE AGRONOMIST
Grant Pringle

EASTERN HIGHVELD AND LIMPOPO AGRONOMIST
Nico Barnard

PRODUCT AGRONOMIST EASTERN PRODUCTION REGION
Hanlie Geldenhuys

NORTH WEST AGRONOMIST
Corné van der Westhuizen
Hybrid Selection

One of the most important and difficult management decisions that farmers make every year is the selection of a package of hybrids to plant. When selecting a suitable hybrid package, yield performance and hedging of risk are both important considerations. This is complemented by the hybrids’ agronomic characteristics and disease tolerance attributes.

The criteria that a farmer sets for a hybrid will vary from farm to farm. Certain hybrid characteristics are important, regardless of where those hybrids are planted. The following characteristics, not necessarily in order of importance, are key considerations in the decision-making process:

- Yield performance, stability and compensation ability
- Hybrid package
- Growing season length
- Prolificacy – multi-eared or single eared
- Standability
- Germination and vigour
- Disease, insect tolerance and weed control

The most desirable characteristics are discussed in short:

**Yield performance, stability and compensation ability:**
Reliability of yield expectation from season to season is probably the most important aspect of hybrid choice. Success depends on risk hedging and it is determined by how accurately a hybrid’s yield prediction or yield probability/stability can be made. The chance of success improves significantly if hybrid choice is based on multi-season results across multiple locations.

Adaptability and stability are extremely important when choosing any hybrid. A hybrid that can deliver above-average returns under both favourable as well as adverse climate conditions will spread your risk. Choose hybrids that are stable over various environments and seasons, as it is difficult to predict the growing conditions of a coming season.

**Hybrid package:**
Despite the best efforts on the part of maize breeders, there is no one ideal hybrid. Therefore, a package of hybrids is recommended to spread the risk and increase the potential for the best yield under the prevailing circumstances. A hybrid package is constructed from various hybrids (different genetics, resistance properties, disease tolerances, etc.) and preferably with varying growing season lengths.

The yield and adaptability of a hybrid is the result of the interaction between a hybrid’s genetics, the environmental factors and management practices that are applied, for example:

- Planting date
- Rainfall distribution
- Stress factors e.g. drought stress, damage due to diseases, insects or hail
- Crop rotation programme
- Fertilisation, soil fertility and soil type
- Cultivation practices
- Weed control

**Growing season length:**
To ensure the best average yield, consider planting hybrids of varying maturity. This reduces the probability that the entire crop will experience hot and dry conditions during the critical pollination period. This will be an advantage if planting is completed over a short period to fit in with the optimum planting window. If planting takes place over a long period, hybrids with different maturity groups are less important.

Under dryland conditions, hybrids in the earlier growth classes are generally better adapted in the cooler regions with limited...
heat units and higher plant populations. In the warmer, dryer production regions, a combination of hybrids from medium to medium early growing season are better adapted. A package also offers the advantage that everything is not combine-ready at the same time. Early maturity hybrids also give the opportunity to bank your money earlier.

Under high input irrigation and double cropping systems (high yield targets, water application and management input) the ultra early hybrids are the best adapted.

**Prolificacy: multi-ear and single ear:**

Optimal plant population for various hybrids depends on several factors; environmental potential, type of ear and possible stress factors that may occur during the critical growth stages of the plant’s development. In general, hybrids that have ears which get smaller when the plant population is increased and larger if the population is reduced are referred to as “flex-ear” hybrids. Certain hybrids exhibit the ability to produce a constant ear size regardless of the plant population and are referred to as “fixed-ear” hybrids.

**Multi-ear Hybrids**

Hybrids that are well adapted to low plant populations generally have a robust plant type, sturdy stalks and big, hanging leaves. Commonly, these hybrids correspondingly have a larger root mass. When these attributes are coupled with strong prolificacy, one would expect that this type of hybrid would be better adapted to varying climatic conditions such as those experienced in the western part of the maize production area. These hybrids generally perform better under drought stress situations since lower plant populations enable some buffering of water use during dry spells. They can, however, compensate under good production conditions by producing a second ear.

**Single Eared Hybrids**

Single eared hybrids with a fixed or semi-flex ear usually have more upright leaves allowing better light penetration, reduced root mass and thinner, more woody stalks. Hybrids exhibiting these characteristics can generally be employed at high plant populations and can deliver excellent yields under high potential conditions. These hybrids are generally better adapted to environments where water application or rainfall is more reliable.

**Standability:**

Good standability facilitates effective combine harvesting. The primary causes of reduced standability are root and stem rot. If root and stem rot is noticed, it is advisable to combine infected fields early to limit losses by lodging of the plants, if drying facilities are available.

**Germination and vigour:**

Rapid germination and a strong seedling lays the foundation of a successful crop. Early vigour is particularly important on sandy soils where wind damage to seedlings may occur. There are marked differences between hybrids with respect to early vigour.

**Disease, insect tolerance and weed control:**

By maintaining healthy leaves the plant’s factory can function more effectively, increasing the chance of good results. The risk profile of hybrids to important diseases is evaluated and plays an important role in area adaptability. Leaf diseases caused by fungal infections are usually more prevalent in the high rainfall production regions, in which case a fungicide spray programme may play an important role in protecting the yield potential.

Bacterial diseases and vector-transmitted viral infections must be managed in other innovative and preventive ways.

The weed spectrum determines which herbicides should be applied as well as the hybrids that can be planted. Hybrids with glyphosate tolerance provide broad spectrum weed control. Keep in mind that tolerance to the harder herbicides (such as sulfonylurea) differs between hybrids. Read and adhere to herbicide prescriptions and check the tolerance of the hybrid against the planned herbicide programme.

**In summary, some basic guidelines:**

- Select hybrids that are proven performers based on multi-season data from multiple trials across a large, homogeneous area. It is about yield performance, stability and adaptability.
- New hybrids should be phased in gradually.
- Select a package of hybrids with a variety of maturity or growth classes to spread the risk.
- Include early growing season hybrids in your package if early harvesting is important.
- Consider Bt-hybrids if plantings are going to be late in the season.
- Prolific hybrids should be considered in the dryland areas with a variable or challenging climate and will generally deliver stable yields.
- Single eared hybrids are better adapted to high plant populations and higher potential conditions.
Advice from the field

Hanlie Geldenhuys – Product Agronomist – East Maize

Hanlie has been an agronomist her entire working career, currently with a special focus on product development for the eastern production areas. “Even after nearly a decade in the industry, I still learn something new in my field every day. The unpredictable, constantly changing environment makes every day a challenge, but despite that, I’m a farm girl at heart – I love the outdoors, maize and the soil.”

CROP TIPS FOR SUCCESS:

1. Soil cultivation is extremely important for root development and water management. A healthy maize plant should have the same depth root growth as above-ground growth. Any form of soil compaction must therefore be addressed.

2. Choose the right cultivars with designated properties for your farm. Choose cultivars with the best resistance to common diseases usually found in your environment. Also, pay special attention to the local seedling pests usually found there.

3. Plant the correct plant population, using starter fertiliser and pest control.

4. Good seedbed preparation always delivers dividends. In a no-till system, strip-tillage can give the advantage of a clean, warmer seedbed in the rows for quicker germination and even emergence. Guard against planting in wet soils, which can cause sidewall compaction and inhibit the development of the roots and their access to fertilisers.

5. Protect the yield potential. Where leaf diseases usually occur, make use of a fungicide spray programme to protect the plants.

Remember: Farming is a continual miracle wrought by the hand of God

RULE OF THUMB:
Rapid emergence + Good planting conditions + Strong plants = YIELD.
NB! The management of possible insect resistance to the Bt gene is legally binding. The planting of a refuge according to regulations is required where any Bt hybrids are used (B or BR). Refer to the schematic guidelines on page 32.
WHITE HYBRID PACKAGE – DRYLAND EASTERN REGION

The PANNAR white hybrid package displays good performance, adaptability and stability across regions for good risk management. PAN 4A-111 is one of the top performers in the ARC trials for the eastern production regions.

### AGRONOMIC CHARACTERISTICS - EASTERN DRYLAND

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Hybrid</th>
<th>Plant Population per ha ('000s)</th>
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<tbody>
<tr>
<td></td>
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<td>Cool</td>
</tr>
<tr>
<td></td>
<td>BG 5285</td>
<td>25 – 40</td>
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<tr>
<td></td>
<td>BG 5685R</td>
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<td>PAN 4A-111</td>
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<tr>
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<td>BG 5285</td>
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<td>25 – 40</td>
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<tr>
<td>Medium</td>
<td>PAN 5R-791BR</td>
<td>25 – 40</td>
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</tbody>
</table>

### GENERAL CHARACTERISTICS

- **Main planting, highly recommended**
- **Strategic hybrid, supplementary planting**
- *Potential

### YIELD DRYLAND

- (1) Cool Eastern Production Regions
- (2) Temperate Eastern Production Regions
- (3) Mist Belt

### DISEASE RISK

- Northern Corn Leaf Blight
- Grey Leaf Spot
- Common Rust
- Phaeosphaeria Leaf Spot
- Diplodia Cob Rot
- Cob and Tassel Smut

### HERBICIDE SENSITIVITY

- Sulfonylurea

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**White Hybrid Package - Dryland Eastern Region**

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</tbody>
</table>

- *Relative number of days to 50% tassel
- *Relative number of HU to 50% tassel
- *Relative number of days to physiological maturity
- Approximate days to harvest (<15% moisture) (influenced by prevailing humidity)
YELLOW HYBRID PACKAGE – DRYLAND EASTERN REGION

This formidable yellow maize package of ultra early, early and medium hybrids offers a good long-term risk distribution strategy. The ultra early package has an exceptional track record under irrigation and dryland in the eastern production regions. The BG 3792BR platform maintains exceptional performance in the ARC trials under irrigation. PAN SA-182 performed exceptionally well in the ARC trials for the eastern production region.

<table>
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<th>Growth Class</th>
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<th>Plant Population per ha ('000s)</th>
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<td></td>
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<td>Temperate Low Pot.</td>
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<td>High Pot.</td>
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<tr>
<td>Ultra Early</td>
<td>BG 3292 BG 3492B BG 3592R BG 3792BR</td>
<td>40 – 45 45 – 60 40 – 45 45 – 55</td>
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<td>50 – 60 50 – 60</td>
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<td>50 – 60 50 – 60</td>
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<tr>
<td>Medium Early</td>
<td>PAN 4A-156</td>
<td>40 – 45 45 – 60 40 – 45 45 – 55</td>
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<td>50 – 60 50 – 60</td>
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<td>40 – 45 40 – 45</td>
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YELLOW HYBRIDS AGRONOMIC CHARACTERISTICS - EASTERN DRYLAND

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<td>Warmer Areas</td>
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<td>710 710 690 710 710 690 710 725 725 735</td>
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<td>165 165 165 165 165 165 165 165 165 165</td>
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<tr>
<td></td>
<td>Cooler Areas</td>
<td>180 178 180 200 200 200 210 220 223 240</td>
<td>180 178 180 200 200 200 210 220 223 240</td>
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</tbody>
</table>

Yield Dryland

(1) Cool Eastern Production Regions
(2) Temperate Eastern Production Regions
(3) Mist Belt

General Characteristics

Drying Rate
Tilling
Prolificacy
Standability

Disease Risk**
Northern Corn Leaf Blight
Grey Leaf Spot
Common Rust
Phaeosphaeria Leaf Spot***
Diplodia Cob Rot
Cob and Tassel Smut

Herbicide Sensitivity

*NB: Is influenced by planting date and the daily HU during the growing season. *Heat Units determined from emergence to flowering (Max ≤30°C and Min ≥10°C). **Ratings are not absolute, environmental conditions play the greatest role. *** These diseases do not necessarily affect the yield in a significant manner. Note: Where a history of pre-germination occurs, a molybdenum foliar spray is recommended.
AK Geldenhuys – Product Agronomist – West Maize

AK brings a wealth of experience to the agronomy team; he has worked as an agronomist in the agricultural industry for the greater part of his career. Boasting 25 years of in-field experience at PANNAR, today AK is deeply involved in product development. “For me there is nothing more beautiful than healthy maize at the V5 growth stage on the sandy soils of the north western Free State with a thunderstorm overhead.”

CROP TIPS FOR SUCCESS:

1. Accept that crop production in the western production regions takes place under semi-desert conditions where we depend on mercy from above and where moisture conservation is extremely important.

2. The sandy soils in the north western Free State must be managed to successfully control wind damage. Rip cultivation is a must for optimal root development.

3. The planting process is, in my opinion, the most important process in the maize cultivation cycle and should therefore be managed carefully. There is no substitute for good planting conditions. An even seedbed, careful seed spacing, planting depth, fertiliser placement and good contact with moist soil, together create the optimal conditions for germination and early seedling growth.

4. Fertiliser placement below and away from the seed stimulates optimal seedling development. Beware of a high salt index that may burn the seed. Crust formation due to a heavy downpour, especially on sandy soils, impedes emergence and it is necessary to break the crust and aerate the soil.

5. Weed control is not negotiable and certainly the biggest thief when it comes to moisture preservation. Pre-emergence weed control is essential during the first six weeks in order to eliminate weed competition.

6. Watch out for the small foxes (fertiliser placement, herbicide prescriptions, seed placement, planter speed, soil insects, etc.) – they are the ones that destroy the vineyard.

"The planting process is, in my opinion, the most important process in the maize cultivation cycle"
Dryland Western Production Region

The PANNAR maize package comprises an excellent range of medium early and medium hybrids, for a formidable package. The hybrids offer outstanding performance and stability across all western dryland production regions.

The western production region includes the North West, the Western Free State and Limpopo.

Good risk distribution in the western region is achieved by management of the planting date and good moisture conservation practices. An important requirement for hybrids in this region is high prolificacy, in order to maximise production when optimal conditions occur and minimise risk under sub-optimal conditions.

NB! The management of possible insect resistance to the Bt gene is legally binding. The planting of a refuge according to regulations is required where any Bt hybrids are used (B or BR). Refer to schematic guidelines on page 32.
WHITE HYBRID PACKAGE – DRYLAND WESTERN REGION

The white hybrid package is distinguished by its exceptional performance and stability. Hybrids in this range differ in terms of growth class and plant type and complement each other well. PAN 5R-791BR performed very well in the ARC national trials for the western region.

### Plant Population per ha (’000s)

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Hybrid</th>
<th>North Western Free State</th>
<th>North Eastern Free State</th>
<th>North West</th>
<th>Low Rainfall **</th>
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</thead>
<tbody>
<tr>
<td>Ultra Early</td>
<td>PAN 3A-173</td>
<td>-</td>
<td>-</td>
<td>15 – 25</td>
<td>25 – 36</td>
</tr>
<tr>
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<td>PAN 4A-159</td>
<td>-</td>
<td>-</td>
<td>15 – 25</td>
<td>25 – 36</td>
</tr>
<tr>
<td>Medium Early</td>
<td>PAN 5R-791BR</td>
<td>20 – 25</td>
<td>20 – 36</td>
<td>15 – 22</td>
<td>20 – 36</td>
</tr>
</tbody>
</table>

**Main planting, highly recommended**  Strategic hybrid, supplementary planting.  *Potential, **Far North West, South Western Free State and Limpopo

### WHITE HYBRIDS AGRONOMIC CHARACTERISTICS - WESTERN DRYLAND

<table>
<thead>
<tr>
<th>Growing Season Class</th>
<th>PAN 3A-173</th>
<th>PAN 4A-159</th>
<th>PAN 4A-111</th>
<th>PAN 4B-311B</th>
<th>PAN 4R-711BR</th>
<th>PAN 5R-785BR</th>
<th>PAN 6B-465B</th>
<th>PAN 6Q-865BR</th>
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<tbody>
<tr>
<td>Ulta Early</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Early</td>
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<td></td>
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<tr>
<td>Medium Early</td>
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<td></td>
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</tr>
</tbody>
</table>

*Relative number of days to 50% tassel

*Relative number of HU to 50% tassel

*Relative number of days to physiological maturity

Approximate days to harvest (>15% moisture) (Influenced by prevailing humidity)

Yield Dryland

(4) North Western Free State
(5) North West
(6) North Eastern Free State
(7) Far North West, South Western Free State and Limpopo

### General Characteristics

Drying Rate
Tillering
Prolificacy
Standability

### Disease Risk**

Northern Corn Leaf Blight
Grey Leaf Spot
Common Rust

Phaeosphaeria Leaf Spot***
Diplodia Cob Rot
Cob and Tassel Smut

### Herbicide Sensitivity

Sulfonylurea

### Yield Potential

Good Average Poor

Standability and Prolificacy
Good Average Poor

Tillering and Disease Risk
Low Average High

Herbicide Sensitivity
Low High
## YELLOW HYBRID PACKAGE – DRYLAND WESTERN REGION

The medium early and medium class hybrids are a formidable package and are also particularly suitable as maize forage or silage.

### Table: Plant Population per ha ('000s)

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Hybrid</th>
<th>North Western Free State</th>
<th>North Eastern Free State</th>
<th>North West</th>
<th>Low Rainfall**</th>
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<tbody>
<tr>
<td></td>
<td>BG 3492B</td>
<td>–</td>
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<td>25 – 40</td>
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<tr>
<td></td>
<td>BG 3792BR</td>
<td>–</td>
<td>25 – 40</td>
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<td>PAN 3R-766BR</td>
<td>–</td>
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<tr>
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<td>PAN SA-154</td>
<td>18 – 22</td>
<td>18 – 24</td>
<td>15 – 22</td>
<td>18 – 24</td>
</tr>
<tr>
<td>Medium</td>
<td>PAN 6B-410B</td>
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<td>18 – 24</td>
<td>15 – 22</td>
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<td>PAN 6R-710BR</td>
<td>18 – 22</td>
<td>18 – 24</td>
<td>15 – 22</td>
<td>18 – 24</td>
</tr>
</tbody>
</table>

### Note:

- Main planting, highly recommended
- Strategic hybrid, supplementary planting
- *Potential, **South Western Free State, western parts of the North West and Limpopo

## YELLOW HYBRIDS AGRONOMIC CHARACTERISTICS - WESTERN DRYLAND

### Table: Yield Dryland

<table>
<thead>
<tr>
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<td>Cooler Areas</td>
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<td><em>Relative number of days to 50% tassel</em></td>
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<tr>
<td><em>Relative number of HU to 50% tassel</em></td>
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<tr>
<td>Approximate days to harvest (&lt; 15% moisture)</td>
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<td>163</td>
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<td>165</td>
<td>170</td>
<td>173</td>
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</tbody>
</table>

### General Characteristics

- Drying Rate
- Tilling
- Prolificacy
- Standability
- Disease Risk**
- Northern Corn Leaf Blight
- Grey Leaf Spot
- Common Rust
- Phaeosphaeria Leaf Spot***
- Diplodia Cob Rot
- Cob and Tassel Smut
- Herbicide Sensitivity
- Sulfonylurea

**HU = Heat Units. **NB: Is influenced by planting date and the daily HU during the growing season. *Heat Units determined from emergence to flowering (Max ≤30°C and Min ≥10°C). **Ratings are not absolute, environmental conditions play the greatest role. ***These diseases do not necessarily affect the yield in a significant manner. Note: Where a history of pre-germination occurs, a molybdenum foliar spray is recommended. Daily Heat Units = \( \frac{\text{Max. Temp} (°C) + \text{Min. Temp} (°C)}{2} \) - 10
Advice from the field

Klaas van Wyk – Agronomist – Northern Cape

Born and bred in Sutherland in the Karoo, Klaas’s affinity for maize was borne of drought. He has farmed irrigation maize himself in the harsh Karoo climate and later at the Vaalharts scheme. “I am in constant awe of our creator who formed a grass plant that would grow within six months to be two metres tall with a 400- to 800-fold multiplication of kernels. My daily challenge is to push against the upper limit of yield. Remember the 10-tonne club in KwaZulu-Natal in the 80s? Now 20 tonnes per hectare is attainable. Progress is made at a steady pace. For me, 25 tonnes per hectare is the next hurdle.”

CROP TIPS FOR SUCCESS:

1. I believe in principles rather than recipes to unlock the potential in each seed. A good plant population is essential. Proper cultivation practices with water and nutrient scheduling are important. With irrigation, nature can be manipulated to some degree. Educate yourself and believe.

2. No matter what type of cultivation practice you apply, there is one uncompromising principle: THE SEED MUST MAKE GOOD CONTACT WITH THE SOIL. Without this, a good plant population and ultimately a good yield are not possible.

3. Manage the most critical stages of the maize plant correctly. The first critical stage in crop production is to establish a uniform and strong plant population to optimise the yield potential. Any strenuous conditions, whether competition, drought, nutritional deficiencies, leaf loss due to hail, insects or leaf diseases can limit the rate of photosynthesis that results in a reduction in yield. The number of cobs per hectare, the number of kernels per cob and the kernel mass determine the yield potential. It is therefore important to manage all aspects optimally throughout the growing season.

4. The following critical development stages of maize include the rapid vegetative (V5 – V12), pollination and grain filling stages. During the rapid vegetative development period (V5 – V12), the number of kernels per ear is initiated and management is focused to maximise it. During pollination, it is important to ensure that the potential number of kernels develop into kernels. The success of pollination is largely determined by the prevailing climate during this period.

5. The final critical stage is the grain-filling period that commences after pollination has taken place and ends with the formation of the black layer on the base of the kernel when the grain is physiologically mature. Any stress during this period can reduce the number, size and mass of the kernels.

6. Apply quality control regularly and without exception and, if possible, take corrective action. By focusing on efficiency and timing, it is possible to optimise growth and production for better returns.
The best under Irrigation

PANNAR’s ultra early yellow hybrid package is an industry leader. PANNAR’s irrigation package comprises conventional, stalk borer resistant, glyphosate herbicide tolerant and stacked gene hybrids. Hybrid choice is very important, with the emphasis on stability. The package can be utilised in a single or double cropping system, where, for example, maize follows wheat cultivation. The ultra early growth class hybrids are the obvious choice in a wheat-maize rotation system.

The ultra early hybrids typically have a single-stem, upright growth habit, tend to be single cobbing and have excellent standability. The foundation for a high potential grain yield is accurate planting: spacing plants uniformly within the row and planting at the same depth. Uniform seedling emergence creates the opportunity for optimal production per plant. The ultra early hybrids are recommended at a high plant population and it is therefore advisable to reduce planting speed to ensure the best possible intra-row plant spacing (approximately six kilometres per hour is ideal).

If cultivation takes place under less intensive management conditions, the longer season hybrids may be considered for planting under irrigation. Yield results in excess of 12 tonnes per hectare are realistic for these types of hybrids if planted early.
The ultra early hybrids provide top yield results when best management practices are applied, including irrigation scheduling. Under these conditions, PANNAR’s ultra early hybrids have produced exceptional yields in excess of 20 tonnes per hectare. Three new exciting ultra early platforms have been added to the package, namely PAN 3R-500R and PAN 3R-7000R; PAN 3R-524R and PAN 3R-724BR and; PAN 3R-586R and PAN 3R-786BR. Please consult your agronomist for best placement.

### Plant Population per ha ('000s)

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Hybrid</th>
<th>Eastern Highveld and KwaZulu-Natal</th>
<th>Warm Western Highveld, Limpopo and Eastern Cape</th>
<th>Northern Cape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra Early</td>
<td>BG 3292</td>
<td>80 – 100</td>
<td>80 – 100</td>
<td>80 – 100</td>
</tr>
<tr>
<td></td>
<td>BG 3492B</td>
<td>80 – 100</td>
<td>80 – 100</td>
<td>80 – 100</td>
</tr>
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<td></td>
<td>BG 3592R</td>
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<td>PAN 6126</td>
<td>80 – 100</td>
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<td>PAN 3D-736BR</td>
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<td>PAN 3R-524R</td>
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<tr>
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<td>PAN 3R-724BR</td>
<td>80 – 100</td>
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<td>PAN 3R-586R</td>
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<td>PAN 3R-786BR</td>
<td>80 – 100</td>
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<td>Early</td>
<td>PAN 4A-156</td>
<td>50 – 65</td>
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<td>PAN 4B-376B</td>
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<td>Medium Early</td>
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<td>50 – 55</td>
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<td>PAN 5A-182</td>
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<td>Medium</td>
<td>PAN 6R-4108</td>
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<td>PAN 6R-7108BR</td>
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<td>PAN 6R-680R</td>
<td>50 – 55</td>
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### Yield Irrigation

- **Eastern Free State, Mpumalanga and KwaZulu-Natal**
- **Western Free State, North West, Limpopo and Eastern Cape**
- **Northern Cape**

### General Characteristics

- **Drying Rate**
- **Tillering**
- **Prolificacy**
- **Standability**
- **Disease Risk**
  - Northern Corn Leaf Blight
  - Grey Leaf Spot
  - Common Rust
  - Phaeosphaeria Leaf Spot
  - Diplodia Cob Rot
  - Cob and Tassel Smut
- **Herbicide Sensitivity**
  - Sulfonylurea

<table>
<thead>
<tr>
<th>Yield Potential</th>
<th>Standability and Prolificacy</th>
<th>Tilling and Disease Risk</th>
<th>Herbicide Sensitivity</th>
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<tbody>
<tr>
<td>Good</td>
<td>Good</td>
<td>Low</td>
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<td>Average</td>
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<tr>
<td>Poor</td>
<td>Poor</td>
<td>High</td>
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20
WHITE HYBRID PACKAGE – IRRIGATION

The white range includes an ultra early white hybrid and South Africa’s most popular green mealie, SC 701. It is sold exclusively by PANNAR SEED in South Africa and Namibia.

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Hybrid</th>
<th>Eastern Highveld and KwaZulu-Natal</th>
<th>Warm Western Highveld, Limpopo and Eastern Cape</th>
<th>Northern Cape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra Early</td>
<td>PAN 3A-173</td>
<td>80</td>
<td>80</td>
<td>80 – 100</td>
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<td>PAN 4A-159</td>
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<td>55 – 65</td>
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<tr>
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<td>PAN 4B-311B</td>
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<td>PAN 4R-711BR</td>
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<td>BG 5285</td>
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<td>PAN 6Q-865BR</td>
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<td>Green Mealie</td>
<td>SC 701</td>
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**Note:**
- High input irrigation
- Full irrigation
- Supplementary irrigation
- Exception to the rule

WHITE HYBRIDS AGRONOMIC CHARACTERISTICS - IRRIGATION

<table>
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<tbody>
<tr>
<td></td>
<td>Ultra Early</td>
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<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
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<td>Coolers</td>
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<td>*Relative number of days to 50% tassel</td>
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<tr>
<td>*Relative number of HU to 50% tassel</td>
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<tr>
<td>*Relative number of days to physiological maturity</td>
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<tr>
<td>Approximate days to harvest (&lt;15% moisture) (Influenced by prevailing humidity)</td>
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</tbody>
</table>

Yield Irrigation

- Eastern Free State, Mpumalanga and KwaZulu-Natal
- Western Free State, North West, Limpopo and Eastern Cape
- Northern Cape

General Characteristics

- Drying Rate
- Tillering
- Prolificacy
- Standability

Disease Risk***

- Northern Corn Leaf Blight
- Grey Leaf Spot
- Common Rust
- Phaeosphaeria Leaf Spot***
- Diplodia Cob Rot
- Cob and Tassel Smut
- Herbicide Sensitivity
- Sulfonylurea

**HU = Heat Units. **NB:** is influenced by planting date and the daily HU during the growing season. *Heat Units determined from emergence to flowering (Max ≥30°C and Min ≥10°C). **Ratings are not absolute, environmental conditions play the greatest role. ***These diseases do not necessarily affect the yield in a significant manner. Note: Where a history of pre-germination occurs, a molybdenum/feather spray is recommended.**
White Hybrid Package

The PANNAR white hybrid package displays good performance, adaptability and stability across regions for good risk management. PAN 5R-791BR did exceptionally well in the ARC national hybrid trials for the western and eastern production regions during the 2016/17 season. PAN 4A-111 is one of the top performers in the ARC trials for the eastern production regions.

Ultra Early Package:

PAN 3A-173 (NEW):

Dryland: The hybrid is well adapted in the high potential eastern production areas (Mpumalanga, eastern Free State and KwaZulu-Natal) at high plant populations.

High input irrigation (high yield; requires high management input including water application): This irrigation hybrid is a good fit for double-cropping production systems. PAN 3A-173 is recommended for all production regions under irrigation at high plant populations of 80 000 plants and more per hectare.

The hybrid exhibits the typical ultra early plant-type characteristics and is single-stemmed. Its disease tolerance is generally good. In areas where Northern Corn Leaf Blight is encountered, the YIELDBOOST® fungicide spray programme is recommended to curb the disease and protect the yield potential. (Guidelines on page 29)

Early Package:

PAN 4A-159 (NEW):

Dryland: It performs well in the eastern production areas, including Mpumalanga, the eastern Free State and KwaZulu-Natal. Plant at a 20% higher plant population than the typical medium season hybrids. The early nature of this hybrid makes it a good choice in a package to spread risk. It tolerates stress conditions well.

Its disease tolerance is generally good. It has good standability and can be prolific. In areas where Northern Corn Leaf Blight is encountered, the YIELDBOOST® fungicide spray programme is recommended to protect the yield potential.

PAN 4A-111, PAN 4B-311B, PAN 4R-511R, and PAN 4R-711BR:

Dryland: This package is an excellent choice for all the eastern production areas including the north eastern Free State. It delivers excellent performance in the mist belt areas. This early white hybrid package is PANNAR’s most popular series in the eastern production region and is underwritten by its excellent performance in the ARC national trials.

High input irrigation: These hybrids are well suited to an irrigated single-cropping system.

The hybrids have good general disease tolerance, standability, hectolitre mass, grain and milling quality. Where leaf diseases are normally anticipated, the YIELDBOOST® fungicide spray programme provides effective control and protects the yield potential.

Medium Early Package:

BG 5285 and BG 5685R:

Dryland: These two BIOGENE® hybrids offer good stability and are highly prolific. They are recommended as part of the main planting for all the western production regions (north western Free State, north eastern Free State and North West). They are also well adapted to all the eastern production regions.

Irrigation: These hybrids fit in where only a single crop of maize is grown under irrigation or supplementary irrigation.

The hybrids have an attractive plant type, are agronomically well-balanced and show good tolerance to Head and Tassel Smut and Northern Corn Leaf Blight.
PAN 5B-485B and PAN 5R-785BR (NEW):

Hybrids with the MON89034 stalk borer resistance trait.

Dryland: The hybrids are characterised by good stability and prolificacy. They are especially well adapted to the western production regions (north western Free State, north eastern Free State and North West). They are recommended as part of the main planting. This package is also well adapted to the temperate eastern production regions. BG 5685R and PAN 5R-591R are suitable as refuge for PAN 5R-785BR.

Irrigation: These hybrids fit in where only a single crop of maize is grown under irrigation or supplementary irrigation. They have an attractive plant type, are agronomically well-balanced and show good tolerance to Head and Tassel Smut and Northern Corn Leaf Blight.

PAN 5A-291, PAN 5R-591R and PAN 5R-791BR (NEW):

Dryland: This group of hybrids is highly prolific. They produce strong, vigorous seedlings and are well adapted to the western production regions (north western Free State, north eastern Free State and North West). Recommended for the main package. PAN 5R-791BR performed very well throughout the ARC national trials for the western and eastern production regions during the 2016/17 season.

Medium Package:

PAN 6R-779BR (NEW):

Dryland: This new addition is especially suitable for the western production region and is particularly well suited to the water table soils of the north western Free State. Late plantings in the cooler eastern parts should be avoided.

Supplementary irrigation: This hybrid can be planted where only a single crop of maize is grown under irrigation or supplementary irrigation. The recommended plant population should not exceed 55 000 plants per hectare.

PAN 6B-465B and PAN 6Q-865BR:

Hybrids with the MON89034 stalk borer resistance trait.

Dryland: These hybrids are well adapted to all the maize production areas and suited particularly well to dryland production. Late plantings in the cooler eastern parts should be avoided.

Supplementary irrigation: They can be planted where only a single crop of maize is grown under irrigation or supplementary irrigation. The recommended plant population should not exceed 55 000 plants per hectare.

The genetic background of these hybrids provide good tolerance to Diplodia Ear Rot, Grey Leaf Spot (GLS) and Cob and Tassel Smut. They exhibit good standability and reasonably good aluminium tolerance.

Green Mealie:

SC 701:

Irrigation: With its large cob, big tasty kernels and exceptional shelf life, SC 701 is the undisputed leader in the green and roasting mealie industry in South Africa. This is the hybrid of choice for green mealie farmers, traders and hawkers. It is also suitable for producing baby corn. As it falls in the medium late growth class, SC 701 dries down slowly. It is also an excellent silage hybrid.

SC 701, which has good tolerance to Maize Streak Virus, is recommended at a population between 25 000 and 35 000 plants per hectare. A population of 25 000 plants per hectare in the high season from December to February, when green mealies are readily available, will ensure the bigger marketable cobs preferred by street vendors (hawkers). Farmers are advised to take preventative measures against Grey Leaf Spot.
Yellow Hybrid Package

This formidable yellow maize package of ultra early, early, medium early and medium hybrids offers a good long-term risk distribution strategy. The ultra early package has an exceptional track record under irrigation and dryland in the eastern production regions. The BG 3792BR platform maintains exceptional performance in the ARC trials under irrigation. PAN 5A-182 performed exceptionally well in the ARC trials for the eastern and western production region. The medium package has an excellent performance record in the eastern and western production regions.

Ultra Early Package:
BG 3292, BG 3492B, BG 3592R and BG 3792BR:

High input irrigation (high yield; requires high management input including water application): This complete range of BIOGENE® hybrids has performed very well under commercial conditions and in PANNAR’s multi-season irrigation trials over the past five years. They display good stability and are recommended for all production areas.

Dryland: This group of hybrids is well adapted to the eastern Highveld (Mpumalanga and eastern Free State) and KwaZulu-Natal. They are recommended as part of the main planting. Well adapted to the high potential soils of the north western and north eastern Free State. The recommended plant population is at least 20-30% higher than that for typical medium growth class hybrids under dryland conditions.

These hybrids usually produce very few tillers and have very good standability and grain quality. They are agronomically well-balanced and show good tolerance to Rust and Diplodia Ear Rot. Where the ultra early hybrids are grown in the eastern Highveld and KwaZulu-Natal and leaf diseases are normally anticipated, the YIELDBOOST® fungicide spray programme is recommended to protect the yield potential. (Guidelines on page 29.

PAN 6126:

High input irrigation: This hybrid performs well in the warm irrigation regions. PAN 6126 is renowned for its good yield performance and stability. When good stalk borer control is achieved, it competes favourably with the Bt and BR hybrids. Regular inspection of crops for stalk borer infestation is essential.

The YIELDBOOST® fungicide spray programme is recommended in the areas where leaf diseases are usually expected. It is a cost-effective risk management tool that can protect the yield potential.

PAN 3D-736BR:

High input irrigation: This versatile stacked gene hybrid is a solid performer harnessing the benefits of stalk borer resistance and glyphosate herbicide tolerance. It is an excellent hybrid under irrigation, especially in the warm areas.

Good tolerance against Cob and Tassel Smut.

PAN 3R-524R and PAN 3R-724BR (NEW):

High input irrigation: Excellent hybrids under irrigation. Achieved first place in the PANNAR irrigation evaluation trials last season. The plant type lends itself to high plant populations from 95 000 to 100 000 plants per hectare. These hybrids distinguish themselves with good yield and stability in all production areas.

Typical irrigation hybrids with an upright leaf growth habit that can be planted at higher plant populations. Exhibits a fixed ear at planting levels of 95 000 to 100 000 plants per hectare. Attractive grain type that dries down rapidly. Even in high plant population conditions, standability is excellent. Where leaf diseases usually occur, the YIELDBOOST® fungicide spray programme is recommended to protect the yield potential.

PAN 3R-500R and PAN 3R-700BR (NEW):

High input irrigation: Very well adapted in all production areas under irrigation at plant populations of 80 000 to 100 000 plants per hectare. Maintain very good performance in PANNAR trials under irrigation. A very good teammate for PAN 3Q-740BR with similar stability.
Dryland: Adapted to the eastern production areas at a 20-30% higher plant population than normally planted under dryland.

Attractive plant type with good quality semi-flint grain type. Good standability and ear placement. Where leaf diseases usually occur, the YIELDBOOST® fungicide spray programme is recommended to protect the yield potential.

**PAN 3P-502R:**

**High input irrigation:** This hybrid with glyphosate herbicide tolerance produced good results in the ARC multi-season irrigation trials. It is well adapted to all production regions and is a good choice where high weed pressure is a concern, as well as for a refuge for PAN 3D-736BR, PAN 3Q-740BR, PAN 3R-786BR and PAN 3R-7008R.

Dryland: It is well adapted to KwaZulu-Natal and parts of the north eastern Free State. The recommended plant population is at least 20-30% higher than that for typical medium growers under dryland conditions.

This hybrid usually produces very few tillers and has very good standability. It produces good quality grain. The YIELDBOOST® fungicide spray programme is recommended for optimal production in areas where leaf diseases are normally anticipated.

**PAN 3Q-740BR:**

**High input irrigation:** This stacked gene hybrid has been a top performer under irrigation in all production regions. It has shown excellent performance in the ARC irrigation trials. It exhibits good resistance to Phaeosphaeria Leaf Spot. It has good standability and does not show sensitivity to sulfonylurea. It is, however, susceptible to Northern Corn Leaf Blight (NCLB). To protect the yield potential the YIELDBOOST® fungicide spray programme is advised in areas where leaf diseases are usually expected.

**Early Package:**

**PAN 4A-156 (NEW):**

Dryland: A new hybrid especially well adapted to KwaZulu-Natal, Mpumalanga and the eastern Free State. A higher plant population is recommended for this hybrid as it tends to produce a single ear. This is a good alternative hybrid to PAN 4A-172.

Irrigation: The plant population should not exceed 60 000 plants per hectare. It fits in where only a single crop of maize is grown under irrigation or supplementary irrigation.

Good tolerance against leaf diseases especially Phaeosphaeria.

**PAN 4B-376B:**

A hybrid with the MON89034 stalk borer resistance trait.

Dryland: This yellow hybrid is similar to PAN 4R-776BR. It is a dryland hybrid that is well adapted to the production areas of cool KwaZulu-Natal, north eastern and eastern Free State. It exhibits good resistance to Phaeosphaeria Leaf Spot. It has good standability and does not show sensitivity to sulfonylurea. It is, however, susceptible to Northern Corn Leaf Blight (NCLB).

To protect the yield potential the YIELDBOOST® fungicide spray programme is advised in areas where leaf diseases are usually expected.

**PAN 4R-776BR:**

Dryland: The hybrid is recommended as part of the main planting in the north eastern and eastern Free State. It can realise good yields at lower plant populations.

The hybrid is prolific and quick drying. It exhibits good tolerance to cob rots. The YIELDBOOST® fungicide spray programme is recommended where leaf diseases are usually expected to protect the yield potential.
PAN 4A-172 and PAN 4R-672R:

Dryland: These exciting new early yellow hybrids are an excellent choice for the eastern production regions. PAN 4A-172 has distinguished itself as the top performer in PANNAR’s hybrid evaluation trials over the past two years.

These hybrids offer good agronomic balance and tend to produce a single cob. Ears are carried low on the stalk and standability is very good. In areas where Northern Corn Leaf Blight is a problem, the YIELDBOOST® fungicide spray programme is recommended to control the disease and protect the yield potential.

Medium Early Package:

PAN 5A-190 (NEW):

Dryland: This new hybrid’s growing season fits in perfectly for the eastern production area and it has excellent vigour. It is well adapted for the Mpumalanga and eastern Free State. It tends to produce a single cob with good standability.

Excellent tolerance to Diplodia and Rust; a very healthy plant type.

PAN 5A-154 (NEW):

Dryland: This hybrid is an exciting addition to the PANNAR package. In the 2016/17 season, the hybrid performed excellently in the PANNAR cultivar evaluation programme over a wide range of environmental conditions, which indicates good yield stability and adaptability. The hybrid can be prolific at lower plant populations. It maintains its ear size (fixed ear type) and produces grain with a deep orange colour. Recommended as part of a yellow package to spread the risk.

Irrigation: The hybrid can be planted with great success where only a single crop is planned under irrigation or supplementary irrigation.

This hybrid has good standability and general disease tolerance with good tolerance against Diplodia Cob Rot.

PAN 5A-182:

Dryland and irrigation: This conventional hybrid produces very good results and is well suited to all production regions. It performed very well in the ARC trials for the eastern and western production regions.

It exhibits exceptionally stable performance and is recommended as part of every hybrid package in the eastern Highveld (Mpumalanga and eastern Free State).

It produces excellent quality flinty grain with excellent general disease tolerance, especially to leaf diseases.

Medium Package:

The medium class hybrids all perform well in the eastern and western production regions and are also suitable for silage or maize foggage. They are recommended as part of the main planting. It is important to plant this range of medium hybrids at the recommended plant population for the respective production regions.

PAN 6B-410B and PAN 6R-710BR:

Hybrids with the MON89034 stalk borer resistance trait.

Dryland: These hybrids deliver very good results, with good stability in the eastern and western production regions.

Irrigation: These hybrids fit in well where only a single crop of maize is grown under irrigation or supplementary irrigation.

Good tolerance to Rust and Northern Corn Leaf Blight (NCLB). Good standability and drought tolerance. Shows no sensitivity to sulfonylurea herbicides at the recommended dosage.

PAN 6R-680R:

Dryland: This glyphosate herbicide tolerant hybrid has displayed exceptionally stable performance over various seasons and across the entire eastern and western production regions. It is a good choice where high weed pressures are a concern, as well as for a refuge for PAN 6R-710BR.

Irrigation: It fits in well where only a single crop of maize is grown under irrigation or supplementary irrigation.

Good tolerance to cob rot.

NB! The management of possible insect resistance to the Bt gene is legally binding. The planting of a refuge as per regulations is required where any Bt hybrids are used (B and BR). Refer to the schematic guidelines on page 32.
Maize and Sunflower Seed Spacing Guide

### Plant population per ha

<table>
<thead>
<tr>
<th>Row Width (cm)</th>
<th>45 cm</th>
<th>76 cm</th>
<th>91 cm</th>
<th>120 cm</th>
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<tbody>
<tr>
<td>Plant population per ha</td>
<td>Seeds per metre</td>
<td>Distance between Seeds (cm)</td>
<td>Seeds per metre</td>
<td>Distance between Seeds (cm)</td>
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<tr>
<td>90 000</td>
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<td>24,7</td>
<td>6,8</td>
<td>14,6</td>
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<td>80 000</td>
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<td>27,8</td>
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### Plant population per ha

<table>
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<th>Row Width (cm)</th>
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<th>180 cm</th>
<th>210 cm</th>
<th>230 cm</th>
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<tr>
<td>Plant population per ha</td>
<td>Seeds per metre</td>
<td>Distance between Seeds (cm)</td>
<td>Seeds per metre</td>
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</table>
PANNAR is committed to supporting farmers by providing first class products and expertise. We strive to deliver tailored advice and service through our experienced sales team and agronomists.

NEW TECHNOLOGIES AND OPTIMISED AGRICULTURAL PRACTICES

This is carried out under the auspices of the PANAGRI® practical farming solutions and the PANACEA® complete seed and crop protection initiatives.

The PANAGRI® research focuses on optimising all the disciplines that play a key role in progressive crop production, including fertilisation practices, cultivar selection, optimal plant population, crop rotation, tillage and use of agricultural chemicals. The latter includes the research under the PANACEA® umbrella whereby Research and Development develops seed treatment programmes for optimal germination, plant population and seedling protection, as well as first class advice for the identification and control of diseases and pests that occur on farmers’ crops from time to time. The YIELDBOOST® fungicide spray programmes offer guidelines for control of such outbreaks.

EXPERT ADVICE AND GUIDANCE

Innovative pre-plant care and crop protection provides a complete risk management package

Research for progressive crop production

GUIDANCE

- Astute application of knowledge.
- Crop protection: Disease diagnosis, advice and guidance.

SEED TREATMENT

- Precautionary crop protection (seed treatment presentations: fungicides, insecticides and polymers).
- Fungicide spray programme.
- Insecticide spray programme.

GUIDANCE

- Production management guidelines for every facet of production.
- Precision placement of cultivars. Interaction between yield potential, growth class, prolificacy, plant population and cultivar type.

PANNAR® SPROUT™ MOBILE APP

The PANNAR® Sprout™ mobile app has proved a great technical support to farmers in Africa over the last three years since its launch. The app continuously evolves in response to our farmers’ needs and this year, we are pleased to bring you PlantDr - Sprout’s latest and most sophisticated feature yet.

Grain crop farmers can now upload pictures of disease infected plants and submit them along with some background information to our expert team of agronomists and plant pathologists for analysis. PANNAR, in turn, will track the spread of diseases and alert farmers to potential disease threats in their areas. The popular disease guide with all the commonly occurring and economically significant diseases and disorders of maize, sunflower and wheat in South Africa will remain in the app for quick and easy self-diagnosis.

There are also tools to assist farmers in identifying the correct hybrid for their particular production system and to compare similar hybrids head-to-head to make an informed selection. There is a tool to determine the correct plant population per product and calculate the economic viability of replanting after damage to a new planted maize crop. The yield estimates provide a means to estimate crop yields pre-harvest and the SAFEX prices and currency conversions are available for convenient reference. There is also a unit conversion facility to help convert Imperial to Metric units when researching case studies from abroad.

In the fight for ever healthier, better performing crops we’re in the farmer’s corner, providing all the expertise and resources possible to win in the marketplace.

With this App you have streamlined access to:
- Our Products
- Disease Fact Sheets
- Estimated Yield Calculator(s)
- Plant Population Recommendation Tool(s)
- Hybrid Comparison Tool(s)
- Replant Feasibility Calculator
- Contact Details

Additional information can be found on www.pannar.com
- Production Guides
- Technical Articles
- Company Information

At PANNAR we are committed to bringing digital solutions to farmers, to simplify their operations. You can expect the app to evolve as technology does, because together, we farm for the future.
PANACEA® PRE-PLANT CARE

Get off to a great start

PANNAR SEED’s goal is to ensure your crop gets off to a great start, that’s why we place such an emphasis on plantability and strong seedling growth. PANNAR is committed to identifying and providing quality seed treatment products and technologies to improve the efficiency of farming in an environmentally friendly way.

Before any seed treatment is applied to any crop seed, it must comply with the following principles:

**Plantability:** It plants as well or better than the current products. To ensure a good plant population, seed should flow easily through the mechanical planter after treatment.

**Application:** The treatment products are applied correctly to the seed. During planting, the seed treatment must adhere to the seed and not come off and remain in the bag. This ensures that the correct dose reaches the target. The use of film coatings (adhesives) helps to keep the product on the seed, making it safer for handling and improving the plantability of the seed.

**Stewardship:** It is a sustainable solution for customers and a low-risk for the environment. Producers and consumers should remember that seed treatments can contain chemicals that must be handled in a safe manner.

**Seed safety:** The addition of a seed treatment may not adversely affect seed safety, vigour or germination when properly stored.

**Regulatory:** It is a registered product in the country where the seed is planted.

SEED TREATMENT

High yields start with a uniform and healthy plant population. The PANACEA® seed treatment package protects the seed and seedlings from early-season insects and seed or soil-borne diseases for a great start. Top quality chemicals and film coatings (polymers) are used as seed treatments. The products currently applied to maize as seed treatments consist of coatings (polymers) are used as seed treatments. The products are applied correctly to the seed and not come off and remain in the bag. This ensures that the correct dose reaches the target. The use of film coatings (adhesives) helps to keep the product on the seed, making it safer for handling and improving the plantability of the seed.

**Benefits of fungicides:**
- They control fungi and diseases that occur on the seed surface.
- They control fungi in the seeds and soil-borne fungi.
- Stimulate the development of seedlings and give them a good boost to success.

Insecticides:
- e.g. Poncho® (Clothianidin), Cruiser® (Thiamethoxam)
- Treatment against Nematodes: e.g. Poncho® (Clothianidin) and Votivo® (Bacillus firmus)

**Effects of film coatings:**
- Film coatings are used to protect the seed and seedlings from disease in the early stages of plant development. The effect of fungicides is threefold:
  - They control fungi and diseases that occur on the seed surface.
  - They control fungi in the seeds and soil-borne fungi.
  - Stimulate the development of seedlings and give them a good boost to success.

Benefits of fungicides:
- They control fungi and diseases that occur on the seed surface.
- They control fungi in the seeds and soil-borne fungi.
- Stimulate the development of seedlings and give them a good boost to success.

**Benefits of polymers (protective coatings or film coatings):**
- The seed is safer for handling and inhibits pollution.
- It serves as an adhesive for the other important seed treatment products.
- It limits the amount of “chemical dust” during handling.
- It improves the flow of seed through the planter and plantability.

**Regulatory:** It is a registered product in the country where the seed is planted.

**Stewardship:** It is a sustainable solution for customers and a low-risk for the environment. Producers and consumers should remember that seed treatments can contain chemicals that must be handled in a safe manner.

**Seed safety:** The addition of a seed treatment may not adversely affect seed safety, vigour or germination when properly stored.

**Regulatory:** It is a registered product in the country where the seed is planted.

FUNGICIDE SPRAY PROGRAMME

**Benefits of fungicides:**
- They control fungi and diseases that occur on the seed surface.
- They control fungi in the seeds and soil-borne fungi.
- Stimulate the development of seedlings and give them a good boost to success.

**Benefits of polymers (protective coatings or film coatings):**
- The seed is safer for handling and inhibits pollution.
- It serves as an adhesive for the other important seed treatment products.
- It limits the amount of “chemical dust” during handling.
- It improves the flow of seed through the planter and plantability.

**Regulatory:** It is a registered product in the country where the seed is planted.

**Stewardship:** It is a sustainable solution for customers and a low-risk for the environment. Producers and consumers should remember that seed treatments can contain chemicals that must be handled in a safe manner.

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**Seed safety:** The addition of a seed treatment may not adversely affect seed safety, vigour or germination when properly stored.
Grain producers may only cultivate hybrids containing any of the Genetically Modified (GM) traits if he/she has signed a valid Technology and Product Stewardship Agreement, thereby accepting the strict conditions and responsibilities regarding the planting and cultivation of the seed. Farmers are required to acquaint themselves with the GMO user guidelines and adhere to the requirements regarding the planting of suitable refuge areas in the case of Bt hybrids and the prescribed herbicide dosage and time of application for glyphosate tolerant hybrids. If there is any risk of cross-pollination from GM-maize to non-GM-maize cultivated for non-transgenic contracts, please take the necessary isolation precautions to minimise it.

**GLYPHOSATE TOLERANT HYBRIDS**

Hybrids with glyphosate tolerance offer the following benefits:

- Broad spectrum weed control.
- Excellent crop safety.
- Advantage of conservation cultivating practices.
- Herbicide application flexibility.
- Easy to manage, has no residual effect in the soil and is environmentally friendly.

PANNAR markets maize hybrids with the glyphosate tolerance gene under licence from Monsanto (maize with the ROUNDUP READY® trait). Only Roundup PowerMAX® (L7769) herbicide is recommended by the registration holder for post-emergence use on maize with the ROUNDUP READY® trait.

Glyphosate herbicide may be applied in combination with certain residual pre-emergence and post-emergence herbicides, independently or as tank mixtures. This provides additional flexibility and better weed control. Please consult your PANNAR or chemical representative for guidelines for the safe and optimal use of the glyphosate tolerant cultivars.

**Management Guidelines:**

- Broadcast (over the top) glyphosate herbicide application should only take place from the GROUND CRACKING STAGE UP TO THE V8 STAGE of the maize plant. The V8 stage is reached when the first plants in the field have eight leaves, with closed collars around the main stem. The actual number of visible leaves may be more. Do not make broadcast applications if mechanical crop damage will occur due to the passage of the spray rig.

- BROADCAST APPLICATION AFTER THE V8 STAGE MAY RESULT IN YIELD LOSS OR DELAYED MATURITY. For best results, use flat fan or twin jet nozzles that are suitable for low water volume deliveries.

- Where sequential applications are necessary to control specific weed species (e.g. *Cyperus esculentus*), the second application should not occur within 10 days of the first application. If by this time the maize is beyond the V8 stage, a post directed application (see below) will be necessary.

- Directed glyphosate applications between the rows can be made after the V8 stage where row spacing permits the passage of the application equipment without causing mechanical damage to the maize crop.

**Importance of managing herbicide tolerant crops and weed resistance to herbicides.**

Proper management of herbicide tolerant crop technology is important to preserve the effectiveness and value of the tolerant crop seed and its corresponding herbicides for future use. If you have any questions, please contact your PANNAR sales representative or agronomist.

*ROUNDUP READY® is a registered trademark used under licence from Monsanto Technology LLC.*
**STALK BORER RESISTANT HYBRIDS**

The stalk borer resistance gene in the PANNAR stalk borer resistant hybrids offers protection against first and second instar stalk borers and affords the crop the opportunity to develop to its full potential. The Bt gene will only control small, immature larvae and not adult larvae.

**Insect Resistance Management Strategy:**

The purpose of the strategy is the protection of the technology, extending its shelf life and ensuring its long-term usability. The insect resistance management strategy comprises the following elements and is legally binding:

- There are always some individual stalk-borers that are naturally tolerant to the Bt-proteins. Producers must follow an “Insect Resistance Management” programme to ensure that they remain rare in the population.
- The best way to prevent the tolerant individuals from increasing is to combine effective control with Bt maize in maize fields, with a nearby “refuge” area.
- A “refuge” is an area where only non-Bt maize is cultivated and where non Bt-based insecticides are used. In this area, maize stalk-borers which are susceptible to the Bt-protein can feed and breed. These susceptible stalk-borers can in turn breed with any of the few naturally tolerant stalk-borer individuals, which survive.
- If a susceptible stalk-borer breeds with a tolerant one, the offspring are also susceptible. In this way producers can preserve the efficacy of the Bt-technology.

The refuge is also important if farmers encounter problems of any sort with Bt plantings. Continuous monitoring of maize plantings and stalk borer populations is important. Regular inspection will enable farmers to intervene and apply insecticides if it appears that the stalk borer population is not being controlled by the Bt technology.

**Options for the refugia:**

The farmer can select one of the following options to plant a refuge:

**Option A:** 5% non-Bt maize refuge that may not be treated with an insecticide. In practice, this means that for every 95 hectares of stalk borer resistant maize, the farmer must plant five hectares of non-Bt maize (i.e. maize without any Bt genes). This non-Bt maize may not be treated with any insecticide registered for control of maize stalk borers.

**Option B:** 20% non-Bt maize refuge that may be sprayed with a non-Bt protein-containing insecticide/biopesticide. In practice, this means that for every 80 hectares of stalk borer resistant maize, the farmer must plant 20 hectares of non-Bt maize (i.e. maize without any Bt genes). This non-Bt maize can be treated with registered insecticides but not with insecticides that contain Bt proteins.

In addition to planting a refuge either to Option A or B, the grower must also adhere to certain important requirements when planting the refuge.

**Refuge of non-Bt maize (refer page 32):**

- The non-Bt maize (i.e. refuge) must –
  - have a similar maturity to the Bt maize;
  - be planted within seven days of planting the Bt maize;
  - be planted on the same farm as the Bt maize; and
  - be planted under the same cultivation techniques and growing conditions (e.g. under irrigation) as the Bt maize.

- Every farmer must plant his/her own maize refuge. In other words, neighbouring farmers’ non-Bt maize lands may not serve as refuge.
- Refuge “strip” areas must be at least six rows wide with no crossover of Bt and non-Bt rows.
- Refuge areas must be positioned in such a manner that some refuge is planted on the outside borders of the Bt maize.
- Mixing of Bt maize seed and non-Bt maize (refuge) seed is not permissible.
- Refuge maize must be planted in such a manner that no Bt plant is more than 400 m away from a refuge maize plant.
- Farmers must regularly (weekly) monitor and inspect their Bt crop and immediately contact their seed representative or agent if stalk borer infestation exceeds the threshold values in the Bt maize. In the case of Monsanto, the threshold is 10% or more plants damaged.

Compliance with the insect resistance management strategy and particularly with the refuge requirements will be monitored as follows:

- On-farm compliance monitoring by an independent third party; and
- General compliance monitoring at individual seed company level during farmer visits.

The representative is required to advise the farmer to ensure on-farm compliance with the refuge planting provisions. It is of the utmost importance that the necessary technology stewardship requirements are observed. In instances where farmers do not comply with these requirements, it will be viewed in a very serious light.

_Detailed guidelines for Bt maize production are available from the PANNAR representative._
Plant the correct refuge area for Bt-Maize

STEP 1: Choose the best option for your farm.

**OPTION A:** 95% Bt, 5% non-Bt
No chemical control of stalk borer in refuge.

**OPTION B:** 80% Bt, 20% non-Bt
Chemical control of stalk borer in refuge allowed.

STEP 2: Depending on the option chosen above, your refuge must be planted in the following manner:

- Similar hybrid (growth season)
- May not cross Bt rows
- Don’t mix with Bt seed
- Strips a minimum of 6 rows
- Plant within 7 days
- Same agronomic conditions
- Plant within 400 m of all Bt plants
- Cover outside borders
- Plant your own refuge

STEP 3: Regularly monitor and inspect (weekly) your Bt crop and immediately contact your seed representative/agent if stalk borer infestation exceeds the threshold values in the Bt maize. In the case of Monsanto traited products, the threshold is 10% or more plants damaged; in the case of Syngenta, it is 5% or more of plants.
**Correct layout of the refuge area**

### Pivot Positioning

<table>
<thead>
<tr>
<th>Pivot Size</th>
<th>Minimum number of rows required per row width in m (5% refuge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius (m)</td>
<td>0,60 m</td>
</tr>
<tr>
<td>178</td>
<td>10</td>
</tr>
<tr>
<td>252</td>
<td>20</td>
</tr>
<tr>
<td>309</td>
<td>30</td>
</tr>
<tr>
<td>357</td>
<td>40</td>
</tr>
<tr>
<td>*399</td>
<td>50</td>
</tr>
<tr>
<td>*437</td>
<td>60</td>
</tr>
<tr>
<td>*472</td>
<td>70</td>
</tr>
<tr>
<td>*505</td>
<td>80</td>
</tr>
<tr>
<td>*535</td>
<td>90</td>
</tr>
<tr>
<td>*564</td>
<td>100</td>
</tr>
<tr>
<td>*592</td>
<td>110</td>
</tr>
<tr>
<td>*618</td>
<td>120</td>
</tr>
</tbody>
</table>

* User must also plant at least six rows in the centre of the pivot, in addition to the rows on the outside.
CROP TIPS FOR SUCCESS:

1. Select a cultivar as part of a package for a planting. Take note of the yield potential and yield probability according to a realistic yield potential for each field.

2. Field selection. Look at the field’s history regarding previous crops cultivated, yields harvested (water consumption), weed control and chemicals sprayed. Consider the possibility of chemical carry-over, as well as the expected weed spectrum to be addressed.

3. Plant population and the planting process. This is where a harvest can be made or broken. Rapid, even germination and early plant development are essential for a good, evenly spaced plant population. Take note of planter speed, planting depth, seed-to-soil contact, fertiliser placement, early insect control and possible soil crusting in the pursuit of ideal plant population.

4. Early and effective weed control is non-negotiable.

Advice from the field

Corné van der Westhuizen – Agronomist – North West
Corné has spent the greater part of the last decade with PANNAR. “It has been an honour for me to service my farmers in the North West and to grow and develop with them in this challenging and rewarding profession. The saying ‘measure twice, cut once’ is most applicable in crop farming. Do the small things right in the pursuit of that record yield.”
The PANNAR sunflower hybrid package performs well in all sunflower production regions of South Africa. This diverse hybrid package provides good, stable performance with good risk management to help sustain your farming operation. The South African farmer can plant PANNAR’s sunflower range with peace of mind, knowing that these hybrids incorporate the best technology on the market.

The conventional sunflower package performs exceptionally well, is stable and adaptable. In addition to these hybrids, PANNAR also markets high-yielding hybrids with the CLEARFIELD® PLUS trait. The PANNAR package also features a hybrid high in oleic acid, with high mono-unsaturated fatty acid content. High oleic sunflower oil is addressing the trend for healthier deep-frying oils.

A hybrid package is recommended as a strategy to better manage disease and drought stress. It is also recommended that farmers stagger the planting date for better risk management.

CLEARFIELD® PRODUCTION SYSTEM

PANNAR’s range of hybrids with the CLEARFIELD® PLUS trait competes head to head with the conventional hybrids, setting a totally new precedent for crop rotation. The EURO-LIGHTNING® herbicide (L8436, with active ingredients Imazapyr and Imazamox) provides effective post-emergence control of a variety of broadleaf weeds and grasses.

The inherent herbicide resistance is a natural mutation; the hybrids are not genetically modified and all sunflower hybrids are GMO-free.

PAN 7102CLP – The top performing hybrid in the 2016/17 ARC trials
- This single cross hybrid contains the CLEARFIELD® PLUS trait, with the benefit of improved weed control.
- This hybrid is based on PAN 7049 genetics.
- This full season sunflower hybrid with CLEARFIELD® PLUS has the same good yield potential as the conventional hybrids.

PAN 7156CLP – A high potential hybrid with CLEARFIELD® PLUS
- This is a high potential single cross hybrid with exceptional stability.
- It has the same good yield potential as the conventional hybrids.
- This hybrid is a top performer in the PANNAR and the ARC’s national trials.
- PAN 7156CLP is similar to PAN 7049.

PAN 7160CLP – The second-best performer in the 2016/17 ARC trials
- This hybrid is a three-way cross and contains the CLEARFIELD® PLUS trait, with the benefit of improved weed control.
- It is based on PAN 7100 genetics.
- This full season sunflower hybrid has the same good yield potential and stability as the conventional hybrids.
- PAN 7160CLP has shown top performance in the ARC trials over the past two seasons.

CONVENTIONAL HYBRID PACKAGE

PANNAR’s versatile conventional hybrids are known for their excellent performance and wide adaptability. A diversified hybrid package is recommended for good risk management and sustainable return on investment.

PAN 7100 – Excellent yield potential and stability across all production regions
- A full season three-way cross with good stability and adaptability.
- Good yield potential and excellent oil content.
- Recommended as part of the main planting for all sunflower production regions.

PAN 7057 – A proven performer
- A top seller in the PANNAR sunflower range.
- Wide adaptability across all production regions with excellent oil content.
- A formidable package in combination with PAN 7080 and PAN 7100. Recommended for the main planting in all production regions.

PAN 7080 – A hybrid with a very good track record
- This hybrid has been one of the top performers in the PANNAR and ARC’s national trials over the past eight years.
- This hybrid has excellent yield potential and has maintained a phenomenal performance record.
- It is well adapted to all production regions with exceptional stability under varying conditions.
- Second most popular hybrid in the PANNAR range.
- Recommended for all sunflower production regions.

HIGH OLEIC ACID HYBRID

PAN 7158HO – High oleic acid hybrid
- A medium season hybrid, well adapted to all sunflower production regions.
- A very uniform plant type.
- Oleic acid content of 80% and higher, producing a healthier oil type.
- This hybrid is based on the genetic model of PAN 7080 and is highly competitive with the conventional range of hybrids.

NOTES
## SUNFLOWER HYBRIDS - AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>PAN 7158HO</th>
<th>PAN 7102CLP</th>
<th>PAN 7156CLP</th>
<th>PAN 7160CLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing season</td>
<td>Medium</td>
<td>Medium Late</td>
<td></td>
<td></td>
</tr>
<tr>
<td>± Days to 50% flowering*</td>
<td>70</td>
<td>75</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>± Days to physiological maturity*</td>
<td>125</td>
<td>130</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>± Days to harvest</td>
<td>135 – 140</td>
<td>150 – 155</td>
<td>150 – 155</td>
<td>150 – 155</td>
</tr>
<tr>
<td>Uniformity (9 = Excellent; 1 = Poor)</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Standability (9 = Excellent; 1 = Poor)</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Plant height (cm)</td>
<td>165</td>
<td>170</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Average oil content</td>
<td>40%</td>
<td>43%</td>
<td>40%</td>
<td>42%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>PAN 7100</th>
<th>PAN 7057</th>
<th>PAN 7080</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing season</td>
<td>Medium Late</td>
<td></td>
<td></td>
</tr>
<tr>
<td>± Days to 50% flowering*</td>
<td>76</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>± Days to physiological maturity*</td>
<td>130</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>± Days to harvest</td>
<td>150 – 155</td>
<td>150 – 155</td>
<td>150 – 155</td>
</tr>
<tr>
<td>Uniformity (9 = Excellent; 1 = Poor)</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Standability (9 = Excellent; 1 = Poor)</td>
<td>8</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Plant height (cm)</td>
<td>160</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>Average oil content</td>
<td>43%</td>
<td>43%</td>
<td>40%</td>
</tr>
</tbody>
</table>

* Varies according to planting date and temperatures during growing season.

<table>
<thead>
<tr>
<th>Uniformity and Standability</th>
<th>Excellent (9)</th>
<th>Average (5)</th>
<th>Poor (1)</th>
</tr>
</thead>
</table>
CLEARFIELD® HERBICIDE PROGRAMME

CLEARFIELD® Herbicide Programme
- Successful control, apply at 2 – 6 leaf stage of weeds
- Poor water quality use Imiboost at 2%
- Soil application 150 – 200 litre water/ha

<table>
<thead>
<tr>
<th>Subsequent Crops</th>
<th>Waiting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEARFIELD® sunflower</td>
<td>NONE</td>
</tr>
<tr>
<td>Wheat</td>
<td>4 months</td>
</tr>
<tr>
<td>Grain sorghum</td>
<td>5 months</td>
</tr>
<tr>
<td>Dry beans</td>
<td>5 months</td>
</tr>
<tr>
<td>Cabbage</td>
<td>9 months</td>
</tr>
<tr>
<td>Conventional sunflower</td>
<td>8 months</td>
</tr>
<tr>
<td>Maize</td>
<td>10 months</td>
</tr>
<tr>
<td>Other crops</td>
<td>20 months</td>
</tr>
</tbody>
</table>

CLEARFIELD® PLUS and EURO-LIGHTNING® are the registered trademarks of BASF.

Lasso MT/ Dual Gold / Metagan Gold

Euro-lightning @ 1 l/ha
Ideal at 4 leaf (V4) stage of weeds

Diseases’ biggest influence
Critical moisture requirement
Physiological maturity
Ready for harvest 10% moisture

Top dressing
Weed control important

Development stages*

<table>
<thead>
<tr>
<th>VO</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
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<td>75</td>
<td>85</td>
<td>95</td>
<td>115</td>
<td>135</td>
<td>155</td>
<td></td>
</tr>
</tbody>
</table>

Germination and seedling establishment
Leaf development
Flower bud stage
Flowering stage
Seed development

* Planting date/climate may influence development.
CROP TIPS FOR SUCCESS:
Some of the important aspects for successful soybean production:

1. Select the cultivar that is adapted to your environment and stay at the forefront of the latest genetics.

2. Make sure the basic principles of grain production are correct, things like good soil-to-seed contact, fertilisation, weed control and a good, even plant population.

3. Apply phosphorus and potassium according to the expected withdrawal rates.

4. A final plant population of 240 000 – 280 000 plants per hectare (0.76 m and 0.91 m wide rows) is ideal for most areas and conditions. Remember to compensate with more seed as conditions may require.

5. The best management practice is your footsteps in your fields.

Advice from the field
Nico Barnard – Agronomist – Mpumalanga
Nico Barnard is a born agriculturalist. “What a privilege it is to have grown up in the bush, between the Sweet Thorn, Wild Syringa and Hook-thorn trees. I’ve had my hands in the soil since childhood and planted every seed I could find.”

Nico’s career has focused on maize and soybeans for the past 16 years. “There are few things as beautiful to me as a healthy field of soybeans after a good rain.”

“The best management practice is your footsteps in your fields.”
A good rotation programme in your cropping system is one of the practices that will sustain your farming business for the future. Soybeans offer many advantages as a rotation crop, particularly in combination with maize in the medium and high potential areas. PANNAR’s soybean package is versatile and should give you the best chance to succeed. PANNAR has access to the very best commercial soybean cultivars, either locally bred or accessed from around the world. PANNAR’s policy is to release the best varieties possible into the South African market, regardless of where they originate. To illustrate this point, consult the 2015/16 National Cultivar Trial Results for what is considered to be an unbiased evaluation of all the cultivars competing in the marketplace. PANNAR varieties held the top position in the cool, moderate and hot regions, as well as the overall top position. A clean sweep! An overall top position was achieved again in 2016/17. These amazing performances were also reflected in PANNAR’s internal trial results. We are reliant on incremental gains in yield over a long term in soybeans; however, with PANNAR’s new cultivars a big leap in genetic potential has occurred.

Superb soybeans, grow and reap success

Farming for the future means building your farming operation on a long-term vision and objectives that will keep you in business for generations. The versatile PANNAR soybean package has unparalleled stability at different yield potential levels and over different production regions. It is a proven and safe choice.
There has been a renewed interest in the soybean cultivar market in recent times. PANNAR is the only seed company that has supported the soybean industry with cultivar research and development unabated since the 1970’s, so for us, the growth in the market is a reward for perseverance. Together, we will continue to farm for the future.

PANNAR has managed to contain the cultivar package to six exceptional products, offering a full range of maturity classes that will cover almost all planting date/production area combinations. In our case, less is more.

**GLYPHOSATE TOLERANT CULTIVARS**

4 Maturity Class: Cool regions

**PAN 1454R – First across the finish line**
- A quick-maturing cultivar for regions with a restricted growing season, especially if the need is to combine early.
- Robust cultivar ideally suited to the cooler eastern Highveld.
- High oil content.
- Not recommended for the warm production regions.

5 Maturity Class: Temperate regions and later planting in warm regions (Irrigation)

**PAN 1532R – Widely adapted to cool and temperate regions**
- Very good, stable performance across all production areas.
- An excellent irrigated cultivar.
- First choice for wheat/soybean rotation.
- Upright plant type, well adapted to high plant populations and narrow inter-row spacing.
- Very good standability and harvests easily.

6 Maturity Class: Early planting in temperate areas and main planting in warm dryland areas

**PAN 1521R – Crowned Miss South Africa, the new queen of soy**
- If we need to single out a cultivar for preferential planting it is PAN 1521R.
- Exceptional stability across all regions: Equally well suited to cool, moderate and hot regions.
- Consistent performance over seasons.
- A winning combination of yield and agronomic characteristics.

**NOTES**
### SOYBEAN CULTIVAR RECOMMENDATIONS FOR THE DIFFERENT REGIONS

<table>
<thead>
<tr>
<th>Growth Class (MG)</th>
<th>Cool regions</th>
<th>Eastern temperate regions</th>
<th>Dry warm region</th>
<th>Hot regions (Irrigation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early (4 – 5)</td>
<td>PAN 1454R*</td>
<td>PAN 1454R*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium (5 – 6)</td>
<td>PAN 1532R</td>
<td>PAN 1532R</td>
<td>PAN 1521R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAN 1521R</td>
<td></td>
<td>PAN 1521R</td>
<td></td>
</tr>
<tr>
<td>Late (6 – 7)</td>
<td>PAN 1623R</td>
<td></td>
<td>PAN 1623R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAN 1644R</td>
<td></td>
<td>PAN 1644R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAN 1653R</td>
<td></td>
<td>PAN 1653R</td>
<td></td>
</tr>
</tbody>
</table>

*PAN 1454R should be limited as a smaller portion of the total package. PAN 1521R and PAN 1623R are two cultivars with exceptional performance and are complemented by PAN 1532R, a slightly quicker alternative and the two new additions to our range: PAN 1644R and PAN 1653R.

### SOYBEAN CULTIVARS - AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>PAN 1454R</th>
<th>PAN 1532R</th>
<th>PAN 1521R</th>
<th>PAN 1623R</th>
<th>PAN 1644R</th>
<th>PAN 1653R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing season (MG*)</td>
<td>4,3</td>
<td>5,3</td>
<td>5,7</td>
<td>6,1</td>
<td>6,7</td>
<td>6,7</td>
</tr>
<tr>
<td>Growth type**</td>
<td>Ind.</td>
<td>Ind.</td>
<td>Ind.</td>
<td>Ind.</td>
<td>Ind.</td>
<td>Det.</td>
</tr>
<tr>
<td>Relative maturity</td>
<td>Early</td>
<td>Early</td>
<td>Early</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Plant height*** (cm)</td>
<td>78</td>
<td>63</td>
<td>82</td>
<td>82</td>
<td>78</td>
<td>69</td>
</tr>
<tr>
<td>Pod height (9 = High, 1 = Low)</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Standability (9 = Excellent, 1 = Poor)</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Shattering resistance (9 = Excellent, 1 = Poor)</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Average seed count**** (seeds/kg)</td>
<td>4 650</td>
<td>5 759</td>
<td>5 865</td>
<td>6 000</td>
<td>6 222</td>
<td>5 971</td>
</tr>
</tbody>
</table>

* Maturity Group (MG). **Indeterminate (Ind.) or Determinate (Det.). *** Varies according to planting date and temperatures during growing season. **** Seed mass may vary between seasons.
CROP TIPS FOR SUCCESS:

Grant most commonly sees as an opportunity for improved crop performance is soil fertility. In general terms, farmers who invest effectively in their soils are also the ones who consistently have the higher farm average yields at the end of the season.

1. Getting a good, even plant stand of seedlings that emerge uniformly. This is achieved by using quality seed planted into an even, moist seedbed.

2. Making sure that weeds are well controlled. Weed pressure can be severely yield-limiting in dry beans. Weeds will also hinder harvest at the end of the season.

3. Effective pest control – regular scouting for disease and insect pests is crucial to success.

4. A good crop rotation plan that includes monocotyledonous crops. Pay careful attention to the residual action of any herbicides used in your rotation.

Implementing these management actions will help unlock yield potential in dry bean plantings.

Advice from the field

Grant Pringle – Agronomist – KwaZulu-Natal

“Having grown up and spending my entire working career in KwaZulu-Natal, minimum tillage systems and disease management are areas in which I have strong experience. During my nearly 10 years of service at PANNAR SEED, I have enjoyed working with farmers to understand their specific systems and needs. Offering advice on how they could adjust or improve production aspects to convert untapped potential into outputs. It is immensely gratifying when these often small changes have a resoundingly positive impact on a farmer’s system.”
The dry bean industry in South Africa is vulnerable to influences on many fronts. There are few players in the market (seed and grain), which means that individual elements within the market could have potentially large impacts.

### Reliable Dry Beans

Two breeding programmes contribute to the vast majority of the cultivars released. A relatively small number of farmers contribute to the grain deliveries, while a small number of traders influence local grain prices and China dictates the quality and price of imported dry beans.

This said, it is a good business to be in. Dry bean farmers are specialists and it will remain this way for years to come, even if mechanisation of harvesting reduces the risk factor. PANNAR has been at the forefront of the drive to mechanise dry bean production and has been focusing on the transfer of technology to assist farmers in mechanising their harvesting process. Progress is, however, slow in both cultivar development and improvement in cultural practices which will facilitate mechanisation.

Grain quality is an important attribute in our selection process. Despite the complexity of breeding for a number of additional selection criteria, PANNAR has made important improvements. Because of the overriding effects of season, farmers would generally not be aware of incremental yield gains. When seasonal fluctuations are removed, our data shows that yield improvement in our sugar bean programme is 130 kg per hectare per year, calculated over ten seasons at Delmas. Whilst new cultivars are slow to reach the market for a multitude of reasons, the mechanism that delivers the new cultivars to your farm gate is healthy. Embrace the crop; it is the sharpest arrow in our multi-crop quiver.

### RED SPECKLED BEANS

A top-performing, red speckled bean package that offers exceptional yield performance and stability. The package provides a cultivar for all production systems, from the high input, mechanised operation to the low input, subsistence setup.

**PAN 148 – A proven performer**
- The most popular cultivar in the PANNAR dry bean package.
- An integral player in dry bean production in South Africa.
- Maintains excellent performance in multi-season national strip trials in Mpumalanga and the eastern Free State.
- Well adapted to all production regions and still the cultivar of choice in Mpumalanga and the eastern Free State.
- Responds well to fungicide spray in moist environments.

**PAN 9292 – The best in the west**
- A cultivar similar to PAN 116, but with some significant improvements.
- PAN 9292 is especially well suited to the North West production regions. It displays good general disease resistance, wide area adaptability and increased yield stability.
- Grain quality is good. The smaller, rounder bean reduces potential for mechanical damage during harvest.
- The good all-round disease resistance makes it an excellent choice for both small-scale producers and large commercial farmers.

**PAN 9216 – Red flower, indeterminate growth habit**
- Good performance in statistical trials and strip trials.
- Potential for direct mechanical harvesting with a combine harvester.
- Important agronomic traits: indeterminate growth habit; excellent standability; large seeded.
- Good grain quality and superior cooking characteristics makes this variety the consumer’s first choice in sugar bean varieties.
- Unique red flower makes it recognisable anywhere in the world.
- Excellent general disease tolerance, including Rust, Angular Leaf Spot, Root Rots and BCMV resistance.

### SMALL WHITE CANNING BEAN

A winning combination of exceptional yield, disease tolerance and grain quality.

**PAN 123 – A top performer**
- The first choice in small white canning beans in South Africa.
- Accepted by all major canning companies.
- Good yield potential and Rust resistance makes for a widely adapted cultivar.
- Cultivar of choice in the eastern Highveld.
- Excellent performance in all major canning bean production regions.

**PAN 9141 – A new top performer (NEW)**
- Restricted release while factory-scale canning tests are conducted.
- Has similar agronomic qualities to PAN 123, but has improved resistance to Anthracnose.
- Has been selected to have a more uniform grain size, to improve canning grade.
## DRY BEAN CULTIVARS - AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>PAN 148</th>
<th>PAN 9292</th>
<th>PAN 9216</th>
<th>PAN 123</th>
<th>PAN 9141</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bean type</td>
<td>Red speckled</td>
<td>Red speckled</td>
<td>Red speckled</td>
<td>Small white canning</td>
<td>Small white canning</td>
</tr>
<tr>
<td>± Days to 50% flower</td>
<td>50 – 60</td>
<td>50 – 60</td>
<td>50 – 60</td>
<td>50 – 60</td>
<td>50 – 60</td>
</tr>
<tr>
<td>± Days to maturity</td>
<td>100 – 120</td>
<td>100 – 120</td>
<td>100 – 120</td>
<td>100 – 120</td>
<td>100 – 120</td>
</tr>
<tr>
<td>Planting date – Temperate areas</td>
<td>Dec/mid-Jan</td>
<td>Dec/mid-Jan</td>
<td>Dec/mid-Jan</td>
<td>Dec/mid-Jan</td>
<td>Dec/mid-Jan</td>
</tr>
<tr>
<td><strong>Diseases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angular Leaf Spot (ALS)</td>
<td>S</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Rust</td>
<td>MR</td>
<td>MR</td>
<td>MR</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>BCMV</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Seed size: seeds/kg***</td>
<td>2 000</td>
<td>2 500</td>
<td>1 900</td>
<td>4 500</td>
<td>4 500</td>
</tr>
<tr>
<td><strong>Recommended Planting Rate (kg/ha)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 cm rows x 7.5 cm (148 000 seeds/ha)</td>
<td>74</td>
<td>59</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 cm rows x 5 cm (222 000 seeds/ha)</td>
<td>111</td>
<td>89</td>
<td>117</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 cm rows x 7.5 cm (178 000 seeds/ha)</td>
<td>89</td>
<td>71</td>
<td>94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dryland (small white) (245 000 seeds/ha)</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Irrigation and High Potential Dryland (small white) (260 000 seeds/ha)</td>
<td></td>
<td></td>
<td></td>
<td>65</td>
<td>65</td>
</tr>
</tbody>
</table>

* Indeterminate (Ind.) / Determinate (Det.). ** Diseases: S - Susceptible, MS - Moderately susceptible, MR - Moderately resistant, R - Good resistance. *** Seed mass may vary between seasons.
“Sorghum is 30% more moisture efficient than maize”

Advice from the field

Pieter Rademeyer – Agronomy Manager

Pieter has immersed himself in agriculture, devoting his career to the pursuit of deeper understanding of the complexities of agronomy. This point is endorsed by his motto: “You have to approach every day with enthusiasm and a view to help farmers achieve their goals. This can only be accomplished by bringing them expertise - the foundation of success. You need to learn something new every day to enrich yourself – by being observant and having an enquiring mind, you will find that agriculture is a gold mine of knowledge waiting to be tapped”.

CROP TIPS FOR SUCCESS:

1. Grain sorghum can withstand drought conditions better than maize and deliver better economic results on marginal and heavy clay soils. One of the advantages of grain sorghum is that it responds to drought stress by entering a dormant phase. The stems and leaves have a waxy layer that protect them from dehydration.

2. Sorghum is 30% more moisture efficient than maize, making it a good alternative on marginal soils and especially in the drier production region. Just as in the case of maize, the sorghum seedling is very sensitive to weed competition and it should be avoided at all costs.

3. PANNAR’s grain sorghum seed is treated with CONCEP® seed safener, allowing for the use of a pre-emergence grass herbicide.

4. Regular inspection for bollworm infestation is essential and spraying should take place if threshold levels are reached. Grain sorghum with an open-type panicle give a much better opportunity to control the infestation. Use two different chemical groups in combination to control the pest, as bollworms are resistant to most synthetic pyrethroids.
The PANNAR grain sorghum package maintains an excellent record of performance in the ARC and PANNAR trials. PAN 8944 and PAN 8816 are recommended as the main planting for all grain sorghum production regions. PAN 8944 is particularly well suited to the milling industry. PAN 8816 has excellent yield stability and area adaptability. It is a malting hybrid, also very suitable for the milling industry.

Medium Growth Class

**PAN 8944 – Good milling quality (NEW)**
- Suitable for all production regions, specifically Limpopo.
- Uniform growth habit and very good head length (panicle).
- Attractive bright red grain.
- Large-seeded with high bushel weight.
- Classified GM with good milling characteristics.
- Good early start high cold tolerance.
- Excellent standability and good general leaf disease tolerance.
- Good Head Smut and Fusarium tolerance.

Medium Late Growth Class

**PAN 8816 – The best hybrid in the PANNAR package**
- Excellent yield potential and stability.
- Very uniform growth habit and good standability.
- Attractive plant type.
- Large-seeded grain, high bushel weight and good threshability.
- Classified GM; good malt quality.
- Well suited to ethanol production.
- Good general leaf disease tolerance.
- Good Head Smut tolerance. Plant where Head Smut problems have occurred in the past.
- Open head (panicle) facilitates spraying.

Late Growth Class

**PAN 8625 – Speciality bitter sorghum**
- Outstanding yield performance and agronomic characteristics.
- Widely adapted.
- Bitter grain type; classified GH. Good malt quality.
- Medium plant height with good standability.
- Good tolerance to Head Smut.

### GRAIN SORGHUM HYBRIDS – AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Growing Characteristics</th>
<th>PAN 8944</th>
<th>PAN 8816</th>
<th>PAN 8625</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing season</td>
<td>Medium Early</td>
<td>Medium Late</td>
<td>Late</td>
</tr>
<tr>
<td>± Days to 50% flowering</td>
<td>60 – 65</td>
<td>79 – 81</td>
<td>82 – 85</td>
</tr>
<tr>
<td>± Days to harvest</td>
<td>120 – 130</td>
<td>135 – 142</td>
<td>140 – 145</td>
</tr>
<tr>
<td>Plant height (cm)</td>
<td>105 – 110</td>
<td>112 – 117</td>
<td>120 – 130</td>
</tr>
<tr>
<td>Uniformity (9 = Excellent, 1 = Poor)</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Standability (9 = Excellent, 1 = Poor)</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Threshability (9 = Excellent, 1 = Poor)</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Head Smut (9 = Excellent, 1 = Poor)</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Plant colour</td>
<td>Purple</td>
<td>Purple</td>
<td>Purple</td>
</tr>
<tr>
<td>Grading</td>
<td>GM</td>
<td>GM</td>
<td>GH</td>
</tr>
<tr>
<td>Seed colour</td>
<td>Red</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Seed size* (seeds/kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 1</td>
<td>25 600</td>
<td>25 500</td>
<td>26 500</td>
</tr>
<tr>
<td>Class 2</td>
<td>33 000</td>
<td>34 000</td>
<td>33 600</td>
</tr>
</tbody>
</table>

*Estimated seed mass may vary between seasons*
It is important when selecting a hybrid to identify the correct hybrid for a specific application as their characteristics may vary significantly with regards to regeneration (regrowth), yield potential and sugar content.

PANNAR forage sorghum hybrids are grain sorghum crossed with Sudan grass. The result is a high yielding grass that can be manipulated by flowering date and growth habit to make it ideal for silage, grazing, foggage or green chop.

These crops require nitrogen fertilisation to achieve their production potential. A guideline is 16 kg N per tonne of dry material (DM). Apply 40 – 60 kg N per ha after every utilisation. Ask your PANNAR representative for the yield potential of your area. The above is simply a guideline and various other factors also play a role in the recommended nitrogen application rate. The best planting time is from October to December, as soon as the minimum soil temperature rises above 16°C.

### Hybrid Characteristics and Use

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Characteristics and Use</th>
<th>Seeding Rate kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANN 868 Late flowering</td>
<td>This hybrid has the best yield potential in the package. The high yield potential of PANN 868 comes into its own when it is allowed to grow out once to 75 to 100 cm and then used as grazing, for ensiling, in a green chop system (cut and carry) or as foggage in early winter (May/June). It flowers at about 130 days, which means that it stays in the vegetative stage for an extended period of time and produces an abundance of good quality, palatable leaves and stems. The sucrose content of the hybrid is high (approximately 15 Brix). It has very good drought and leaf disease tolerance. The standability is excellent for a hybrid that grows up to 2,8 m tall.</td>
<td>Rainfall &lt;600 mm: Rows: 4 – 6, Broadcast: 15&lt;br&gt;Rainfall &gt;600 mm: Rows: 7 – 15, Broadcast: 20</td>
</tr>
<tr>
<td>PANN 888 Normal Sorghum</td>
<td>The best regrowth capacity in the package. Use in a grazing system where it is utilised two to three times as grazing or for green chop purposes. Graze when the forage reaches a height of approximately 75 to 100 cm; graze it to a height of no less than 25 cm for good regrowth. Flowering date is approximately 75 to 80 days. Widely adapted with the best drought tolerance in the package.</td>
<td>Rainfall &lt;600 mm: Rows: 4 – 6, Broadcast: 15&lt;br&gt;Rainfall &gt;600 mm: Rows: 7 – 15, Broadcast: 20</td>
</tr>
</tbody>
</table>

General: Take necessary prussic acid precautions when any forage sorghum is grazed. Forage sorghum is not suitable for horses.
CROP TIPS FOR SUCCESS:

1. The most important element in crop cultivation is to try to do the basics right at the beginning and if that is achieved, further refinements can be made to achieve top yields.

2. When cultivating wheat, it is very important to make sure that all necessary soil preparations have been done to ensure a good, weed-free seedbed. With this in the pocket, a major part of the game has already been won.

3. Cultivar selection is of paramount importance, because cultivars prefer certain planting dates to achieve their full potential.

4. The importance of a good fertilisation programme cannot be over emphasised, because what you sow is what you will reap. The time and rates applied play a major role, especially under irrigation and it is risky to apply too much nitrogen too soon.

5. Next is good weed management; weeds must be controlled as quickly and efficiently as possible to limit crop competition to ensure a top yield.

6. Finally, water management can make or break your yield potential.

Advice from the field

Hendrik Linde – Agronomist – Western Free State

Hendrik grew up on a farm in the Free State. “I inherited my passion for agriculture from my Dad who, rather than teaching me how to farm, led by example showing me the meaning of farming.” Hendrik applies this meaning to his career as an agronomist, helping farms and farmers to flourish.

“The most important element in crop cultivation is to try to do the basics right from the beginning.”
PANNAR’s wheat breeding programme makes a major contribution to local wheat production. The programme focuses on improving the yield potential of wheat production in South Africa, as well as the development of cultivars with new sources of resistance to Russian Wheat Aphid and Rust.

PANNAR cultivars maintain an excellent track record in the ARC Small Grains Institute’s national trials, confirming the package’s excellent yield potential and adaptability in the various local production regions.

PANNAR’s dryland package consists of true winter, winter and intermediate wheat cultivars. There are several highlights. PAN 3111 is a true winter type with excellent yield potential and has excellent standability due to its shorter straw. PAN 3161 is a true winter type and has a combination of good aluminium tolerance and Russian Wheat Aphid resistance. PAN 3161 seedlings grow vigorously and the cultivar is an excellent choice on fields with a wind risk. In the intermediate growing period PAN 3368 is a good choice for later plantings in the central and eastern production areas of the Free State.

PANNAR is a “one-stop seed supplier” in the various irrigation areas. The package boasts high potential irrigation cultivars divided into three growing period classes: medium late, medium and medium early. The package consists of PAN 3497, PAN 3471 and PAN 3400. PAN 3497 performed exceptionally well in the ARC national trials and, with its slightly longer growing period compared to PAN 3471, it is more suitable for early plantings. PAN 3400, with a quick growing period and excellent yield potential, is ideal for later plantings. The PANNAR package is the obvious choice for the irrigation farmer.

Wheat cultivars classified as resistant to Rust and Russian Wheat Aphid must, as with susceptible cultivars, still be monitored for the occurrence of these pests, since new races/biotypes that have the ability to overcome the resistance may develop. Factors such as disease pressure, appearance of symptoms at the seedling stage and prevailing climatic conditions may also affect the effectiveness or expression of resistance.

### WHEAT CULTIVARS – AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Growth Class</th>
<th>Cultivar</th>
<th>Area Adaptability and Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRYLAND, SUMMER</td>
<td>PAN 3111</td>
<td>Exceptionally wide area adaptability with top performance in the ARC national trials. High yield potential, good aluminium tolerance and excellent standability provided by its shorter straw length. It has a high cold requirement and is more suited to early plantings.</td>
</tr>
<tr>
<td>True Winter Types</td>
<td>PAN 3161</td>
<td>Good yield potential and wide area adaptability, exceptionally strong seedling vigour and shorter straw length providing excellent standability. Russian Wheat Aphid resistance and good aluminium tolerance.</td>
</tr>
<tr>
<td>Intermediate Type</td>
<td>PAN 3368</td>
<td>A top performer in the eastern Free State. Resistant to two of the Russian Wheat Aphid biotypes and particularly suitable for cultivation in the central and eastern Free State.</td>
</tr>
<tr>
<td>DRYLAND, SUMMER</td>
<td>PAN 3471</td>
<td>PAN 3471 is certainly the top performer in the medium growing period class. PAN 3471 is the top choice for the main planting because of its consistent and reliable performance across various seasons, planting dates, environments and at different yield potential levels. PAN 3471 has good straw strength and standability. It displays good resistance to Stripe and Leaf Rust pathotypes.</td>
</tr>
<tr>
<td>IRIGATION</td>
<td>PAN 3497</td>
<td>The medium late grower PAN 3497 is the number one choice for early plantings. It has an excellent yield potential at early plantings and achieves top performance in the ARC Small Grains Institute’s trials. It has good stooling capacity, grading characteristics and tolerance to Stripe Rust. The cultivar is susceptible to Leaf Rust.</td>
</tr>
<tr>
<td>IRIGATION</td>
<td>PAN 3400</td>
<td>A top performer in the medium to early growing period class and a good choice for planting at medium to late planting dates. Its shorter straw makes PAN 3400 suitable for higher seeding rates as required by later planting dates to compensate for the reduced stooling capacity as temperatures rise later in the season. Irrespective of its growing period, PAN 3400 competes favourably yield-wise. PAN 3400 is resistant to Stripe Rust and moderately susceptible to Leaf Rust.</td>
</tr>
<tr>
<td>WESTERN CAPE</td>
<td>PAN 3471</td>
<td>Has a high yield potential, good straw strength, standability and shows good resistance to current Leaf Rust and Stripe Rust pathogenic types. PAN 3471 is very well suited to dryland cultivation in the Western Cape, as supported by its performance in the ARC test results.</td>
</tr>
<tr>
<td>Spring Types</td>
<td>PAN 3408</td>
<td>A cultivar with a medium late growing period with stable, consistently high yields over many seasons in the Ríens and Swartland production areas. PAN 3408 is resistant to Stripe Rust and moderately susceptible to Leaf and Stem Rust.</td>
</tr>
</tbody>
</table>
More accurate area planting date recommendations are provided on PANNAR’s website and in the ARC-SGI Wheat Production Guide. The information below provides only broad guidelines.

**Cooler Central Irrigation Areas**
(Lower Vaal and Orange River Areas)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Planting Date</th>
<th>Seeding Rate kg/ha</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAN 3400</td>
<td>10/6 – 31/7</td>
<td>110 – 130</td>
<td>275 – 325</td>
</tr>
<tr>
<td>PAN 3471</td>
<td>5/6 – 25/7</td>
<td>100 – 120</td>
<td>250 – 300</td>
</tr>
<tr>
<td>PAN 3497</td>
<td>1/6 – 20/7</td>
<td>90 – 110</td>
<td>225 – 275</td>
</tr>
</tbody>
</table>

**Warmer Irrigation Areas**
(Limpopo)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Planting Date</th>
<th>Seeding Rate kg/ha</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAN 3400</td>
<td>15/5 – 15/7</td>
<td>110 – 130</td>
<td>275 – 325</td>
</tr>
<tr>
<td>PAN 3471</td>
<td>6/5 – 5/7</td>
<td>100 – 120</td>
<td>250 – 300</td>
</tr>
<tr>
<td>PAN 3497</td>
<td>1/5 – 25/6</td>
<td>90 – 120</td>
<td>225 – 300</td>
</tr>
</tbody>
</table>

**Eastern Highveld**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Planting Date</th>
<th>Seeding Rate kg/ha</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAN 3400</td>
<td>1/7 – 5/8</td>
<td>110 – 130</td>
<td>275 – 325</td>
</tr>
<tr>
<td>PAN 3471</td>
<td>25/6 – 31/7</td>
<td>100 – 120</td>
<td>250 – 300</td>
</tr>
<tr>
<td>PAN 3497</td>
<td>25/6 – 25/7</td>
<td>90 – 120</td>
<td>225 – 300</td>
</tr>
</tbody>
</table>

**KwaZulu-Natal**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Planting Date</th>
<th>Seeding Rate kg/ha</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAN 3400</td>
<td>5/6 – 10/7</td>
<td>110 – 130</td>
<td>275 – 325</td>
</tr>
<tr>
<td>PAN 3471</td>
<td>1/6 – 5/7</td>
<td>100 – 130</td>
<td>250 – 325</td>
</tr>
<tr>
<td>PAN 3497</td>
<td>1/6 – 30/6</td>
<td>100 – 120</td>
<td>250 – 300</td>
</tr>
</tbody>
</table>

**Western Cape**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Swartland</th>
<th>West and South Rûens</th>
<th>East Rûens</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAN 3408 (PTR)</td>
<td>1/5 – 31/5</td>
<td>1/5 – 31/5</td>
<td>25/4 – 31/5</td>
<td>175 – 225</td>
</tr>
<tr>
<td>PAN 3471 (PTR)</td>
<td>1/5 – 31/5</td>
<td>1/5 – 31/5</td>
<td>25/4 – 5/6</td>
<td>175 – 225</td>
</tr>
</tbody>
</table>

**NOTES**

- Wheat seed is available from: Overberg Agri at Moorreesburg: PAN 3408. PANNAR’s depot at Swellendam: PAN 3471.
- PTR: Cultivar protected by plant breeder’s rights.
# WHEAT CULTIVARS – AGRONOMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>Irrigation</th>
<th>Western Cape</th>
<th>Dryland Free State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PAN 3400</td>
<td>PAN 3471</td>
<td>PAN 3497</td>
</tr>
<tr>
<td>± Days to 50% Flowering*</td>
<td>Warm</td>
<td>94</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Cool</td>
<td>104</td>
<td>109</td>
</tr>
<tr>
<td>± Days to Physiological Maturity*</td>
<td>Warm</td>
<td>144</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>Cool</td>
<td>154</td>
<td>159</td>
</tr>
<tr>
<td>± Days to Harvest (&lt;15% moisture)*</td>
<td>Warm</td>
<td>154</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td>Cool</td>
<td>164</td>
<td>169</td>
</tr>
<tr>
<td><strong>Yield Potential and Adaptability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Cape</td>
<td>9</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Eastern Free State</td>
<td>9</td>
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<tr>
<td>Central Free State</td>
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</tr>
<tr>
<td>North Western Free State</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>South Western Free State</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Irrigation</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td><strong>Agronomic/Quality Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hectolitre Mass</td>
<td>7</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Pre-harvest Sprouting Tolerance**</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Aluminium Tolerance**</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Coleoptile Length</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Russian Wheat Aphid Resistance#</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Leaf Rust***</td>
<td>5</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Stem Rust***</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Stripe Rust***</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Standability</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

*Planting date/climate may influence data.
† Suited to supplementary irrigation in winter dryland region.
**Data obtained from ARC-Small Grains Institute.
#Biotype info: PAN 3161 and PAN 3368 are resistant against RWASA1 and 2.
***Screened for reaction to prevailing pathotypes.
Forage Crops

PANNAR SEED is a leader in the certified pasture seed industry and complies with the regulations for genetic and physical quality set by the Seed Certification Scheme. PANNAR is synonymous with quality. We have a wealth of expertise in planted pasture and a wide range of versatile cultivars to meet your unique needs. PANNAR’s forage crops are thoroughly tested under local growing conditions for high carrying capacity and palatability for sustainable animal production.

MILD OR WINTER FORAGE CROPS

<table>
<thead>
<tr>
<th>Crops</th>
<th>Establishment</th>
<th>Seeding Rate (kg/Ha)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rainfall (mm)</td>
<td>Broadcast</td>
</tr>
<tr>
<td>RYEGRASS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUKARI Italian Diploid</td>
<td>Feb – Apr or</td>
<td>Irrigation 25 – 30</td>
<td>20 – 25</td>
</tr>
<tr>
<td></td>
<td>Aug – Sept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RYEGRASS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOYAGER 10 Westervold</td>
<td>Feb – Apr</td>
<td>Irrigation 35</td>
<td>30 – 35</td>
</tr>
<tr>
<td>Tetraploid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERENNIAL RYEGRASS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASE Tetraploid</td>
<td>Feb – Apr or</td>
<td>Irrigation 30 – 35</td>
<td>25 – 35</td>
</tr>
<tr>
<td></td>
<td>Aug – Sept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAPANESE RADISH:</td>
<td></td>
<td>Supl. Irrig./Dryland</td>
<td>–</td>
</tr>
<tr>
<td>ENDURANCE</td>
<td>Dec – Jan/Feb</td>
<td></td>
<td>2 – 3.5</td>
</tr>
<tr>
<td>OATS:</td>
<td></td>
<td>Supl. Irrig./Dryland</td>
<td>50 – 70</td>
</tr>
<tr>
<td>LE TUCANA Intermediate</td>
<td>Feb – Mar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAJORIS Spring Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRITICALE:</td>
<td></td>
<td>Supl. Irrig./Dryland</td>
<td>60 – 80</td>
</tr>
<tr>
<td>PAN 248 Intermediate</td>
<td>Feb – Apr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAN 299 True Winter</td>
<td></td>
<td></td>
<td>35 – 45</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STOOLING RYE:</td>
<td></td>
<td>Supl. Irrig./Dryland</td>
<td>40 – 60</td>
</tr>
<tr>
<td>STOOLING RYE:</td>
<td>Mar – Apr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOROM Spring Type</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
## SUMMER FORAGE CROPS

<table>
<thead>
<tr>
<th>Crops</th>
<th>Establishment</th>
<th>Seeding Rate (kg/Ha)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rainfall (mm)</td>
<td>Broadcast</td>
</tr>
<tr>
<td><strong>FORAGE SORGHUM</strong></td>
<td>End Oct – Jan</td>
<td>&lt;600 mm</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;600 mm</td>
<td>20</td>
</tr>
<tr>
<td><strong>TEFF: ROOIBERG</strong></td>
<td>Oct – Dec</td>
<td>&gt;600 mm</td>
<td>15 – 20</td>
</tr>
<tr>
<td><strong>LUCERNE: PAN 4770</strong></td>
<td>Cool areas:</td>
<td>&lt;700</td>
<td>–</td>
</tr>
<tr>
<td>Intermediate Dormant</td>
<td>Feb – Apr</td>
<td>700 – 900</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Warm areas:</td>
<td>Irrigation</td>
<td>20 – 25</td>
</tr>
<tr>
<td><strong>PAN 4992</strong></td>
<td>Mar – Jun</td>
<td>Irrigation</td>
<td>20 – 25</td>
</tr>
</tbody>
</table>

### NOTES

- Forage Sorghum (see page 47)
- Forage Sorghum suitable for grazing, green chop or silage. Types with high sugar contents are also suitable for forage.
- Teff: Rooiberg suitable for hay for horses.
- Lucerne: PAN 4770 and PAN 4992 suitable for hay production or grazing.
### RSA Regional Offices

#### HEAD OFFICE
- **PO Box 19, Greytown 3250**
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#### PRODUCT AGROMONIST EASTERN PRODUCTION REGION
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#### AGROMONIST
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  - **Cell no:** 079 527 7695

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- **Tel:** (056) 216 3013

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  - **Cell no:** 072 665 6488

#### NORTHERN CAPE
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- **Tel:** (018) 406 1717

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  - **Cell no:** 082 921 0887

#### AGROMONIST
- **Klaas van Wyk**
  - **Cell no:** 072 665 6488

#### Eastern Highveld and Limpopo
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- **GPS:** S26.14488° E28.70768°
- **Tel:** (013) 665 8500

#### AREA SALES MANAGER
- **André du Randt**
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#### AGROMONIST
- **Nico Barnard**
  - **Cell no:** 082 850 1503
RSA Regional Map

Sales Representatives

Bela-Bela  Christo Jacobs  083 283 4251
Bethal    Willem du Plessis  071 676 2296
Bethlehem Lofie van den Berg  082 375 0277
Bloemfontein Charl van der Merwe  082 785 1216
Bothaville Robbie Prehn (Robvil)  082 550 7193
Bothaville Stefan Prehn (Robvil)  082 417 7193
Brits/Koedoeskop Paul Minnaar  083 996 0284
Carolina Fanie Roux  082 928 7378
Ciskei/Eastern Cape Phelisa Ndayi  064 850 8097
Coligny Jannie van Aswegen  083 449 4526
Delareyville Cornel Ferreira  079 878 6486
Delmas Zander Labuschagne  076 510 6150
Douglas Henri Grovè  082 824 8690
East London Duwal Edwards  083 228 5951
Ermelo Riaan Jacobs  082 456 8120
Frankfort Carl Otto  079 523 9980
Heidelberg/Balfour Tinus van Rensburg  082 556 9325
Hoopstad Hannelie Tait  083 967 7858
Hopetown Martin Bullock  082 921 0887
Jacobsdal Fanie Schoeman  083 650 7299
Kokstad Delia Thomson  082 332 4870
Koster Xavier Yssel  060 995 7288
Kroonstad Jan Heymans  072 560 2518
KwaZulu-Natal Midlands Andrew du Plessis  079 529 8987
Lichtenburg Ben Dunhin  082 785 7503
Lydenburg Dawie Jacobs  083 455 7969
Mafikeng Hendrik Mokoto  082 767 7333
Middelburg Francois Joubert  083 388 2617
Mpumalanga/Limpopo Reggie Mchunu  082 098 5242
North Eastern Cape Eugène Marias  083 777 7091
Parys/Heilbron Carl Otto  079 523 9980
Port Elizabeth Darryl Lloyd  082 466 7163
Potchefstroom/Vereeniging Stephan le Roux  078 612 4065
Prieska/Upington Johannes Fourie  083 260 4182
Reitz Ras Meintjes  082 925 7167
Sannieshof Pokkenos Otto  071 552 5511
Schweizer-Reneke/Vryburg Nelis Potgieter  083 780 6979
Senekal/Ficksburg Rossouw Grobbelaar  083 501 4010
Standerton Jan Saaiman  083 526 4123
Swellendam Janie de Bruyn  082 457 2245
Ventersdorp Pieter Geldenhuyse  082 929 0570
Viljoenskroon Ben Zengerink  082 927 9399
Bloemhof/Christiana/ Vaalharts/Barkley Wes Christo Nel  082 856 5430
Vryheid Frik Moolman  082 973 6671
Welkom Le Roux Breitenbach  084 451 9050
Wesselbron Martin Maartens  082 377 3618
Winterton Gavin Robinson  083 627 5769
Wolmaransstad Thys Ellis  082 613 3436
Zululand Welcome Zulu  082 973 6604
License Agreements and Stewardship for Maize, Sunflowers and Soybeans

**MAIZE**

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SC 701 Developed by SEED CO. Sold under exclusive licence by PANNAR SEED (PTY) LTD in South Africa and Namibia.

ROUNDUP READY®, YIELDGARD®, GENUITY® and design are trademarks used under license from Monsanto Technology LLC.

NB! The management of possible insect resistance to the Bt gene is legally binding. The planting of a refuge as per regulations is required where any Bt hybrids are used (B and BR). Refer to the schematic guidelines on page 32.

**SOYBEANS**

All PANNAR cultivars are tested using the rhizobial strain WB74 nodule-forming bacterial inoculant. All yield data is generated using this strain, which means that if a farmer chooses to use a different strain of rhizobium, the yield information and cultivar recommendations provided may be irrelevant.

**Glyphosate Tolerant**

Always follow grain marketing, stewardship practices and pesticide label directions. Varieties that are glyphosate tolerant (including those designated by the letter “R” in the product code) contain genes that confer tolerance to glyphosate herbicides. Glyphosate herbicides will kill crops that are not tolerant to glyphosate.

**DISCLAIMER**

The information contained in this catalogue is based on long-term results. It is given in good faith and PANNAR does not accept any legal liability in terms thereof. Information regarding disease tolerance is based on available research data as at 2017. The disease tolerance ratings are not absolute, but only guidelines and may change depending on the prevailing environmental and cultivation conditions.

All products are subject to plant-breeders’ rights and any propagation or sale of such seed is prohibited by law.

**CLEARFIELD® SUNFLOWER STEWARDSHIP GUIDELINES**

Always grow CLEARFIELD® sunflowers in a three-year rotation with other crops, i.e. non-CLEARFIELD wheat/maize/sunflower.

- Breaks the cycle of continuous sunflower production and allows use of alternate mode-of-action herbicides and tillage.
- Promotes good agronomics by reducing disease and insect pressure in sunflowers.

Use alternate (non-ALS) mode-of-action herbicides with activity on sunflowers in the rotational crop, i.e. growth regulator or photosynthesis inhibitor.

- Reduces the selection pressure from continuous dependence on the ALS-inhibiting acetolactate synthase herbicide.
- Provides alternate mode-of-action to control volunteer CLEARFIELD® sunflowers and other ALS resistant weeds present.

Limit the sole reliance on ALS herbicides to no more than two out of four years in the same field.

- Where applicable, use sequential or tank mix partner herbicides with multiple modes-of-action on target weed species in the sunflower crop and in rotational crops.

Do not plant CLEARFIELD® sunflowers on land with a history of a heavy infestation of wild sunflowers.

- Reduces the threat of outcrossing of CLEARFIELD® sunflower with wild sunflowers.

Control wild sunflowers in adjacent areas to CLEARFIELD® sunflower fields (road ditches, field borders and fence rows) through the use of non-ALS herbicides and/or mowing prior to seed set.

- Minimises the potential of cross-pollination of wild-type sunflowers with CLEARFIELD® sunflowers.
- Promotes good sanitation practices by eliminating vectors for insects and disease.

Control emerged wild sunflowers prior to planting CLEARFIELD® sunflowers with non-ALS burndown herbicides (no-till/min-till) or tillage (conventional-till).

- Reduces reliance on ALS herbicide in controlling wild sunflowers.
- Eliminates any emerged naturally occurring biotype that may be resistant to ALS-inhibiting herbicides.

Registration No. 1986/002148/07
Website: www.pannar.com
E-mail: infoserve@pannar.co.za
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