Heritageseeds

Product Guide

Summer Crop

EDITION 3.0

GROW WITH CONFIDENCE

INSIST ON THE YELLOW BAG

Heritageseeds

Contents

Summer Crop Product Guide.
Edition 3.0
HS888 - June 2019

HGS Grain Sorghum

Heritage Seeds' first grain sorghum hybrid was released in 2012. HGS-102 proved itself to be very adaptable, performing well in all grain sorghum growing environments.

The following year a second hybrid was released, HGS-114, which has shown tremendous yield potential in both marginal and high yielding situations, eclipsing many industry benchmarks for yield along the way. A new hybrid, HGS-747 is now available for commercial uptake; HGS-747 offers reliable yield potential, industry leading standability ratings and a very attractive agronomic package.

Since the initial release in 2012, Heritage Seeds has evaluated a number of sorghum hybrids via replicated trials throughout Queensland and New South Wales. Trials have been conducted in locations such as Bellata, Billa Billa, Bongeen, Comet, Jandowae, Killarney, Kupunn, North Star, Premer and Yelarbon.

Each variety is evaluated for yield plus a wide range of important traits including lodging, seed size, maturity, disease tolerance, midge rating, end use and tillering. The performance of our hybrids is based on two important attributes: **yield** and **stability**.

HGS-114

Grain Sorghum

Features

- Semi-open head type
- Medium to tall height
- Mid maturity option – 70–73 days to flowering
- Excellent seed size
- Strong seedling vigour
- Good lodging tolerance
- Suited to dryland and irrigation.

Advantages

- Midge rating of 6
- Moderate stay-green (standard spray out practices)
- Moderate tillering
- Easy insect control – semi-open head
- Good standability.

Benefits

- Suited across a broad range of environments
- Excellent top end yield potential
- Proven profitable sorghum hybrid in the field
- Consistent performer year-in year-out.

HGS-114 Grain Sorghum, Ed Simson, Liverpool Plains, NSW

HGS-747

Grain Sorghum

Features

- Open head type
- Medium height
- Mid to quick maturity option – 68–70 days to flowering
- Good seed size
- Good seedling vigour
- Good lodging tolerance
- Suited to dryland and irrigation.

Advantages

- Midge rating of 5
- Moderate stay-green (standard spray out practices)
- Easy insect control – open head
- Excellent standability.

Benefits

- Handles tough conditions
- Reliable and profitable sorghum
- Great companion hybrid to complement HGS-114.

HGS-747 Grain Sorghum

Grain Sorghum Attributes Chart

	HGS-747	HGS-114
Maturity	Mid / Quick	Mid
Maturity comparison	MR-Bazley, MR-Taurus, G33, Archer	MR-Buster MR-Scorpio Cracka, A75, G44
Grain Colour	Red	Red
Head Type	Open	Semi-open
Production Zones	All	All
Irrigation	Yes	Yes
Wide Rows	Yes	Yes
Seedling Vigour	6	7
Early Spring Vigour	6	5
General Appearance	6.5	8
Head Exertion	6.5	7
Standability	Excellent (5/5)	Good (4/5)
Lodging – Stress	8	7
Lodging – Charcoal Rot	7.5	7.5
Grain Size	7	8
Stay Green	Medium	Medium
Tillering	Medium	Medium-Low
Midge Rating	5	6

In regards to the above traits, 1 = poor and 9 = excellent

Target Population/ha	Dryland			Irrigation	
Zones	Marginal	Average	Good	Supplementary	Full
Central Queensland (CQ)	30–40,000	40–55,000	–	50–100,000	100 –150,000
Callide Dawson (CD)	30–40,000	40–55,000	–	50–100,000	100 –150,000
Darling Downs (DD)	35–45,000	45–60,000	55–75,000	70–100,000	100 –150,000
Western Downs (WQ)	30–40,000	40–55,000	–	50–100,000	100 –150,000
Northern NSW (NNSW)	30–40,000	40–55,000	–	50–100,000	100 –150,000
Liverpool Plains (LP)	35–45,000	45–60,000	55–75,000	70–100,000	100 –150,000

Target population recommendations sourced from NSW DPI and QLD DAF resources and local growing experience

Seed Enhancements

OptiCote PLUS™

Heritage Seeds' grain sorghum hybrids are available with OptiCotePlus™ seed treatment (Thiram fungicide + Crusier® 600 insecticide + Concep II® seed safener).

OptiCotePlus™ seed treatments, with Crusier® 600 and Concep II®, offer the highest levels of protection to enhance growth and improve yield.

Cruiser

Cruiser® 600 is a systemic insecticide which provides long term residual activity against a range of sucking & chewing pests. As a seed treatment Cruiser dissipates into the immediate soil solution where it protects the developing seedling from chewing pests. Cruiser is also translocated uniformly into shoot growth where it protects the seedling from both chewing and sucking pests, leaving no window for these pests to access the crop. Cruiser's unique chemistry in the form of a seed treatment offers a wide range of benefits:

- IPM friendly – Cruiser has no direct contact with beneficials
- Convenience – Cruiser controls a wide range of established pests
- Environmentally friendly – a very small environmental footprint
- Seed safety – no detrimental affect on long term storage.
- Early vigour – Cruiser promotes early seedling vigour independently of its insecticidal activity
- Reliable activity – Cruiser's high solubility provides reliable activity even under drying conditions.

Concep® II Sorghum Seed Safener

Concep II applied at label rates of 36g to 20kg seed is used as a seed treatment to protect grain or forage sorghum from the phytotoxic effects of metalochlor herbicides (e.g. DUAL GOLD® and PRIMEXTRA GOLD®). Metalochor is critically important in managing weeds in sorghum crops and an ideal herbicide rotation partner. The use of these two herbicides gives growers the advantage of adequately controlling germinating weeds which would otherwise compete strongly with the crop for valuable nutrients and soil moisture.

Sowing Guide

Sowing time

Sorghum should be planted when the soil temperature at 9am EST (at the intended seed depth, about 5 cm) is at least 16°C (preferably 18°C) for three to four consecutive days and the risk of frosts has passed.

Planting into cold soils slows emergence, reduces germination and establishment, and increases susceptibility to seedling blight. Low soil and air temperatures slow plant growth and reduce nutrient uptake (especially phosphorus) inducing purpling in some hybrids. Very early planted paddocks frequently have to be replanted. Note that some hybrids do have better cold tolerance than others.

Row spacing

Solid plant rows (75 or 100 cm) typically out-yield skip row or wide rows under good growing conditions, making solid plant more appropriate with high-yielding irrigated crops and/or high rainfall environments. Skip row configurations are more advantageous in low moisture, lower yielding dryland situations.

Solid row advantages decrease rapidly as soil moisture declines, especially in more marginal areas.

Skip rows are a useful method of conserving water during the vegetative stage of a crop, for use at flowering and grain fill. This term 'skip row' indicates that the row configuration is changed by 'skipping' or not planting rows.

Skip or wide row configurations are most effective when starting soil water levels are good, with the wide areas between rows acting as a buffer for poor or variable in-crop rainfall. In more marginal western dryland areas, growers could regard wide or skip rows as mandatory and consider either single skip or double skip rows.

These wider rows improve risk management by increasing yield stability and greatly reducing the risk of crop failure. However, in high yielding environments or seasons, resulting in 1.0m solid plant yields of 5 t/ha or higher, yield loss of 10–40% (compared

to solid plant) should be expected if wide or skip row configurations are used.

Agronomic management is very important if sorghum is planted on wide or skip row configurations. Plant population should be the same as solid plant on an area basis (same plants/ha).

Uniform (as opposed to patchy) plant establishment within rows will maximise the water use between the wide rows. Good stubble management (ground cover) is necessary to reduce water and soil loss in the skip areas. Effective weed control before and during the season is critical, otherwise the advantages of the wider rows will be lost. Wide rows (>150 cm) allow inter-row cultivation and shielded spraying for weed control.

Crop establishment

Apart from moisture stress, poor crop establishment and weed competition are major factors in significantly reducing yields. The following recommendations should help to improve crop establishment and crop yields.

Uniform establishment and accurate depth placement of seed is essential. Precision planters achieve both of these. Planters should be in small enough sections to follow paddock undulations, with large diameter depth wheels located within the frame and tines or discs mounted on parallelogram planter units.

Narrow points or discs are better suited to no-till and minimum-till conditions and work very well in free flowing soils, however excessive planting speeds will reduce establishment. In moist seedbeds, the seed should be placed about 5 cm deep. In dry seedbeds, using moisture seeking for deep furrow planting, the seed is also placed 5 cm deep. That may be 10–12 cm below the original soil surface.

Press wheels are essential to improve establishment and to help control soil insect pests of germinating and emerging sorghum, including true and false wireworms. Use press wheel pressures of 4 to 6 kg/cm width of press wheel for conventional seedbeds and 6 to 10 kg/cm for no-till and minimum-till seedbeds. Use pressures at the higher end of the range when sowing moisture is marginal, seed is deeply planted or soil insects are present. Use pressures at the lower end of the range when soils are hard setting or surface crusting. Crop establishment is improved when the shape of the press wheel matches the shape of the seed trench.

Irrigation

Quantities of water required for full irrigation of a sorghum crop will vary depending on seasonal and soil conditions, however budget on 1.4 ML/ha (delivered to the field) for a pre-irrigation, and 3 irrigations of 1.2 ML/ha during the growing season.

The timing of the first irrigation in the absence of rainfall should be mid to late tillering, while the second and third irrigations should be at flowering, and 10–14 days later during early grain fill. Irrigated yields should be in the vicinity of 10–12 t/ha.

Weed management

Significant yield losses occur if weeds are not killed until 4–5 weeks after planting. For effective control of most weeds, apply atrazine either before planting, at planting or immediately after planting. Apply Primextra®Gold, Dual®Gold or other metolachlor products as a pre-emergent spray for grass control, especially liverseed grass. Treat seed with Concep®II seed safener when using Primextra®Gold, Dual®Gold or other S-metolachlor products.

No-till and minimum-till fallowed crops where atrazine and glyphosate have been used should have excellent weed control at planting, and during crop growth. These fallows conserve more soil moisture and should improve the chances of planting crops at the optimum time.

Disease management

Key diseases that can affect grain sorghum include sorghum ergot (*Claviceps africana*), leaf rust (*Puccinia purpurea*) and fusarium stalk rot (*Fusarium spp.*).

For broader disease management programs, please consult advisors from the various State government primary industry departments, or experienced commercial agronomists / consultants in the relevant growing areas.

Sorghum midge

Sorghum midge (*Stenodiplosis sorghicola*) is a serious insect pest of grain sorghum in Australia.

It can result not only in major damage, but can also require several repeat insecticide applications during the season. Costs from residual losses and uncontrolled damage are estimated at being up to $10 million annually. Management of this pest is now centred on growing midge resistant hybrids. Adult midge emerge in early spring and often spend several generations in Johnson grass (*Sorghum halepense*) before moving into sorghum crops.

Females lay eggs into the flowering spikelets. The larvae then hatch and feed on the developing grain, preventing normal seed development.

The midge life cycle is between 2–4 weeks, so with optimal seasonal conditions, extremely high midge numbers can build-up over a growing season (particularly if the flowering period is extended by successive plantings). On a susceptible hybrid, offspring of each egg-laying adult can destroy up to 1.4 g of grain. Large numbers can lead to devastating damage and in some cases, complete destruction of the crop.

To manage this problem, midge resistant hybrids were introduced over 30 years ago. In 1993, the (now) Queensland Department of Agriculture and Fisheries (QLD DAF) in partnership with GRDC and the commercial sorghum breeding

Sorghum Midge (courtesy of Department of Agriculture and Fisheries QLD)

Sorghum head ratings (courtesy of Department of Agriculture and Fisheries QLD)

companies, developed a protocol for measuring the midge resistance (MR) levels in grain sorghum hybrids and assigned official MR ratings to all commercially released lines. The rating number is a measure of: the amount of grain lost per visiting female midge per day. It ranges from 1 (nil resistance) through to 8+ (‘practical field immunity’ under most conditions and maximum commercially available resistance). In practical terms, this means that a 7 rated hybrid, when exposed to the same midge pressures as a 1 rated hybrid, will sustain 7 times less damage.

The testing protocol, carried out by QLD DAF, involves planting an annual trial in a semi-controlled environment (ideal for sorghum and midge) and subjecting the plants to high midge pressures. The resulting midge damage per head is then assessed for all entries. For evaluation purposes, the test (pre-commercial) hybrids are grown alongside standard/control lines of known MR ratings.

After statistical analysis of the results, official MR ratings are then assigned for each hybrid. This testing regime provides a measure of quality assurance for growers by ensuring hybrids are independently assessed for relative midge resistance in a precise and consistent manner. MR ratings and the accompanying rating mark are only issued to hybrids assessed by the scheme.

Growers are able to use the MR rating as a guide to selecting suitable hybrids at planting, and as a tool for calculating threshold limits for crops, permitting more targeted insecticide applications. These threshold limits not only vary with resistance levels, but take into account commodity prices and the cost of insecticides. They are also calculated using the factor of 1.4 g of grain destroyed per one egg-laying adult.

Heritage Seeds is proud to be an active member of the Midge Testing Scheme.

Insect management

Other insects that can affect grain sorghum include aphids *(corn – Rhopalosiphon maidis, oat – R. padi and rusty plum aphid – Hysteroneura setariae)*, heliothis (*Helicoverpa armigera*), Rutherglen bugs (*Nysius vinitor*), Grey cluster bugs (*N. clevelandensis*) and wireworms (*Orondina spp.*)

For broader insect management programs, please consult advisors from the various State government primary industry departments or experienced commercial agronomists / consultants in the relevant growing areas.

Lodging

Lodging can be a problem in all growing areas. Choose hybrids with good lodging resistance where moisture stress is likely during the latter stages of grain fill. Moisture stress is the most common cause of lodging. Fusarium and charcoal stem rots are often associated with lodging, leading to plant death and considerable yield loss. Crops that remain green with some available soil moisture during grain fill are generally less prone to lodging.

Agronomic practices such as no-till, stubble retention and controlled traffic farming, which all aim to store more fallow and in-crop rainfall, will help reduce lodging. The use of wide or skip rows will also help.

These practices allow medium maturity hybrids with higher yield potential to be grown. Lodging is rarely a problem on fully irrigated crops but can occur in partially irrigated crops that are stressed during the later stages of grain fill or following desiccation.

Dessication

A pre-harvest spray of either glyphosate or Reglone® knockdown herbicides, can be applied immediately after physiological maturity has been reached. This will hasten dry down of the grain and should kill or desiccate the crop.

Desiccation allows crops to be harvested earlier and more efficiently than if crops were not sprayed. Herbicide application at this time can also be used as a salvage weed spray.

> The timing of the pre-harvest sprays is critical.

Crops should be sprayed before the end of March when temperatures are still warm and crops are still green.

The aim is to maximise yield through the assimilation of carbohydrate in the seed, but balance this moisture use with storing water for the next crop. When 95–100% of the grains have formed a 'black layer' (i.e. are physiologically mature), the crop is ready to be desiccated. Sprayed crops should be harvested as soon as they have dried down and the withholding period for the herbicide has been met as they are more prone to lodging.

Harvest

Once grain has dried to a level where it can be safely stored (<12%), or transported to an accumulation site, harvest should commence. The availability of good on-farm storage can speed up harvest and give attention to the post- harvest marketing of grain. Both aeration and drying facilities may also assist in progressing harvest. It is most important that storage facilities are clean and free from grain insect pests.

Issues of trafficability should also be addressed particularly in heavier clay soils. Serious soil compaction can occur when soils are too wet. This can result in long-term soil damage reducing the performance of following crops.

Information sourced from 2014 NSW DPI NSW Summer Crop Production Guide and other sources.

HGS-747 Grain Sorghum

HM Corn

Heritage Seeds released its first corn hybrid in 2012. HM-102 proved itself to be a very useful feed grain and silage hybrid, performing very well in northern sub-tropical areas. In subsequent years a number of new hybrids have been released, allowing Heritage Seeds to develop a wider portfolio of feed grain and silage hybrids with maturities and characteristics suited to all corn-growing regions across Australia.

Over the years, Heritage Seeds has trialed its current commercial corn hybrids and a number of new varieties via replicated trials throughout Queensland and New South Wales. The trials were conducted across 10 sites including Berrigan, Bongeen (dryland), Bongeen (irrigated late plant), Boort, Brookstead (irrigated), Coleambally, Dalby (irrigated), Gunnedah, Killarney, Leeton, Narrabri and South Burnett.

HM-330

Corn

The new future of feed grain and silage corn. This market leading hybrid has all the features and benefits of our established true all-rounder HM-114 it replaces, but with significant yield gains. Suitable for dryland or irrigation, feed grain or silage situations, with the versatile mid-maturity sweet spot Heritage Seeds corn users have come to love. HM-330 comes with excellent standability, sowing flexibility across multiple regions and higher silage and grain yields.

Features

- CRM 114
- Conventional hybrid
- Medium maturity
- Highest grain & silage yield potential
- Exceptional silage quality, with high grain to stover ratio
- Higher performance across irrigated and dryland sites, in all regions tested
- Excellent fusarium cob rot tolerance
- Excellent stalk lodging tolerance.

Advantages

- Tight husk cover
- Low basal tillering
- Flexible planting date.

Benefits

- Suited across a broad range of environments
- Suited to grain and silage production
- Stable high yields with excellent stress tolerance
- Excellent seedling vigour.

Suitability for dryland	YES
Suitability to irrigation	YES
Market use	FEED GRAIN – Feedlots / Dairy SILAGE – In all markets

HM-114

Corn

A true all-rounder, HM-114 is suitable for dryland or irrigation, silage or grain, with the mid-maturity sweet spot. Let HM-114 fill your pit or silo with a combination of good standability, sowing flexibility in conjunction with excellent silage and grain yields.

Features

- CRM 114
- Conventional hybrid
- Medium maturity
- Proven grain & silage yield potential
- Excellent silage quality
- Consistent performer across irrigated and dryland sites, in all regions tested
- Excellent fusarium cob rot tolerance
- Good stalk lodging tolerance.

Advantages

- Tight husk cover
- Very low basal tillering
- Flexible planting date.

Benefits

- Suited across a broad range of environments
- Suited to grain and silage production
- Stable high yields with excellent stress tolerance
- Excellent seedling vigour.

Suitability for dryland	YES
Suitability to irrigation	YES
Market use	FEED GRAIN – Feedlots / Dairy SILAGE – In all markets

HM-152

Corn

A corn hybrid that offers a great all-round bundle of agronomic traits and wide adaptability. Produces top quality, high energy silage. HM-152 is suitable for dryland or irrigation, silage or feed grain and ideal for short season environments. Maturity sits between P9400 and Maximus. This is an ideal hybrid variety for high input silage maize in areas with a short-medium length growing season. Good later planting or earlier harvest option where longer season varieties are normally grown.

Features

- CRM 97
- Conventional hybrid
- Quick maturity
- Leading grain & silage yield potential
- Excellent silage quality
- Shorter season option.

Advantages

- High cob % of total yield
- High digestibility
- Excellent starch and sugar content.

Benefits

- Suitable for medium to high population density
- Consistent performance in central and southern markets
- Ideal for TAS, VIC and Southern NSW, Southern WA
- Late plant option in longer season environments.

Suitability for dryland	YES
Suitability to irrigation	YES
Market use	FEED GRAIN – Feedlots / Dairy SILAGE – In all markets

HM-151

Corn

A hefty hybrid, rain or shine that makes the most out of every drop. HM-151 is a tough hybrid that provides growers with silage production stability. Performs well where water maybe limited as well as under ideal conditions. A top yielding hybrid for silage and feed grain that has excellent all round agronomic traits and a balanced disease resistance profile. This is an ideal hybrid variety for high input silage maize in areas with a short growing season. Good later planting or earlier harvest option where longer season varieties are normally grown.

Features

- CRM 88
- Conventional hybrid
- Quick maturity
- Leading grain & silage yield potential
- Excellent silage quality
- Short season option.

Advantages

- High cob % of total yield
- High digestibility
- Excellent starch and sugar content.

Benefits

- Suitable for medium to high population density
- Consistent performance in southern markets
- Ideal for TAS, VIC and Southern WA
- Late plant option in longer season environments.

Suitability for dryland	YES
Suitability to irrigation	YES
Market use	FEED GRAIN – Feedlots / Dairy SILAGE – In all markets

Heritage Seeds Corn Attributes

	HM-330	HM-114	HM-152	HM-151
CRM	114	114	97	88
Maturity comparison	P1467, P1414, P1315IT, PAC606, Olympiad	P1467, P1414, P1315IT, PAC606IT, Olympiad	PAC301, P9400, P9911, Maximus	Maximus, Titus, Asterix, Obelix
Market End Use	Feed grain, silage	Feed grain, silage	Feed grain, silage	Feed grain, silage
Irrigation	Yes	Yes	Yes	Yes
Dryland	Yes	Yes	Yes	Yes
Grain Yield for Maturity	9	9	9	9
Plant Height	8	8	8	8
Stalk Strength	9	9	9	9
Drought Tolerance	8	8	8	8
Husk Cover	7	8	7	7
Silage Yield	9	9	7	9
Leaf Blight Resistance	7	4	7	7
Early Growth	7	7	6	6
Whole Plant Digestibility	9	9	9	9
Cob Rot Resistance	7	7	7	7
Common Rust	6	6	6	6

In regards to the above traits, 1 = poor and 9 = excellent

Staygreen	8	7	7	7
Tillers	7	9	9	9

In regards to staygreen, 1 = very low and 10 = very high.

In regards to basal tillering habit, 1 = profusive tillering habit and 10 = nil tillering habit.

Heritage Seeds Corn Target Population Chart (plants/ha)

	HM -330	HM -114	HM -152	HM -151
Dryland - < 650mm	20 - 30,000	20 - 30,000	20 - 30,000	20 - 30,000
Dryland - > 650mm	30 - 45,000	30 - 45,000	30 - 45,000	30 - 45,000
Irrigation	60 - 85,000	60 - 85,000	75 - 100,000	75 - 100,000

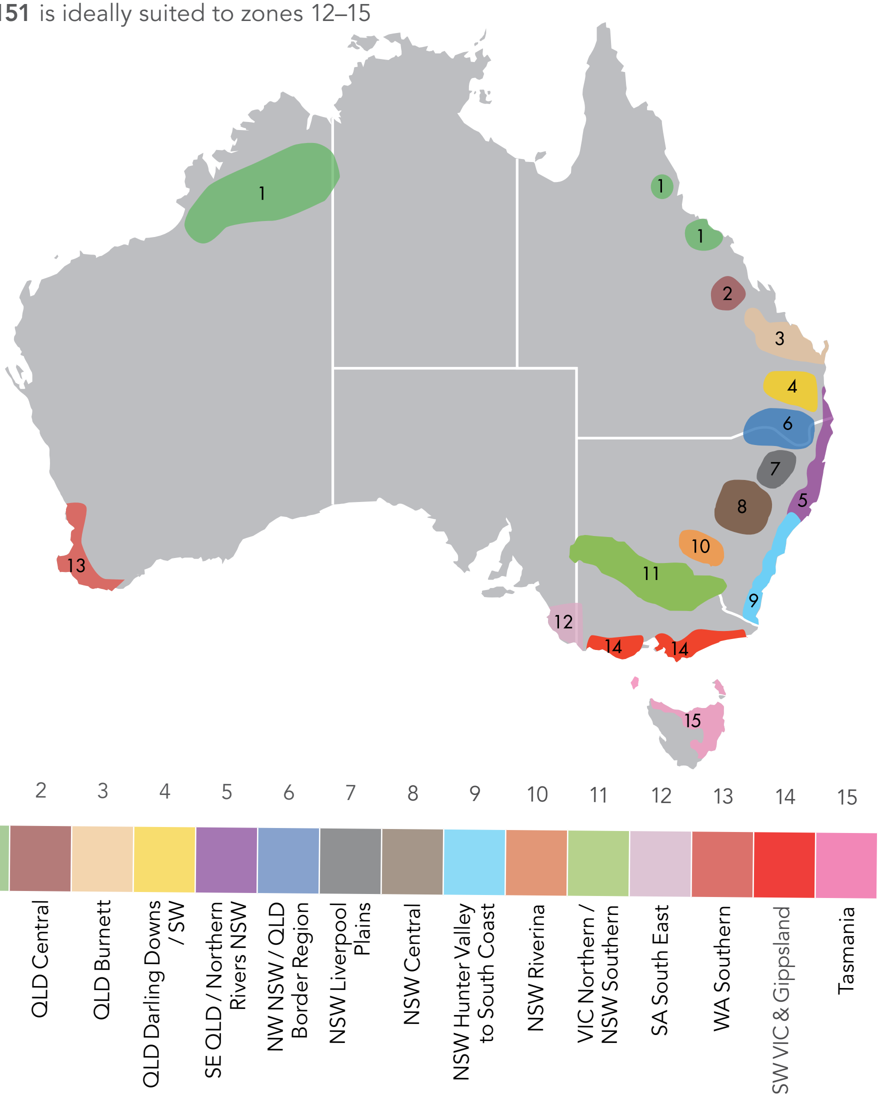
Target population recommendations sourced from NSW DPI and QLD DAF resources and local growing experience

Guide Map – Reference Key

HM-330/HM-114 can be grown across all environments, with the most ideal zones being 1–11

HM-152 can be grown in zones 9–15

HM-151 is ideally suited to zones 12–15



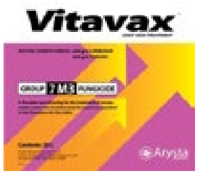
Seed Enhancements

OptiCote™

Heritage Seeds corn hybrids are available with OptiCote™ seed treatment (Vitavax® fungicide and Gaucho® insecticide).

Gaucho® is an insecticidal seed treatment widely used across a diverse range of crops. It has excellent systemic properties, ensuring protection of the plant against pests from the time of sowing well into the growing period. It has a broad spectrum of activity, particularly against sucking pests and mites. In the soil, the active ingredient forms a treatment-halo around the seed that is taken up by the roots as they develop. Gaucho is absorbed very efficiently by the germinating plant and is transported in the sap-flow to the stem and leaves.

Gaucho® is a registered trademark of Bayer Crop Science.



The world's leading seed treatment, providing effective control of common seed and seedling diseases in a variety of crops including maize. More than 600 field tests around the world have shown average yield increases of around 10%. Vitaxax® provides control above and below the ground, with two active ingredients (carboxin and thiram) that protect against smuts, bunt and early soil-borne diseases affecting plant establishment. It stimulates germination and early seedling growth even under adverse weather conditions. Provides protection against boil smut, head smut, seed decay and seedling blight complex in maize.

Vitavax® is a registered trademark of Arysta Life Science Inc.

Hybrid Characteristics

Hybrid selection

Select two or three hybrids to spread your risk. Growing hybrids of different corn relative maturity (CRM) and various planting times will reduce exposure to risks associated with adverse climatic conditions, especially during tasseling and grain fill.

End use

The desired end use of a corn crop should be considered, as if more than one market is intended, a different variety may be required for each in order to achieve best results.

Feed grain for feed

If the crop is to be used as stockfeed, select varieties adapted to your area that produce a high feed grain yield.

Silage

Corn is a premium silage crop, producing a large bulk of high-energy forage without the need for wilting prior to ensiling or the addition of silage additives. It is best suited for chopped silage stored in a pit or bunker. The economic viability of corn silage is very dependent on yields and energy values. The major limiting factors are inadequate nutrition, low plant populations and delayed preparation leading to unsuitable hybrid selection. Mid maturity hybrids are usually preferred. A corn crop intended for silage can be harvested for grain if circumstances change.

Select varieties adapted to your area that:

- continue to grow over the full season (to ensure the maximum amount of dry matter per ha);
- produce a high grain and biomass yield;
- retain a high proportion of green leaf through to harvest;
- tolerate relatively high density planting.

Sowing Guide

Sowing time

Sowing time is governed by soil temperature, soil moisture and targeted flowering date.

Commence sowing when the 9am EST soil temperature at sowing depth reaches 12°C and is rising. For irrigated crops, the temperature of water used for pre-irrigation or watering-up can influence sowing time. If watering-up, allow for a 3°C to 4°C drop in soil temperature following watering. The rate of seedling emergence increases with increasing soil temperature.

At 12°C emergence will occur in 14 days, whereas at 25°C emergence occurs in 4 to 5 days. Planting into cold soils slows emergence, reduces germination and establishment and increases susceptibility to seedling blight. Low soil and air temperatures slow plant growth and reduce nutrient uptake (especially phosphorus) inducing purpling in some hybrids. Very early-planted paddocks frequently have to be replanted. Note that some hybrids do have better cold tolerance than others.

Row spacing

Row spacing is commonly 75–110 cm. Width is ultimately determined by the available planter, tractor, harvester and other equipment. Narrow rows are an advantage when there is good in-crop rainfall or irrigation, high fertility and high plant populations. In such conditions, narrower rows will usually produce slightly higher yields as plants are more evenly spaced.

For dryland production in drier areas, single or double skip on 100 cm rows are suggested so that soil moisture is conserved for grain fill.

With skip row configurations, use the same target plant population as for solid planting. This means, for example, that in-row plant population in double skip rows will be twice that in solid planting.

Crop establishment

Apart from moisture stress, poor crop establishment and weed competition are usually the major factors that significantly reduces yields. The following recommendations should help improve crop establishment and crop yields.

Uniform establishment and accurate depth placement of seed is essential. Precision planters achieve both of these. Planters should be in small enough sections to follow the paddock undulations with large diameter depth

wheels located within the frame and tines or discs mounted on parallelogram planter units.

Narrow points or discs are better suited to no-till and minimum-till conditions and work very well in free flowing soils but excessive planting speeds will reduce establishment. In moist seedbeds, the seed should be placed about 5 cm deep. In dry seedbeds using moisture seeking for deep furrow planting, the seed is also placed 5 cm deep. That may be 10–12 cm below the original soil surface. Press wheels are essential not only to improve establishment but also to help control soil insect pests of germinating and emerging corn, including true and false wireworms. Use press wheel pressures of 4 to 6 kg/cm width of press wheel for conventional seedbeds and 6 to10 kg/cm for no-till and minimum-till seedbeds. Use pressures at the higher end of the range when sowing moisture is marginal, seed is deeply planted or soil insects are present. Use pressures at the lower end of the range when soils are hard setting or surface crusting. Crop establishment is improved when the shape of the press wheel matches the shape of the seed trench.

Nutrition

Good yields of grain or silage require high levels of soil fertility. The amount of nitrogen, phosphorus and potassium required in fertiliser applications is dependent on previous cropping and fertiliser history, age of cultivation, fallow conditions and yield targets. The overall removal of nutrients is greater in silage compared to grain crops, particularly for potassium.

Continuous removal of these nutrients without replacement leads to declining soil fertility. Defining a target yield and its expected nutrient removal is the basis of building a nutrition program for corn.

Corn takes up only small amounts of nutrients until 4 weeks after planting when nutrient uptake rapidly increases. More than 90% of potassium uptake occurs between 4 and 7 weeks after planting, when less than half of the final above ground dry matter has been produced.

Nitrogen uptake also increases rapidly with 55% of uptake occurring in the short window from 7 weeks after planting until the end of silking. Nitrogen uptake is virtually complete 2 weeks after flowering. Phosphorus uptake is complete 4 weeks after flowering.

The timing of fertiliser application is extremely important. Crop accumulation of nitrogen, phosphorus and potassium is rapid in the early stages of growth. Banding fertiliser at sowing ensures that the crop can access nutrients from the very early stages of root development. Referred to as the 'pop-up effect', seedlings are observed to develop at a faster rate when sown with banded fertiliser. An added advantage of band applied fertiliser over broadcast fertiliser is that the nutrients remain in available forms for a longer time.

Banding fertiliser at sowing is possible with most modern precision planters. Apply mixed fertilisers (nitrogen, phosphorus and potassium) in a band 5 cm to the side of the seed and 5 cm below it. This placement prevents damage to the seedling by fertiliser burn which is a risk if the seed and fertiliser are in direct contact.

Zinc fertilisers are needed for corn grown on heavy alkaline soils as deficiencies commonly occur. Zinc can be broadcast at 10–20 kg Zn/ ha and incorporated at

least 3 months prior to planting. This application rate should last for five to six years, as zinc is relatively immobile in the soil. Lower rates are sufficient on lighter textured soils.

Irrigation

Well irrigated corn crops use water very efficiently, commonly yielding 16–18 kg grain/ ha/mm of water. Trial work has recorded efficiencies in excess of 20 kg of grain/ha/ mm of water. Irrigation water use efficiency is affected by crop agronomy, irrigation system efficiency and seasonal conditions – primarily evaporation and in-crop rainfall. In generating yield responses to applied water it is as critical to avoid waterlogging stress as it is to avoid stress from moisture deficits.

Water budgeting – When planning a corn crop it is important to consider the area that can be fully watered, as corn is less tolerant of moisture stress than other summer crops. At Gunnedah, Northern NSW – budgeting 7 ML of irrigation water applied to the field/ha will satisfy crop water requirements in four out of five years. In the Murrumbidgee Valley, Southern NSW - irrigation water use ranges from 6 to 10 ML applied to the field. The average budget is 8–9 ML/ha.

Peak water use – High water use occurs from tassel appearance through to early dent grain maturity. Approximately 70% of the crop's total water use will occur in this window between 5 and 12 weeks after planting. During this time cob initiation, flowering, pollination and kernel set occur.

HM-114 Corn. Rob Johnston, Commercial Manager, Heritage Seeds.

Peak water use occurs during the 3 weeks following silking (weeks 10–12). The greater the canopy, the greater the water use during this period. Taller, denser crops will use more water as they intercept more light and are exposed to more wind.

Weed management

Corn is most susceptible to weed competition in the early stages of growth until the crop reaches 0.8m in height, approximately 8 weeks after planting. Effective weed control through this period is essential for high yields, particularly in dryland crops. Maintaining weed control beyond this stage is important for harvestability and preventing contamination of the grain sample.

An integrated approach to weed management is recommended. Herbicide resistance is an emerging problem in most grain producing areas. Producers should target their weed control carefully so that the correct rate and time of application is achieved. This is particularly important for harder to kill weeds such as barnyard grass, liverseed grass, fleabane, bindweed and wild oats.

Herbicides

Due to the impact of early competition, the weed control program should include pre-plant or post-plant pre-emergent herbicides targeting both grass and broadleaf weeds. Efficient and economical herbicides are available for the common weeds of corn, however some residual herbicides may have plant back restrictions that limit their suitability.

Disease management

Many diseases in corn can be overcome by selecting resistant hybrids.

Additionally, good farm hygiene, including washing down equipment and controlling weeds and volunteers, can minimise disease spread from crop-to-crop and season-to-season.

While diseases are important to corn production because of their potential to reduce yield, the marketing of grain can be severely restricted by the presence of disease, adding further to the need to choose hybrids carefully.

Key diseases that can affect corn include Turcica leaf blight or Northern leaf blight (*Exserohilum turcicum*), boil smut or common smut (*Ustilago maydis*), dwarf mosaic virus, cob and stalk rots (*Aspergillus, Fusarium* and *Gibberella spp.*), wallaby ear and rust (*Puccinia sorghi*).

For broader disease management programs, please consult advisors from the various State government primary industry departments or experienced commercial agronomists/consultants in the relevant growing areas.

Insect management

The successful management of insect pests is important for achieving high grain or silage yields. Growers who maintain awareness of pest activity through regular crop inspections will be better able to decide if and when insect control measures are needed. Infestations of insect pests can occur at any time but crops are most susceptible to damage during establishment and from tasselling until harvest.

Insects that can affect corn include African black beetle (*Heteronychus arator*), armyworm (*Spodoptera spp.*), black field earwig (*Nala lividipes*), corn aphid (*Rhopalosiphum maidis*), cutworm (*Agrostis spp.*), heliothis or corn earworm (*Helicoverpa armigera*) red shouldered leaf beetle (*Monolepta australis*) true wireworm (*Agrynus variabilis*) and false wireworms (*Pterohelaeus darlingensis, P. alternatus, Gonocephalum macleayi*) and two-spotted spider mite (T*etranychus urticae*).

For broader insect management programs, please consult advisors from the various State government primary industry departments or experienced commercial agronomists/consultants in the relevant growing areas.

Harvest Guide

Silage harvest

Timing – Harvest timing is a compromise between maximum dry matter yield, moisture content and potential feed quality. These factors need to be balanced to ensure the feed will ferment and ensile effectively without spoiling. Ideally, harvest should occur 10–14 days prior to physiological maturity when the maturing grain reaches the milk line score (MLS) of 2.5. When the milk line score is in the range 2–3, dry matter production is near to the maximum and moisture content is 63–67%, which is ideal for fermentation.

Feed quality declines rapidly if crops are held over for more than 10–14 days past the optimum harvest time, as dry matter yield is lost and the chopped material becomes difficult to compact, resulting in poor fermentation and ineffective silage. If harvest at the optimum time is delayed due to rain, it may be preferable to hold the crop for grain.

At MLS 2.5 the milk line is halfway down the grain. This often coincides with the cob husk turning from green to white and the dying off of lower leaves.

Frosted crops – After frost damage, the crop will generally have a higher moisture content than is apparent looking at the damaged leaves. Leaves usually constitute 15% of the total dry matter; the remainder of the plant still retains moisture. Frosted corn must be allowed to dry to at least 30% DM.

When frost occurs early in grain fill, the moisture content will be too high for immediate harvest and ensiling and could either be cut and fed as green chop or left standing to dry down. Where high field losses are expected during dry down, a silage additive such as hay or grain could be incorporated with the harvested material prior to ensiling to boost fermentation. When frosts occur close to the intended time of harvest, the crop should be ensiled as soon as possible as leaf loss is likely to be greater and can reduce yield.

Drought-stressed crops – The effect drought has on yield and forage quality will depend on the timing and severity of the moisture stress. Drought stressed corn can be harvested at a DM content of 30–40%. When a crop grown with high nitrogen inputs becomes drought-stressed, there may be the risk of nitrate poisoning if the crop is grazed or fed as green chop. Ensiling will reduce this risk as nitrate concentrations fall by 40–60% during the first 3–4 weeks of storage. Harvest should be delayed while plants have green leaf if there is a chance of rain.

Cutting height – Nominating an optimum cutting height is difficult due to variations in hybrids and growing conditions. The lower the cutting height, the higher the dry matter yield. However higher cutting heights increase silage quality by increasing the proportion of grain in the chop. Raising

Information sourced from 2014 NSW DPI NSW Summer Crop Production Guide and other sources.

the cutting height from 15 cm to 45 cm would reduce yield by 15% and raise digestibility by 2%. The potential for the remaining stubble to assist or hinder the establishment of the next crop in the field should also be considered when nominating a cutting height.

Chop length – Calibrate machines and aim for an actual chop length of 10–15 mm. Very fine chopping will crack more grain but increase power requirements. If harvesting is delayed (DM >38%) the chop length should be set as fine as possible to aid effective compaction. If forced to harvest early (DM <28%) a longer chop length of 15–20 mm will aid compaction. However harvesting at low DM is not advised as poor fermentation and unacceptable effluent losses can result.

Grain harvest

Timing – Most end users require grain moisture content at 12–14%, with 12% being optimal for storage on-farm. As grain reaches physiological maturity, moisture content is usually 28–34%, which requires significant drying down. Natural dry down is possible until early May, depending on location.

Corn can dry at a rate of 0.5–1.0% each day in suitable weather conditions. Once conditions become cool, consideration should be given to harvesting crops at 16–18% moisture content and artificially drying to below 14%. Crops can be left to stand over winter for natural drying to resume in the spring, but this increases the risk of mycotoxin contamination.

With access to drying facilities, harvest usually commences at 18% grain moisture content. Most harvesters perform best; losing and damaging less grain, when moisture content is between 18 and 24%. Aeration equipment is not sufficient to dry corn grain.

Notes

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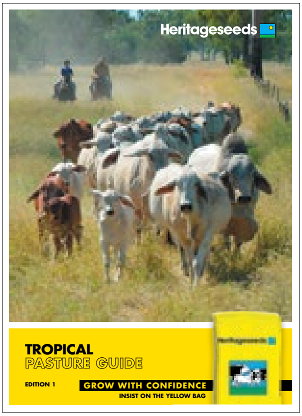
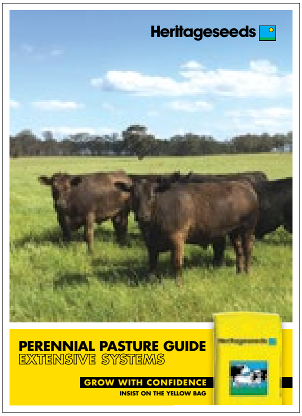
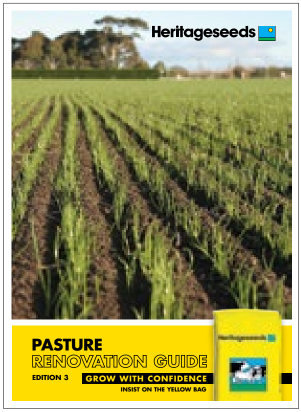
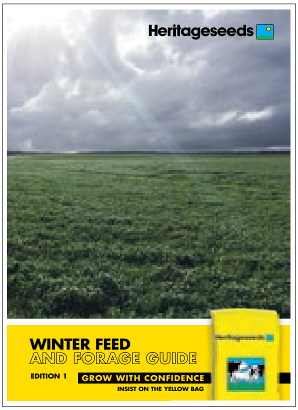
Other Publications from Heritage Seeds

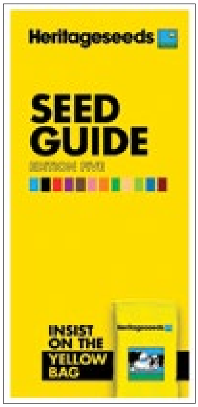
For a copy of any of these guides please call **Freecall 1800 007 333**, email **heritage@heritageseeds.com.au** or visit **www.heritageseeds.com.au**











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