

WE ARE SMART STEWARDSHIP

BIOTECHNOLOGY GUIDE 2023

PIONEER® BRAND PRODUCTS

STEWARDSHIP OVERVIEW

A MESSAGE ABOUT STEWARDSHIP

Pioneer is committed to the responsible management of all its seed products and when Pioneer introduces a new product in the market, we are in it for the long haul. Our philosophy of product stewardship means responsible management of the life cycle of our technologies, every step of the way – from initial research to the discontinuation of a product – for maximum product value, benefits and longevity (See *Figure 1*). Therefore, for the benefit of all value chain stakeholders (i.e. technology developer, producers and consumers) Pioneer requires all growers to comply with in-country biosafety regulations, Pioneer policies and crop management strategies specific to the product. In the Pioneer Technology Use Agreement (TUA) and Terms and Conditions of Purchase, growers who purchase and plant Pioneer® brand seed with biotech traits agree to adhere to the stewardship requirements described in this guide.



Figure 1: Biotech Product Stewardship from research until product is discontinued.

Stewardship includes, without limitation, the following:

- Adhering to directions of use on all seeds, and labels for pesticides
- Seeds must be planted with an accompanying refuge of non-biotech maize seed for Insect Resistance Management (IRM). The refuge must either consist of at least 5% of the total maize crop planted (in which case the refuge may not be treated with an insecticide for the target insects), or at least 20% of the total maize crop planted if it is to be treated with an insecticide for the target insects. (See *Table 2* & *Figure 2* for more details)
- Following IRM requirements to delay the development of resistance to biotech traits by the target pest populations
- Confirming trait acceptance, intended uses, and destinations with grain handlers (prior to delivery or using those products on-farm) for crops or material containing biotech traits (as indicated on *Table 1*)
- No exportation of seeds or any other material containing biotech traits into countries where the product is not allowed or registered, including through a third party
- Implementing any additional stewardship requirements that Pioneer deems necessary for a particular product (e.g. grain or feed use restrictions and geographical planting restrictions)

WHY IS STEWARDSHIP IMPORTANT?

Proper stewardship of products is important because it offers the following benefits to growers:

- Access to Pioneer germplasm and biotech trait technologies in its seed products, subject to signing of the Technical Use Agreement.
- Protecting the long-term efficacy of Bt technologies
- Encouraging technology developers to invest in the development of better, high yield potential germplasm and additional technologies and innovations, further improving agricultural productivity for farmer's benefit

OUR COMMITMENT TO EXCELLENCE THROUGH STEWARDSHIP®

Pioneer is a member of Excellence Through Stewardship® (ETS) and Pioneer® brand products are commercialised in accordance with ETS Product Launch Stewardship Guidance and in compliance with the Pioneer policies regarding stewardship of those products. Crops and materials containing biotech traits may only be exported to or used, processed, or sold in jurisdictions where all necessary regulatory approvals have been granted for those particular crops and materials. It is a violation of national and international laws to move materials containing biotech traits across borders into jurisdictions where their import is not permitted. Growers should discuss these issues with their purchaser or grain handler to confirm the purchaser or handler's position on products being purchased. Excellence Through Stewardship® is a registered trademark of the Excellence Through Stewardship. For more information <https://www.excellencethroughstewardship.org/>.



PIONEER TECHNOLOGY USE AGREEMENT (TUA)

Pioneer has a long history of investing in intellectual property to provide growers with high performing varieties and industry leading services. Our continued commitment to product research results in brand products that consistently deliver high yield potential to help make a grower more profitable. Pioneer® brand is the flagship seed brand of Corteva Agriscience and it uses patents and Plant Variety Protection (PVP) laws to protect our investment in patented germplasm, native and transgenic traits, and breeding technologies. PVP laws give breeders exclusive control over plant varieties for up to 20 years, enabling Corteva Agriscience to bring new products to the marketplace supported by improved technology. It is important to note that Pioneer product offerings, even if not biotech, can carry multiple types of intellectual property protection, such as patented genetics, patented breeding technologies, plant variety protection, patented transgenic traits, and patented native traits, including through the terms and conditions of use found in the Pioneer TUA. The purchase of any Corteva Agriscience variety or trait is done so under license with certain limitations. By using the seed supplied in connection with a Pioneer Technology Use Agreement, you agree to the fact that the seed – and technology within that seed – includes subject matter owned by Corteva Agriscience, or licensed from a third party, that is protected under U.S. intellectual property laws. Under this contract, you agree to a single-commercial planting of the seed and agree to not bin run or save your seed.

Why is a TUA required?

- A TUA is required for the purchase of any Pioneer® brand seed – all crops, biotech and non-biotech. The TUA serves as an agreement between the customer and Pioneer demonstrating that the customer understands and agrees to follow all license terms, stewardship and applicable legal responsibilities related to their seed products.
- Even though some products do not contain biotech traits, the TUA protects the intellectual property associated with non-biotech products such as germplasm and other intellectual know-how and patents.
- The TUA grants a limited license for the grower to use/plant Pioneer® brand seed containing Corteva Agriscience sourced technologies (including germplasm, non-biotech traits, and biotech traits) and produce a single commercial crop.
- The TUA requires growers to use and follow the applicable Product Use Guide which can be obtained on the Pioneer website (www.pioneer.com/za) and labels (seed and herbicide).
- The TUA prohibits certain activities such as saving seed or use of unauthorised herbicides on herbicide tolerant crops (where applicable).
- By abiding by your Pioneer Technology Use Agreement, you are enabling Pioneer to continue to invest in advances in genetics and technology that bring forward new research discoveries. These discoveries ultimately help you increase production and meet new pest and production challenges.
- It is required by biotechnology laws and regulations for the supplier and purchaser who intend to use the technology to enter into a lawful agreement by signing a TUA.

The Pioneer TUA allows farmers to purchase and plant Pioneer® brand products containing certain technology traits. Such an agreement should be signed every season and be handed over to the Pioneer sales professional immediately before seed can be issued.

The TUA also stipulates that:

- Any grower who has not signed a TUA must immediately notify Pioneer and make arrangements to sign the TUA or return the seed to the company.
- Biotech seed products are to be used solely for planting a single commercial crop and shall not be exported for planting in another country or supplied to any other person for planting
- Any purchase of biotech seed products by a grower who is not authorised or is not our licensed grower (i.e. did not sign a TUA) shall be void.

GROWING CONVENTIONAL AND BIOTECH CROPS

For decades, multiple agricultural systems have coexisted successfully around the world from production through supply chains. Over time, best practices to facilitate these different agricultural systems have developed and have been improved continuously to ensure that high-purity and high-quality seed and grain are available to support trade from various agricultural systems.

One example of such coexistence is the production of similar commodities in close proximity such as field maize, sweet corn, white maize and popcorn. Coexistence strategies should meet market requirements using science-based industry standards and management practices, and should be flexible to facilitate options and choices for growers and the food and feed supply chain. This flexibility should also include the ability of co-existence strategies to be modified as changes in products, markets or practices occur.

The ongoing success of coexistence strategies depended upon co-operation, communication, flexibility and mutual respect for each cropping system and among growers using these various systems. Over the years, growers have adapted to changes and innovations in agriculture by using new farm management practices, new technologies and other appropriate practices. It is incumbent upon a grower who is growing a crop to satisfy a particular market and to implement best practices to satisfy those market standards. By seeking to satisfy that market, the grower inherently agrees to use the appropriate practices to ensure the integrity and marketability of his or her crop in the market in which he or she seeks to market it. This is true, regardless of the particular market being served, whether it is white corn, sweet corn, organically produced corn or conventionally produced corn. In each of these cases, the grower is producing a crop supported by a special market price and therefore, assumes responsibility for meeting any applicable market specifications to receive the applicable premium price from that market. Even though the responsibility rests with the grower producing the crop for a particular market, it is each grower's responsibility to communicate with, and be aware of the planting intentions of his or her neighbours to gauge the need for any appropriate best management practices.

IDENTITY PRESERVED (IP) CROPS

IP crops are crops produced to meet the needs of specialised end-use markets. These crops are grown with a specific end use in mind, such as waxy, white and organic, amongst others, and should meet the defined requirements of that market. IP crops provide benefits for both the grower, with processor-paid incentives, as well as the end user. Growers who choose to preserve the identity of their crops to receive the additional end-use market value assume the responsibility of ensuring that their crops meet the contract specifications. To meet these specifications, the specialised end-use agricultural industry has developed generally accepted IP agricultural practices to manage IP production, as further described below. Accordingly, IP growers have the responsibility to implement any processes that are necessary to meet quality specifications. The special care required for IP crop production generally causes an increase in production costs that, in turn, causes an increase in the value of the goods sold.

MAINTAINING THE INTEGRITY OF IP CROPS



In order to preserve the identity of IP crops, thorough clean-out procedures should be implemented before and after contact is made with the IP crop. This may include cleaning areas in seed storage bins, seed boxes (hoppers), transportation vehicles, combines and harvesters. Thorough clean-out procedures should be upheld throughout all aspects of the planting procedure, which include storage, transportation, planting and harvesting. Additionally, growers of IP crops should consider steps to minimise the potential for crosspollination given the generally recognised and accepted occurrence of the movement of incidental amounts of pollen. As previously stated, communication between growers is key in determining the best agricultural management practices that should be implemented to maintain the identity of IP crops.

SEED TREATMENT STEWARDSHIP

Seed treatments, including fungicides, insecticides, nematicides and amendments, play a critical role in agriculture and the production of a healthy crop. In addition to managing early-season pests and diseases, they serve as a viable alternative to foliar and soil applications in some cases.

Seed treatment management and responsible stewardship play a vital role in sustaining our environment, while maximising crop health. Responsible stewardship practices help maintain seed and seed treatment integrity, which keeps the active ingredient on the seed to achieve the maximum crop health benefit for the investment. In addition, these practices help minimise the potential for adverse effects on producers and the environment, including pollinators which may be present at the time of planting.

The following best management practice suggestions are recommended:

HANDLING

- Always read and follow the label directions and recommendations for proper handling and use of treated seed and seed treatments
- Use personal protection equipment as recommended on the product label or seed tag
- Follow all safety precautions as indicated on the label or seed tag
- Transport and transfer treated seed safely and in a manner that minimises the risk of spillage and dust

PLANTING

- Always follow planter manufacturer recommendations and avoid excess use of talc and graphite
- Eliminate flowering plants and weeds in and around the field prior to planting.
- Limit dust movement from seed packages containing seed treatment. For example, consider factors such as wind speed and direction and avoid shaking the bottom of the treated seed bag when filling planting equipment
- Do not transfer treated seed next to active hives, at field margins, and adjacent to flowering plants and vegetation
- At planting, be aware of honeybees and hives located near the field, taking note of nearby hives and flowering plants and weeds, which could be attractive to pollinators and communicate with beekeepers when possible
- For pneumatic planters, direct the exhaust towards the soil surface
- Ensure all seeds are planted or incorporated into the soil at a proper planting depth

DISPOSAL AND CLEAN-UP

- Follow national and local regulations for the disposal or storage use of unused seed
- Properly dispose of unused treated seeds, seed packaging or containers in accordance with national and local regulations and the container management return policy as advised by CropLife South Africa.
- Clean the planting equipment in a manner that minimises dust
- Avoid cleaning the planting equipment next to active hives, at field margins, and adjacent to flowering plants and vegetation

GUIDE FOR THE USE OF BIOTECHNOLOGY PRODUCTS

This guide contains information for proper Insect Resistance Management for Pioneer® brand maize that contains the Pioneer Insect Protection Technologies – also referred to as the Biotech Traits. The Biotech Traits include:

NB: Table 1: The protective proteins (insect protection and herbicide tolerance traits) and the genetic material necessary for the expression of protective proteins are approved as safe for humans, animals and the environment in terms of the *GMO Act (Act No. 15 of 1997)*. The products are protected by one or more patent rights.

PRODUCTS

Bt Trait (corn borer technology)

PRODUCT USE STATEMENT

The product Bt trait technology contains *cry1A(b)* gene obtained from *Bacillus thuringiensis var. kurstaki*. The *Cry1A(b)* protein produced in this maize provides control of susceptible stalk borers, *Busseola fusca* and *Chilo partellus*.

YieldGard® Maize 2 technology (MON89034)

The product YieldGard® Maize 2 technology contains *cry1A.105* and *cry2Ab2* genes from *Bacillus thuringiensis var. kurstaki*. *Cry1A.105* and *Cry2Ab2* proteins produced in this maize provide control of susceptible maize stalk borers, *Busseola fusca* and *Chilo partellus*.

YieldGard® Maize 2 and the YieldGard® Maize 2 logo design are registered trademarks of Monsanto Technology LLC.

Roundup Ready® Maize 2 technology (NK603)

The product Roundup Ready® Maize 2 technology contains *cp4 epsps* gene from *Agrobacterium* strain CP4. Roundup Ready® Maize 2 technology produces CP4 EPSPS protein which provides tolerance to registered glyphosate formulations.

WARNING: The Roundup Ready® gene will safeguard this hybrid ONLY against applications of approved glyphosate products such as Roundup PowerMax® (L 6702), when applied at labelled rates. The Roundup Ready® gene WILL NOT safeguard this hybrid against applications of other herbicides which require a different herbicide resistance gene. Always read and follow herbicide label directions prior to use. Roundup Ready®, the Roundup Ready® logo and Roundup PowerMax® are registered trademarks of Monsanto Technology LLC.

Intrasect® insect protection technology (TC1507xMON810xNK603)

The product Intrasect® insect protection technology contains the Herculex® I insect protection trait that produces a *Bacillus thuringiensis* (Bt) *Cry1F* protein and also contains the Bt trait technology that produces a Bt *Cry1Ab* protein which provide protection against susceptible maize borers *Busseola fusca* and *Chilo partellus*. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. This product also contains the Roundup Ready® Maize 2 technology with gene *cp4 epsps* from *Agrobacterium* strain CP4. The CP4 EPSPS protein provides tolerance to registered glyphosate formulations. This product is protected by one or more patent rights. Roundup Ready® Maize 2 technology provides tolerance to registered glyphosate formulations.

WARNING: The Roundup Ready® gene will safeguard this hybrid ONLY against applications of approved glyphosate products such as Roundup PowerMax® (L 6702), when applied at labelled recommended rates. The Roundup Ready® gene WILL NOT safeguard this hybrid against applications of other herbicides which require a different herbicide resistance gene. Always read and follow herbicide label directions prior to use. ACCIDENTAL APPLICATIONS OF INCOMPATIBLE HERBICIDES TO THIS HYBRID COULD RESULT IN TOTAL CROP LOSS. Roundup Ready® and Roundup PowerMax® are registered trademarks used under license from Monsanto Technology LLC.

PoweCore™ technology (MON89034xTC1507xNK603)

The product PoweCore™ technology trait produces the active ingredients *Cry1A.105*, *Cry2Ab2*, and *Cry1F*, proteins from *Bacillus thuringiensis* which provides good control over spotted stalk borer (*Chilo partellus*) and the maize stalk borer (*Busseola fusca*). In addition, this seed contains Roundup Ready® Maize 2 technology which provides tolerance to registered glyphosate-based herbicides. Product responses may vary by location, pest population, environmental conditions, and agricultural practices. This product is protected by one or more patent rights. PoweCore™ multi-event technology developed by Corteva Agriscience and Monsanto. PoweCore™ is a trademark of Monsanto Technology LLC. Roundup Ready® Maize 2 is a registered trademark of Monsanto LLC.

Always read and follow herbicide label directions prior to use. All herbicides used with this product must be properly registered with the Department of Agriculture, Land Reform and Rural Development in terms of the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act No. 36 of 1947 (as amended) and used in accordance with herbicide registered label and recommendations and all other applicable laws.

WARNING: The Roundup Ready® gene will safeguard this hybrid ONLY against applications of approved glyphosate products such as Roundup PowerMax® (L 6702), when applied at labelled rates. The Roundup Ready® gene WILL NOT safeguard this hybrid against applications of other herbicides which require a different herbicide resistance gene. Always read and follow herbicide label directions prior to use.

THE ACCIDENTAL APPLICATION OF INCOMPATIBLE HERBICIDES TO THIS HYBRID COULD RESULT IN TOTAL CROP LOSS.

IMPORTANT – READ BEFORE PLANTING

WHAT ARE PIONEER INSECT PROTECTION TECHNOLOGIES?

Pioneer insect protection technologies and/or the Biotech Traits allow farmers to plant Pioneer brand maize with built-in protection to control important maize stalk-borer insect pests. Pioneer brand maize with the insect protection technology confers protection against susceptible *Busseola fusca* (maize stalk borer) and *Chilo partellus* (spotted stalk borer).

Note: These insects will be referred to collectively as ‘stalk borers’ throughout the balance of this document.

EFFECTIVENESS OF PIONEER® BRAND MAIZE HYBRID WITH THE BIOTECH INSECT PROTECTION TECHNOLOGY

STALK BORER TECHNOLOGY

The *Busseola* stalk borer is not easily controlled. Please note that, in general, the population pressure of stalk borers is higher during the reproductive phase of the plant (window period – VT to R1 stage) compared with the first generation that infests the plants in an earlier growing phase. Stalk borer resistance is therefore scored lower for the window period compared to the first generation.

It is important to carefully monitor fields for all pests to determine whether treatment with a pest control method is needed. Scouting techniques and remedial pest control treatments should address the fact that larvae must hatch and feed before incorporated plant protection technologies have an effect on the pests. Scouting should be performed regularly, particularly after periods of heavy or sustained egg laying (especially during bloom), to determine whether larval survival is significant in a particular field. If unexpected damage is observed, contact your Pioneer agronomist.

INSECT RESISTANCE MANAGEMENT (IRM)

What is IRM?

Insecticide Resistance Management (IRM) program is an essential part of good stewardship. The aim of an IRM program is to reduce the probability of target insects developing increased tolerance to the insecticidal Bt proteins, thus maximizing the longevity and effectiveness of these valuable traits in an environmentally-conscious way. Sustainable preservation of this technology places individual responsibility on everyone in the seed distribution system, from the seed supplier to the grower planting the seed. Additionally, IRM is a legal obligation for all as stipulated in the commercial permit granted by South Africa government for all Bt corn products.

THE IMPORTANCE OF INSECT RESISTANCE MANAGEMENT (IRM)

Compliance with IRM requirements is a stewardship obligation and is critical to maintaining the longevity and effectiveness of maize with Biotech Traits. When maize with biotech insect protection technology is the only crop being cultivated, only the rare resistant individuals of an insect pest population will survive and mate with each other, producing resistant offspring. To delay the development of insect pest populations resistant to maize with biotech insect protection technology, growers planting Pioneer® brand maize with the technology are required to also plant a separate area of Pioneer brand maize without the technology, known as a ‘refuge’.

What is a refuge?

A refuge is a block or strip of maize without biotech insect protection technology. The primary purpose of a refuge is to maintain a population of stalk borers that are susceptible to the biotech insect protection technologies. This increases the probability that the rare resistant individuals emerging from fields with the biotech insect protection technology will mate with susceptible individuals emerging from the refuge. This will result in offspring that are susceptible to biotech insect protection technologies. Please refer to *Figure 2* which illustrates this concept.

REFUGE MANAGEMENT FOR PIONEER® BRAND MAIZE WITH Bt INSECT PROTECTION TECHNOLOGY

Table 2: Planting a refuge is a requirement for growing the technology and is a primary component of IRM. There are two acceptable refuge options:

PRODUCTS	REFUGE REQUIREMENTS	INSECT PROTECTION
Bt Trait	✓ 95% Biotech insect protection technology with an accompanying 5% refuge – with this option, no chemical control for targeted insects is permitted on the refuge areas or	<i>Busseola fusca</i> (maize stalk borer) and <i>Chilo partellus</i> (spotted stalk borer)
YieldGard® Maize 2 technology (MON89034)		
Intrasect® insect protection technology	✓ 80% Biotech insect protection technology with an accompanying 20% refuge – with this option, chemical control of targeted insects is permitted on refuge areas if economic thresholds are met.	
PowerCore™ technology		

- Maize refuge options include (i) hybrids without stalk borer biotech insect protection technologies, (ii) hybrids with Roundup Ready® Maize 2 technology, and (iii) conventional maize
- Pioneer® brand maize with stalk borer biotech insect protection technology and refuge hybrids must be of similar maturity
- The refuge must be planted within seven (7) days, under the same growing conditions as the hybrid with stalk borer biotech insect protection technologies. For example, if the hybrid with any of the insect protection technologies is planted under irrigation, the refuge must also be under irrigation
- The refuge area must be closer than 400m from the furthest point of the field containing Pioneer brand maize with any of the stalk borer biotech insect protection technologies (as shown on *Figure 2*)
- **A neighbour’s field does NOT qualify as a refuge**
- Mixing of seed containing stalk borer biotech insect protection technologies with seed without the stalk borer trait is NOT an acceptable refuge design
- Planter bins should be properly cleaned before switching from seed containing stalk borer biotech insect protection technologies to seed without the stalk borer trait, and vice versa
- Avoid the presence of volunteer plants with stalk borer biotech insect protection technologies in the refuge area
- Field Monitoring and scout fields frequently:
 - ✓ Monitoring Bt fields for insect resistance development is an integral part of an IRM plan. If resistant populations are detected early, alternative control measures can be implemented to reduce the population and halt the spread of resistance.
 - ✓ Immediately report to the authorised Pioneer sales professional if unexpected damage is observed with biotech insect protection technologies
 - ✓ Apply only registered products when advise

REFUGE MANAGEMENT



CORRECT LAYOUT OF THE REFUGE AREA

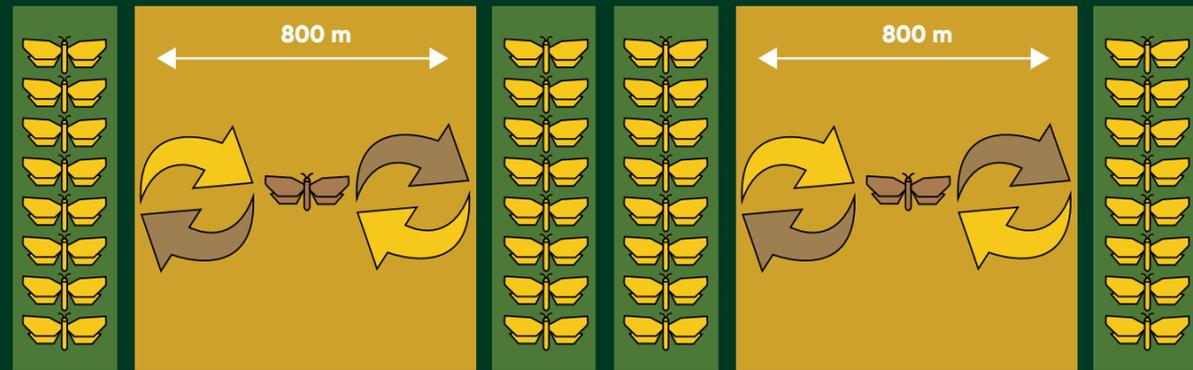


FOR PIONEER® BRAND MAIZE WITH Bt INSECT PROTECTION TECHNOLOGY
PLANT THE CORRECT REFUGE AREA FOR BT-MAIZE

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:

STEP 3: Regularly monitor and inspect (weekly) your Bt crop and immediately contact your seed representative/agent if stalk borer infestation is observed in the Bt maize.

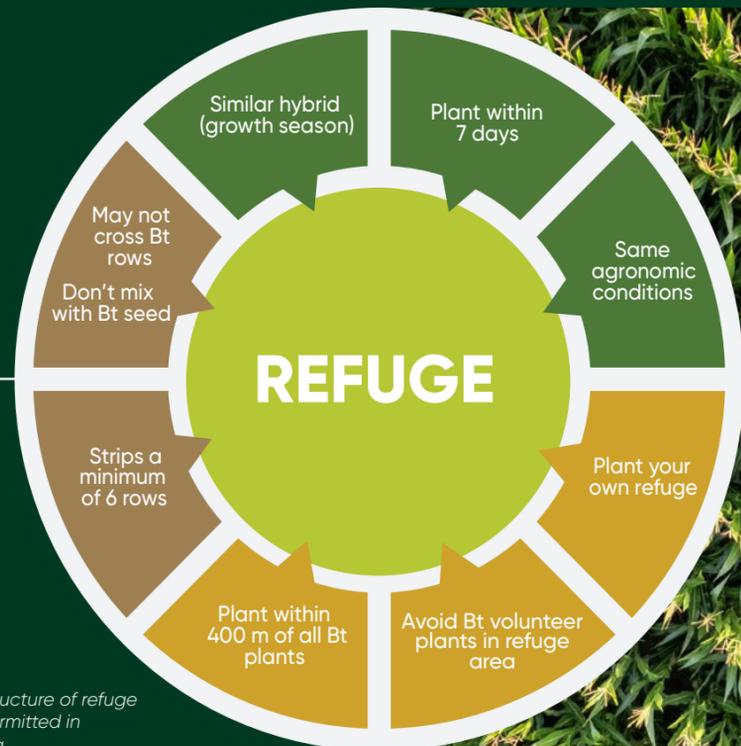
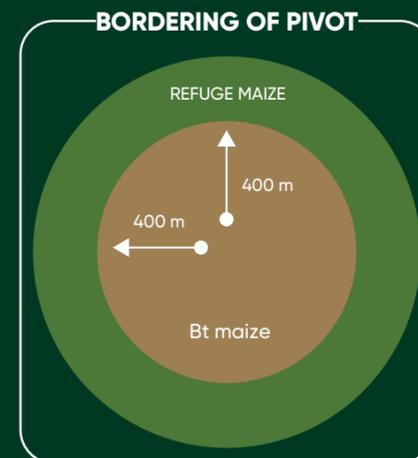
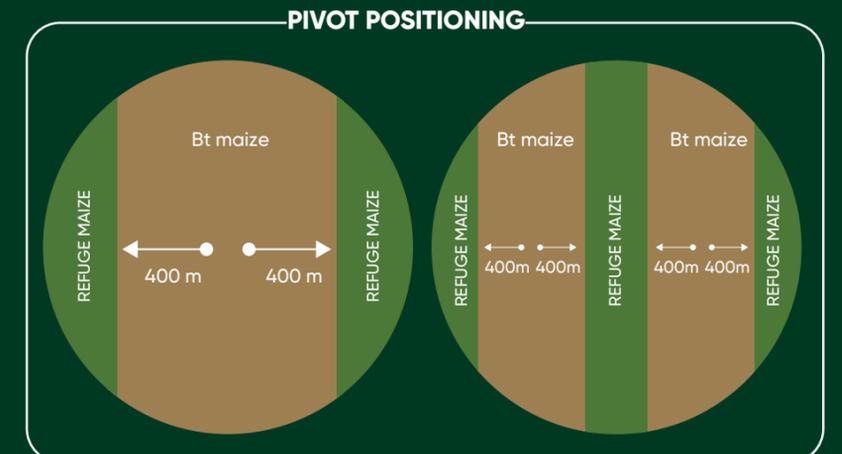
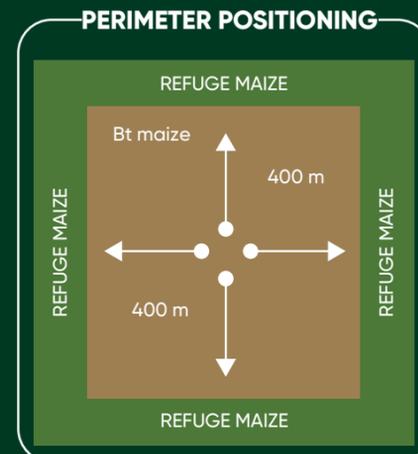
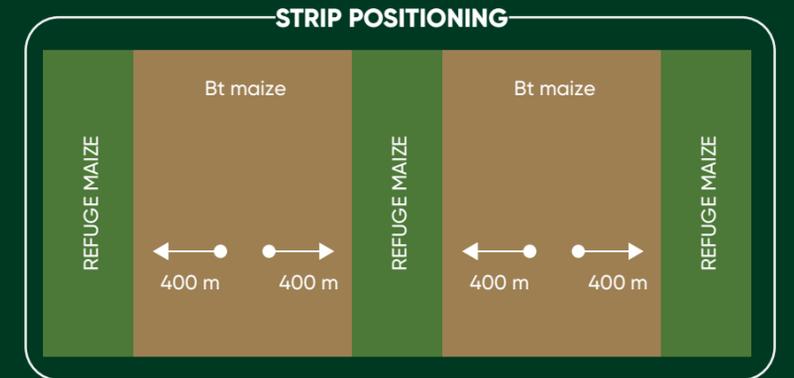
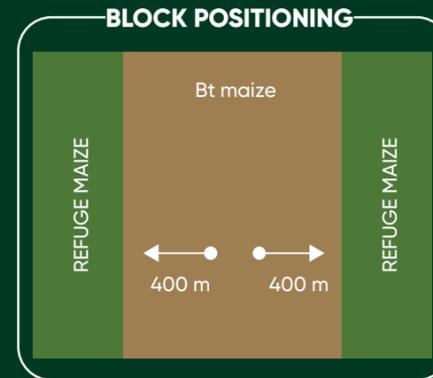


Figure 2: Structure of refuge planting permitted in South Africa.



Pivot Size	Minimum number of rows required per row width in m (5% refuge)							
	Radius (m)	ha	0,60 m	0,75 m	0,91 m	1,00 m	1,20 m	1,50 m
178	10	8	6	6	6	6	6	6
252	20	11	9	7	6	6	6	6
309	30	13	10	9	8	7	6	6
357	40	15	12	10	9	8	6	6
*399	50	17	13	11	10	8	7	6
*437	60	18	15	12	11	9	7	6
*472	70	20	16	13	12	10	8	6
*505	80	21	17	14	13	11	9	6
*535	90	23	18	15	14	11	9	6
*564	100	24	19	16	14	12	10	6
*592	110	25	20	16	15	12	10	6
*618	120	26	21	17	16	13	10	6

* User must also plant at least 6 rows in the centre of the pivot, in addition to the rows on the outside.

BEST PRACTICES FOR FOLLOWING INTEGRATED PEST MANAGEMENT (IPM)

Integrated Pest Management (IPM) enables growers to adapt their approach to the management of weeds, insects, and diseases to the specific conditions within their fields, in lieu of a generic pest management program. IPM involves the responsible use of biotech traits, crop protection products, and cultural management practices. The value of any biotech trait or insecticide spray programme can be enhanced when used within the context of an IPM program.

Pioneer recommends implementing the following IPM best practices to maximise the value of biotech traits:

- Rotation of crops and biotech traits to prevent the build-up of pest populations over multiple seasons and the evolution of resistance within pest populations.
- The use of seed varieties, planting technology, and seedling rates that are appropriate for a given crop in a particular geographic area.
- Monitoring of pest populations throughout the growing season to determine when treatment for pest control is necessary (i.e., when pest damage exceeds action thresholds).
- Using a combination of pest management practices to control pest populations.
- Ensuring the appropriate crop sanitation practices are conducted throughout the growing season and the destruction of crop residues is completed promptly after harvesting.
- Minimizing over-wintering populations of pests through soil management practices.
- The use of multiple modes of action of crop protection products within a season to reduce the likelihood of pest resistance development.
- Regular scouting of the crops containing biotech insect protection technologies for unexpected damage caused by *Busseola fusca* or *Chilo partellus*. (Immediately report any occurrence of unexpected damage to an authorised Pioneer sales professional.)

IPM SPRAY PROGRAMME

Pioneer implements an IPM programme to help farmers maximise the yield of their high yield potential Pioneer® brand maize hybrids with the Intrasect® Insect Protection technology and Bt trait stalk borer technology. **Note** that the IPM programme is not applicable to YieldGard® Maize 2 (MON89034 maize) and PowerCore™ technology fields.

To qualify for the benefits of the programme, customers need to adhere to the following:

- Sign the Technology Use Agreement (TUA) at least once a year and return the signed copy to Pioneer
- Refuge areas must be planted according to the prescribed guidelines contained in the TUA and this brochure

NON-COMPLIANCE with any of the above requirements will disqualify the farmer from the IPM programme incentives

Growers must take note of the following conditions applicable to the Pioneer IPM Programme:

- Insecticide sprays are implemented at >5% damage (before the tassel formation growth stage)
- The IPM spray programme DOES NOT apply to MON89034 (YieldGard® Maize 2 technology) maize or PowerCore™ technology maize.
- If unexpected insect damage is observed on MON89034 or PowerCore™ technology maize plants, a Pioneer sales professional or agronomy team member must be contacted to provide advice and appropriate remedial actions
- Only insecticide costs are covered, and NO application costs will be covered by the spray programme
- This programme covers one spray per season (not per target pest)

Any person who participates in the IPM insecticide spray programme must first enrol for the programme and receive procedure manuals. Please consult your seed sales agent for additional information regarding specific details (protocols) of the IPM programme.



BEST PRACTICES FOR MANAGING HERBICIDE-TOLERANT CROPS

IMPORTANT – READ BEFORE PLANTING

WHAT IS HERBICIDE-TOLERANT SEED TECHNOLOGY?

Herbicide-tolerant crops can tolerate herbicide applications at product recommended application rates that will kill non-herbicide-tolerant Pioneer® brand maize or varieties of the same crop species. Crops with traits for herbicide tolerance allow farmers to apply herbicides to their crops that they would otherwise be unable to utilise, without causing death or unacceptable injury to that crop.

IMPORTANCE OF MANAGING HERBICIDE-TOLERANT CROPS AND WEED RESISTANCE TO HERBICIDES

Properly managing herbicide-tolerant crop technology is important to preserve the long-term effectiveness and value of the tolerant crop seed and its corresponding herbicides. Growers utilising herbicide programmes that include herbicide-tolerant crops can do so on an annual basis provided the technology is managed effectively.

BEST PRACTICES

- The use of herbicide-tolerant crops does not limit the grower to use only one herbicide product. Conventional herbicides can and should still be part of the grower's overall weed management system
- Limit the number of applications of a single herbicide or herbicides from the same mode of action family within a single growing season
- Use mixtures or sequential treatments of an effective alternative mode of action to control target weeds, as recommended on the label(s)
- Apply herbicides at recommended dosages and at the recommended stage of weed growth, as stated on the label(s)
- Use alternative weed management practices such as crop rotation, mechanical cultivation, delayed planting and weed-free crop seed
- Clean equipment before moving between fields to minimise the dispersion of weed seed
- Scout fields after herbicide application to detect weed escapes or shifts. If a potentially resistant weed or weed population has been detected, use available control methods to avoid seed dispersion in the field

MANAGING VOLUNTEER HERBICIDE TOLERANT CROPS

The seed of some crops can escape harvest, germinate the following year and become 'volunteer weeds' in a rotational crop. This can happen regardless of whether the crop seed was herbicide-tolerant or not. Many tools are available for managing herbicide-tolerant volunteers, but advanced planning is advised to ensure the greatest adaptability and success.

The best strategies for managing herbicide tolerant volunteers are crop rotation and rotation of herbicides with different modes of action. The proper adjustment of harvesting equipment and the cultivation and tillage management will also help reduce volunteer plants from previous crops. Plan at least a year ahead when planting an herbicide-tolerant crop to make sure you have a weed management plan that will control any herbicide-tolerant volunteers, using alternative herbicide with different mode-of-action families and/or tillage for the next crop.

HERBICIDES RESISTANT WEED

Grower awareness and proactive management of herbicide resistant weeds are part of a successful weed control program. Suspected herbicide resistance is defined as the situation where the following three indicators occur at a site or location:

- Failure to control a weed species normally controlled by the herbicide at the dose applied (as per label recommendation), especially if control is achieved on adjacent weeds.
- A spreading patch of non-controlled plants of a particular weed species; and
- Surviving plants mixed with controlled individuals of the same species.

Possible indicators of weed resistance to herbicides include achieving good control of all but one of the labelled weed species in the field with the herbicide, and/or failure of repeated applications of the same herbicide to control only that weed species in a field.

Take note that weed control failures can have many causes that are not necessarily related to herbicide resistance. Lack of rainfall to activate pre-emergence herbicides, rainfall right after post-emergence applications that wash the herbicide off the plant, cool temperatures, slow growth reducing herbicide activity in the plant, improper application timing, or improperly calibrated application equipment are amongst the many causes of less-than-expected herbicide performance. If you suspect a weed control failure is caused by weed resistance to an herbicide, you should first contact your herbicide retailer's or herbicide manufacturer's representative and your local Pioneer agronomist and conduct a thorough investigation that can eliminate other more common causes of poor weed control. Your local Pioneer agronomist will assist you with the additional steps that will be required if weed resistance to the herbicide is believed to be the issue.

If you have any questions after reviewing this information, please contact your authorised seed dealer or agronomist

Pioneer® brand products are provided subject to the terms and conditions of purchase which are part of the labelling and purchase documents.

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ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate.

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