

Forage Cereal Guide 2007



Pastures for Profit.®

Why are Forage Cereals Used?

To produce larger volumes of quality feed than are possible from pasture, or to provide extra grazing in winter.

Most livestock industries have objectives to increase the amount of meat or milk produced, and to achieve this are striving to increase the amount of forage produced per hectare per year. Research has shown that 28 tonnes of dry matter per hectare can be produced in a year in Canterbury using forage cereals, when the average production from pasture is 15 t DM/ha/yr (Fraser 2005).

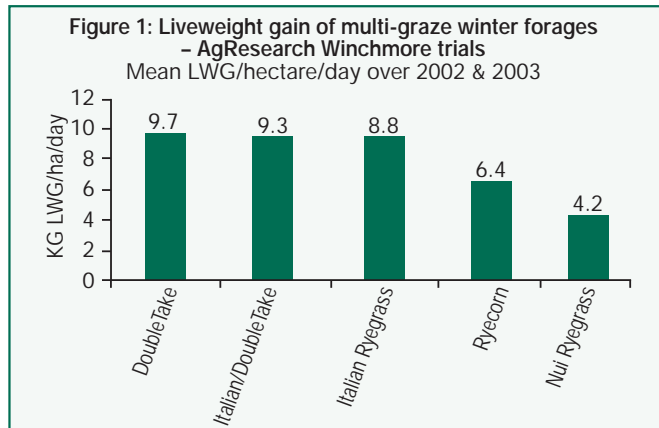


Table 1: Economics of DoubleTake triticale compared with perennial ryegrass pasture, AgResearch Winchmore trials 2002 & 2003

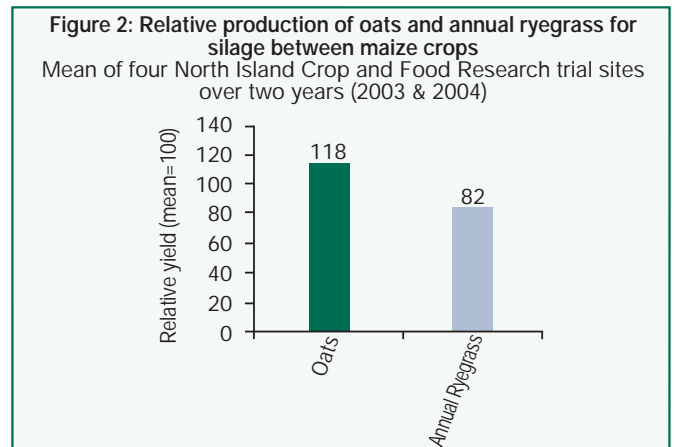
	Winter grazing	Spring silage	Total
DoubleTake	\$1,737	\$2,153	\$3,890 per ha
Nui	\$747	\$1,202	\$1,949 per ha
		Gain	\$1,941 per ha

Cereals can be used to produce similar silage to maize, but cereals grow successfully all year round and have lower input costs. Silage similar to grass silage can also be made from cereals, with the advantage of higher volumes at harvest.

Forage cereals also provide grazing in winter, often providing two to three times more grazing per hectare than pastures (Figure 1). Cereals for winter grazing are planted in autumn, this can suit some farms better than spring-planted brassicas.

The net profit that can be generated by multi-purpose forage cereals (e.g. DoubleTake) can be twice that achieved from pasture (Table 1).

A common use of forage cereals in the North Island is to plant after the harvesting of maize, to produce green-chop silage in spring before maize is planted again. Yields are usually higher than can be achieved with annual ryegrass (Figure 2).



What Types of Cereal can be used?

Oats

Forage oats provide a large amount of feed for a single grazing during winter. They can be planted in February for early-winter grazing, through to April – May in mild climates for late-winter grazing. Oats are also popular for growing between maize crops and harvesting for green silage in September, because they can produce 44% more than annual ryegrass and are up to \$600 per hectare more profitable to grow.

Oats are also planted in early spring to produce green-chop silage. This is an effective way to ensure adequate silage storage in districts where dry spring weather often restricts amounts of grass silage that can be harvested.

Barley

Barley is planted in spring for whole-crop silage. It matures quicker than triticale, so becomes the preferred species when crops cannot be planted until mid to late-spring, or in dryland climates.



Milton Oats

Triticale

Triticale is a cross between wheat and ryecorn. Most autumn-planted triticale cultivars can only be grazed once, but DoubleTake is the only triticale that will reliably grow back after grazing, and can be grazed 1 – 2 times in winter and then kept for spring silage production.

Triticale is also planted in winter and early-spring for whole-crop silage production, with no grazing.

Peas

Peas can be added to spring-planted triticale for whole-crop silage. Provider peas are a good option to boost ME and quality of silage.



DoubleTake Triticale



How to Fit Forage Cereals to Your Farm System

Sheep – most sheep farmers are keen to increase grazing in winter/early spring. This allows more breeding stock to be carried, increasing the number of lambs born in spring, and having more stock to control pasture growth over this period.

Single-graze winter cereals (e.g. oats) can carry large numbers of animals for several weeks on small areas of the farm. This reduces grazing on pastures, either allowing for higher pasture covers at lambing, or higher winter stocking rates. They are a valuable tool on dryland farms, being able to be drilled deep into dry soils in February, germinating as soon as the first autumn rain falls, and providing post-drought feed more rapidly than other options.



Mature oat crops should not be fed to pregnant ewes as a sole diet within three weeks of lambing as they may not be able to provide enough protein and calcium.

The multi-graze cereal DoubleTake provides the same benefits of oats, but has the possibility of an extra grazing. DoubleTake complements winter brassica crops well, because it is usually ready for grazing in early winter before the brassica, and its regrowth allows for further grazing after the brassica has been grazed. It has an advantage over oats in cooler climates for single-grazed forage because it is more tolerant of frost and maintains better quality at grazing.



Milton Oats

Cereals are also used to produce high volumes of spring silage on sheep farms. Options include DoubleTake, either for multi-grazing, or for no-grazing if planted in early winter. Silage can be harvested in mid-spring as green-chop silage (can suit dryland farms), or whole crop cereal silage (WCCS) in late December.

Dairy – forage cereals are generally used for two purposes, producing spring-harvested silage and/or providing winter grazing. Farms with winter run-off blocks use them for winter grazing, but a significant land area is needed because they cannot produce the mass of standing feed that spring-planted winter brassica can (cereals are in the ground for half the time).

However, if the aim is to produce the maximum amount of feed per year from a run-off block, double-cropping systems with forage cereals will do this. Autumn-planted cereals (e.g. oats) can be grazed in winter, then paddocks can be drilled in winter/early spring with triticale for whole crop cereal silage (harvested January), then drilled again in cereal for winter grazing. This system can produce up to 26 tonnes DM/ha/year, compared with 8-12 tonnes from a single brassica crop. Another common crop rotation is winter brassica followed by August-planted triticale for WCCS, and then sowing in pasture in late summer (can produce up to 28 tonnes DM/ha over 13 months). Multi-graze crops can be hard to manage with dairy cows as they often eat too much of the forage and can cause pugging on heavy and wet soils.

Many dairy farms also feed cereal silage to milking cows, mainly at the start and end of lactation. The silage is usually grown on run-off blocks, or purchased from local growers. Crops are sometimes grown on milking platforms where they fit in with pasture renewal programmes.



Regrowth of **DoubleTake** (L)
vs. a standard triticale (R)

Beef – autumn-planted forage cereals are used to increase the winter carrying capacity of breeding cows and finishing cattle, or the liveweight gain of young cattle (Figure 1). Single or multi-graze crops can be used. Multi-grazed crops allow spring silage to be harvested, which is valuable for maintaining liveweight gain (LWG) in periods when pasture quantity or quality is low. Cereal silage is also used to boost feeding levels when finishing cattle, either as a supplement to pasture, or in a feed-lot system.



DoubleTake triticale

Deer – DoubleTake is very palatable to deer and it has good nutritional quality. It must however be block grazed with back fences to create reliable re-growth. Oats can be strip grazed, but for young stags, they must be grazed before losing protein content. The later maturing and higher quality oats (e.g. Hokonui) are preferred options. Silage is also used to boost nutrition of deer when pasture availability is low.



Table 2. Best cereal options for desired uses

Desired Use	Planting Time	Best Options	
		South Island	North Island
Single-graze in early winter	February-March	Milton oats	Milton oats
Single-graze in late winter	March-April	Hokonui oats	Milton oats, DoubleTake
Green-chop silage after maize, no grazing	March-April	Milton oats, DoubleTake triticale	Milton oats, DoubleTake triticale
Two grazings in winter, and spring silage	February-March	DoubleTake triticale	DoubleTake triticale
One grazing in winter, and spring silage	Late March-April	DoubleTake triticale	DoubleTake triticale
Spring silage and no winter grazing	April-June	DoubleTake triticale	DoubleTake triticale
Spring whole-crop silage and no winter grazing	July-September	Rocket triticale, Crackerjack triticale DoubleTake triticale	Rocket triticale, Crackerjack triticale DoubleTake triticale
Spring green-chop silage	July-September	Milton oats	Milton oats
Spring whole-crop silage	September-November	Salute™ barley	Salute™ barley

Terms Used with Forage Cereals

- **Triticale** – cross between wheat and rye. Most are bred for spring planting and grain, but a few are designed for autumn planting and single-grazing, or spring silage. DoubleTake is the only triticale bred for multi-grazing.
- **Oats** – single-graze cereals.
- **Barley** – spring-planted cereal for whole-crop silage.
- **Single-graze** – cereals grown for one grazing only. Includes oats and some triticales.
- **Multi-graze** – cereals that reliably grow after autumn or winter grazing. DoubleTake is the best cereal for this. Other triticales, barley and oats will only re-grow in mild climates and with very careful management.
- **Whole crop cereal silage (WCCS)** – cereals harvested when grain has reached full size but still soft (38%DM). Autumn sown DoubleTake or spring sown triticales and barley.
- **Green-chop cereal silage** – cereal silage harvested at the boot stage and wilted, similar properties to pasture silage.

Establishment and Management

Time of sowing is critical for forage cereals, as it has a major impact on total yield, days to first grazing, and quality at grazing. Cereals can be planted early (late January) in southern regions to provide grazing during ewe mating. Oats planted in late February and March will provide high yields for grazing in mid-to-late winter. To reliably achieve two winter grazings from DoubleTake, it must be planted by late-February in both Canterbury and the North Island. Triticale for silage and no grazing can be planted in winter or early-spring (May to September).

Paddock preparation is less critical than for new pastures, as cereal seed is less sensitive to deep sowing, and they are more competitive with weeds. Best results will however be achieved from paddocks that have been sprayed and carefully cultivated, or sprayed and direct-drilled. It is very important to drill nitrogen-based fertiliser (e.g. 150-250 kg/ha DAP) with the seed, especially when direct-drilling. Seed can be drilled at 3-4 cm, depending on soil density. Shallow drilling (<2 cm) on loose soils increases the chances of bird theft.

Seeding rates and treatment vary. Oats are sown at about 100 kg/ha. Triticale seed is much larger than oat seed, so the sowing rates must be higher (DoubleTake is planted at 140-180 kg/ha). The seed size and germination percentage varies between lines of seed, so your retailer can advise you on the best sowing rates. If insects such as grass grub are present, treating seed with Gaucho® or Raxil Combi is recommended, especially for autumn-plantings. Raxil® or Raxil Combi are commonly used on cereals planted in winter and spring, to control seed-borne diseases.



Grass grub

Insects may need controlling, especially if seed is not treated. Aphids carry barley yellow dwarf virus (BYDV), and crops planted in late autumn may need spraying (e.g. with Karate Zeon at 20-40 ml/ha) at GS12 and then 21 days later. Slugs need to be monitored and controlled, especially when direct-drilling.

Weed control is important with cereals, as they can impact on yields and quality at grazing or cutting. Assess the need to spray early, and apply before the cereal seedlings cover the ground. Many herbicides are available, contact your seed retailer.



Post-establishment fertiliser is necessary on most crops to achieve reasonable yields. The establishment fertiliser should be enough until after the first grazing with early autumn-planted DoubleTake crops. Nitrogen (40-70 kg N/ha) should be applied after the first grazing. Oat crops will need at least one nitrogen application if grazed in winter, and two if grown for silage in spring. Application rates will depend on paddock history, soil type, and previous leaching. As with most winter-active forages, nitrate toxicity can occur on cereals. Excessive rates of nitrogen fertiliser should be avoided, as should nitrogen fertiliser within four weeks of grazing. Certain crop growth and weather conditions make toxicity more likely to occur, and nitrate levels can be checked by taking fresh samples to your veterinarian.

Crops grown only for silage production (e.g. triticale or barley), should be planted with nitrogen-based fertiliser (e.g. 150-250 kg/ha DAP). Spring-planted triticale crops normally have 66% of their total nitrogen requirements applied at the end of tillering (GS31). Further nitrogen should be applied at flag leaf emergence (GS39) to allow crops to achieve their yield potential. Barley crops require most of their total nitrogen to be applied at earlier growth stages because the crop develops at a faster rate. Normally, 60% is applied at sowing and 40% at the end of tillering (GS31).

When DoubleTake is planted in autumn for multi-grazing, the first grazing is important for subsequent production. A common mistake is to let it develop too much herbage before grazing, and this reduces tiller populations. It should be grazed when it reaches 20-30 cm in height (this can be 60-90 days after planting). A first grazing at 20 cm may be needed with early-planted DoubleTake during warm autumns. If a paddock will take more than five days to graze, start at the lower height so that the last breaks are not too rank. Graze animals for a short duration (1 day) and move them to leave a 10 cm (1200-1500 kg DM/ha) residual. Back-fencing is essential. If you want to restrict animal intake, a run-off paddock may be needed so that the DoubleTake is only grazed for part of the day. Avoid grazing when the soil is wet and soft enough to cause any pugging, because this will severely reduce recovery. The second grazing should be done in a similar manner. If the crop is to be kept for whole crop cereal silage in spring, grazing should be completed by late August in the South Island, and the end of July in the North Island.



Back-fencing is essential when grazing **DoubleTake**

Grazing of oats is usually done by strip grazing, so that intakes can be restricted and utilisation maximised. Crops should be grazed before they become too mature because feed quality will decline as leaves turn from green to yellow, and the proportion of stem increases. Plan the sowing dates and cultivar maturity to suit dates you need to graze the paddock, if you want grazing in August there is no point planting early-maturing oats in February. Over-mature oats can have low protein levels, so are not suitable for grazing with pregnant ewes within three weeks of lambing, or with young male deer.



Murray Davidson was impressed with the winter feed from Milton oats after a Canterbury drought



Red-band gumboot height is ideal for grazing

Managing DoubleTake for spring silage. Management through winter can have a large impact on spring silage yields. The aim of winter management is to encourage tiller development and survival, through good fertiliser use and careful grazing. For autumn-planted crops, grazing is necessary to ensure the crop does not get excessively bulky before stem elongation occurs in spring. For detailed information on how to manage DoubleTake in spring for silage, see the website www.agricom.co.nz.



Basic Recipes for Growing Forage Cereals

The following are typical management plans for autumn forage cereals, but there will obviously be a huge range of variations to this according to individual situations.

1. Oats – basic management recipe for Milton or Hokonui planted in autumn for grazing.

Timing	Action	Details (examples)
Early February	Spray out old pasture	Glyphosate at 3-6 l/ha plus surfactant
Early March	Monitor slugs and grass grub	Wet sacks or boards, digging
Early March	Second spray	Glyphosate at 2-4 l/ha plus surfactant
Mid-March	Drill oats and fertiliser	100kg/ha oat seed 200kg/ha DAP at drilling
3 weeks after sowing	Assess weeds and spray if needed	e.g. MCPA at 3 l/ha
5 weeks after sowing	Apply nitrogen	80-150 kg/ha urea
When crop has reached target yield, or stem starts to become thick and dominant	Start grazing	Strip grazing
Before last break has lost quality	Finish grazing	

2. DoubleTake – basic management recipe for autumn-planting, winter grazing and spring silage.

Timing	Action	Details (examples)
Early February	Spray out old pasture	Glyphosate at 3-6 l/ha plus surfactant
Late February	Monitor slugs and grass grub	Wet sacks or boards, digging
Early March	Second spray	Glyphosate at 2-4 l/ha plus surfactant
Mid-March	Drill seed and fertiliser	160kg/ha seed with 200kg/ha DAP with drilling
3 weeks after sowing	Assess weeds and spray if needed	e.g. MCPA at 3 l/ha
When crop reaches 20-30 cm	Start first grazing	Block grazing with back fences while soil firm
After first grazing	Apply nitrogen	80-150 kg/ha urea
When crop reaches 25 cm,	Start second grazing	Block grazing with back fences while soil firm, no later than mid-August
Late August	Begin management for spring silage	Nitrogen, weed spray, growth regulator, fungicide

3. Triticale – basic management recipe for Rocket or Crackerjack planted winter/spring for silage

Timing	Action	Details (examples)
July – September	Spray out old pasture or winter crop residue	Glyphosate @ 3-6 l/ha + surfactant
Sow early in spring (July – September)	Drill seed and fertiliser	175-185 kg triticale, 250kg DAP
4-6 weeks post-sowing (GS31)	Assess weed pressure. Consider first fungicide	3 l/ha MCPA. Tank mix fungicide with herbicide
4-6 weeks post-sowing (GS31)	Main nitrogen application. Consider plant growth regulator	75-100kg N/ha (depending on soil fertility)
Flag leaf/booting stage (GS39)	Fungicide application. Final nitrogen	Protectant + curative fungicide 50-70kg N/ha

N.B. Plant growth regulators will benefit crops sown in exposed/high fertility situations – seek advice on timing and application.

4. Barley – basic management recipe for Salute™ planted in spring for silage

Timing	Action	Details (examples)
Early October	Spray out old pasture	Glyphosate @ 3-6 l/ha + surfactant
October/November	Sow Salute barley and fertiliser	150kg/ha seed + NPK fert providing 75-100kg N/ha
4-5 weeks post-drilling (GS31)	Assess weeds and spray if required	e.g. MCPA at 3 l/ha
4-5 weeks post-drilling (GS31)	Tank mix fungicide with above herbicide	Product mix to provide curative plus protectant properties
4-5 weeks post-drilling (GS31)	Final nitrogen application	50-75kg N/ha

Approx maturity of spring-sown cereal crops for whole-crop silage

Triticale	
Early-spring sown (e.g. July/August)	140* days to harvest
Mid-spring sown (e.g. September/October)	120* days to harvest

Barley	
Mid-spring sowings (e.g. October)	100–110* days to harvest
Later sowings (e.g. November)	80–100* days to harvest

* Seasonal variations will influence maturity timeframes.



Harvesting Cereal Silage

The correct stage to harvest whole-crop silage is when the grain has reached its full size and weight, but before it becomes hard. The grain needs to get to a greater size than the seed you planted. The grain will have changed from a green colour, to a yellow-golden colour. When you squeeze a grain between your finger nail and finger, it should crease easily, but no liquid or white 'slop' should ooze out of the grain. If you pull off the outer coating of the seed, the inside of the grain will be white and have a texture similar to Colby cheddar cheese.

At this stage, the dry matter percentage of the whole crop above harvest height should be 36-40%. If it is drier than 44%, the silage will be difficult to compact and there will not be enough moisture for good ensiling. Also, the grain will be hard, and more likely to be un-digested by animals.



Correct cheesy-dough stage

Where the crop is to be baled, farmers may find it easier to cut slightly earlier (34-37%) to prevent brittle stems poking through the silage wrap.

To produce good quality silage, it is important to cut the crop at the right stage, but also to consolidate and cover well to exclude air, and to manage the pit face when feeding out to minimise spoilage.



At the correct harvest stage, the crop will have changed from green to mostly yellow.

Trials have shown that inoculation of cereal silage with Sill-all® has significant benefits. pH levels are raised, and lipid and dry matter loss is reduced.

Once harvested, it pays to protect the silage from rodent attack, as they are strongly attracted to the grain and put holes in covers, leading to spoilage of the crop. Options include maintaining a perimeter of baiting, and/or a diesel barrier. Putting a layer of grass silage on a pit of whole crop cereal silage reduces the attraction of rats and mice.

The Value of Whole Crop Cereal Silage (WCCS)

WCCS is a breakthrough for New Zealand farming. It creates the opportunity to substantially increase the amount of feed produced from an area of land. For example, on irrigated pastures it is considered that 18 t DM/ha is the limit for annual feed production. Large scale trials by AgResearch have shown that double cropping systems with WCCS can produce 28 t DM/ha in a year.



Being able to produce large volumes of quality silage creates many opportunities to increase farm profitability. Sheep farmers use it to boost feeding over winter and produce feed reserves for droughts (including during mating in droughts). Dairy farmers use it in autumn to increase days in milk and cow condition, to fill feed deficits in early spring, and supplement brassica crops during winter. Innovative beef farmers use it to winter large numbers of finishing cattle on small areas, then spread them out to utilise the spring pasture flush.



WCCS has a very useful nutritional balance. It has a high concentration of carbohydrates, including starch which is important for putting condition and weight on cattle. It has a good level of effective fibre, and is used to balance other low fibre feeds (e.g. winter brassicas, Italian ryegrass). Trials have proven WCCS produces good milk responses in dairy cows, and liveweight gain in cattle and sheep.

To achieve good yields and quality, it is important to manage the crop well during the growing (see "Basic Recipes" section), harvesting (see "Harvesting Cereal Silage" section), and feeding out stages.

Further Information

For more detailed information, see the website www.agricom.co.nz.

For local advice, contact your seed retailer. Also available is the book, "Whole crop cereal silage – production and use". Contact Agricom to purchase a copy.

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