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Maize: NSW planting guide 2006–07

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Southern NSW maize crop 2006 highlights

- A smaller area of maize was grown in the Riverina last season due to reduced processor requirements.
- Growers considered it a tough season for maize. However, where plant water requirements were met during the hot season, yields were at least average.
- The dry conditions with low humidity kept diseases such as fusarium to a minimum.
- Growers were reminded of the need to manage crop stress in hot weather as crops can become more prone to disease.
- The need for staggered plantings to reduce the risk of heatwave conditions at flowering was highlighted.
- The better water productivity of maize compared to other southern summer crops is generating interest from new growers.

Northern NSW maize crop 2006 highlights

- Dryland crops that showed high yield potential at Christmas struggled with the hot January conditions and yielded 2.5–4.0 t/ha.
- Harvest in March and April was uninterrupted due to very hot dry conditions.
- Two spotted mite prematurely ripened a number of irrigated crops and further reduced yields.

NSW maize production for the 2005–06 season increased by 80 000 tonnes compared to the previous season with good soil moisture at planting favouring more production in Northern NSW.

Key management issues

- Plant hybrids that have the desired characteristics for your conditions and market.
- Adjust plant population and row spacing to target yield and suit moisture availability.
- Plant at the optimum time: not too early (heavy frosts and low soil temperatures) or too late (slow dry down).
- Plant irrigated crops early to reduce the risk of yield loss from heliothis attack.

Table 1. NSW maize grain production 2005–06 (Source: 2006 March Grains Report, NSW DPI)

	Area (ha)	Tonnes	% of Total Production
North West	23,700	110,940	47 %
Central West	650	3,150	1 %
South West	9,615	90,640	39 %
Tablelands	2,000	15,000	6 %
North Coast	2,100	17,640	7 %
State Total	38,065	237,370	

- Use nitrogen fertiliser based on target yields, soil tests and/or previous crop yields and protein levels.
- Use phosphatic and/or potassium starter fertilisers where responses are indicated by previous crop performance and soil tests.
- Effective weed control is essential.
- Check for soil insects before sowing. If necessary treat soil at sowing and/or use treated seed. Always use press wheels at planting.
- Monitor insects such as cutworms, armyworms and heliothis from sowing and treat if necessary.
- Calculate water budgets to match crop area to water allocation with irrigated maize. Do not stress crops by increasing irrigation intervals as crops will be more prone to disease infections such as fusarium cob rot.
- Avoid moisture stress in irrigated crops from just prior to tasselling to the start of the dent or milk line formation stage.
- Plant inland dryland crops when there is at least one metre depth of wet soil.
- Use no-till for inland dryland crops to increase yields.
- Use controlled traffic farming with no-till to reduce soil compaction (maize is relatively susceptible to compaction), improve moisture storage and reduce fuel consumption.

Hybrid selection

Select two or three hybrids to spread your risk. Use hybrids of different maturity with various planting times to spread the risks in adverse climatic conditions, especially during tasselling and grain fill.

Maturity

Select hybrids to fit your local climatic conditions so they can reach physiological maturity before frosts kill them or before temperatures are too cool (10ºC) to complete grain fill. In southern NSW aim to harvest crops before winter. Hybrids selected for silage production may have later maturity than those selected for grain.

For grain production using irrigation or with adequate rainfall, medium maturity hybrids generally perform best. These hybrids are usually taller and leafier than shorter quicker maturing hybrids and need lower plant populations.

In the Northwest Slopes and Plains, the medium-quick to medium maturity hybrids with drought tolerance are usually superior.

Yielding ability

Select hybrids that perform well over a range of seasonal conditions. Some quicker maturing hybrids may yield as much grain as slower hybrids and have a more rapid dry down. Use hybrid trials as a guide, but always test hybrids on your farm and grow those that best suit your conditions. The slower maturing hybrids usually produce far more silage than quicker maturity hybrids.

Lodging resistance

Good lodging resistance is essential to avoid significant yield losses and difficult harvesting.

Major causes of lodging include seedling diseases, imbalance of plant nutrients, stalk and root rots during grain-fill, very high plant populations, weak root systems and poor stalk strength.

Good irrigation management, especially from tasselling onwards, will significantly reduce stalk and root rots, and hence reduce lodging.

Disease resistance

Seek hybrids that have resistance to diseases prevalent in your area.

On the North Coast, hybrids need good resistance to turcica leaf blight (also known as northern leaf blight) and maize dwarf mosaic (MDM).

In many areas, fusarium kernel rot has caused significant yield losses and quality issues in grain samples.

Commercial hybrids are relatively tolerant to boil smut but so far this disease has not caused significant yield losses, except where crops have been moisture stressed just before silking.

Grain quality

Choose hybrids that produce grain of the required quality, especially if you are growing for the food processing industry. Grit manufacturers, for example, require hard endosperm hybrids to make breakfast cereals and confectionery products. In Table 6, hybrids designated as G are used by at least one of the grit manufacturers. Other hard endosperm hybrids not used by grit manufacturers are designated as H. Check that you are growing the correct hybrid for the company buying your maize.

Select hybrids with tight husk cover to help prevent weevil damage in coastal districts and also to significantly reduce cob and kernel rots, heliothis and weather damage.

Special purpose hybrids such as waxy maize, white maize, high amylose maize and popcorn should only be grown under contract. Some special purpose hybrids may not be as vigorous as yellow maize hybrids, have poorer lodging and disease resistance, and yield less, especially high amylose and popcorn hybrids. However, recently released waxy and white hybrids have improved performance and good lodging resistance.

Planting guide

Plant population

Many factors, including soil moisture, climatic conditions, soil fertility, hybrid, and end use, determine the best plant population for a crop.

Dryland crops in drier areas should have lower plant populations than irrigated or high rainfall area crops (see Table 2).

Quick maturing hybrids produce smaller plants and so need higher populations than slower maturing hybrids.

However, within any maturity group hybrids have different tolerances to high plant populations with the more tolerant having better resistance to lodging, a low percentage of barren plants and good timing of silking with pollen shedding. Silage crops need higher populations than grain crops (see Table 2).

Table 2. Recommended plant populations for grain and silage crops

Irrigation status	Plants/ha (x 1000)	
	Grain	Silage
Irrigated	60–80	70–80
Non-irrigated		
Coastal	45–55	50–65
Tablelands	40–45	50–60
Northern Slopes	30–50	30–50
Northern Plains	20–30	

When calculating the planting rate, allow an extra 10%–15% for establishment losses. Obtain the number of seeds/kg and the germination percentage from the bag label.

Calculating planting rate and seed spacing within the row

$$\text{Planting rate (kg/ha)} = \frac{\text{Required number of plants/ha} \times 10\,000}{\text{Seeds/kg} \times \text{germination \%} \times (100 - \text{establishment loss \%})}$$

$$\text{Example} = \frac{70\,000 \times 10\,000}{3\,000 \times 95 \times (100 - 10)} = 27.3 \text{ kg/ha}$$

Seed spacing within a row for a particular planting rate (kg/ha) may be calculated as follows:

$$\text{Seed spacing} = \frac{10\,000 \times 10\,000}{\text{kg/ha} \times \text{seeds/kg} \times \text{row width (cm)}}$$

$$\text{Example} = \frac{10\,000 \times 10\,000}{27.3 \times 3\,000 \times 91.4} = 13.4 \text{ cm}$$

Row spacing

In most areas, 75–100 cm wide rows are best depending on the planter, tractor and harvester front. With good in-crop rainfall or irrigation, narrower rows usually produce slightly higher yields.

However, in drier areas such as the Northwest Plains, single or double skip on 100 cm rows is suggested so that soil moisture is conserved for grain fill.

With single and double 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.

Planting time

Crops should be planted to avoid:

- the main heat period at flowering
- frost in the first three weeks after emergence – frosts will slow growth but usually the growing point remains protected until the V6 stage (28 days after emergence)
- slow dry down
- increased risk of insect or disease pressure at the end of the season.

The recommended times for planting are:

Inland areas (irrigated crops) – Oct to Nov

Southern NSW – late Sept to mid Dec

Northern NSW – Sept (early to late depending on location) to late Dec (early Jan if using quick maturity hybrids)

Northern and Central Coast – late Nov to Dec (some crops may be planted in September but frequent dry springs significantly reduce yields)

South Coast and Tablelands – Oct to Nov

Inland crops should be planted early so that crop drying and harvesting are completed before the onset of cold weather and winter rain, which can delay harvest, especially in southern districts.

Soil moisture

Conserving soil moisture during fallow periods is less critical in irrigation and high rainfall coastal districts than in inland dryland crops. These dryland crops require at least one metre of wet soil at planting.

Plant inland crops using no-till methods wherever possible as this increases soil moisture more quickly and to a greater depth than conventional fallows, leading to increased yields and water use efficiency.

Controlled traffic farming with no-till lifts yields by reducing soil compaction and improving soil moisture storage and also reduces fuel consumption.

Coastal rain grown crops should be planted so that the critical period from two weeks before and four weeks after silking occurs when there is a high probability of good rain.

Growers should estimate their soil water holding capacity and target a refill point so that irrigation scheduling, yield targets and starting moisture can be established. Impediments to moisture availability such as salinity, which will also affect yield, should also be considered.

Nutrition

Good yields of grain or silage require high levels of soil fertility. The amount of nitrogen (N) fertiliser required can be determined by the previous cropping and fertiliser history, age of cultivation, fallow conditions, yield targets and nitrogen budgeting.

For high yields in coastal areas, up to 200 kg/ha of nitrogen fertiliser may be needed. High yielding inland irrigated crops may need 250–300 kg N/ha, depending on the yield target (see Tables 3 and 4).

Table 3. Nitrogen, phosphorus and potassium requirements and removal by maize

Grain production (t/ha)	Total crop requirement (kg/ha)	Removal in grain (kg/ha)
6	170 (N)	100 (N)
	30 (P)	22 (P)
	120 (K)	27 (K)
10	250 (N)	160 (N)
	40 (P)	30 (P)
	190 (K)	45 (K)

Table 4. Nitrogen rates (kg N/ha) for irrigated maize

Previous crop	Target yield		
	8 t/ha	10 t/ha	12 t/ha
Sorghum, maize, cotton, sunflower	200	250	300
Soybeans	180	230	280
Long fallow wheat	160	210	260
Long fallow faba beans	140	190	240

Inland dryland crops need about the same amount of nitrogen as grain sorghum (see Table 5).

Table 5. Nitrogen rates (kg N/ha) for dryland maize grown on the Liverpool Plains and for land with a cultivation age older than 25 years

Previous crop	Target yield	
	4 t/ha	6 t/ha
Sorghum, sunflower, cotton, maize	100	150
Long fallow winter cereal	80	120
Long fallow faba beans	30	80
Long fallow chickpea	50	100
Cowpeas, mung beans	70	120
Lucerne (good stand)	0	0

Nitrogen budgeting can also be used to determine the nitrogen requirements of a crop by following the calculations below. The quantity of N required to grow the crop is about 1.6 times the quantity removed in the grain.

N removed in grain (kg/ha)
= target yield (t/ha) x grain protein % x 1.6 (conversion factor)

N required for crop (kg/ha) = N removed in grain x 1.6

Example = [10 (t/ha) x 10 (protein %) x 1.6] x 1.6
= 256 kg N/ha

N uptake by a crop comes from the available soil nitrate N and from fertiliser N.

Soil nitrate N is estimated by testing soil (preferably to 90 cm depth) and considering the cropping history, especially the grain yield and protein content of the previous crop. If in the above example, 86 kg/ha of nitrate N was available in the soil, then a further 170 kg N/ha would need to be supplied.

Phosphorus rates used may be as high as 30 to 50 kg/ha on high-yielding irrigated crops. Soil testing, soil type, test strips and VAM fungi levels (in northern NSW) are guides to the phosphorus requirement of a crop.

Potassium is usually required on lighter soils of the tablelands and coastal areas at rates of 60–125 kg/ha of muriate of potash. Large quantities of potassium are removed in silage (see Table 3).

Zinc fertilisers are needed for maize grown on heavy alkaline soils. Zinc can be broadcast at 10–20 kg Zn/ha and worked into the soil well before planting. This application rate should last for five to six years.

Banding zinc compound fertilisers rather than zinc-blended fertilisers with the seed at planting can also be an effective way of applying zinc.

Alternatively, when the maize is 20–30 cm high, apply two foliar sprays, 7 to 10 days apart, of zinc sulphate heptahydrate solution (1 kg per 100 L of water) at 150–200 L/ha.

Molybdenum deficiency usually occurs on acid coastal soils. The deficiency should be overcome by a single application of molybdenum superphosphate every five years, or a seed dressing of molybdenum trioxide or a foliar spray of sodium molybdate or ammonium molybdate.

Water use

Water use efficiency is affected by weed control, nutrient supply, plant population, variety, irrigation method and efficiency, including tailwater management.

An unstressed crop of maize should have a water use efficiency of 16–18 kg of grain/ha/mm of water.

The amount of irrigation water required for irrigated crops will vary depending on seasonal conditions and the efficiency of irrigation methods.

When planning to plant maize it is important to consider the area you will be able to water properly.

At Gunnedah, 7 ML of irrigation water/ha will satisfy crop water requirements in four out of five years. In the Murrumbidgee Valley, budget on using 8–9 ML/ha on average.

Weed control

Good weed control is essential for high yields. Grasses and broadleaf weeds are best controlled by using pre-plant or pre-emergent herbicides.

Remember that maize is most susceptible to weed competition up to 0.8 m in height.

Insect management

Check the seedbed before planting and the crop regularly and thoroughly for insect pests. Spray only when the insect population exceeds the economic threshold of the particular insect and use only registered insecticides.

The main insect pests are:

- soil inhabiting insects (wireworm, cutworm, African black beetle, black field earwig)
- insects attacking stems leaves and tassels (armyworm, two spotted mite, corn aphid, leaf hoppers, large cane-moth borer)
- insects attacking cobs (heliothis, monolepta beetle, yellow peach moth larva)
- insects attacking grain (maize weevil, Angoumis grain moth).

Maize seed treated with either Gaucho® or Cruiser® is available from seed companies. These seed treatments should help achieve target plant populations by reducing the damage to establishing crops from soil insects such as false wireworms and true wireworms. Growers may use other products such as Semevin®, Counter® or chlorpyrifos to reduce damage from soil insects

Heliothis caterpillars (*Helicoverpa armigera*) are common pests of maize. Maize cobs are usually damaged only at the top with a few kernels being eaten and the likely economic loss mostly does not warrant spraying. However, sweet corn crops are more valuable and often suffer severe economic damage if heliothis are not controlled.

Any insect control options should be compatible with the insecticide resistance management strategy for your region.

Further information

Consult your local district agronomist for further information on maize. See the following NSW Agriculture publications.

Weed Control in Summer Crops 2005–06
Summer Crop Farm Budgets 2006–07
Insect and Mite Control in Field Crops 2005
Maize Growing Agfact P3.3.3 2nd Edition
Insect Pests of Maize Agfact P3.AE.2
Diseases of Maize Agfact P3.AB.4
Boil Smut of Maize Agfact P3.AB.8
Boil smut - an update for sweet corn, maize and popcorn industries Agnote DPI/104

Table 6. Maize hybrid (grain) characteristics for 2006–07

Brand	Hybrid	CRM (days)	End use	Lodging resistance	Disease resistance			Husk cover	Plant height at maturity
					Turcicum leaf blight	Maize dwarf mosaic	Cob rot		
Lefroy Seeds	Cobber – flint	110	C,G,S	8	8	8	8	8	7
	Cobber – feed	112	F	8	4	–	7	7	7
Pacific	DK 477	97	F,S	8	7	7	7	6	7
	Hycorn 503IT* #	104	F,S	7	5	5	5	6	7
	Hycorn 533	109	F,S	8	5	7	7	6	6
	Hycorn 424	115	F,S	7	7	8	6	6	7
	Hycorn 75	117	F,S	7	6	4	7	6	7
	Hycorn 675IT*#	118	C,F,S	7	7	6	7	7	7
	XL80	118	G,F	7	5	5	8	6	7
	Hycorn 345	119	G,C,F,S	7	5	5	8	7	7
	Hycorn901	126	F,S	8	8	8	8	8	8
	DK703W	120	W	7	8	7	7	8	7
Pioneer	36H36	100	F,S	8	5	NA	5	7	5
	3527	106	F,S	8	5	5	8	7	8
	34B28IT *#	109	F,S	7	4	NA	7	5	7
	34N43 #	110	F,S	8	5	NA	7	6	5
	3395IR*	111	F,S	8	4	4	5	6	8
	3335	113	F,S	7	5	5	7	6	7
	3237	118	F,S	9	5	5	6	7	6
	3153	118	G,S,C	9	7	7	8	8	8
	C79	123	G,F,S	8	9	8	8	6	5
	33A63	115	Wx	7	5	5	6	7	7
	32H39	114	W,C,F	8	4	6	5	7	5
	3287W	116	W,C,F	7	5	6	6	6	6
	36B08	103	F,S	7	7	NA	5	7	5
	34H98	108	Wx	8	6	NA	7	7	5
	31G98	117	F,S	7	6	NA	6	5	8
	31H50	118	F,S	7	8	NA	8	8	8
	31G66 #	118	F,S	8	5	NA	8	8	8
Hylan Snowy River	Julius	98	F,S	9	6	NA	8	8	6
	Maximus	102	F,S	8	8	NA	8	7	8
	SR73	103	S	5	4	NA	6	6	7
	Hercules	105	F,S	8	6	NA	7	8	9
	SR103	105	S	8	5	NA	6	7	9
	Roman	107	F,S	9	7	NA	8	8	8
	Colossus	110	F	8	5	NA	7	9	8
	Hannibal	112	G,H,F	8	8	NA	9	8	8
	Olympiad	116	F,S	9	7	NA	8	8	9

New hybrid for 2006–07

* IT = imidazolinone tolerant, IR = imidazolinone resistant

NA = Information Not Available. Only hybrids commercially available in NSW are listed.

Information in Table 6 was kindly supplied by seed companies.

Plant characteristics and ratings

Comparative relative maturity (CRM)	End use		Lodging resistance		Disease resistance		Husk cover		Plant height	
Comparative relative maturity allows the maturity of hybrids to be compared but actual days to maturity will vary with sowing time and location	G	Flaking grit	9	Excellent	9	Highly Resistant	9	Very Tight	9	Very Tall
	H	Hard/feed	5	Average	5	Intermediate	5	Medium	5	Medium
	C	Corn chips	1	Poor	1	Highly Susceptible	1	Very Open	1	Very Short
	S	Silage								
	F	Feed/starch								
	wx	Waxy								
	W	White								

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