Maize Silage Manual

Your guide to producing high quality maize silage
Making Quality Maize Silage

High quality maize silage provides many benefits for the farmer, including:

- Provides a high potential DM yield to fill feed deficits
- Helps mitigate climatic risk
- Extracts excess soil nutrients if planted on high fertility effluent paddocks
- Improves pasture from planned cropped rotation

Producing high quality maize silage requires three factors to be optimized; a quality crop, a good fermentation and effective planning and management of silage making from harvest to feed-out.

This guide provides industry best practice for silage making, to maximise crop return and reduce feed wastage.
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Maximise your crop

Maize yield can be affected by many factors, including: location and environment, sowing time, hybrid, plant sowing rate, weeds, water logging, soil structure, nutrient deficiency, disease and pests. Seek expert advice and use crop monitoring services to maximise maize yield1.

A quality crop can suffer silage losses at harvest from:

**Weeds**

Weeds at harvest can introduce moulds and toxins to the silage, eg. Paspalum contains mould; Ragwort is noxious and Docks have a hard stick, making oxygen elimination difficult and risking puncture to the wrap. All weeds can leave pockets of mould once decomposed.

Record weeds that are present at harvest.

**Nitrogen Application too close to cutting**

Nitrogen is important for leaf growth, protein levels and total yield. However, nitrogen content of silage should be less than 0.44% or it can become unsafe to feed to animals.

Do not apply N fertiliser to silage crops too close to cutting.

It is also important to avoid applying manure/effluent prior to closing a paddock for silage, to avoid contamination with clostridium bacteria.

Weeds such as Amaranthus also have high N levels and should be noted if present at harvest.

**Improving soil conditions and nutrient content with biological products**

Post harvest break down crop trash and increase nutrients in the soil: Apply BioStart Digester at 2 L.

At sowing improve soil structure, reduce water logging/compaction and boost maize early root development: Apply BioStart Aerator at 2 L/ha.

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1. Refer to Best Management Practices for growing maize on dairy farms, p 7 - 8, Foundation of Arable Research (FAR) September 2009
Harvest Planning

Book harvest contractor and supplies

- Select and book in a reputable contractor as soon as the crop is in the ground.
- Confirm the target DM% for crop monitoring.
- Check the equipment is well maintained, chop length can be varied, plant processor settings.
- Check the contractor can apply BioStart MaizeKing preservative.
- Advise the contractor of any site works or maintenance required to bunkers or stacks.
- Confirm who is supplying the cover, silage tape and tyres for weighing down the stack.
- High quality tape for joins or repairing damage (check if the contractor or farmer is supplying this).
- Check if the contractor or farmer is supplying BioStart MaizeKing preservative.
- Ensure heavy, clean tyres are available for sealing.

Site preparation

- Well away from gullies or other places where run-off catchment water can flow into storage area.
- Decide on stack or bunker: Stacks (or buns) can be located around the farm and are therefore more flexible. Bunkers are initially more expensive, BUT have higher compaction rates and therefore less wastage.
- Flat and free draining, not prone to flooding or that has a high water table.
- Remove last year’s silage residues. If necessary re-cut dirt walls to give them a straight, clean edge.
- If laying down a metal or lime pad: do in advance and compact well.
- Bait the area with rat bait for at least two weeks prior to the maize harvest.
Site size

- 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.
- The top of the face should be easily reached from ground level using feed-out machinery (for operator safety and good feed-out management).
- Ensure it is large enough to hold the crop. Refer to pg 26 NZ Dairy Facts and Figures.
- For good compaction the bunker of stack must be at least twice the width of the vehicle that will be used to prepare it.

### Storage space required for grass and maize silage

<table>
<thead>
<tr>
<th>Silage storage</th>
<th>Tonnes DM multiplied by</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize stack</td>
<td>5.0</td>
<td>50 t DM x 5.0 = 250m²</td>
</tr>
<tr>
<td>Maize bunker</td>
<td>4.4</td>
<td>50 t DM x 4.4 = 222m²</td>
</tr>
<tr>
<td>Grass silage</td>
<td>5.7</td>
<td>50 t DM x 5.7 = 285m²</td>
</tr>
</tbody>
</table>

Note: Cubic metres = length (in metres) x width (in metres) x height (in metres).

Good bunker and stack construction will ensure better compaction and sealing and minimise silage leachate. Refer to DairyNZ Farmfacts Designing silage and feed storage ares (1 - 48) for best practice guidelines.
Harvest the maize silage crop when it is within the whole plant dry matter (WPD) range of 30 - 38% (whole plant moisture 62 – 70%).

This gives the best possible compromise between grain content, sugar content, stover digestibility and moisture content.

### Relationship between maize dry matter content and dry matter and effluent losses

<table>
<thead>
<tr>
<th>Whole Plant Moisture (%)</th>
<th>Recoverable Dry Matter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30% DM</td>
<td>Nutrient losses from immaturity. Wet silage, high stack leakage</td>
</tr>
<tr>
<td>30 - 38% DM</td>
<td>Optimum harvest range</td>
</tr>
<tr>
<td>&gt;38% DM</td>
<td>Field losses and spoilage from inadequate moisture for ensiling, poor stack compaction, air exclusion or ferment losses</td>
</tr>
</tbody>
</table>

Source: Corn silage management NDSU, p1.

### Assessment of DM% at 30 - 38%

- The milk line is at 1/3 kernel (indicative only)
- Conduct a laboratory test or microwave dry matter test.
Maize silage is pickled maize. Pickling or the fermentation process allows the maize crop to be preserved a lot longer than it would have been if left in the open air.

An efficient fermentation process is desirable for two reasons:

- To preserve nutrients.
- To minimise forage dry matter lost in the fermentation process and spoilage at feed-out.

### Six Phases of Silage Fermentation and Storage (without an inoculant/preservative)

<table>
<thead>
<tr>
<th>Age of silage without inoculant/preservative</th>
<th>Phase 1 - Aerobic</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2 days</td>
<td></td>
<td>2 - 3 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cell respiration; production of CO₂ heat and water.</th>
<th>Production of acetic acid and lactic acid ethanol.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature change</td>
<td>20 - 32°C</td>
<td>32 - 29°C</td>
</tr>
<tr>
<td>pH change</td>
<td>6.5 - 6.0</td>
<td>6.0 - 5.0</td>
</tr>
<tr>
<td>Produced</td>
<td>Oxygen or water soluble carbohydrate are exhausted.</td>
<td>Acetic acid and lactic acid bacteria</td>
</tr>
<tr>
<td>Phase is finished when</td>
<td>Poor compaction or sealing allows the growth of aerobic spoilage organisms and extends this phase.</td>
<td>pH drops below 6.0 inhibiting enterobacteria</td>
</tr>
</tbody>
</table>

### MaizeKing preservative’s role in Silage Fermentation and Storage

**MaizeKing preservative activity**

- **During Phase 1**, MaizeKing helps inhibit the growth of spoilage organisms on the crop at harvest, allowing the naturally occurring beneficial ensiling microbes to dominate; increases long term stability of the silage.
- Aids in activating the naturally occurring ensiling microbes and reduces fermentation time of Phase 1 - 4
NB. Fermentation losses can be 12 – 15% with a good fermentation and is much higher with a poor one. Spoilage losses can be significant.

Understanding the preservation or fermentation process helps us understand what we need to do to make quality silage and how MaizeKing preservative aids in the process.

<table>
<thead>
<tr>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 4 days</td>
<td>4 - 21 days</td>
<td>21 days +</td>
<td>Aerobic decomposition on re-exposure to oxygen.</td>
</tr>
<tr>
<td>Lactic acid formation</td>
<td>Lactic acid formation</td>
<td>Material storage</td>
<td></td>
</tr>
<tr>
<td>29°C</td>
<td>29°C</td>
<td>29°C</td>
<td>29°C</td>
</tr>
<tr>
<td>5.0 - 4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0 - 7.0</td>
</tr>
<tr>
<td>Lactic acid bacteria</td>
<td>Lactic acid bacteria</td>
<td>Mold and yeast activity</td>
<td></td>
</tr>
<tr>
<td>pH drops below 5.0</td>
<td>pH drops below 4.0 inhibiting growth of (but not destroying) all organisms.</td>
<td>Stable phase. Changes only occur due to environmental changes eg. exposure to air (&amp; reactivation of spoilage microbes), heavy rain and rodents/birds.</td>
<td>As spoilage microbes were inhibited in Phase 1, there will be less spoilage inoculum present in the stack or bale when it is opened and re-exposed to oxygen in Phase 6. This ultimately results in less spoilage.</td>
</tr>
</tbody>
</table>
The preservation process

Phase 1
At harvest the crop has both naturally occurring spoilage microbes and beneficial ensiling microbes living on it. From the time the plant is cut the aerobic phase begins. The microorganisms compete for the plant’s food source using oxygen to convert water-soluble carbohydrate to carbon dioxide, water, and heat. The microorganisms convert plant enzymes hydrolyse starch and hemicellulose to sugars required in the lactic acid fermentation phase.

Under ideal conditions of moisture, chop length, and compaction, this aerobic activity should last only a few hours and is complete when there is no oxygen left in the stack or the water-soluble carbohydrate is exhausted.

A poorly sealed stack or bunker can reduce aerobic stability of the feed by promoting the growth of aerobic spoilage organisms (such as yeast, fungi and/or spore-forming Bacillus species).

Although this aerobic phase results in small nutrient losses, this is required to establish the anaerobic conditions needed for ensiling and will extend aerobic stability of the silage during feed-out.

The shorter this phase, the lower the number of spoilage microorganisms, and the better the long term aerobic stability of the silage.

MaizeKing helps to inhibit the growth of spoilage organisms during this phase aiding better long term aerobic stability.

Phase 2
This is an oxygen-free (anaerobic) environment. Depletion of oxygen triggers an anaerobic heterofermentation that is carried out by enterobacteria. These bacteria produce short-chain volatile fatty acids (VFAs; acetate, lactate, and propionate), ethanol, and carbon dioxide from the fermentation of water-soluble carbohydrates.

The enterobacteria of the second phase rapidly reproduce and reduce the pH of the silage from 6.0 to below 5.0 which signals the end of the early anaerobic phase. Phase 2 generally lasts no longer than 24 to 72 hours.
Phase 3
The pH drop to below 5.0 promotes the growth of efficient homofermentative lactic-acid bacteria. These bacteria reduce silage pH faster and more efficiently by producing (predominantly) lactic acid. Phase 3 lasts for approximately 24 hours. As heat dissipates from the silage and pH continues to decrease, the action of Phase 3 lactic-acid bacteria becomes inhibited and the activity of Phase 4 lactic-acid bacteria increases.

Phase 4:
During phase 4 the silage temperature stabilizes as the homofermentative lactic-acid bacteria ferment water-soluble carbohydrate to lactic acid; a strong volatile fatty acid that rapidly reduces pH. Lactic acid generally predominates in good quality silage (> 60% of total VFAs) and is present at 3% to 6% of dry matter. A predominance of lactic-acid bacteria creates a faster fermentation thereby conserving more nutrients in the forage.

Phase 4 is the longest fermentation phase and continues until forage pH is low enough to inhibit, but not destroy, the growth potential of all organisms; in corn silage pH < 4. When silage reaches this terminal pH the forage is in a preserved state.

Natural fermentation of silage can take up to 21 days to complete, with fermentation time depending on the crop's buffering capacity, moisture and maturity.
MaizeKing aids in activating ensiling microbes to reduce fermentation time. Across Phase 2 to 4.

Phase 5
Phase 5 is the stable phase of silage and lasts throughout storage. During Phase 5 changes can occur depending on environmental factors such as air penetration and the numbers and types of aerobic spoilage microorganisms (such as yeasts, moulds, and aerobes) on the crop at harvest.
MaizeKing helps to inhibit the growth of spoilage organisms during this Phase.

Phase 6
Phase 6, the last fermentation phase, occurs when silage is fed from the storage structure. Most DM losses result from secondary aerobic spoilage on the surface of the silage during storage.
Aerobic spoilage microbial activity is stimulated when oxygen is reintroduced into the silage on opening the pit.
This aerobic activity produces heat and reduces the palatability and nutrient availability of silage.
Silage is predisposed to aerobic instability if high numbers of yeast, mould and/or aerobic bacteria are present or if the silage contains excess water-soluble carbohydrates.
As MaizeKing inhibited spoilage microbes in Phase 1, there will be less spoilage inoculum present in the stack or bale. MaizeKing therefore decreases the likelihood of aerobic instability.
The aerobic stability of silage is lowered if the crop has been exposed to environmental stresses such as application of manure (which can inoculate the crop with spoilage microbes), and contamination with soil microorganisms (through raking or by rain splashing soil onto the cut crop).
MaizeKing preservative

MaizeKing contains a concentrated blend of fermentation extracts including bacteriocins, secondary metabolites, enzymes and signal molecules. These extracts combine to provide a dual mode of action. MaizeKing aids with:

- Inhibits the growth of decomposition and spoilage microbes once the crop is cut
- Helps reduce the spoilage inoculum which can reactivate when the stack is opened
- Aids the naturally-occurring, beneficial ensiling bacteria to dominate
- Helps activate the naturally-occurring, beneficial ensiling bacteria to increase in number
- Increases the speed of fermentation
- Helps reduce the spoilage inoculum which can reactivate when the stack is opened

Zone of Inhibition

Every batch of MaizeKing is tested at an independent laboratory for activity against a minimum of three known pathogens which cause decomposition and spoilage. MaizeKing causes a zone of inhibition in which the pathogen cannot grow.

Treated Cladosporium showing zone of inhibition

Untreated control showing Cladosporium growth.

Directions for use

<table>
<thead>
<tr>
<th>Format</th>
<th>Dosage</th>
<th>20L/20kg pack treats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>115ml/wet tonne</td>
<td>175 wet tonnes</td>
</tr>
<tr>
<td>Granules</td>
<td>130gm/wet tonne</td>
<td>155 wet tonnes</td>
</tr>
</tbody>
</table>
Apply SilageKing at harvest. BioStart recommends the use of a BioStart applicator. Clean the applicator system to remove any product residues prior to use. To maximise MaizeKing’s efficacy it should always be used in conjunction with good silage making practices as outlined in this guide.

MaizeKing is available in liquid (20 L) and granule (20 kg) form.

Handling precautions: When mixing or applying, avoid contact with skin and eyes. Wear protective clothing, gloves and goggles. Flush applicator thoroughly with water after use. Do not eat or drink while using. Wash hands and face before meals and after work. Wash protective clothing after use.

Product storage: MaizeKing contains fermentation extracts. Store out of direct sunlight and below 30˚C, otherwise product efficacy may be affected.

Disclaimer: As BioStart Ltd and BioStart Brands Pty Ltd has no control over use, handling and storage of this product, no express or implied representations or warranty (other than non excludable warranties) are made. It is the buyer or user’s responsibility to store, handle and use the product in accordance with our label instructions and in conjunction with good silage making practices outlined in this guide.

“It is at the feeding-out stage when the silage stack is open to the air that MaizeKing really works the hardest for you, maintaining your feed quality. MaizeKing keeps the stack face cold, reducing secondary fermentation in the stack and in the mixer wagon. MaizeKing is also a lot cheaper than the inoculant brand I was previously using, it is made in New Zealand and the cows really mow it down.”

- Hamish Galloway, Dairy Farmer, Southern Hawkes Bay

Contractors and farmers report MaizeKing:
- Quick and efficient ferment
- Silage stays in top condition for longer
- Once opened faces remain cool
- Increases harvest window
- No pasture damage when feeding-out
- Lower cost than traditional inoculants
- No refrigeration, mixing or clean water source required
How does MaizeKing differ from traditional inoculants?

Traditional inoculants rely on introducing live lactic acid producing bacteria to and colonise the crop. These inoculants rely on large numbers to out-compete the decomposition and spoilage microbes.

MaizeKing inhibits the decomposition and spoilage microbes creating an environment where the naturally occurring ensiling microbes can flourish. MaizeKing helps activate the ensiling microbes to reproduce.

Live microbes must be treated carefully as temperature and unclean or chlorinated water can kill them. As MaizeKing contains fermentation extracts rather than live bacteria it is a lot more stable and easier to use.

“This new technology really works. No live bacteria means no refrigeration, no mixing and no clean water required. MaizeKing is easier to use and gives me quality silage that lasts longer.”

-Murray Andrews, Contractor & Dairy Farmer, Taranaki

<table>
<thead>
<tr>
<th>How does MaizeKing differ from traditional inoculants?</th>
<th>Inoculants with live bacteria</th>
<th>MaizeKing preservative</th>
<th>MaizeKing benefit over traditional inoculants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Live bacteria competes with decomposition &amp; spoilage microbes.</td>
<td>Fermentation extracts inhibit decomposition &amp; spoilage microbes, activate naturally occurring ensiling microbes.</td>
<td>Dual mode of action. Every batch is independently tested for inhibition activity against a variety of spoilage microbes.</td>
</tr>
<tr>
<td>Storage</td>
<td>Keep refrigerated or bacteria can die.</td>
<td>No refrigeration required. Simply store below 30 C and out of direct sunlight.</td>
<td>Easier to use, no concern over whether inoculant’s bacteria is still alive.</td>
</tr>
<tr>
<td>Mixing</td>
<td>Mix with clean, non-chlorinated water or the bacteria can die.</td>
<td>No mixing required, no clean water source required.</td>
<td>Easier to use, no concern over whether inoculant’s bacteria is still alive.</td>
</tr>
<tr>
<td>Country of origin</td>
<td>Most are made overseas.</td>
<td>Made in NZ.</td>
<td>Developed for local conditions.</td>
</tr>
<tr>
<td>Cost</td>
<td>Find out how much you can save by using MaizeKing over other inoculants. Call BioStart 0800 116 229.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chopping and plant processing

Precision chopping is necessary to achieve top quality maize silage. The ideal chop-length for maize at 30 - 36% WPD is between 12 - 15 mm.

If the WPD is higher or lower then chop length should be adjusted as per the table below:

<table>
<thead>
<tr>
<th>WPD</th>
<th>Chop length</th>
<th>Plant processor setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30%</td>
<td>17 - 20mm</td>
<td>5 - 9mm</td>
</tr>
<tr>
<td>30 - 36%</td>
<td>12 - 15mm</td>
<td>2 - 3mm</td>
</tr>
<tr>
<td>&gt;36%</td>
<td>7 - 10mm</td>
<td>1mm</td>
</tr>
</tbody>
</table>

Source: Farm Technical Manual, Lincoln University, p D-35.

Squeeze test to check chop length is correct

Squeeze a handful of harvested maize and assess result:
1. Maize does not stay compressed: the maize is too dry – shorten chop length
2. Palm is moist: chop length is correct
3. Water runs out of material: maize is too wet – increase chop length or delay harvest

The chopped maize then passes through a plant processor within the forage harvester. The plant processor
• squashes the material, making the starch and stem more digestible for stock.
• should have a target of 99% of the kernels broken into at least four pieces, allowing the rumen bacteria access to the highly digestible starch inside the grain

It is important that the maize is fully processed. At the ideal WPD (30 - 36%) the kernel processor should be set at 2 - 3 mm. If the WPD is higher or lower then adjust the processor as per the table above.

Compaction

Good compaction is required to make top quality silage. Silage fermentation is an anaerobic (oxygen-free) process so the aim of the compaction process is to remove all the air out of the maize silage. Compaction is affected by vehicle weight, rolling time and the depth of the chopped maize layers being compacted.

To achieve a good compaction:

- Fill the bunker or stack as quickly as possible to minimise exposure to air.
- Use wheeled vehicles, as they have a higher weight per surface area and achieve better compaction than tracked.
- Spread each load into a 100 - 150 mm thin layer.

Fill in a wedge shape from the back (1) to the front of the bunker (6) for good compaction and minimal air exposure.

- Dump large loads in front of the stack and build the stack with small loads in layers.
- Increase the weight/number of vehicles to ensure the compaction capacity matches the harvest rate and avoid pile-ups.
- Continue compacting for up to two hours after the final load has arrived at the stack.
- Straighten sides and remove loose material from sides and ends by hand with a rake and/or wide – mouthed shovel.

Footnote: Content adapted from Farm Technical Manual, Lincoln University Section 4.3.1.4, p D31-32
Sealing keeps air out of the stack. Silage fermentation does not begin until the forage in the stack or bunker is under oxygen-free conditions.

Cover and seal immediately after compaction to increase the speed of the fermentation process and reduce losses.

To achieve a good seal on your stack or bunker:

- Smooth the surface to avoid creases or folds in the cover.
- Tape holes and joins, avoiding a large overlap as condensation can form between the layers and cause spoilage.
- Weigh the cover down tightly against the silage with tyres that are touching, sand bags or lime.
- Seal around the base of the stack with a layer of sand or lime on top of the cover.

Rats, mice and birds can make holes in the cover, exposing the silage to the air and causing spoilage. Rodents also carry disease.

To protect against rodent and bird damage:

- Keep the area around the stack tidy, fenced and free from vegetation.
- Place rat-baits in clay pipes on the ground at each side of the stack.
- Use a shade-cloth or bird-netting (placed over the tyres) to deter birds pecking holes in the cover.
- Use insulation tape to patch any holes that appear in the cover.
Feeding-out

There is an estimated 20% + feed wastage at feeding-out. During feed-out the aim is to minimise the silage that is exposed to the air, to reduce losses from aerobic bacteria breaking down the feed.

To check face tightness: You should not be able to push your fingers into the stack any further than the depth of your fingernails.

Face Management

- Open the stack at the opposite end to the prevailing wind to prevent air getting pushed under the cover.
- Use a front end loader to create a face to minimise the loosening of silage in the stack. Use the bucket to chip down silage from the top of the face and then scoop it up from the ground.
- Avoid digging or ramming the silage forks or bucket into the stack as this creates shatter and may allow air to penetrate into the maize stack.
- Estimate how far into the face you need to feed, scoop out the lowest section of the silage and then, using the bucket-blade, chip down the silage one section at a time, starting at the bottom.
- Alternatively, move sideways across the bunker face, removing small amounts from the whole face.
- Silage-grabs and block cutters will assist in keeping the face of the stack or bunker tight.
- Use a wide mouth shovel and a broom to ensure no loose material is left at the base of the stack.
- It is not advisable to lower the silage cover if maize is being fed on a daily basis. This is because the air trapped under the cover will heat, creating an ideal environment for mould growth.
- Lowering the cover is advisable during periods of heavy rain. Heavy rainfall can pose a risk if water gets into the stack creating leachate.
- If birds are a problem, use either bird netting or shade cloth to cover the face of the stack.

Spoilage

Maize silage that is well compacted and sealed will not contain moulds as mould requires air to grow. Once the face is open mould will grow after a few days of air exposure. In some conditions 1 day of exposure is sufficient for mould growth. Not all moulds are harmful, but some can cause animal health problems and even death.

Never feed mouldy or ‘rotten’ silage to your cows without clearance from a laboratory test.

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Storage</th>
<th>Feeding-out paddock</th>
<th>Feeding-out bins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize &amp; cereal silage (%)</td>
<td>Excellent 6</td>
<td>Excellent 15</td>
<td>V.Good 5</td>
</tr>
<tr>
<td></td>
<td>Average 10 - 15</td>
<td>Average 25</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Poor 20 - 40</td>
<td>Poor 40</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Dairy NZ facts and figures, p 31.
## Facts & figures

### Feed value of maize

<table>
<thead>
<tr>
<th>Silage</th>
<th>DM %</th>
<th>ME MJ/kg DM</th>
<th>CP %DM</th>
<th>NDF %DM</th>
<th>SSS %DM</th>
<th>Starch %SSS</th>
<th>Fat %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize, high grain</td>
<td>33 - 38</td>
<td>10.8 - 11.0</td>
<td>8.0</td>
<td>42 - 45</td>
<td>35</td>
<td>75 - 80</td>
<td>3.1</td>
</tr>
<tr>
<td>Maize, low grain</td>
<td>28 - 40</td>
<td>10.0 - 10.5</td>
<td>8.0</td>
<td>45 - 50</td>
<td>30</td>
<td>70 - 80</td>
<td>3.1</td>
</tr>
</tbody>
</table>

### Interpreting maize silage analysis

<table>
<thead>
<tr>
<th>Factors</th>
<th>Quality of typical fermentation range</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>3.7 - 4.2</td>
<td>pH higher than 4.0 may be due to the silage being very high DM (&gt;42%) or the silage has had considerable aerobic exposure.</td>
</tr>
<tr>
<td>Ammonia N (% total N)</td>
<td>5 - 7</td>
<td>High value (&gt;12%) is the result of high protein breakdown. Note: maize silage has low crude protein (8%) ie. less crude protein available to be degraded.</td>
</tr>
<tr>
<td>Lactic acid (%DM)</td>
<td>4 - 7</td>
<td>High concentrations indicate well preserved silage. Low values may indicate restricted fermentation due to high DM or after considerable aerobic exposure.</td>
</tr>
<tr>
<td>Acetic acid (%DM)</td>
<td>1 - 3</td>
<td>High concentrations are often found with very wet silage (&lt;25% DM) or due to loose packing. Silage treated with inoculant containing <em>I. buchneri</em> show higher levels of acetic acid; this should not be mistaken for a poorly preserved silage.</td>
</tr>
</tbody>
</table>

### Density and DM% of silage

<table>
<thead>
<tr>
<th>Silage type</th>
<th>DM %</th>
<th>Wet weight silage kg/m³</th>
<th>DM silage kg/m³</th>
<th>Density in wagon kg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize stack</td>
<td>33 - 38</td>
<td>500 - 760</td>
<td>170 - 250</td>
<td>80 - 120</td>
</tr>
<tr>
<td>Maize bunker</td>
<td>33 - 38</td>
<td>600 - 820</td>
<td>200 - 270</td>
<td></td>
</tr>
<tr>
<td>Maize deep bunker (uncommon)</td>
<td>33 - 38</td>
<td>760 - 900</td>
<td>250 - 300</td>
<td></td>
</tr>
</tbody>
</table>

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1. Facts and Figures for NZ dairy farmers, September 2012, P 18 - 19, Dairy NZ
2. Facts and Figures for NZ dairy farmers, P 28, Dairy NZ
3. Facts and Figures for NZ dairy farmers, P 26, Dairy NZ