

# Maize Silage

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More profit,  
More environmentally friendly



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## References

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### Abbreviations that appear in this publication:

**c/kgDM** - cents per kilogram of drymatter **cm** - centimetres **BCS** - body condition score **ha** - hectare  
**kgMS** - kilograms of milk solids **MJME/kgDM** - megajoules of metabolisable energy per kilogram of drymatter  
**tDM** - tonnes of drymatter **tDM/ha** - tonnes of drymatter per hectare **kg** - kilograms  
**\$/kgDM** - dollars per kilogram of drymatter **MS** - milk solids **DM/ha** - drymatter per hectare  
**C/MJME** - cents per megajoule of metabolisable energy **ME** - metabolisable energy

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## MAIZE SILAGE – MORE PROFIT, MORE ENVIRONMENTALLY FRIENDLY

To survive and thrive into the future, New Zealand dairy farm systems must be profitable and sustainable as well as globally competitive. Our dairy land is expensive compared to farm land prices overseas. Increasing milk production per hectare is a key to profitability and the long term competitiveness of the dairy industry but is it environmentally sustainable? Recent research shows growing and feeding maize silage provides a win-win solution for both farmers and the environment.

This booklet is divided into two parts. The first section (pages 3 - 8) outlines why maize silage is the supplement of the future for New Zealand dairy farm systems. The second section (pages 9 - 14) outlines how successful New Zealand farmers are using maize silage to increase their production and profit whilst building environmentally sustainable dairy farm systems that will thrive into the future.

## Cost effective

Many New Zealand farmers can grow crops of maize for silage that yield 18 - 26 tDM/ha on-farm or a run-off for 15 - 22 c/kgDM (in the stack)<sup>1</sup>.

Higher yielding crops (20 - 28 tDM/ha) can be grown on high fertility dairy farm paddocks including those with a history of effluent application for an even lower cost per kgDM (see Table 1).

**Table 1:** Average on-farm cost of home-grown maize silage for the 2012/13 growing season\*

Yield Maize silage yield (tDM/ha in the stack)	Average fertility paddock		High fertility paddock	
	Maize silage cost per kgDM in the stack (c/kgDM)	Maize silage cost per unit of energy in the stack (c/MJME)	Maize silage cost per kgDM in the stack (c/kgDM)	Maize silage cost per unit of energy in the stack (c/MJME)
16	24.2	2.24	-	-
18	21.5	1.99	15.7	1.46
20	19.4	1.80	14.2	1.31
22	17.6	1.63	12.9	1.19
24	16.2	1.50	11.8	1.09
26	14.9	1.38	10.9	1.01
28	13.8	1.28	10.1	0.94

\*See Pioneer® brand products Maize for Silage 2012/2013 catalogue, pages 24-25 for a comprehensive list of costs and assumptions or visit [www.pioneer.co.nz](http://www.pioneer.co.nz).

## Drives milk protein

When cows are fed a starch or sugar-based supplement, more of the additional milk solids they produce is protein and lactose. When cows are fed a fibre-based supplement, more of the additional milk solids is fat<sup>2</sup>. Since milk protein is generally worth two or three times more than milk fat, this effect of supplement type has implications on milk returns. Starch-based supplements such as maize silage will generate a higher milk revenue per kgDM fed than fibre based supplements such as grass silage or palm kernel.

**Table 2:** Estimated milk revenue (\$ in bold) from 1 tonne DM of different supplements at different payouts (grazing residual 1,550 kgDM/ha)<sup>2\*</sup>

Supplement	Percent of extra MS		ME MJ/kgDM	Feeding system	Milk price, \$/kgMS	
	Fat	Protein			\$6.50	\$7.50
PKE	75	25	11.0	In-shed	<b>440</b>	<b>510</b>
				Feed pad	<b>415</b>	<b>480</b>
				Trailer	<b>395</b>	<b>455</b>
Grass silage	70	30	10.5	Feed pad	<b>375</b>	<b>430</b>
				Paddock	<b>330</b>	<b>385</b>
Maize silage	45	55	10.5	Feed pad	<b>445</b>	<b>515</b>
				Paddock	<b>385</b>	<b>445</b>

\*See Roche and Hedley, 2011. Supplements – the facts to help improve your bottom line. DairyNZ Technical Series July, 2011 p 6-11 for a full list of assumptions.

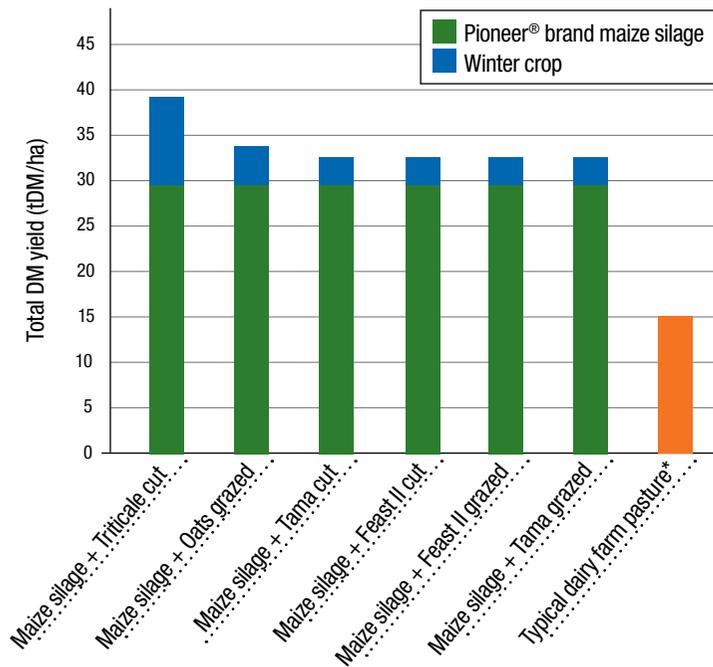
# High drymatter yields

Maize allows farmers to maximise the return from their high value dairy land by harvesting more drymatter from every hectare.

A replicated, two-year forage production trial conducted in the Waikato showed maize silage followed by a winter crop could produce an annual drymatter yield of over 38 tDM/ha<sup>3</sup> (Figure 1).

Even on farms harvesting more than 15 tDM/ha of pasture each year, planting 20% of the farm area in maize silage can lift the overall farm drymatter yield by more than 15%.

**Figure 1: Total annual drymatter yields for maize and a range of winter crop options (two year average data)<sup>3</sup>**



\*Trial did not include a pasture treatment.

# Environmentally sustainable

Growing and feeding maize silage can reduce some of the environmental concerns associated with the intensification of dairying.

## Growing maize

Maize has:

- An effective rooting depth of 150 - 180 cm which allows it to capture nutrients that have dropped out of the root zone of shallow rooted pasture species<sup>4</sup>.
- A nitrogen use efficiency approximately three times that of pasture<sup>5</sup>.
- A water use efficiency up to twice that of perennial ryegrass on an annual basis and up to three times greater on a summer seasonal basis<sup>6</sup>.

## Feeding maize

Feeding maize silage:

- In conjunction with high protein pasture dilutes dietary protein and reduces nitrogen excretion by the cow.
- Can reduce the quantity of nitrogen leached per kgMS provided best-management maize cropping practices are followed<sup>5</sup>.

Using best management practices to grow maize silage and feeding it on a feed pad can significantly reduce nitrogen leaching losses when compared to intensive all-grass systems<sup>5</sup>.



# Reliable

Modern maize hybrids have excellent yield stability allowing them to produce consistently high yields even under challenging growing conditions. This means that the cost per kilogram of drymatter of maize silage is relatively stable.

Always having a stack of maize silage on hand allows dairy farmers to weatherproof their feed supply, giving stable production, improved reproduction and greater peace of mind.

Maize silage that is well covered and sealed will maintain its quality for several seasons, providing cost-effective, quality feed when pasture growth rates are low.

With a feed buffer of maize silage on-farm there is no lead time to procuring additional feed and it can be fed the instant that it is required.

**Table 3:** Typical cost of maize silage that has been stored 1 - 2 years

Maize silage	Initial feed cost (c/kgDM)	Feed cost after 1 year @ 7.5% interest (c/kgDM)	Feed cost after 2 years @ 7.5% interest (c/kgDM)
Grown on-farm*	11 - 22	11.8 - 23.7	12.7 - 25.4
Bought in	28 - 35	30.1 - 37.6	32.4 - 40.4



\*On-farm growing costs do not take into consideration the amount of pasture that is lost while the maize crop is in the ground since both the amount of pasture and its value varies between farms.

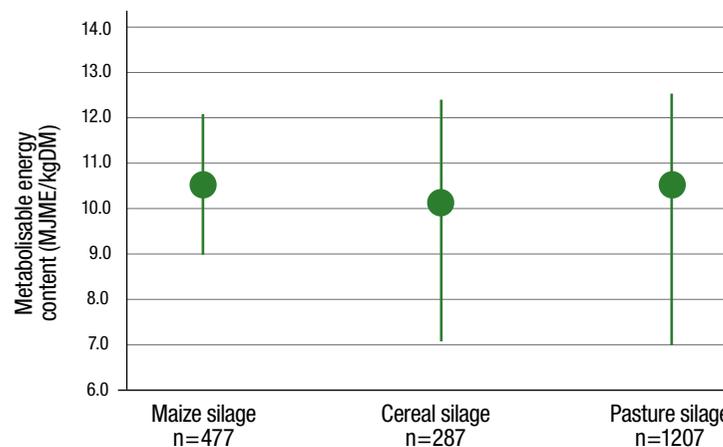
# Consistent quality, palatable, safe to feed

Maize silage has a consistent high quality when compared to other New Zealand silages (Figure 2).

Since maize silage contains a mix of carbohydrates (mainly from the maize grain) and fibre (from the green parts of the plant), maize silage is safe to feed. In fact, overseas research has shown that as long as it is introduced slowly, cattle can eat more than 90% of their diet as maize silage (note that feeding rates will be influenced by cow nutritional requirements and the type and amount of other feeds in the ration).

Because it is palatable and safe to feed, maize silage can be fed at high rates during periods of severe feed shortage\*.

**Figure 2:** New Zealand silage quality data showing maximum, minimum and average metabolisable energy content<sup>7</sup>



Well managed farm systems use maize silage and the latest technology to simplify management and reduce workload. For more information talk to your local Pioneer Forage Specialist.

\*Always introduce maize silage into the diet slowly.

## More profit, more environmentally friendly

More than twenty years of research and on-farm experience has demonstrated how maize silage integrates into the framework of dairy farm systems offering a suite of benefits that no other supplement can match. Together, maize silage and pasture will help keep New Zealand farmers profitable and environmentally sustainable into the future.

Maize silage allows farmers to:

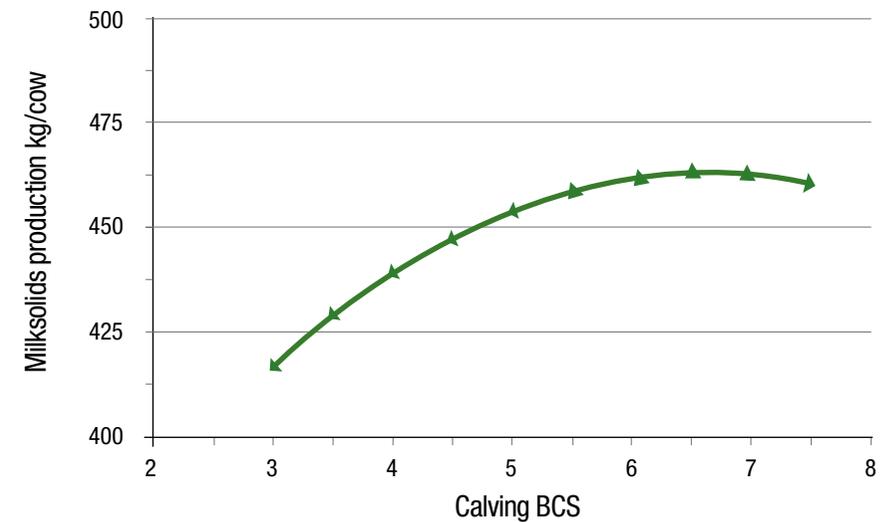
- **Maximise pasture harvested.** There is a strong relationship between the amount of pasture harvested on dairy farms and their profitability. However one downside of highly stocked farm systems is the risk posed by the significant and unpredictable variations in pasture growth rate which occur almost every season. Maize silage allows you to stock so that you can achieve a high pasture harvest even in a bumper pasture growing season. As pasture levels fluctuate you can feed maize silage to maintain animal intakes.
- **Fill feed deficits.** By always having maize silage on hand, you will never be short of feed. This will allow you to fill feed deficits throughout the season, lifting milk production and maintaining cow condition score levels.
- **Extend lactation.** Feeding maize silage in the autumn will allow you to increase the number of cow milking days while at the same time ensuring pasture cover and cow condition score targets are met.



## Increase cow condition

The benefits of having cows in better condition (the target is condition score 5 for mature cows and 5.5 for two and three year old cows) are substantial. A cow calving at condition score 5.0 will produce 12 kg more milksolids annually than a cow that calves at condition score 4.0. Cows that are fatter at calving cycle earlier, have higher in-calf rates and are more likely to give birth to a heifer calf the following year<sup>8</sup>.

**Figure 3:** Relationship between BCS at calving and annual milksolids production<sup>8</sup>



Maize silage is the premium cow conditioner because:

- Energy from maize silage is used 50% more efficiently for gaining body condition score than energy in autumn pasture.
- Maize silage is highly palatable and large volumes can be safely fed if required.

## Improve pasture persistence

Planting a maize silage crop is an integral part of the pasture renewal process because it provides an opportunity to address more of the factors that were negatively impacting pasture yield than a grass-to-grass pasture renewal programme does.

**Table 4:** Factors that influence pasture yields

Can be addressed	Can not be addressed
<ul style="list-style-type: none"><li>- Poor drainage</li><li>- Low soil fertility</li><li>- Low soil pH</li><li>- Soil compaction</li><li>- Weeds</li><li>- Insects and slugs</li><li>- Low yielding pasture species</li></ul>	<ul style="list-style-type: none"><li>- Topography</li><li>- Aspect</li><li>- Soil type</li></ul>

Growing maize silage as part of a pasture renewal programme can help improve pasture persistence by reducing the level of weeds, insect pests and carryover ryegrass seed.

Feeding maize silage results in higher pasture substitution rates than feeding concentrates. This reduces grazing pressure and can be used to manipulate farm pasture cover levels, reducing overgrazing and improving pasture persistence. The combination of maize silage and a well-designed stand-off pad with feeding facilities allows farmers to keep cows off wet pastures, decreasing pugging damage and subsequent losses in pasture production without compromising milk production or animal welfare<sup>9</sup>.

## Reduce on-farm nutrient build up

Increased stocking rates and more bought-in supplements contribute to an increase in soil nutrient levels. This has been implicated in a rising incidence of milk fever and grass staggers on some farms. Maize crops produce high drymatter yields and require high levels of nutrients, especially nitrogen and potassium. The benefits are two-fold; a reduction in soil nutrient levels as well as high yields of low cost maize silage.

A two year Ministry project jointly funded by the Ministry of Agriculture (MAF) Sustainable Farming Fund, Environment Waikato, the Foundation for Arable Research, DairyNZ and Pioneer® brand seeds<sup>10</sup> has shown that maize crops can be grown in high fertility paddocks, including those with a history of dairy shed effluent application, without the need for additional fertiliser to be applied.

Growing maize silage on dairy shed effluent paddocks without additional fertiliser:

- Decreases the cost per kgDM maize silage.
- Reduces excessive levels of nutrients especially nitrogen, phosphorus and potassium in the soil, decreasing the risk of nutrient leaching.
- Reduces the risk of milk fever caused by cows grazing very high potassium pastures.

The key rule to remember is to always soil test and don't apply more nutrients than you need.



Use maize silage to

## Increase run-off efficiency

Many dairy farm run-offs are not farmed to their full potential. Growing maize silage can help increase the drymatter production from run-offs.

An analysis by Scott Ridsdale (DairyNZ)<sup>11</sup> shows that a partially cropped run-off growing maize silage could harvest 86% more drymatter than a traditional run-off. The partially cropped run-off provided an 83% higher return on assets for the farmer that owned it.

**Table 5:** Comparison between the amount of drymatter harvested from a traditional run-off and one partially cropped with maize<sup>11</sup>

Traditional run-off 30 ha	Partially cropped run-off 30 ha
<b>Heifer grazing</b> 75 calves 75 yearlings	<b>Heifer grazing</b> 87 yearlings
<b>Winter grazing</b> 100 cows for 4 weeks	<b>Winter grazing</b> 120 cows for 4 weeks
<b>Standing grass for hay</b> 20 tDM	<b>Maize silage</b> 10 ha or 235 tDM
—	<b>Winter triticale crop</b> 10 ha or 80 tDM
<b>TOTAL FEED HARVESTED</b> 300 tDM or 10 tDM/ha	<b>TOTAL FEED HARVESTED</b> 558 tDM or 18.6 tDM/ha

## Maximise your maize silage return

The Pioneer® brand products team recognises that no two farms are the same – no two farmers have the same production, financial and lifestyle goals. Pioneer Forage Specialists use a number of FarmCheck<sup>SM</sup> tools and calculators to assist farmers to analyse and fine-tune their dairy farm systems. These include:



### Pasture Harvest Check<sup>SM</sup>

Estimates how much pasture is being harvested.



### Farm System Check<sup>SM</sup>

Determines whether your feed supply matches cow demand and your production target.



### Nutrition Check<sup>SM</sup>

Helps you ensure your cows diet is balanced so you can achieve your production targets.



### Run-off Efficiency Check<sup>SM</sup>

Determines how much drymatter you are harvesting from your run-off.



### Silage Stack Check<sup>SM</sup>

Highlights whether your maize, pasture or cereal silage is well ensiled.



### Feed Pad Check<sup>SM</sup>

Helps determine whether building a feed pad will pay dividends for you.



### FarmCheck<sup>TM</sup>

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