

Farmlands Maize Field Guide

Your complete guide to growing
and harvesting maize silage



cm = centimetres **CRM** = comparative relative maturity
DM = drymatter **K** = potassium **kg** = kilogram
kgN/ha = kilograms of nitrogen per hectare **m** = metres
m² = square metre **mm** = millimetres **N** = nitrogen
P = phosphorus **kgDM/ha** = kilograms of drymatter per hectare
kgDM/ha.mm = kilograms of drymatter per hectare millimetre

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Introduction

During the last few seasons farmers have faced an increasing number of challenges as they seek to maintain or increase production. Climatic conditions have been tough and a combination of factors including low soil moisture and an increased number of insect pests has led to decreases in pasture yield and persistence. While ryegrass-clover pasture continues to be the backbone of New Zealand dairy farm systems, maize silage has become increasingly important as farmers strive to maintain production and profit.

There are a number of reasons why maize is the ideal complement to pasture including:

- Maize is a reliable crop producing high drymatter yields even in dry seasons.
- Growing and feeding maize can help improve pasture persistence.
- Maize silage can fill feed deficits increasing cow condition score, milk production and beef liveweight gains.
- Maize silage is environmentally sustainable.

This field guide provides an overview of the maize growing and harvesting process as well as best practice management guidelines to ensure that you maximise the return from your investment in maize.

Contact your local Farmlands representative or call the Pioneer Advice Line toll-free on 0800 PIONEER (0800 746 633) for crop specific advice.

Growing maize silage

Successful establishment of a maize crop relies upon following all the recommended steps on the following pages at the correct time.

Paddock selection

Timing

Most farmers choose a paddock for their maize crop during the winter or early spring. Selecting a paddock and spraying it out in the autumn will allow better control of hard-to-kill perennial weeds.

Paddock type

Choose a flat to rolling paddock with good vehicle access. Consult your planting contractor prior to finalising your site as they can assist you in selecting the best paddock to sow in maize.

Drainage

Maize does not perform well in waterlogged soils. Drain any areas where water ponds to allow earlier cultivation, better weed control and less chance of nutrient leaching.

Soil test

Always take a representative soil test to determine fertiliser and lime inputs. Soil core to the depth of cultivation - normally 150 mm and up to 300 mm on peat soils. Ensure that the soil sample is free of plant or crop debris and large root pieces. Take a deep nitrogen (60 cm) soil sample 2 - 4 weeks after planting to determine whether your crop requires any sidedress nitrogen.

Your Farmlands representative can arrange soil sampling and assist with interpretation of the results.

Soil preparation

Spray out pasture

Spray out pasture as soon as the paddock can be taken out of the grazing rotation. Spraying out 3 - 6 weeks prior to planting date is ideal as it gives plenty of time to create a good seedbed, however many farmers spray out 1 - 3 weeks prior to planting.

Contour and lime

If contouring is not required apply lime as soon as pasture has started to change colour. If contouring is required, undertake cultivation and apply lime when shaping is completed. Apply extra lime where drain banks or humps have been removed, especially on peat or clay soils.

Base fertiliser

Spread and incorporate the base fertiliser dressing. Allow 7 - 10 days between applying the base fertiliser and planting to reduce the chance of fertiliser burn damaging the seed or seedling roots. This is especially important in free draining soils.

Cultivate seedbed

Keep cultivation to a minimum and avoid cultivation when the soil is too wet or too dry. Bring the seedbed to a crumb size no larger than a maize seed. A well-prepared seedbed enables herbicides and insecticides to give optimum results, enhances crop establishment and allows planting machinery to function more accurately.

Final cultivation

If more than 24 hours have elapsed or it has rained since the last pass of the cultivator, make a further pass with a surface cultivator (e.g. rotor-tiller), before planting.

Determine maize nutrient requirements

The maize plant produces high drymatter yields and therefore has a high requirement for nutrients especially nitrogen (N), phosphorus (P) and potassium (K) (Table 1).

Table 1: Maize silage nutrient requirements

	Nutrient requirement (kg per tonne of DM removed)
Nitrogen	12.9
Phosphorus	2.6
Potassium	12.0
Magnesium	1.7
Sulphur	1.4

Source: National Research Council, 2001.

It is not usually necessary to apply fertiliser to supply all the crop's nutrient requirements. There are a number of reasons for this fact:

- Maize has a deep rooting structure (up to 1.8 m) and can use nutrients which have dropped below the root zone of pasture.
- Cultivating paddocks which have been in long-term pasture releases up to 300 kgN/ha from soil organic matter.

Fertiliser requirements will vary greatly depending on the history and fertility status of the paddock. Long-term dairy pastures which have had a history of effluent application may require no additional fertiliser while continually cropped paddocks or run-out sheep and beef farm pastures sometimes require capital fertiliser applications.

Maize seed treatment

New Zealand research has shown that establishing a high maize plant population is critical to achieving maximum silage yields. There are several important steps to achieving recommended plant population levels. These include planting high quality seed, preparing a fine, even seedbed that allows good seed-to-soil contact, planting at the correct plant populations and using insecticide treated seed to reduce the risk of insect damage to seedling plants.

Poncho®¹

Poncho®¹ represents a quantum leap in seed insecticide treatment technology. It is the preferred seed treatment option for maize growers because it:

- controls all three major maize insect pests (Argentine Stem Weevil (ASW), Black Beetle and Greasy Cutworm) in a single treatment
- gives the very best control of ASW which means farmers can reduce crop fallow periods
- is applied at low rates so it has minimal impact on the environment
- delivers a high degree of safety to seed treatment and planter operators.

Poncho Plus®¹

Poncho Plus®¹ is a seed treatment containing Poncho®¹ as well as Measuro¹ for bird repellency.

When you place your seed order ask for Poncho®¹ or Poncho Plus®¹ treated seed. The withholding period of Poncho®¹ is 42 days.

¹Poncho® and Measuro¹ are registered trademarks of Bayer CropScience.

Selecting a maize silage hybrid

It is important to choose the correct Pioneer® brand maize hybrid for your area and farming system. Some important factors to consider are:

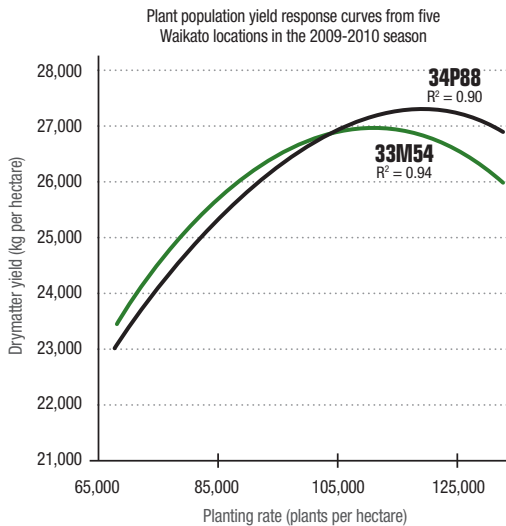
- **Comparative relative maturity (CRM).** This is an indication of the growing period from planting to harvest. Choosing the right hybrid CRM will ensure that you maximise yields whilst still meeting target dates for autumn regrassing or crop establishment. See pages 15 and 16 for average planting and harvest dates for Pioneer hybrids in your area.
- **High total drymatter and grain yield.** Hybrids must have a high total drymatter yield as well as a high grain yield to achieve maximum metabolisable energy yield per hectare. Grain yield is important as grain contains 70% more metabolisable energy than stover (the green part of a maize plant).
- **Agronomic strengths.** Selecting hybrids that have the right agronomic strengths for your area will help to ensure yield stability. That means that you will get good yields year after year. For example if you are planting maize on light soils in a low rainfall area, choose a hybrid with a good drought tolerance rating.
- **High quality seed.** Seed harvesting method, handling, drying, seed treatment type and method, shipping and storage can all influence the emergence and growth potential of the maize seed that you plant. For best results purchase high quality New Zealand produced seed from a company that has ISO certified quality control systems in place.
- **High population adaptability.** High plant populations are necessary to ensure high silage yields. All Pioneer® brand maize hybrids have been fully tested for their adaptability to high populations and fulfill this requirement. See page 10 for more information.

Silage plant population

New Zealand research has demonstrated that high yields result from uniform well grown crops of high yielding hybrids planted at populations selected to optimise drymatter yields. Talk to your local Farmlands representative for more information on planting populations.

Each year Pioneer® brand seeds conduct multiple silage small plot trials to determine the optimum planting populations for their hybrids.

Maize plant population yield response curves



In the table above maize silage yield data collected from five replicated trials showed that the highest plant populations (110,000 and 130,000 established plants per hectare) gave the highest drymatter yields. Crops planted at these populations produced a statistically significant yield advantage over crops established at 90,000 plants per hectare, which in turn were higher than 70,000 plants per hectare.

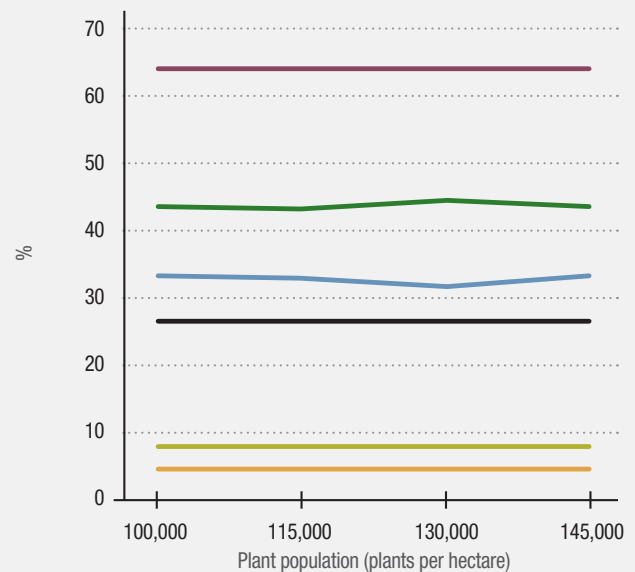
Silage Quality

A paper evaluating the impact of maize plant population on the yield and quality of 12 maize hybrids grown at 13 locations over two seasons was published in 2003¹. As plant population increased from 85,000 to 145,000 plants per hectare drymatter yield increased significantly but, with the exception of crude protein, there was no difference in nutritional quality.

For specific hybrid recommendations please refer to the Maize Silage Hybrid Performance Update 2011 for your region or consult your Pioneer® brand seeds Area Manager.

¹Densley et al, 2003. The effect of increasing plant populations on maize silage yield and quality. Proceedings of the New Zealand Grassland Association 65:117-121.

Impact of planting population on maize silage quality



Legend for Impact of planting population on maize silage quality:

- Soluble Sugars (Red line)
- Starch (Blue line)
- ADF (Black line)
- NDF (Green line)
- Whole Plant Digestibility (Purple line)
- Crude Protein (Yellow-green line)
- ASH (Orange line)

Pioneer® brand maize silage hybrids

Right Product. Right Paddock.SM

Pioneer® brand seeds goal is simple yet complex: Help farmers place the right product on the right paddock.

Farmers' challenges seem infinite: variations in rainfall, temperature, disease and pest pressure from season to season, paddock to paddock. So Pioneer's search for ways to maximise individual grower performance is endless.

Pioneer® brand products offer the broadest range and combination of plant attributes to meet specific needs. They are not 'one-size-fits-all' products.

Introducing more choice - two ranges of maize hybrids: Pioneer® brand Elite Performers and Pioneer® brand Proven Performers.

Pioneer® brand Elite Performers

The **Elite Performer** range includes the new leading edge hybrids most recently released from the New Zealand Research Programme.

Incorporating Pioneer's latest germplasm, these products have dominated New Zealand trials. The Elite range offers farmers industry leading yields, improved stability, productivity and flexibility.

Pioneer® brand Proven Performers

The **Proven Performer** range includes hybrids that have been trusted and have delivered yield stability and peace-of-mind to farmers over a number of seasons.

Pioneer® brand Elite Performers

39V43 (72 CRM) NEW Distinctively the earliest of the earliest! Best used in high altitude and latitude environments where **39G12** is considered too late in maturity.

39G12 (78 CRM) Excellent yields, sound drought tolerance and outstanding early growth.

39T45 (84 CRM) NEW Combines excellent agronomics with top silage yields.

38V12 (88 CRM) Strong early emergence, excellent roots, sound stalks and impressive drought tolerance.

38H20 (91 CRM) Produces a tall plant with strong resistance to Northern Leaf Blight, dependable drought tolerance, superior roots, stalks and staygreen.

P9400 (94 CRM) NEW Stands tall – delivers big time! A tall bulky plant producing high grain content silage with superior energy and digestibility.

37Y12 (95 CRM) Exceptional hybrid that produces silage yields with excellent energy and digestibility.

P0021 (100 CRM) NEW Mid maturity but top of the class! Produces excellent grain and silage yields on plants with sound standability and staygreen, bundled together with top disease resistances.

36M28 (103 CRM) Dual purpose hybrid producing outstanding silage yields with excellent digestibility and readily available energy.

35A30 (105 CRM) Combines great all round agronomics with dependable staygreen and drought tolerance. Has strong Northern Leaf Blight and Common Rust resistances.

P0791 (106 CRM) NEW Bulk and grain! Cows will love it! Produces a tall bulky silage hybrid with a chunky ear delivering impressive yields of soft textured grain. Outstanding drought tolerance.

34F95 (109 CRM) NEW Impressive combination of agronomics, leaf disease resistances and silage yields from a hybrid very similar in type and appearance to **34P88**.

34P88 (109 CRM) A tall hybrid with dependable stalks and superior drought tolerance.

33M54 (112 CRM) Industry leading grain dense silage yields with superior digestibility and readily available energy.

Pioneer® brand Proven Performers

39F58 (94 CRM) Combines superior ratings for Northern Leaf Blight, Common Rust and early growth.

38P05 (94 CRM) Produces high grain content silage with superior digestibility and is adapted to a wide range of environments from Northland to Canterbury.

36H36 (100 CRM) Widely adapted, consistent performer with sound agronomics and disease resistance.

34D71 (107 CRM) The Northern Leaf Blight resistant option! Exceptional yields in moderate to high yield environments.

34B23 (107 CRM) Great yields of exceptional quality silage. Best used in paddocks of medium to higher fertility that are straight out of pasture.

34K77 (109 CRM) Tough to take the drought! Has good agronomics and grain yields for the production of consistent quality silage.

33G26 (112 CRM) A very tall full season plant with superior early growth, dependable drought tolerance and solid agronomics.

33J56 (113 CRM) Huge plants with "king hit" yields. A full season hybrid for paddocks straight out of pasture.

Pioneer® brand maize silage hybrids
for 2011/2012

	Northland South Auckland Coastal BOP Gisborne Northern Hawke's Bay	North and Central Waikato King Country	South Waikato Coastal Taranaki Manawatu Rangitikei Southern Wairarapa Central Hawke's Bay	Central Taranaki Rotorua Taupo Southern Hawke's Bay Northern Wairarapa Horowhenua	Challenging yield environments*	Medium yield environments*	High yield environments*	
Hybrid	Estimated days from planting to harvest				Recommended established plant populations (000s/ha)			Hybrid
NEW 39V43				133-143	NR	120	130	NEW 39V43
39G12			126-140	140-150	108	115	120	39G12
NEW 39T45			134-148	144-158	108	115	120	NEW 39T45
38V12			136-150	146-160	104	108	115	38V12
38H20	124-138	129-143	137-152	148-162	104	108	115	38H20
NEW P9400			144-156	151-165	100	108	115	NEW P9400
37Y12	127-141	132-146	144-156	151-165	104	108	115	37Y12
NEW P0021	130-144	134-148	145-159	153-168	100	108	115	NEW P0021
36M28	132-145	137-153	148-160		100	104	108	36M28
35A30	133-147	138-154			100	104	108	35A30
NEW P0791	135-151	139-155			100	104	108	NEW P0791
NEW 34F95	136-151	140-155			100	104	108	NEW 34F95
34P88	136-151	140-155			100	104	108	34P88
33M54	143-157	146-160			100	104	104	33M54
39F58	122-135	125-139	135-149	143-158	NR	115	120	39F58
38P05	126-140	131-145	140-154	149-163	104	108	115	38P05
36H36	130-144	134-148	145-159		100	104	108	36H36
34D71	135-151	139-155			NR	104	108	34D71
34B23	138-152	141-155			100	104	108	34B23
34K77	136-152	140-155			100	104	108	34K77
33G26	142-156	145-159			100	104	108	33G26
33J56	144-159	146-162			100	104	108	33J56

NOTE: Estimated days from planting to harvest should be used as a guide only. When choosing hybrids, also review carefully the trait ratings found in the Pioneer® brand Maize for Silage 2011/2012 catalogue.

Contact your local Pioneer® brand seeds Area Manager or Farmlands representative for further advice.

*For more information on yield environment definitions refer to the Pioneer® brand Maize for Silage 2011/2012 catalogue.

Elite Performers

Proven Performers

Planting

Maize planting can commence once the 9 am soil temperature reaches 10°C at 50 mm and is rising when measured over three consecutive days.

Seed

Seed is a living organism. Store it in a cool, dry place prior to planting and handle with care. Avoid throwing bags. Cracked and damaged seed is more vulnerable to microbial and fungal infections once planted.

Planting

Maize hybrids for silage must be precision planted. Choose a competent contractor with well-maintained machinery. Have the insecticide treated seed and starter fertiliser on hand for his arrival.

Plant population

Plant Pioneer® brand maize silage hybrids at the recommended rate (see the Pioneer® Brand Maize for Silage 2011/2012 catalogue page 19).

Starter fertiliser

This is a mixture of N-P or N-P-K formula fertiliser which is applied through the planter. The type and rate of starter fertiliser used will be determined by your soil test results.

Weed control

Good weed control is essential to achieve a high yielding, high quality maize silage crop.

Weeds fall into two main categories - grass weeds and broad leaf weeds. Some sprays control mainly grass weeds, others only broad leaf weeds and a third group give control of both.

Time of application varies depending on the herbicide and the weed species present. The best weed control option will vary from farm to farm depending on the soil type and the number and species of weeds present. Plan pre and/or post-planting herbicide applications based on specific weed problems by paddock.

Pre emergent herbicide application

Pre emergent herbicides should always be applied before maize and weed seedlings germinate. They will be most effective if applied within 24 hours of planting.

Post emergent herbicide application

Post emergent herbicides are used to control seedling weeds that are already growing. Satisfactory weed control can only be achieved if crops are sprayed prior to row cover.

The type of herbicide used is determined by the type of weeds present. Seek specialist advice from your local Farmlands representative or Pioneer® brand seeds Area Manager.



Crop checks

From about 6 days after planting check crop emergence. Full emergence normally occurs 7 to 14 days from planting depending on temperature. Continue to walk the crop, preferably daily, checking for insect damage as well as weeds.

Maize insect pests

The three main insect pests of maize are Argentine Stem Weevil, Black Beetle and Greasy Cutworm.

Argentine Stem Weevil

Plants that have been damaged by the Argentine Stem Weevil (ASW) turn a blue-grey colour, the inside leaves wilt, and then the plant dies. There is no known spray to control ASW in seedling maize. Significant seedling damage is uncommon where Poncho^{®1} treated seed has been planted.



Greasy Cutworm

The symptoms of Greasy Cutworm in the crop are plants that have been cut off at ground level. Greasy Cutworm is a dark coloured caterpillar that feeds at night and burrows down into the soil during the day. To reduce the risk of Greasy Cutworm damage plant Poncho^{®1} treated seed. If you have a greasy cutworm problem in your crop and significant numbers of plants are affected an urgent spray programme is required. Consult your local Farmlands representative for assistance.



Black Beetle

Black Beetles do not occur every season but when they do, they are a very damaging pest in seedling maize with numbers as low as 1/m² causing economic losses. Damage is characterised by rough, rasped plant tissue damage in the bottom 3 cm of the stem. Visible black damage may not peak until the maize is in the 3rd or 4th leaf stage. Damage to the plant growing tip results in plant death. Each beetle kills one plant on average. Stunted plants and plants with multiple tillers can also occur as a result of Black Beetle damage. Currently there are no chemicals registered for the control of Black Beetles in emerged maize crops. The best control option is to plant Poncho^{®1} treated seed.

Sidedressing

Sidedressing with nitrogen fertiliser may be necessary to maximise maize silage yields especially in paddocks which have been continually cropped. Take a deep nitrogen (N) soil sample (0 - 60 cm) 3 - 4 weeks after planting. Your fertiliser representative can arrange soil sampling and interpretation of the deep N soil test. Deep N results can also be run through AmaizeN, a fertiliser forecasting tool developed for maize.

If your crop does require additional nitrogen it should be applied from 6 weeks post planting until just prior to row cover. Urea is the most commonly used nitrogen product for sidedressing. Methods of application range from broadcasting the urea just prior to rain to specific machines that knife the urea into the soil between the rows. Talk to your local contractor for further information.

¹Poncho[®] is a registered trademark of Bayer CropScience.

Guide to nutrient deficiency symptoms

Healthy leaves shine with a rich dark green colour when fed adequately.



Phosphate shortage marks leaves with reddish-purple, particularly on young plants.



Potash deficiency appears as a firing or drying along the tips and edges of lowest leaves.



Nitrogen hunger sign is yellowing that starts at tip and moves along middle of leaf.



Magnesium deficiency causes whitish strips along the veins and often a purplish colour on the underside of the lower leaves.



Drought causes the maize to have a greyish-green colour and the leaves roll up nearly to the size of a pencil.



Chemicals may sometimes burn tips, edges of leaves and at other contacts. Tissue dies, leaf becomes whitecap.



Deep, spreading roots of healthy, high-yielding plant.



Phosphate shortage during early weeks causes a shallow root system with little spread.



Poor drainage and hardpan are causes of a flat, shallow root system. Maize with poor roots can't stand drought and is easily blown over by high winds.



Acid soil is indicated when the lower part of the root is discoloured and decayed, particularly when brace roots shoot from third or fourth node.



Normal ear on well fertilised high-producing maize weighs about 450 grams. It has well filled tips.



Big ears weighing up to 900/1350 grams indicate that plant population was too small for most profitable yields.



Small ears usually are a sign of low fertility. For better yields, boost fertiliser application.



Potash shortage shows up in ears with poorly filled tips and loose chaffy kernels.



Phosphate shortages interfere with pollination and kernel fill. Ears are small, often are twisted and underdeveloped kernels.



Nitrogen is essential throughout the growing season. If plant runs out of nitrogen at a critical time, ears are small and protein content is low. Kernels at tip do not fill.

Maize leaf diseases

Maize diseases seldom cause significant yield loss in maize silage crops especially those planted in paddocks that have just come out of pasture. Growers in high risk situations (e.g. continually cropped maize) should consider planting hybrids with at least moderate disease ratings of 5 or higher to help reduce risk.

Northern Leaf Blight

Northern Leaf Blight (NLB) is a fungal disease of the maize plant. It is one of the easiest diseases to identify producing distinct cigar shaped lesions that are 25 mm to 150 mm or longer and grey-green in colour.

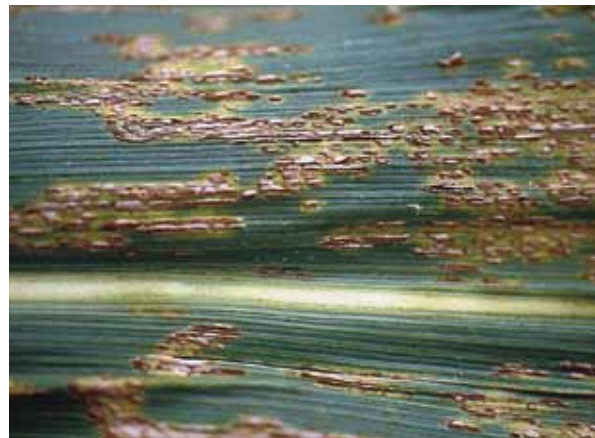
The fungi overwinters in diseased maize leaves, husks and other plant parts. Spores are produced on this crop residue and are spread by rain splash and air currents to the leaves of new crop plants. Secondary infection readily occurs from plant to plant, and even from field to field as spores are carried long distances by the wind. Infections generally begin on lower leaves first and then progress up the plant. Heavy dews, frequent light showers, high humidity, and moderate temperatures favour the spread of this disease.



Common Rust

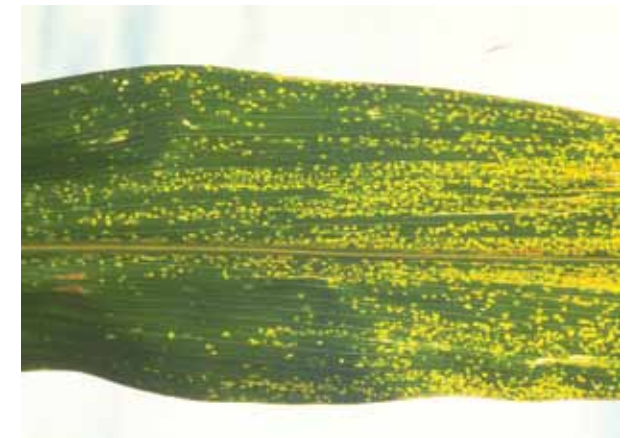
Common Rust can be easily recognised by the development of dark, reddish-brown pustules scattered over both the upper and lower surface of the maize leaves. Pustules appear oval to elongate in shape, are generally small, (less than 6 mm long), and are surrounded by the leaf epidermal layer, which appears as a whitish covering. These pustules may appear on any above ground portion of the plant, but are most abundant on the leaves.

The rust fungus does not overwinter on maize crop residues. Spores capable of infecting maize are spread by wind to new crop plants. Rust development and spread is favored by prolonged cool temperatures ranging from 16°C to 23°C and high relative humidity.



Eyespot

The leaves of plants affected with eyespot are covered with numerous small round spots which are about 3 mm in diameter. The central area of the spot soon dies, leaving a tan to cream-coloured center surrounded by a distinct brown to purple border. Since the small spot with its distinctive border resembles an eye, the disease was named Eyespot. Spores produced by the Eyespot fungus are widely dispersed by the wind. They settle on susceptible maize leaf and may germinate and initiate infection within a week, especially during cool, wet weather. Older maize leaves appear to be more susceptible to infection. Eyespot is favoured by long periods of cool, wet weather during the growing season.





Harvesting maize silage

Good harvest management will ensure that you maximise silage quality and minimise drymatter losses.

Plan ahead

The timing of maize silage harvest and harvest management factors such as chop length and compaction have a major impact on the quality and quantity of the resultant silage.

Contractors

Choose a reliable contractor with well maintained equipment. Ensure that he is prepared to vary chop length and processor settings if crops are too wet or too dry. Book your harvest contractor as soon as your crop is in the ground. Make sure that he can apply Pioneer® brand maize silage inoculant to your crop as it is harvested. Keep in touch with your contractor as your crop nears maturity.

Silage making supplies

Talk to your contractor as to what silage making supplies will be required e.g. cover, tape and Pioneer® brand silage inoculants. If you are responsible for procuring these items, make sure they are on farm well before harvest time. Talk to your local Farmlands store about the wide range of silage making supplies we have available.

Stack access

Discuss with your contractor where you will build the silage stack and who will do the stack work. Where required, widen gateways, culverts and/or races to allow easy and safe access for the silage harvester and silage transport units. Check overhead electric fence and power wires and tree branches have plenty of clearance for these large machines.

Silage storage facilities

Maize silage can be stored in a bunker or an above ground silage stack. The approximate amount of storage for different amounts of maize silage is shown in Table 2.

Table 2: Storage space required for maize silage

Amount of maize silage (tonnes of DM)	Approximate storage space required (cubic metres)	
	Stack	Bunker
25	125	111
50	250	222
75	375	333
100	500	444
125	625	556
150	750	667

Building new bunkers and stacks

Build your bunker or stack on a firm base away from hedges, trees and major drains. Choose a site that you will have access to all year round. Where possible, stacks should be built away from areas where rats, opossums, wild cats, ducks, pukekos, or any other wildlife that could make holes in the cover congregate. Feed-out costs will be reduced if the bunker or stack is built close to where the maize silage will be fed. The size of the face of the stack or bunker should match the rate of feed-out. Ensure the stack is built so that you can feed across the face of the stack every three days taking at least half metre from the face. A long and narrow stack or bunker is the most desirable.

Permanent bunker or stack sites

Plan to carry out any maintenance of permanent bunker or stack sites well before harvest. Crumbling dirt walls should be re-cut to give a straight, clean edge. If you have a permanent bunker or stack site that you use each year, clean out residues of last year's silage. This should be done at least a week before the new silage is put into the stack.

Time of harvest

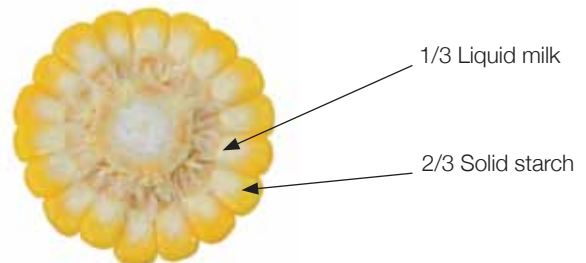
The ideal time to harvest your maize silage crop is when the whole plant drymatter is between 30% - 38%. Estimating the kernel milk line score, the plant cob:stover ratio and the plant drymatter content will help you determine if your crop is ready to harvest.

Please note that the following guidelines should only be used to determine if the crop is ready to harvest. **There is a Code of Practice for the Trading of Maize Forage** available free of charge from www.far.org.nz.

Milk line

The whole plant drymatter can be estimated by looking at the milk line of the grain. To check whether your crop is in the range of 30% - 38% drymatter:

1. Take a cob from a plant that is at least 20 rows into the crop.
2. Break / snap the cob in half and discard the end of the cob that was attached to the plant.
3. Hold the point of the cob downwards and remove a kernel from the "snapped" end.
4. Slide your fingernail along the length of the kernel starting at the flat (dented) end of the kernel.
5. Note the point where the solid starch ends and the liquid milk begins. The hybrid will be ready for harvest when the milk line is two thirds of the way down the kernel.



Harvest drymatter chart

Ideally maize silage should be harvested at 30% - 38% drymatter in order to optimise fermentation characteristics, feed value and utilisation by livestock.

Using basic field observations and the table below, it is possible to make a more accurate prediction of the standing crops overall drymatter percentage. This table should be used as a guide for the time of harvest only. Accurate drymatter levels can only be obtained by conducting an oven (or microwave) drymatter test.

ESTIMATED COB: STOVER RATIO		MEDIUM GRAIN CONTENT				HIGH GRAIN CONTENT				VERY HIGH GRAIN CONTENT			
HUSK COVER COLOUR	STOVER DRYMATTER CONTENT (%)	21% GREEN	23% YELLOW EDGES	25% YELLOW/BROWN	27% BROWN	21% GREEN	23% YELLOW EDGES	25% YELLOW/BROWN	27% BROWN	21% GREEN	23% YELLOW EDGES	25% YELLOW/BROWN	27% BROWN
		ANTICIPATED WHOLE PLANT DRYMATTER (%)											
GRAIN DRYMATTER %	DESCRIPTION OF KERNELS	26	28	29	30	27	28	29	30	27	28	29	31
34	Milky, starchy cap only	26	28	29	30	27	28	29	30	27	28	29	31
42	1/3 Milk-line	28	30	32	33	29	31	32	34	29	31	33	34
48	1/2 Milk-line	30	32	33	35	30	32	34	36	31	33	35	36
54	2/3 Milk-line	31	33	35	37	32	34	35	37	32	34	36	38
60	No milk left, solid starch	32	34	36	38	33	35	37	39	34	36	38	39

NOTE: This table is a GUIDE ONLY and is NOT FOR TRADE USE. This table should not be used for frosted, nutrient or drought stressed crops.

Harvest management

Precision chopping

Precision chopping is necessary to achieve top quality maize silage.

Chop length

The ideal chop length is 10 - 15 mm. This is a theoretical chop length and you will find some particles that are shorter or longer in your silage. Some longer particles are beneficial as they stimulate the rumen of the animal that is being fed. If your silage is very dry (greater than 38% drymatter), decrease the chop length to 5 - 9 mm. In the case of very wet crops (less than 30% drymatter) chop length may be increased up to 20 mm.

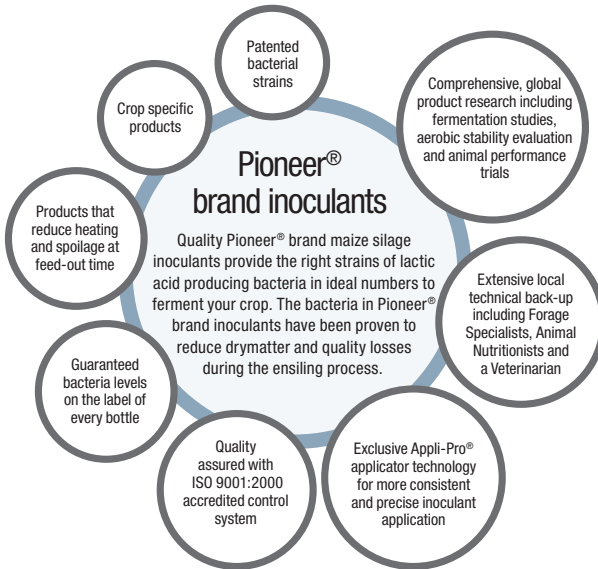
A good method of testing whether the chop length that you are using is correct for the moisture level is to take a handful of the harvested maize and squeeze it. The palm of your hand should feel moist. If you can wring water out of the material, you are almost certain to have run-off from your silage stack. Either increase the chop length or delay the harvest. On the other hand, if the maize silage does not stay compressed after squeezing, the maize is too dry. Chop length should be shortened.

Plant processing

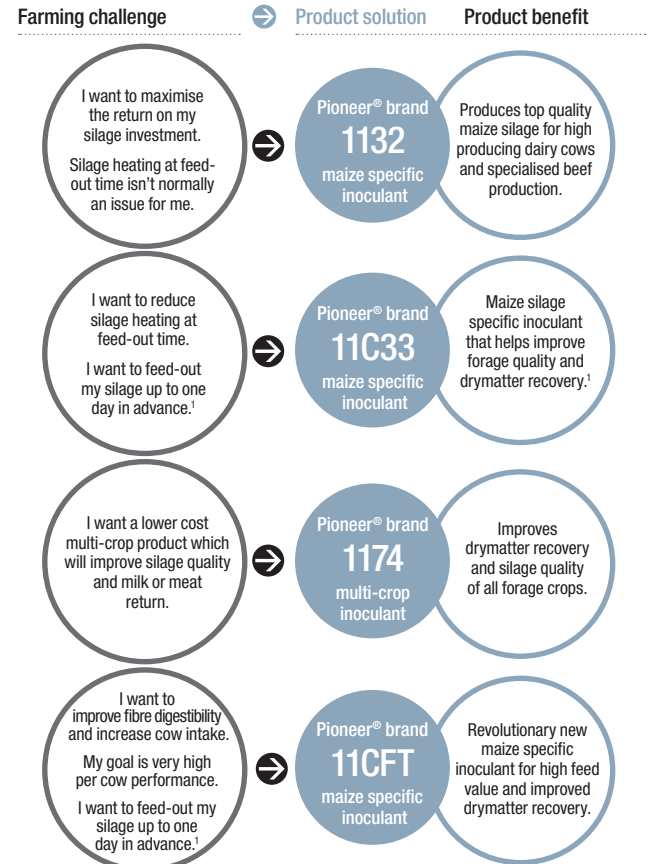
Use a plant processor to ensure that all of the kernels are broken into at least four pieces.

Pioneer® brand silage inoculant

You've invested in maize silage so make sure you get the most out of it by applying quality Pioneer® brand silage inoculants at harvest time.



Pioneer® brand maize silage inoculant options



¹For maximum aerobic stability benefits, silage must ferment at least 30 days before feeding.

Compacting and sealing

Rapid silage fermentation will reduce drymatter and energy losses associated with ensiling. Fermentation is an anaerobic (oxygen-free) process. The aim of the compaction process is to remove all of the air out of the maize silage. Sealing helps to keep it out ensuring that your silage will retain its quality.

Compaction

To achieve a good compaction:

- **Harvest** at 30% - 38% drymatter. Very dry or very wet crops are difficult to compact well.
- **Match the chop length to the harvest drymatter.** Aim for a chop length of 12 - 14 mm for silage that is between 30% - 38% drymatter.
- **Spread the chopped maize into 100 - 150 mm layers.** Thin layers compact to a higher density than thick layers.
- **Ensure that compaction capacity matches the harvest rate** to avoid "pile-ups". Increase the weight and/or the number of vehicles as required.
- **After harvest has finished, continue compacting** until the stack or bunker surface is firm.

Sealing

Once all of the air has been compacted out of the silage stack it should be sealed to prevent any air returning. Use a high quality plastic cover. Tape any joins in the cover, seal the edges using lime or sand and weigh the cover down with tyres that are touching.

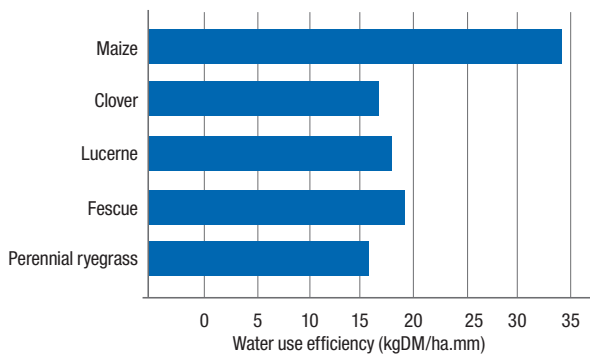


Maize silage and the environment

Research has shown that growing and feeding maize silage can reduce some of the environmental concerns associated with farm intensification. There are a number of reasons for this fact:

1. **Maize has a deep rooting system.** Typically a maize plant roots down to 150-180 cm depth in unrestricted soil. This allows it to capture water and nutrients from depths 2-3 times greater than most pasture grasses. Growing maize silage on high fertility dairy farm paddocks (including effluent paddocks) without additional fertiliser decreases the cost per kgDM maize silage. It also reduces excessive levels of nutrients especially nitrogen, phosphorus and potassium in the soil decreasing the risk of nutrient leaching.
2. **Maize uses water efficiently.** On an annual basis, maize produces more than twice as much drymatter as perennial ryegrass for every unit of water used. If you consider summer water use alone, maize is up to three times as efficient as perennial ryegrass.

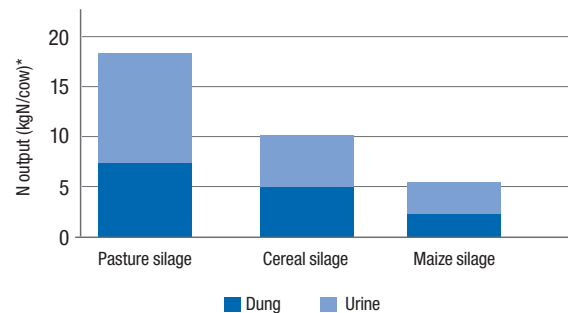
Figure 1: Annual water use efficiency of maize and pasture species in New Zealand and Australia.



Source: Adapted from Neal et al. 2007. Water efficiency, productivity and profitability - how do forages compare? Proceedings Australian Dairy Science Symposium.

3. **Maize uses nitrogen efficiently.** Maize has a nitrogen use efficiency approximately three times that of pasture.
4. **Feeding maize silage reduces nitrogen excretion by the cow.** Maize silage is a low protein feedstuff. Feeding it in conjunction with high protein pasture dilutes dietary protein levels. This in turn reduces nitrogen excretion by the cow in her dung and urine (Figure 2).

Figure 2: Effect of feed on cow nitrogen output*.



*Assumes 1tDM/cow.

Source: Ledgard, S. 2006. Nitrogen Management – why is it important and what can we do about it? Proceedings of the Dairy3 Conference 4:23-31.

5. **Feeding maize silage reduces nitrogen leached per unit of milk solids.** Following best-management maize growing and feeding practices will ensure maize silage environmental benefits are achieved.

Maize crop diary

The following crop diary lists the steps involved in producing an excellent crop. Use the date column to determine the ideal timings for your cropping operation.

Steps	Target date	Actual date	Notes	Area 1 ha	Area 2 ha
Soil test					
Base fertiliser			Fertiliser Rate		
Paddock sprayed out			Herbicide Rate		
Cultivation			Cultivation method		
Planting			Hybrid Population Seed treatment		
Starter fertiliser			Fertiliser Rate		
Pre emergent herbicide			Herbicide Rate		
Post emergent herbicide			Herbicide Rate		
Sidedressing			Fertiliser Rate		
Inoculant			Product		
Harvest			Total wet tonnes Drymatter percentage Drymatter yield (tDM/ha)		
Future planting			Autumn planting options		

Farming calendar

2011/2012

June							July						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
		1	2	3	4	5					1	2	3
6	7	8	9	10	11	12	4	5	6	7	8	9	10
13	14	15	16	17	18	19	11	12	13	14	15	16	17
20	21	22	23	24	25	26	18	19	20	21	22	23	24
27	28	29	30				25	26	27	28	29	30	31

August							September						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
1	2	3	4	5	6	7				1	2	3	4
8	9	10	11	12	13	14	5	6	7	8	9	10	11
15	16	17	18	19	20	21	12	13	14	15	16	17	18
22	23	24	25	26	27	28	19	20	21	22	23	24	25
29	30	31					26	27	28	29	30		

October							November							
M	T	W	T	F	S	S	M	T	W	T	F	S	S	
					1	2			1	2	3	4	5	6
3	4	5	6	7	8	9	7	8	9	10	11	12	13	
10	11	12	13	14	15	16	14	15	16	17	18	19	20	
17	18	19	20	21	22	23	21	22	23	24	25	26	27	
24	25	26	27	28	29	30	28	29	30					
31														

December							January						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4							1
5	6	7	8	9	10	11	2	3	4	5	6	7	8
12	13	14	15	16	17	18	9	10	11	12	13	14	15
19	20	21	22	23	24	25	16	17	18	19	20	21	22
26	27	28	29	30	31		23	24	25	26	27	28	29
							30	31					

February							March							
M	T	W	T	F	S	S	M	T	W	T	F	S	S	
			1	2	3	4	5				1	2	3	4
6	7	8	9	10	11	12	5	6	7	8	9	10	11	
13	14	15	16	17	18	19	12	13	14	15	16	17	18	
20	21	22	23	24	25	26	19	20	21	22	23	24	25	
27	28	29					26	27	28	29	30	31		

April							May							
M	T	W	T	F	S	S	M	T	W	T	F	S	S	
						1			1	2	3	4	5	6
2	3	4	5	6	7	8	7	8	9	10	11	12	13	
9	10	11	12	13	14	15	14	15	16	17	18	19	20	
16	17	18	19	20	21	22	21	22	23	24	25	26	27	
23	24	25	26	27	28	29	28	29	30	31				
30														

2012/2013

June							July						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
				1	2	3							1
4	5	6	7	8	9	10	2	3	4	5	6	7	8
11	12	13	14	15	16	17	9	10	11	12	13	14	15
18	19	20	21	22	23	24	16	17	18	19	20	21	22
25	26	27	28	29	30		23	24	25	26	27	28	29
							30	31					

August							September								
M	T	W	T	F	S	S	M	T	W	T	F	S	S		
			1	2	3	4	5							1	2
6	7	8	9	10	11	12	3	4	5	6	7	8	9		
13	14	15	16	17	18	19	10	11	12	13	14	15	16		
20	21	22	23	24	25	26	17	18	19	20	21	22	23		
27	28	29	30	31			24	25	26	27	28	29	30		

October							November							
M	T	W	T	F	S	S	M	T	W	T	F	S	S	
					1	2					1	2	3	4
3	4	5	6	7	8	9	5	6	7	8	9	10	11	
10	11	12	13	14	15	16	12	13	14	15	16	17	18	
15	16	17	18	19	20	21	19	20	21	22	23	24	25	
22	23	24	25	26	27	28	26	27	28	29	30			
29	30	31												

December							January							
M	T	W	T	F	S	S	M	T	W	T	F	S	S	
					1	2			1	2	3	4	5	6
3	4	5	6	7	8	9	7	8	9	10	11	12	13	
10	11	12	13	14	15	16	14	15	16	17	18	19	20	
17	18	19	20	21	22	23	21	22	23	24	25	26	27	
24	25	26	27	28	29	30	28	29	30	31				
31														

February							March						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
				1	2	3					1	2	3
4	5	6	7	8	9	10	4	5	6	7	8	9	10
11	12	13	14	15	16	17	11	12	13	14	15	16	17
18	19	20	21	22	23	24	18	19	20	21	22	23	24
25	26	27	28				25	26	27	28	29	30	31

April							May						
M	T	W	T	F	S	S	M	T	W	T	F	S	S
						1			1	2	3	4	5
1	2	3	4	5	6	7	6	7	8	9	10	11	12
8	9	10	11	12	13	14	13	14	15	16	17	18	19
15	16	17	18	19	20	21	20	21	22	23	24	25	26
22	23	24	25	26	27	28	27	28	29	30	31		
29	30												

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