

ORGANIC MAIZE SILAGE

Maize silage is an excellent option for organic dairy farms because it is a readily available, consistently high-quality feed that can be grown on-farm at a relatively low cost. Maize also provides a great sink for excess nutrients in dairy effluent. This technical insight deals with both how to successfully grow, harvest, and store an organic maize for silage crop and then how to profitably feed it.

Growing organic maize for silage

Maize is the organic farmer's dream crop. It grows rapidly, produces a large amount of dry matter and plenty of energy in the form of starch. To ensure crop success there are a few steps which need to be followed. These are outlined below:

1. Paddock selection

Successful establishment of a maize crop relies upon following all the recommended steps at the correct time. If possible, select your paddock in the early autumn. Walk the whole area and check for the following:

- **Perennial grass weeds** (e.g., couch and mercer grass). If perennial weeds (e.g., couch/twitch, mercer grass, kikuyu) are not controlled they can cause a significant reduction in maize yield. Avoid using paddocks which have a major perennial weed problem as they are virtually impossible to eradicate in an organic system.
- **Drainage.** Choose a free-draining paddock. Maize does not perform well in waterlogged soils and wet paddocks also tend to be weedy.

2. Soil test

Soil test to determine the most suitable fertiliser and lime input. 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 fertiliser while run-out farm pastures often require capital fertiliser applications. Soil core to the depth of

cultivation - normally 150 mm and up to 300 mm on peat soils. Increase lime application in areas where contour correction is required especially on heavy soils and peats.

Fertiliser: Organic certified fertiliser must be used. Fortunately, the two key minerals maize needs for growth (potassium (K) and nitrogen) (N) are available organically at reasonable prices. Sources of K include muriate of potash (MOP) while animal manures including chicken litter, goat bedding or dairy shed effluent contain both N and K.

3. Maize hybrid selection

It is important to choose the correct Pioneer® brand maize hybrid for your area. Your local Pioneer representative will have a range of hybrids that better suit growing maize organically, contact them for regionally appropriate advice. Some important factors to consider include:

- **Comparative relative maturity (CRM).** This is an indication of the growing period from planting to harvest. The actual crop growing period will vary according to the amount of heat the crop receives (i.e. spring, summer and autumn temperatures) during the season. The warmer the season, the shorter the period from planting to harvest. See the Pioneer® brand maize silage catalogue for average planting and harvest dates for Pioneer hybrids in your area.
- **High total DM 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 and greater carbohydrate levels than stover (the green part of a maize plant).
- **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. It is important to plant as high a population as possible to maximise suppression of all developing weeds.

- **Drought tolerance.** If planting into paddocks with drought prone soils, choose a maize hybrid with a good drought tolerance rating.
- **Plant shape.** Light suppression is really important to prevent weed growth in organic systems. Choose a hybrid with more prostrate rather than erect leaf shape. Your local Pioneer representative can assist you in identifying more prostrate hybrids.

4. Choose your ideal planting date

Maize grows faster when the temperature is warmer. Aim to plant organic crops when the soil temperature is consistently above 14°C and day temperatures are above 18°C. For most areas this will be late October or early November. Planting once soil temperatures are warmer will allow the maize to grow quickly and stand a better chance of outcompeting weeds.

5. Cultivate as soon as possible

Begin cultivating at least six weeks prior to the target planting date. The aim of the cultivation process is preparing the seedbed for planting to reduce the weed bank and reduce the population of maize insect pests (e.g. Argentine stem weevil, black beetle and greasy cutworm). You may need to cultivate the ground three or four times before planting. Check the ground regularly and when sufficient weeds have germinated, run a spring-tine cultivator or some other similar implement over the ground.

6. Lorem ipsum dolor sit amet

If contouring is not required apply lime just after the initial cultivation. 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.

7. Fertiliser

Spread and incorporate the fertiliser dressing at least a week before planting.

8. 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. If the soil is very dry and there is still a significant number of weeds present only cultivate the soil very lightly and shallowly so that you kill the weeds but prevent too much soil moisture loss.

9. Insect control

Organic maize is limited when it comes to insect control. Effective cultivation followed by a long fallow

period is the best way to reduce insect pressure. For information about insect control refer to “Plant Protection in Organic Arable and Vegetable Crops – a growers resource” available from <https://nzpps.org/book/plant-protection-in-organic-arable-and-vegetable-crops/>

10. Weed control

Post emergent weed control is best achieved by:

- Pre-plant cultivation to reduce the size of the weed seed bank.
- Choosing prostrate leafed maize hybrids and planting them at high populations.
- Inter-row cultivating when the plants are knee high.

11. Crop checks

Full emergence normally occurs 7 - 14 days from planting depending on temperature. Walk the crop every second or third day checking for insect and bird damage and weeds.

- **Insects.** We are unaware of any organic options for insect control in maize however identification of insect issues is still worthwhile as it can help determine the fallow period for next season.
- **Bird damage.** If you find small seedling plants pulled out of the ground with the roots still attached, it is probably bird damage. Planting when the soil temperature is 14°C or higher and using a greater planting depth (65 mm) can help reduce bird damage. If pukekos, ducks or pheasants are a problem, permits can be obtained from the local Fish and Game office to control these. Some growers use mechanical bird scarers but often the size of the area grown makes these ineffective.
- **Seedling weeds.** Inter-row cultivate just prior to canopy cover.

Harvesting and ensiling maize silage

The secret to making good silage is to ensure it is harvested at the right time, compacted and then kept airtight until feed out time. It is important to follow the correct procedure in order to make high quality maize silage. Key steps are:

1. Organise your contractor

Contact your chosen harvest contractor early. On an organic farm, outside contractors are required to have cleaned their equipment before entering the property.

Giving your contractor plenty of notice of your job will allow them to plan your work after a normal clean-up procedure. A standard “contractor” form needs to be completed each time a contractor brings equipment onto the property to confirm their machinery was cleaned - your organic certifier can provide you with a template.

2. Organise your bunker or stack

Choose a low-risk site and design the silage stack carefully to reduce leachate or runoff risks. Ensure the chosen site for the stack is well back from any waterways, drains or tiles, and avoid wet areas. Keep in mind property boundaries, neighbours, water abstraction points and critical source areas. Design your stack to sit on an impermeable base to prevent loss to groundwater. Divert rainwater away from the stack.

3. Timing of harvest

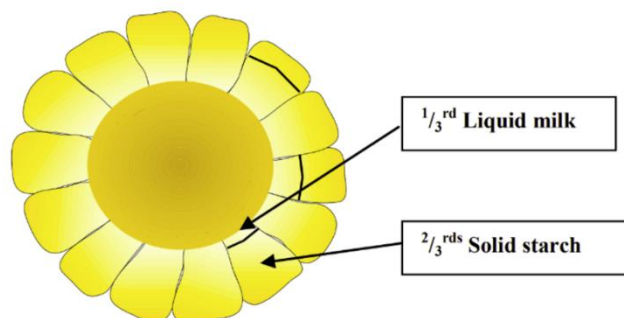
The ideal time to harvest your maize for silage crop is when the whole plant drymatter is between 30 - 38%. Harvesting a crop too early (below 30% DM) will result in reduced yield and a higher risk of silage effluent runoff. Late harvest may result in a loss of quality as plant stover (leaf and stalk) increase in fibre and become less digestible. Dry crops are also difficult to compact properly. In a crop that is still green (i.e., not frosted or drought stressed), the first sign that harvest is approaching is the husk covers turn slightly yellow brown.

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:

- Take a cob from a plant that is at least 20 rows into the crop. The plant that you take the cob from must be in a uniformly planted row.
- Break / snap the cob in half and discard the end of the cob that was attached to the plant.
- Hold the point of the cob downwards and remove a kernel from the "snapped" end.
- Keep the kernel the same way up as when you removed it from the cob. Slide your fingernail along the length of the kernel starting at the flat (dented) end of the kernel.
- Note the point where the solid starch ends and the liquid milk begins. The hybrid will be close to harvest when the milk line is two thirds of the way down the kernel (see Figure1).

- The milk line test is only indicative that harvest time is near. The only sure way to test plant drymatter is by sending a plant to a suitable laboratory.

Figure 1:



4. Harvest time

Most contractors harvest and stack maize silage. Clarify who will be covering the silage and make sure you have adequate supplies of tape (that's compatible with the cover) and tyres or sandbags.

Pioneer® brand inoculants have not been registered for use on organic maize silage. However, maize silage with its high starch content can still be well ensiled, if it has been harvested at the correct time, compacted well, covered properly, and sealed to keep the air out.

Covering the stack properly entails using a high-quality cover, place tyres on top so they touch and seal around the base of the stack with sand, dirt or lime. If silage covers are in good condition, they can be used to line the walls of bunkers the following season. If they are in poor condition, they should be recycled.

Feeding maize silage profitably

The principles behind feeding maize profitably are exactly the same for organic dairy systems as they are for non-organic dairy systems. Creating feed deficits by increasing stocking rate or by altering calving and drying off dates and then filling the feed deficit with maize silage is highly profitable.

1. Increase pasture harvest

New Zealand dairying is based on turning grass into milk. Supplements are most profitably used when they enable the farmer to increase pasture harvest. Maize silage enables the farmer to confidently carry enough cows to maximise pasture harvest.

When maize silage is combined with a stand-off pad with feeding facilities, the system becomes even more robust. Stand-off pads drastically reduce

wastage of feed, reduce pugging (and therefore increase pasture grown) by enabling cows to be kept off pasture when the soil is wet.

2. More days in milk

Turning a non-milking day into a milking day has always been a profitable use of feed. Having a stack of maize silage on hand provides an important buffer in an organic system allowing farmers to cost-effectively extend lactation.

3. Maize silage is a great cow conditioner

Maize silage is the most efficient home-grown feed available to organic dairy farmers for putting condition on cows.

4. Filling feed deficits

Climatic conditions are becoming more variable with longer summer dry periods in many areas. Supplementary feed options for organic farms are more difficult to procure and more expensive.